

14th Edition

# The Blue Book

OCULAR DISORDERS  
PRESUMED TO BE INHERITED  
IN PUREBRED DOGS

GENETICS COMMITTEE OF  
THE AMERICAN COLLEGE  
OF VETERINARY  
OPHTHALMOLOGISTS

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2022



## Foreword

Ocular disorders, proven or presumed to be inherited in purebred dogs, have been a topic of intense dialogue by Diplomates of the American College of Veterinary Ophthalmologists (ACVO) for many years. Discussions commenced in the latter half of the 20<sup>th</sup> century during the early days of this College's inception, have continued into the 21<sup>st</sup> century, and will no doubt continue for years to come. Our knowledge of the existence, nature, progression, and inheritance of ocular disorders continues to expand as this field of veterinary science evolves. The Genetics Committee of the ACVO was originally formed in response to requests by registries, breed groups, and veterinarians, with the intent to provide a scientific advisory panel and guidelines regarding ocular disorders in purebred dogs. The Genetics Committee of today remains engaged in an ongoing effort to update information on ocular disorders for this purpose.

The content of this production has originated from several sources as the ACVO recently created a Companion Animal Eye Registry (CAER), which is a joint effort between the Orthopedic Foundation for Animals (OFA) and the ACVO. The addition of eye examination results to the OFA database makes the OFA the most complete source of canine health screening results in the world, allowing responsible breeders to make more informed breeding decisions in an effort to reduce the incidence of inherited disease.

The generation of statistical information is made possible by the efforts of dedicated breeders of purebred dogs who present their dogs to Diplomates of the ACVO for an OFA Companion Animal Eye Registry examination. The research copies of these examinations are then conscientiously submitted to OFA by the examining Veterinary Ophthalmologists. These data generate annual statistics. The statistics for each breed are then reviewed by the Genetics Committee for the most recent year and from the previous 5 years. Recommendations regarding the ocular disorders listed for each breed and the breeding advice are compiled following guidelines detailed elsewhere in this publication. A comprehensive review of the scientific literature since the last published edition was undertaken by all committee members. The scientific articles and breed disorders from the statistical and literature review have been added to the information on each breed in the production of this document. The collective educated clinical experience of the committee members is utilized to reach a consensus of opinion in areas where there remains a paucity of hard scientific proof regarding certain identified breed problems.

The current Genetics Committee has instituted an annual scientific literature search, in addition to the previously established yearly statistical data review. This information is compiled and submitted in an effort to maintain a bank of current information for future editions and versions of this document. The content of all editions past, present, and future will remain dynamic and ever changing as more precise technologies advance the study of the canine genome, as continued scientific research expands our knowledge, and as the database grows.

It is an honor and a privilege to serve the ACVO, our fellow Diplomates, reputable dog breeders, and our most trusted canine companions in this endeavor.

Genetics Committee 2023

Sony Kuhn Asif (Chair), Melissa Kubai (Co-chair), Freya Mowat (Past Chair), Ursula Dietrich, Katelyn Fentiman, Simone Iwabe, Sami Pederson, Emily Sharp

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## **14th Edition 2022 Version Acknowledgements**

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The ACVO Board of Regents

Genetics Committee Chairs Dr. Andras Komaromy 2006-2008, Dr. Katie Diehl (2009-2011), Dr. Jacqueline Pearce (2011-2012), Dr. Carrie Breaux (2011-2013), Dr. Kenneth Pierce (2014), Dr. Wendy Townsend (2015), Ellen Belknap (2016), Jessica Meekins (2017), Renee Carter (2018), Adam King (2019), Jane Ashley Huey (2020), Katelyn Fentiman (2021), Freya Mowat (2022) and all previous Genetics Committee members

Eddie Dziuk, Chief Operating Officer, and Erika Werne, CAER Program Manager, for the OFA

## Introduction

### What is the purpose of this book?

The Orthopedic Foundation for Animals (OFA), Canine Eye Registration Foundation (CERF), other breed registry groups, breed clubs, and practicing veterinarians have requested that the American College of Veterinary Ophthalmologists (ACVO) provide a scientific advisory panel to furnish guidelines regarding ocular disorders of major concern to purebred dogs. The Genetics Committee of the ACVO was formed in response to these requests and is engaged in an ongoing effort to update information on ocular disorders proven or suspected to be hereditary in purebred dogs. The compendium of ocular disorders and breeding recommendations which follow are interim guidelines. They are reviewed regularly and revised whenever additional information becomes available.

### How can this information be used?

**National and international breed clubs** are encouraged to submit their input regarding breeding decisions for ocular disorders found in their breeds. **Local breed clubs** can participate by encouraging and organizing ocular examination clinics and forwarding their requests and concerns to their national organization. **Practicing veterinarians** are encouraged to contribute by informing all owners of potential breeding animals of the value and availability of ocular examinations, prior to breeding. Information regarding ocular disorders found in litters or individuals can be forwarded to the Genetics Committee via any ACVO diplomate. **Individual breeders** wishing to uphold high ethical standards for the improvement of their breed are urged to contribute by annual examination of their breeding animals and by encouraging the same from other breeders. Further information can be obtained from the Orthopedic Foundation for Animals (OFA): 2300 E Nifong Boulevard, Columbia, MO, 65201-3806, 573-442-0418. Only through increased awareness of the problems and a sustained cooperative effort to disseminate accurate information, will we be able to control and/or eliminate hereditary eye diseases in purebred dogs.

### How do we identify an inherited eye disease?

Although there are noteworthy exceptions, most of the ocular diseases of dogs which are presumed to be hereditary have not been adequately documented. Genetic studies require examination of large numbers of related animals in order to characterize the disorder (age of onset, characteristic appearance, rate of progression) and to define the mode of inheritance (recessive, dominant). In a clinical situation, related animals are frequently not available for examination once a disorder suspected to be inherited is identified in an individual dog. Maintaining a number of dogs for controlled breeding trials through several generations is a long and costly process. Both of these obstacles are compounded by the fact that many ocular conditions do not develop until later in life. Due to the potential for disease to arise from inherited genetic defects at any age, the Genetics Committee recommends annual eye exams.

Until the genetic basis of an ocular disorder is defined in a published report, we rely on what statistical information is available from registry organizations, informed opinions and consensus from ACVO diplomates, and must satisfy ourselves with terms like "presumed inherited" and "suspected to be inherited." Several companies provide information on genetic testing which greatly assists in providing more information and data to aid in defining the canine genetics of ocular diseases.

**When do we suspect that a disorder is inherited in a given breed?**

- When the frequency is greater than in other breeds
- When the frequency increases in a given breed as a whole
- When the frequency is greater in related dogs within a breed
- When it has a characteristic appearance and location
- When it has a characteristic age of onset and course of progression (predictable stages of development and time for each stage to develop)
- When it looks identical to an entity which has been proven to be inherited in another breed

Special thank you to the “Father of Veterinary Medical Genetics,” Donald F. Patterson, DVM, DSc. Dr. Patterson, who died in 2013, was Emeritus Professor of Medicine and Medical Genetics, University of Pennsylvania School of Veterinary Medicine and Emeritus Professor of Human Genetics, University of Pennsylvania School of Medicine. These guidelines on the heritability of disorders in dogs are based on his lectures and publications.

## Guidelines Used by the ACVO Genetics Committee in Making Breeding Recommendations

In this book, we chose the term "**BREEDING ADVICE**" and intentionally avoided the words "certifiable" and "registerable." The ACVO does not serve as a registry organization. Registry organizations operate independently of the ACVO and set their own standards for registration. However, the OFA does follow the guidelines set forth by the ACVO Genetics Committee in this publication. Any registry organization may use the information in this compendium and results of examinations performed by ACVO Diplomates in the registering of animals with regard to breeding suitability as they see fit.

It is important to recognize that the sensitivity of genetic disorder detection is greater when large numbers of dogs are examined. The extensive number of disorders listed in this book for some breeds may reflect the popularity of the breed and the numbers of animals evaluated. Conversely, the lack of disorders listed for other breeds often reflects only the paucity of examinations reported for each breed. For these reasons, the ACVO Genetics Committee strongly recommends annual evaluations of dogs of all breeds as the imperative first step in the control of hereditary ocular disorders. We would like to acknowledge the contribution of the Orthopedic Foundation for Animals (OFA) and Canine Eye Registration Foundation (CERF) for providing statistical summaries of ophthalmic examinations from their files.

**For each breed, specific ocular disorders have been listed which are known or suspected to be inherited based on one or more of the following criteria:**

- 1) There are published reports in the scientific literature regarding a condition in a particular breed with evidence of inheritance.
- 2) The incidence of affected animals (from OFA and CERF reports) is greater than or equal to 1% of the examined population with a minimum of five affected animals per five year period. Regardless of the population of dogs examined, if 50 or more affected individuals are identified in a five year period, the entity will be listed for that breed.
- 3) A specific request from a breed club that a condition be included for their breed may be considered at the ACVO annual meeting of the Genetics Committee if information is received by August 1. Such requests are reviewed critically and must include specific documentation as to the disorder in question and the numbers seen. Further information from the breed club may be requested. The request must receive agreement by a majority of the committee.
- 4) There is overwhelming opinion by a majority of the Genetics Committee members that clinical experience by ACVO Diplomates would indicate a particular condition should be listed for a breed, in spite of the absence of direct evidence of affected animals on OFA or CERF reports.
- 5) Results of genetic laboratory research and genetic testing.

**The "Breeding Advice" given is determined by the significance of the condition to vision and/or very strong evidence of heritability:**

Two categories of advice regarding breeding have been established:

**NO:** Substantial evidence exists to support the heritability of this entity AND/OR the entity represents a potential compromise of vision or other ocular function.

**BREEDER OPTION:** Entity is suspected to be inherited but does not represent potential compromise of vision or other ocular function.

When the breeding advice is "**NO**," even a minor clinical form of the entity would make this animal unsuitable for breeding. When the advice is "**BREEDER OPTION**," caution is advised. In time, it may be appropriate to modify this stand to "**NO**" based on accumulated evidence. If, in time, it becomes apparent that there is insufficient evidence that an entity is inherited, it may be deleted from the list.

**There are currently eleven disorders for which there is an unequivocal recommendation against breeding in all breeds:**

These are conditions which frequently result in blindness and for which there is definite evidence of heritability in one or more breeds. However, these disorders will not be listed on the individual breed page for a given breed, unless they also meet the criteria described above.

- **Keratoconjunctivitis sicca (KCS)** – Breeding is not recommended for any animal demonstrating keratitis consistent with KCS. The prudent approach is to assume KCS to be hereditary except in cases suspected to be non-genetic in origin. See \*note.
- **Glaucoma** – See \*note.
- **Persistent Pupillary Membranes**
  - **Iris to Lens**
  - **Iris to Cornea**
  - **Iris Sheets**
  - **Endothelial Opacity/No Strands**
- **Cataract** – Breeding is not recommended for any animal demonstrating partial or complete opacity of the lens or its capsule. See \*note.
- **Lens luxation or subluxation** – See \*note.
- **Persistent hyperplastic primary vitreous (PHPV)/persistent hyperplastic tunica vasculosa lentis (PHTVL)** – See \*note.
- **Retinal detachment** – See \*note.
- **Retinal atrophy – generalized (PRA)** - Breeding is not advised for any animal demonstrating bilaterally symmetric retinal degeneration (considered to be PRA unless proven otherwise).
- **Retinal dysplasia, geographic or detached forms** – See \*note.
- **Optic nerve coloboma**
- **Optic nerve hypoplasia**

*\*Note: The prudent approach of these disorders is to assume they are hereditary except in cases specifically known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, or nutritional deficiencies.*

**The following breeds are recommended to have a preliminary examination prior to initial pharmacological dilation to best facilitate identification of these disorders:**

**Dalmatian** – iris hypoplasia/sphincter dysplasia  
**Australian Shepherd** – iris coloboma  
**Miniature American Shepherd/Miniature Australian Shepherd** – iris coloboma  
**Toy Australian Shepherd** – iris coloboma  
**Mudi** – iris hypoplasia/iris coloboma

### **What can be detected during an Eye Certification Examination?**

A routine eye screening examination includes indirect ophthalmoscopy and slit lamp biomicroscopy following pharmacological dilation of the pupils. Gonioscopy, tonometry, Schirmer tear test, electroretinography, and ultrasonography are not routinely performed; thus, dogs with goniodysgenesis, glaucoma, keratoconjunctivitis sicca, or some early cases of progressive retinal atrophy might not be detected without further testing.

The diagnoses obtained during an ophthalmic eye certification examination refer only to the **phenotype** (clinical appearance) of an animal. Thus, it is possible for a clinically normal animal to be a carrier (abnormal **genotype**) of genetic abnormalities.

An individual ACVO Diplomate may disagree with the breeding advice contained in this compendium. It is appropriate for this examiner to contact the ACVO Genetics Committee to voice disagreement, initiate change, or suggest additions. The members of the Genetics Committee represent the ACVO but acknowledge that the information generated for a breed may not agree with the knowledge and clinical experience of every individual ACVO Diplomate.

### **What is the role of the responsible dog breeder?**

The final beneficiary of the information in this book is the dog breeder. It is up to the conscientious breeder to use this information along with other criteria in selecting which animals to breed. To assist this determination, current certification is recommended. Animals currently free of heritable eye disease will be issued a certificate on receipt of the examination/application by OFA. To avoid confusion between a normal animal (no evidence of heritable eye disorders) and one that may have a minor fault coming under the advice of Breeder Option, the Breeder Option category will be printed on the certificate. This is intended to stimulate conversation as to the specific nature of the Breeder Option condition found in that particular animal, allowing breeders using a dog in a breeding program to make an informed decision.

**There are many ocular conditions which are a direct result of selection for a facial conformation considered desirable by breeders.**

These include:

- Entropion
- Ectropion
- Macroblepharon
- Exposure keratopathy syndrome

Facial conformation with excessively prominent eyes, heavy facial folds, or eyelids which are either inverted or everted predispose animals to corneal irritation, discomfort, and if left untreated, can lead to loss of vision. A responsible breeding program should recognize and select away from these exaggerated facial features.

## THE ROLE OF GENETIC TESTING IN THE DETECTION OF OCULAR DISEASE

Genetic testing plays a very important role in the diagnosis of disease. However, it is important to be aware of the limitations of genetic testing and understand its role in the detection and control of genetically inherited diseases.

Genetically inherited diseases are caused by a deleterious sequence change (mutation) in the DNA that results in an abnormal protein (protein can be absent, have insufficient function, or have an abnormal function) that results in disease.

Genetic tests are developed by comparing the DNA sequence of a normal animal to that of an animal with disease. This allows the identification of a particular DNA sequence that can be causally associated with the disease. This is an extremely powerful tool that, in some cases, allows for identification of disease even before it is evident clinically.

However, a particular test is only capable of detecting the DNA sequence it was designed to detect. That is, the DNA test only tests for a specific change in the DNA that can cause disease. For example, a DNA test specific for the *PDE6B* gene mutation (responsible for the rcd1 form of PRA in the Irish Setter) will not detect any abnormalities in other breeds or mixed breeds that have other mutations in the same gene. Thus the specificity of a DNA test is also its limitation, and in the case of PRA in Irish Setters it is specific for the Irish Setter defect and not for any other defects.

In polygenic disorders, a genetic test cannot evaluate the integrity of all the proteins that make up a particular cellular process. Thus, it is possible for a DNA test that has been associated with a disease to be normal and yet the disease can still be present. The disease could be caused by an abnormality in one of the other genes that are involved with that particular cellular process. The defect in the other protein still results in an abnormal cellular process, which still results in disease. A perfect example of this is observed in oculo-skeletal dysplasia in Labrador Retrievers and Samoyed dogs. In both breeds the diseases are clinically identical, yet caused by mutations in different genes involved in fibril formation of a specific kind of collagen molecule.

Thus, obtaining a DNA test that is normal does not guarantee absence of disease. It only guarantees that the particular change the DNA test was designed to detect is not present, and that disease from that particular change will not occur. This is why genetic testing should be combined with ophthalmic examination for maximum efficacy. An ophthalmic exam evaluates the sum total or “result” of all the cellular processes required to maintain ocular health and result in vision, and is an essential part of the ocular wellness exam to ensure that other important clinically recognizable diseases are not present.

## Breeder Option Codes

### A – Eyelids

- A1 Entropion
- A2 Ectropion
- A3 Distichiasis
- A4 Ectopic Cilia
- A6 Imperforate Lacrimal Punctum

### B – Nictitans

- B1 Cartilage Anomaly/Eversion
- B2 Gland Prolapse

### C – Cornea

- C1 Corneal Dystrophy – Epithelial/Stromal
- C2 Corneal Dystrophy – Endothelial
- C4 Pigmentary Keratitis/Keratopathy

### D – Uvea

- D1a Uveal Cyst – Free Floating
- D1b Uveal Cyst – Single
- D1c Uveal Cyst – Multiple
- D2 Iris Coloboma
- D3 Persistent Pupillary Membranes – Iris to Iris
- D4 Iris Hypoplasia

### E – Lens

- E1 Cataract – Suspect Not Inherited
- E2 Posterior Y Tip Suture Opacities

### F – Vitreous

- F1 Persistent Hyaloid Artery
- F2a Vitreous Degeneration – Syneresis
- F2b Vitreous Degeneration – Anterior Chamber

### G – Fundus

- G1 Retinal Dysplasia – Folds
- G5 Micropapilla
- G6a CMR-Type Retinopathy
- G6b Retinopathy

## Glossary of Terms

*(For more detailed definitions, the reader is referred to medical and genetic scientific texts.)*

**Achromatopsia:** see **Day blindness**

**Canine multifocal retinopathy:** characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). The condition includes numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina with accumulation of material that produces gray-tan-pink colored lesions (multifocal bullous retinal detachments). These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs and might not progress or progress slowly, or may appear to heal with discrete areas of tapetal hyper-reflectivity or hyperpigmentation. Most dogs exhibit no noticeable problem with vision despite their abnormal appearing retinas.

**Cataract:** any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies.

**Ceroid lipofuscinosis:** an inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease.)

**Choroidal hypoplasia:** a congenital, inherited, non-progressive defect primarily affecting the choroid resulting in some or all of the following: decreased or lack of pigment in the retinal pigment epithelium or choroid, tapetal thinning, and reduced or abnormal choroidal blood vessels.

**Chronic superficial keratitis (CSK):** see **Pannus**

**Collie eye anomaly:** a congenital syndrome of ocular anomalies characterized by bilateral and often symmetrical defects including any combination of **choroidal hypoplasia**, **coloboma**, and **retinal detachment(s)**.

**Coloboma:** a congenital abnormality in ocular development usually characterized by focal absence of tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure.

**Cone degeneration:** the loss of photopic vision caused by selective degeneration of the cone photoreceptors. Also known as day blindness, hemeralopia, or achromatopsia.

**Corneal degeneration:** opacification of one or more of the corneal layers frequently resulting from deposition of lipid or mineral and occurring secondary to chronic inflammation.

**Corneal dystrophy:** non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers (**epithelium**, **stroma**, **endothelium**). The term dystrophy implies an inherited condition. It is usually bilateral although not necessarily symmetrical and the onset in one eye may precede the other.

**Corneal dystrophy - endothelial:** breed-related loss or dysfunction of corneal endothelial cells resulting in bilateral, progressive corneal edema.

**Corneal dystrophy - epithelial, stromal:** breed-related, non-inflammatory, white to silver-colored opacification of the corneal epithelium and/or stroma frequently resulting from deposition of lipid.

**Day blindness:** see **Cone degeneration**

**Dental-skeletal-retinal anomaly (DSRA):** Dental-Skeletal-Retinal-Anomaly (DSRA) is a syndromic condition documented in the Cane Corso. This condition is associated with a MIA3 splice defect that has been identified in all affected dogs with an autosomal recessive inheritance pattern. Clinically affected dogs present with dwarfism, dental abnormalities including loss of enamel and tooth discoloration, as well as early onset retinal atrophy.

**Dermoid:** a congenital, non-cancerous growth occurring on the cornea, conjunctiva, or eyelid typified by the presence of skin-like structures.

**Distichiasis:** the presence of abnormally oriented eyelashes, frequently protruding from Meibomian gland ductal openings.

**Dry eye:** see **Keratoconjunctivitis sicca**

**Dysplasia:** abnormality of development.

**Dystrophy:** non-inflammatory, developmental, nutritional, or metabolic abnormality; dystrophy implies a possible hereditary basis and is usually bilateral.

**Ectopic cilia:** aberrant hairs emerging through the palpebral conjunctiva which often causes ocular discomfort and corneal disease.

**Ectropion:** a conformational defect resulting in eversion of the eyelid margin, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents, and conformation of the skull.

**Entropion:** a conformational defect resulting in inversion of the eyelid margin which may cause ocular irritation. It is likely that entropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents, and conformation of the skull.

**Euryblepharon:** an exceptionally long eyelid marginal length, which may lead to Ectropion or Entropion. Euryblepharon is synonymous with the term macropalpebral fissure.

**Exposure/pigmentary keratitis:** a condition characterized by variable degrees of superficial vascularization, fibrosis, and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos, and macropalpebral fissure.

**Glaucoma:** characterized by an elevation of intraocular pressure (IOP) which causes optic nerve and retinal degeneration and results in blindness. Diagnosis and classification of glaucoma requires tonometry and gonioscopy, which are not part of a routine eye certification examination.

**Glaucoma, pigmentary:** see **Ocular melanosis**

**Goniodysgenesis:** congenital anomaly characterized by the persistence of a variably fenestrated sheet of uveal tissue spanning the iridocorneal angle, extending from the iris base to the peripheral cornea.

Diagnosis is by gonioscopy, which is not part of a routine eye certification examination.

**Hemeralopia:** see **Cone degeneration**

**Imperforate lacrimal punctum:** developmental anomaly resulting in an imperforate opening of the lacrimal puncta. An imperforate lower punctum may result in epiphora, an overflow of tears onto the face.

**Iridocorneal angle:** the junction between the iris and the cornea; the drainage angle. Aqueous humor leaves the anterior chamber via the trabecular meshwork within the iridocorneal angle into the venous circulation.

**Iris coloboma:** a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the eye certification form.

**Iris cyst:** see **Uveal cyst**

**Iris hypoplasia:** a congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the eye certification form.

**Iris melanoma:** see **Uveal melanoma**

**Iris sphincter dysplasia:** a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality has been noted in the Dalmatian breed.

**Keratitis:** inflammation of the cornea.

**Keratitis, punctate:** inflammation of the cornea accompanied by multifocal, coalescing areas of stromal corneal ulceration of variable depth.

**Keratoconjunctivitis sicca (KCS):** an abnormality of the tear film attributed to deficiency of the aqueous portion of the tears. Progressive KCS may result in ocular surface irritation and/or vision impairment via corneal opacification. Also called dry eye. The test for this condition is the Schirmer Tear Test, which is not part of a routine eye certification examination.

**Lens subluxation/luxation:** partial (subluxation) or complete displacement of the lens from the normal anatomic site. Lens luxation may result in elevated intraocular pressure (secondary glaucoma), causing vision impairment, pain, and/or retinal detachment.

**Lenticonus:** an anomaly of the lens in which the anterior or posterior surface protrudes in a conical form; usually congenital.

**Macroblepharon:** an exceptionally large palpebral fissure. Macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

**Merle:** an incompletely dominant phenotype in which heterozygous (M/m) dogs exhibit a coat color phenotype of various dilute color patches, while homozygous (M/M) dogs exhibit marked hypopigmentation and ocular defects, including microphthalmia, blindness and colobomas, and deafness. Deafness and

ocular defects are sometimes seen in heterozygous individuals.

**Micropapilla:** a congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

**Microphakia:** a congenital anomaly in which there is an abnormally small lens.

**Microphthalmos:** a congenital anomaly in which the globe is abnormally small. Commonly associated with multiple ocular malformations and when severe, may affect vision.

**Nictitans cartilage anomaly/eversion:** a congenital anomaly in the nictitating membrane in which the T-shaped cartilage is malformed and/or folded.

**Nictitans gland prolapse:** protrusion of the tear-producing gland of the nictitating membrane from its normal position posterior to the nictitating membrane, to a position superior to the free margin of this structure.

**Nodular granulomatous episclerokeratitis (NGE):** an inflammatory disorder of the sclera and episclera, with occasional corneal involvement, characterized by granulomatous infiltrates. Previously known as **Proliferative keratoconjunctivitis**. This condition is most commonly seen in the Collie.

**Nyctalopia:** loss of scotopic (night) vision. Causes include genetic defects in photoreceptors and in retinal pigment epithelium, either dystrophy or degeneration of affected cells.

**Ocular melanosis:** progressive bilateral and sometimes asymmetrical increase in pigmentation with melanocytic accumulation the uveal tract and adjacent tissues. Ultimately progresses to glaucoma and loss of vision in most cases (melanocytic glaucoma). Not associated with systemic disease or metastases. Most often recognized in Cairn Terriers.

**Optic nerve coloboma:** a congenital abnormality of the optic nerve commonly associated with failure of closure of the optic fissure, resulting in a defect in the optic nerve in the anterior-posterior plane. May result in partial or total vision loss.

**Optic nerve hypoplasia:** a congenital anomaly, which results in a small optic disk diameter and vision loss. Contrast with micropapilla, which may have a similar ophthalmoscopic appearance but without loss of vision.

**Pannus:** a bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the inferior or inferiotemporal cornea, followed by the formation of a vascularized subepithelial opacity that begins to spread toward the central cornea; pigmentation may follow the vascularization. If severe, vision impairment occurs. Plasma cell infiltration of the nictitans may occur in conjunction with CSK, or on its own. (Also called "CSK".)

**Persistent hyaloid artery (PHA):** congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**Persistent hyperplastic primary vitreous (PHPV):** congenital defect resulting from abnormalities in the regression of the hyaloid artery (the primary vitreous) and the interaction of the blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with congenital cataracts and frequently seen with PHTVL.

**Persistent hyperplastic tunica vasculosa lentis (PHTVL):** congenital defect resulting from failure of regression of the embryonic vascular network which surrounds the developing lens. Often associated with PHPV and a patent hyaloid artery.

**Persistent pupillary membranes (PPM):** persistent blood vessel remnants in the anterior chamber which fail to regress normally by 3 months of age. These strands arise from the iris collaret and may bridge from iris to iris, iris to lens, iris to cornea, or form sheets of tissue in the anterior chamber.

**Persistent tunica vasculosa lentis (PTVL):** clinically insignificant posterior epicapsular lenticular opacities resulting from incomplete regression of the embryonic vascular network which surrounds the developing lens.

**Pigmentary glaucoma:** see **Ocular melanosis**

**Pigmentary uveitis:** see **Uveitis, pigmentary**

**Pigmentary keratopathy:** a condition reported in Pugs in which the cornea becomes pigmented, often resulting in vision impairment. Development of pigmentary keratopathy is associated with congenital uveal pathology – iris hypoplasia and the presence of persistent pupillary membranes – but not with other factors such as Schirmer tear test values or medial canthal entropion.

**Plasmoma:** see **Pannus**. Also called Atypical Pannus. Bilateral thickening and depigmentation of the nictitans due to invasion of lymphocytes and plasma cells. It may or may not be associated with corneal involvement (Pannus).

**Progressive rod-cone degeneration (PRCD)** (see also **PRA**): Typically refers to recessively inherited generalized loss of rod photoreceptors followed by cone degeneration. Many different genetic mutations result in a similar phenotypic presentation.

**Progressive retinal atrophy (PRA):** an umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative diseases of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

**Proliferative keratoconjunctivitis:** see **Nodular granulomatous episclerokeratitis**

**Retinal atrophy:** a non-specific term used to describe a decrease in the number and deterioration of the cells of the retina, regardless of cause.

**Retinal degeneration:** see **Retinal atrophy**

**Retinal detachment:** a separation of the neurosensory retina from the retinal pigment epithelium.

**Retinal dysplasia:** abnormal development of the retina present at birth. This condition is non-progressive and recognized in 3 forms: **folds**, **geographic**, **detached**.

**Retinal dysplasia – folds:** seen ophthalmoscopically as linear, triangular, curved or curvilinear foci of retinal folding. May be single or multiple. In puppies, retinal folds can be seen as a transient phenomenon, resolving as the eye retains maturity.

**Retinal dysplasia – geographic:** an irregularly shaped area of retinal development containing both areas of thinning and areas of elevation. This form may be associated with visual impairment.

**Retinal dysplasia – detached:** severe retinal disorganization associated with separation of the neurosensory retina from the retinal pigmented epithelium. This form results in visual impairment.

**Retinopathy:** any non-inflammatory condition of the retina. These conditions can usually be detected by ophthalmoscopic examination, but an electroretinogram (ERG) may be required in some instances (e.g. canine multifocal retinopathy).

**Rod-cone dysplasia:** an inherited retinal disease characterized by abortive or abnormal development of rods and cones. Affected animals become blind early in life, usually within the first 6 months, with the exception of *rcd4* in the Gordon and Irish Setter dogs. See specific breed pages for rod-cone dysplasia type descriptions.

**Rod dysplasia:** abnormal development of the visual cells resulting in vision impairment in dim light by 6 months and total blindness at 3-5 years.

**Uveal cyst:** a pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

**Uveal cyst, anterior chamber:** a pigmented, fluid-filled, epithelial-lined structure arising from the posterior iris or ciliary body epithelium which has detached from its site of origin and is free-floating in the anterior chamber.

**Uveal cyst, ciliary body:** a pigmented, fluid-filled, epithelial-lined structure arising from the ciliary body epithelium and attached to the ciliary body.

**Uveal cyst, iris:** a pigmented, fluid-filled, epithelial-lined structure arising from the posterior iris epithelium and attached to the iris.

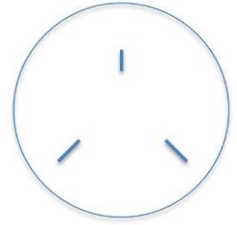
**Uveal melanoma:** a locally invasive melanocytic neoplasm arising within the uveal tract, may be benign (melanocytoma) or malignant (malignant melanoma). Uveal melanomas are reported in higher frequency in German Shepherd Dogs and Labrador Retrievers. Inherited iris melanoma has been reported in Labrador Retrievers.

**Uveitis, pigmentary:** a specific form of uveitis most commonly seen in middle-aged to older Golden Retrievers. Clinically manifests early as pigment deposition in a radial fashion on the anterior lens capsule with iridociliary cysts. Later stages are associated with posterior synechia, fibrinous anterior uveitis, cataract, and ultimately glaucoma. Not associated with systemic disease; may be asymmetric in presentation.

**Uveodermatologic syndrome:** an immune-mediated syndrome of anterior uveitis, chorioretinitis, dermal depigmentation (vitiligo), and hair depigmentation (poliosis). A similar syndrome in humans, called Vogt-Koyanagi-Harada syndrome (VKH), is an autoimmune disease directed against melanocytes. Secondary glaucoma and/or retinal detachment are frequent complications of this disease. Seen most commonly in the Akita, Samoyed, and Siberian Husky breeds.

**Vitreous degeneration:** Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

**Y-suture tip opacity:** These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



## AFFENPINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder Option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# **OCULAR DISORDERS REPORT** **AFFENPINSCHER**

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			411		151	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.2%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.2%	2	1.3%
25.110 DISTICHIASIS			21	5.1%	5	3.3%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.7%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	2	1.3%
70.700 CORNEAL DYSTROPHY			7	1.7%	6	4.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			33	8.0%	15	9.9%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	1.2%	1	0.7%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			3	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	1.9%	1	0.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	2	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	1	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.2%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.2%	2	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	0.7%	1	0.7%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.7%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.2%	2	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT			3	0.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>14</b>	<b>3.4%</b>	<b>7</b>	<b>4.6%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	0.7%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.5%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.5%	0	0.0%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			1	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED			8	1.9%	1	0.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	0.5%	3	2.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			342	83.2%	116	76.8%

## AFGHAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1, 2	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
D.	Cataract	Not defined	1, 3	NO
E.	Y-suture tip opacity	Not defined	1	Breeder Option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### D. Cataract

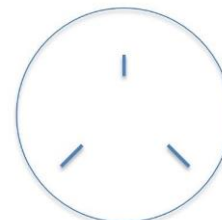
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The characteristic cataract in the Afghan Hound begins as equatorial lens vacuoles in dogs from 4 months

to 2 years of age. The opacities then extend into the anterior and posterior cortices. Rapid progression can occur with visual impairment in young adults. Test breedings have been done which support a hereditary basis; however, the exact mode of inheritance is unknown.

### E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Vainisi SJ, Goldberg MF. *Animal models of inherited disease*. In: *Genetic and Metabolic Eye Disease* Little Brown and Company, Boston, 1974.
3. Roberts SR, Helper LC. Cataracts in Afghan hounds. *J Am Vet Med Assoc*. 1972; 160: 427. PMID: 5014602

## OCULAR DISORDERS REPORT AFGHAN HOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,331		2018-2022 415	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	0	0.0%
10.000 GLAUCOMA			2	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			2	0.1%	0	0.0%
25.110 DISTICHIASIS			28	1.2%	2	0.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	1	0.2%
<b>CORNEA</b>						
70.210 PANNUS			3	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			248	10.6%	58	14.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			4	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			67	2.9%	14	3.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	1	0.2%
93.810 UVEAL MELANOMA			0	0.0%	1	0.2%
<b>FUNDUS</b>						
97.120 COLOBOMA			2	0.1%	0	0.0%
130.110 MICROPAPILLA			0	0.0%	2	0.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			9	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			138	5.9%	30	7.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			6	0.3%	10	2.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			34	1.5%	17	4.1%
100.306 PUNCTATE CATARACT, NUCLEUS			6	0.3%	6	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR			8	0.3%	3	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	0.2%	3	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			4	0.2%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.1%	1	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			13	0.6%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.1%	2	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.1%	1	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			3	0.1%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			23	1.0%	33	8.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.1%	0	0.0%

## OCULAR DISORDERS REPORT AFGHAN HOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,331		2018-2022 415	
		#	%	#	%
<b>LENS Continued</b>					
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>116</b>	<b>5.0%</b>	<b>45</b>	<b>10.8%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		1	0.0%	2	0.5%
110.135 PHPV/ PTVL		1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		6	0.3%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS		7	0.3%	1	0.2%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		6	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		9	0.4%	0	0.0%
120.960 RETINOPATHY		3	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		0	0.0%	1	0.2%
130.150 OPTIC DISC COLOBOMA		3	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		20	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED		34	1.5%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		24	1.0%	23	5.5%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,838	78.9%	272	65.5%

## AIREDALE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
	- endothelial opacity/no strands	Not defined	1	NO
C.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT AIREDALE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 842		2018-2022 138	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	0.4%	0	0.0%
10.000 GLAUCOMA			0	0.0%	1	0.7%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			4	0.5%	0	0.0%
25.110 DISTICHIASIS			58	6.9%	12	8.7%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			9	1.1%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.4%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			30	3.6%	3	2.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			8	1.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			22	2.6%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.8%	4	2.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.6%	5	3.6%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.1%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	1.4%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			7	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			55	6.5%	7	5.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			10	1.2%	5	3.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			6	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.2%	2	1.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			8	1.0%	2	1.4%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.5%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.4%	1	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			9	1.1%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	1.1%	1	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.8%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			5	0.6%	1	0.7%
100.316 INCIPIENT CATARACT, NUCLEUS			2	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.4%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.7%
100.328 Y-SUTURE TIP OPACITIES			1	0.1%	2	1.4%
100.330 GENERALIZED/ COMPLETE CATARACT			4	0.5%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			0	0.0%	1	0.7%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>80</b>	<b>9.5%</b>	<b>14</b>	<b>10.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			4	0.5%	1	0.7%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			7	0.8%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			21	2.5%	1	0.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			9	1.1%	0	0.0%

## OCULAR DISORDERS REPORT AIREDALE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 842		2018-2022 138	
		#	%	#	%
<b>RETINA Continued</b>					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	1.4%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	0	0.0%	1	0.7%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.7%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	8	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	35	4.2%	1	0.7%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	20	2.4%	9	6.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	612	72.7%	95	68.8%

## AKBASH DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AKBASH DOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT AKBASH DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		39 #	%	0 #	%
<b>GLOBE</b> .110 MICROPHthalmia		1	2.6%	0	
<b>EYELIDS</b> 21.000 ENTROPION, UNSPECIFIED		3	7.7%	0	
22.000 ECTROPION, UNSPECIFIED		1	2.6%	0	
<b>UVEA</b> 93.120 IRIS CYST		2	5.1%	0	
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	5.1%	0	
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX		1	2.6%	0	
100.316 INCIPIENT CATARACT, NUCLEUS		1	2.6%	0	
100.330 GENERALIZED/ COMPLETE CATARACT		1	2.6%	0	
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>3</b>	<b>7.7%</b>	<b>0</b>	
<b>VITREOUS</b> 110.120 PERSISTENT HYALOID ARTERY/ REMNANT		1	2.6%	0	
<b>NORMAL</b> .000 NORMAL GLOBE		32	82.1%	0	

## AKITA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	2	NO
B.	Entropion	Not defined	1, 3	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
F.	Cataract	Not defined	1	NO
G.	Y-suture tip opacity	Not defined	1	Breeder option
H.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
I.	Uveodermatologic syndrome	Not defined	4-13	NO

### Description and Comments

#### A. Microphthalmia with multiple ocular defects

Multiple ocular defects consisting of small eye (microphthalmia), opacity of the lens (cataract), conical shape of the posterior lens (posterior lenticonus), and folding of the retina into rosettes (retinal dysplasia) have been reported in related Akita pups. Cataracts affected primarily the nuclear and cortical lens. Retinal dysplasia affected the superior retina overlying the tapetal fundus. Affected dogs may have severe visual dysfunction. An autosomal recessive mode of inheritance is suspected but not proven.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. OFA data indicates that entropion in the Akita usually occurs by 2 years of age.

### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### D. Corneal Dystrophy

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Akita, many of these strands bridge between the iris and lens, thus resulting in focal cataract and possible vision impairment.

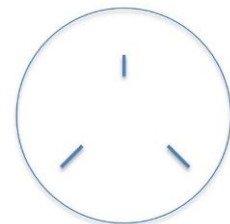
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### F. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

### G. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which

should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and the more severe forms of retinal dysplasia is undetermined.

## I. Uveodermatologic syndrome

Uveodermatologic syndrome in the Akita bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Akitas compared with other dog breeds. Affected dogs are generally young, ranging in age between 1 ½ to 4 years.

## References

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## OCULAR DISORDERS REPORT AKITA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 11,085		2018-2022 818	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			34	0.3%	6	0.7%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			107	1.0%	10	1.2%
22.000 ECTROPION, UNSPECIFIED			15	0.1%	1	0.1%
25.110 DISTICHIASIS			72	0.6%	11	1.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			7	0.1%	3	0.4%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			7	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			59	0.5%	8	1.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			274	2.5%	33	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			37	0.3%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			26	0.2%	2	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.0%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			12	0.1%	9	1.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.0%	2	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			28	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			251	2.3%	13	1.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			9	0.1%	2	0.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			9	0.1%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.0%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			50	0.5%	12	1.5%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.0%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			16	0.1%	6	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			11	0.1%	1	0.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			39	0.4%	1	0.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			10	0.1%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			18	0.2%	2	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			7	0.1%	2	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			11	0.1%	2	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	2	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			13	0.1%	13	1.6%
100.330 GENERALIZED/ COMPLETE CATARACT			26	0.2%	2	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>247</b>	<b>2.2%</b>	<b>37</b>	<b>4.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			19	0.2%	1	0.1%
110.135 PHPV/ PTVL			5	0.0%	1	0.1%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			8	0.1%	1	0.1%

## OCULAR DISORDERS REPORT AKITA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 11,085		2018-2022 818	
			#	%	#	%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	0.4%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			208	1.9%	9	1.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			22	0.2%	4	0.5%
120.190 RETINAL DYSPLASIA, DETACHED			4	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			90	0.8%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			6	0.1%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.1%
120.970 CMR/ CMR-LIKE RETINOPATY			0	0.0%	1	0.1%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			8	0.1%	1	0.1%
130.150 OPTIC DISC COLOBOMA			2	0.0%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			52	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED			177	1.6%	2	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			102	0.9%	25	3.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			9,874	89.1%	663	81.1%

## ALANO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ALANO breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ALANO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## **ALAPAHO BLUE-BLOOD BULLDOG**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ALAPAHO BLUE-BLOOD BULLDOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ALAPAHA BLUE-BLOOD BULLDOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	1 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	100.0%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		0	0.0%	1	100.0%

## ALASKAN KLEE KAI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT ALASKAN KLEE KAI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 727		2018-2022 207	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			51	7.0%	9	4.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			3	0.4%	1	0.5%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			12	1.7%	2	1.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.3%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			9	1.2%	2	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.7%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			18	2.5%	6	2.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	1.0%	2	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.3%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.4%	3	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			9	1.2%	2	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>24</b>	<b>3.3%</b>	<b>8</b>	<b>3.9%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			8	1.1%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			5	0.7%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.5%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED			4	0.6%	1	0.5%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			12	1.7%	5	2.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			627	86.2%	182	87.9%

## ALASKAN MALAMUTE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Cone degeneration - day blindness	Autosomal recessive	2-8	NO	Mutation in the <i>CNGB3</i> gene

### Descriptions and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**E. Cone degeneration - day blindness or hemeralopia**

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day-blindness, color blindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. Genetically, the condition results from a deletion in the *CNGB3* gene. A DNA test is available.

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## OCULAR DISORDERS REPORT ALASKAN MALAMUTE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 9,204		2018-2022 970	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	0	0.0%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			5	0.1%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			205	2.2%	15	1.5%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			77	0.8%	14	1.4%
<b>UVEA</b>						
93.120 IRIS CYST			6	0.1%	3	0.3%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			3	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			590	6.4%	82	8.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			39	0.4%	4	0.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			12	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			4	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			9	0.1%	10	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.0%	0	0.0%
93.810 UVEAL MELANOMA			2	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			3	0.0%	0	0.0%
97.120 COLOBOMA			1	0.0%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			125	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			368	4.0%	48	4.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			29	0.3%	13	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			149	1.6%	11	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			24	0.3%	5	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			20	0.2%	3	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			74	0.8%	8	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			20	0.2%	6	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			44	0.5%	16	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			30	0.3%	5	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			372	4.0%	36	3.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			44	0.5%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			8	0.1%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			81	0.9%	6	0.6%
100.316 INCIPIENT CATARACT, NUCLEUS			23	0.2%	3	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			49	0.5%	8	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.0%	2	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			22	0.2%	8	0.8%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT ALASKAN MALAMUTE

Year Examined: Total # Dogs:		1993-2017 9,204		2018-2022 970	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	4	0.0%	2	0.2%
100.328	Y-SUTURE TIP OPACITIES	11	0.1%	3	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	81	0.9%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.1%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>1,210</b>	<b>13.1%</b>	<b>136</b>	<b>14.0%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	10	0.1%	4	0.4%
110.135	PHPV/ PTVL	6	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	12	0.1%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	60	0.7%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	20	0.2%	1	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	18	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	10	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.1%
120.960	RETINOPATHY	1	0.0%	1	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	3	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	9	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.0%	2	0.2%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	75	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	259	2.8%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	126	1.4%	41	4.2%
<b>NORMAL</b>					
.000	NORMAL GLOBE	7,223	78.5%	706	72.8%

## **ALASKAN NOBLE COMPANION DOG**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ALASKAN NOBLE COMPANION DOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ALASKAN NOBLE COMPANION DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			71 #	%	19 #	%
<b>UVEA</b>						
93.170 ANTERIOR CHAMBER CYST			1	1.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			5	7.0%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	1.4%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	1.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>1.4%</b>	<b>0</b>	<b>0.0%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	1.4%	0	0.0%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	5.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			66	93.0%	18	94.7%

## AMERICAN ALSATIAN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN ALSATIAN breed. Therefore, there are no conditions listed with breeding advice.

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Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	2 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	2	100.0%

## AMERICAN BANDOGE MASTIFF

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN BANDOGE MASTIFF breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT  
AMERICAN BANDOGGE MASTIFF

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## AMERICAN BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	3	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

American Bulldogs with glaucoma were reported to have uveal cysts (evident on ophthalmic exam, ultrasound biomicroscopy and/or histopathology), goniodysgenesis, and anterior segment inflammation. Consistent clinical findings among reported individuals included an absent menace response, diminished to absent light perception, mydriasis, and elevated intraocular pressures.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas. A DNA test is available.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Pumphrey SA, Pizzirani S, Pirie CG, et al. Glaucoma associated with uveal cysts and goniodysgenesis in American Bulldogs: a case series. *Vet Ophthalmol*. 2013 Sep; 16(5):377-85. PMID: 23110479
3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967. PMID: 17460247

## OCULAR DISORDERS REPORT AMERICAN BULLDOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		139		13	
		#	%	#	%
<b>EYELIDS</b>					
20.160 MACROPALPEBRAL FISSURE		3	2.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED		9	6.5%	0	0.0%
22.000 ECTROPION, UNSPECIFIED		2	1.4%	0	0.0%
25.110 DISTICHIASIS		31	22.3%	1	7.7%
<b>NASOLACRIMAL</b>					
40.910 KERATOCONJUNCTIVITIS SICCA		4	2.9%	0	0.0%
<b>CORNEA</b>					
70.220 PIGMENTARY KERATITIS		1	0.7%	0	0.0%
<b>UVEA</b>					
93.120 IRIS CYST		1	0.7%	0	0.0%
93.170 ANTERIOR CHAMBER CYST		0	0.0%	1	7.7%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		5	3.6%	1	7.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		1	0.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		1	0.7%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		0	0.0%	1	7.7%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	1.4%	1	7.7%
100.307 PUNCTATE CATARACT, CAPSULAR		1	0.7%	1	7.7%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		1	0.7%	1	7.7%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		3	2.2%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		16	11.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	0.7%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		97	69.8%	10	76.9%

## AMERICAN BULLY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN BULLY breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT AMERICAN BULLY

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		18 #	%	198 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		1	5.6%	6	3.0%
<b>CORNEA</b>					
70.700 CORNEAL DYSTROPHY		1	5.6%	1	0.5%
<b>UVEA</b>					
93.110 IRIS HYPOPLASIA		0	0.0%	1	0.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	5.6%	8	4.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		0	0.0%	3	1.5%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	11.1%	4	2.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		0	0.0%	2	1.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		2	11.1%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS		0	0.0%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR		0	0.0%	1	0.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX		0	0.0%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES		1	5.6%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>2</b>	<b>11.1%</b>	<b>7</b>	<b>3.5%</b>
<b>FUNDUS</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	1	0.5%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	3	1.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	1	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		1	5.6%	0	0.0%
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	5.6%	4	2.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		12	66.7%	164	82.8%

## AMERICAN ENGLISH COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN ENGLISH COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

# **OCULAR DISORDERS REPORT AMERICAN ENGLISH COONHOUND**

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	3 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		2	100.0%	3	100.0%

# AMERICAN ESKIMO DOG

(all varieties)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Lens luxation	Autosomal recessive	2	NO	Mutation in the <i>ADAMTS17</i> gene
C.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Autosomal recessive	3, 4	NO	Mutation in the <i>prcd</i> gene

## Description and Comments

### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### C. Retinal atrophy

#### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### - *prcd*

Studies have shown that the principal form of PRA in the American Eskimo is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. However, in the American Eskimo Dog the phenotype can be very variable in the age of onset. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically

with signs of night blindness followed by day blindness. A DNA test is available.

Other forms of retinal degeneration that are not *prcd* are recognized in the breed. The currently available genetic test will not detect these other forms of PRA.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384. PMID: 22050825
3. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425
4. Moody JA, Famula TR, Sampson RC, Murphy KE. Identification of microsatellite markers linked to progressive retinal atrophy in American Eskimo Dogs. *Am J Vet Res*. 2005 Nov;66(11):1900-2. doi: 10.2460/ajvr.2005.66.1900. PMID: 16334947.

## OCULAR DISORDERS REPORT AMERICAN ESKIMO DOG

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	2,497		244	
			#	%	#	%
<b>EYELIDS</b>						
21.000	ENTROPION, UNSPECIFIED		4	0.2%	1	0.4%
25.110	DISTICHIASIS		18	0.7%	1	0.4%
<b>NASOLACRIMAL</b>						
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		1	0.0%	0	0.0%
<b>CORNEA</b>						
70.700	CORNEAL DYSTROPHY		9	0.4%	3	1.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION		4	0.2%	0	0.0%
<b>UVEA</b>						
93.120	IRIS CYST		4	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		21	0.8%	2	0.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		1	0.0%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		5	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS		4	0.2%	0	0.0%
<b>LENS</b>						
100.200	CATARACT, UNSPECIFIED		3	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		141	5.6%	15	6.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		31	1.2%	6	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		10	0.4%	3	1.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX		9	0.4%	3	1.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES		3	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		9	0.4%	3	1.2%
100.306	PUNCTATE CATARACT, NUCLEUS		5	0.2%	2	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR		3	0.1%	1	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		27	1.1%	7	2.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		24	1.0%	3	1.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		14	0.6%	2	0.8%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES		5	0.2%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES		3	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS		7	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR		7	0.3%	2	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX		0	0.0%	1	0.4%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX		1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS		0	0.0%	2	0.8%
100.327	INCOMPLETE CATARACT, CAPSULAR		2	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES		4	0.2%	6	2.5%
100.330	GENERALIZED/ COMPLETE CATARACT		10	0.4%	1	0.4%
100.340	RESORBING/ HYPERMATURE CATARACT		1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED		3	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		174	7.0%	36	14.8%
<b>VITREOUS</b>						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT		7	0.3%	1	0.4%
110.135	PHPV/ PTVL		3	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER		1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS		18	0.7%	0	0.0%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		8	0.3%	1	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC		2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		184	7.4%	1	0.4%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.0%	0	0.0%
120.960	RETINOPATHY		1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT AMERICAN ESKIMO DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,497		2018-2022 244	
		#	%	#	%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	2	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
<b>FUNDUS</b>					
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	8	0.3%	0	0.0%
900.100	OTHER, NOT INHERITED	86	3.4%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	27	1.1%	10	4.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,998	80.0%	198	81.1%

## AMERICAN FOXHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN FOXHOUND breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT AMERICAN FOXHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		2	18.2%	0	
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		6	54.5%	0	
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		4	36.4%	0	
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		1	9.1%	0	
<b>NORMAL</b>					
.000 NORMAL GLOBE		6	54.5%	0	

## AMERICAN HAIRLESS TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1,2	NO	Mutation in the <i>ADAMTS17</i> gene

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### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

1. Farias FH, Johnson GS, Taylor JF, et al. An *ADAMTS17* splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010 Sep;51:4716-4721. PMID: 20375329
2. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14:378-384. PMID: 22050825

## OCULAR DISORDERS REPORT AMERICAN HAIRLESS TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			52		103	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			0	0.0%	1	1.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	1.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	3.8%	1	1.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	1.9%	4	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	1.9%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	1.9%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	2	1.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	1.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	1.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	1.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	1.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	1.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	1.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>3.8%</b>	<b>8</b>	<b>7.8%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	1.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	1.9%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	1.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	1.9%	1	1.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			46	88.5%	93	90.3%

## AMERICAN HUSKY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN HUSKY breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT AMERICAN HUSKY

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	0	

## AMERICAN LEOPARD HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AMERICAN LEOPARD HOUND breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT AMERICAN LEOPARD HOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0 #	%	3 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0		1	33.3%
<b>NORMAL</b> .000 NORMAL GLOBE		0		2	66.7%

## AMERICAN PIT BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- cone-rod dystrophy 2 ( <i>crd2</i> )	Autosomal recessive	1	NO	Mutation in the <i>IQCB1</i> gene

### Description and Comments

#### A. Retinal atrophy - cone-rod dystrophy 2 (*crd2*)

A cone rod dystrophy characterized by initial loss of cones (day vision) followed by degeneration of the rods (night vision). Evidence of vision loss is evident at an early age with severe retinal degeneration and complete blindness by a year of age. The disease is a severe early onset retinal blindness more appropriately considered a form of Leber congenital amaurosis (LCA). The condition is inherited as an autosomal recessive trait and caused by a mutation in *IQCB1*. A DNA test is available.

### References

1. Goldstein O, Mezey JG, Schweitzer P, et al. IQCB1 and PDE6B mutations cause similar early onset retinal degenerations in two closely related terrier dog breeds. *Invest Ophthalmol.* 2013;54:7005-7019. PMID: 24045995

## OCULAR DISORDERS REPORT AMERICAN PIT BULL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 204		2018-2022 43	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			7	3.4%	1	2.3%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.5%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.5%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			5	2.5%	2	4.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	1.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	1.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.5%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	3.4%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	1.0%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	1.0%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.5%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.5%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.5%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	2.3%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>8</b>	<b>3.9%</b>	<b>0</b>	<b>0.0%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	1.0%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	1.0%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED			10	4.9%	1	2.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.5%	3	7.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			173	84.8%	35	81.4%

## AMERICAN STAFFORDSHIRE TERRIER\*

Please note that since 1972 the AKC considers the Staffordshire Bull Terrier a different breed from the American Staffordshire Terrier. Since the latter breed evolved from the former, it is possible that the same genetic diseases exist in both.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1, 2, 3	NO	
D.	Retinal atrophy				
D.	- rod cone dysplasia 1b ( <i>rcd1b</i> )	Autosomal recessive	4	NO	Mutation in the <i>PDE6B</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, cataracts usually develop by one year of age. There is initial opacification of the suture lines progressing to nuclear and cortical cataract formation; complete cataracts and blindness develop by three years of age. A simple autosomal recessive mode of inheritance has been proposed; however, the genetics have not been defined and additional studies will be required.

#### D. Retinal Atrophy - Rod-cone dysplasia 1b (*rcd1b*) [previously considered cone-rod]

**dystrophy 1(crd1)]**

The disease was previously considered a cone-rod dystrophy (crd1) based on incorrect phenotype ascertainment using ERG (Aguirre, personal communication, 2016). The term crd1 should no longer be used to refer to the disease in this breed. The disease is more appropriately classified as rod-cone dysplasia 1b (rcd1b). In affected dogs there is evidence of vision loss at an early age with severe retinal degeneration and complete blindness by early adulthood, and ophthalmoscopic evidence of advanced retinal degeneration by 1 year of age. The disease is caused by a mutation in the *PDE6B* gene, with clinical abnormalities similar to what is found in rcd1-affected Irish Setters, and rcd1a affected Sloughis and Spanish Water Dogs. A DNA test is available.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978;19:109-120. PMID: 642468  
\*\*reference derived from non-USA dog population\*\*
3. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305-316. \*\*reference derived from non-USA dog population\*\*
4. Goldstein O, Mezey JG, Schweitzer P, et al. IQCB1 and PDE6B mutations cause similar early onset retinal degenerations in two closely related terrier dog breeds. *Invest Ophthalmol.* 2013;54:7005-7019. PMID: 24045995

## OCULAR DISORDERS REPORT AMERICAN STAFFORDSHIRE TERRIER

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	774		109	
			#	%	#	%
<b>EYELIDS</b>						
21.000	ENTROPION, UNSPECIFIED		2	0.3%	0	0.0%
25.110	DISTICHIASIS		35	4.5%	3	2.8%
<b>CORNEA</b>						
70.210	PANNUS		1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS		2	0.3%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION		1	0.1%	0	0.0%
<b>UVEA</b>						
93.110	IRIS HYPOPLASIA		0	0.0%	1	0.9%
93.120	IRIS CYST		1	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST		1	0.1%	1	0.9%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		31	4.0%	4	3.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		2	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		1	0.1%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		1	0.1%	0	0.0%
<b>LENS</b>						
100.200	CATARACT, UNSPECIFIED		1	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		30	3.9%	4	3.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		1	0.1%	1	0.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		2	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX		2	0.3%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES		1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		3	0.4%	2	1.8%
100.306	PUNCTATE CATARACT, NUCLEUS		0	0.0%	2	1.8%
100.307	PUNCTATE CATARACT, CAPSULAR		1	0.1%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		4	0.5%	1	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		3	0.4%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		4	0.5%	1	0.9%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX		0	0.0%	1	0.9%
100.328	Y-SUTURE TIP OPACITIES		2	0.3%	2	1.8%
100.330	GENERALIZED/ COMPLETE CATARACT		1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED		2	0.3%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		23	3.0%	8	7.3%
<b>VITREOUS</b>						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT		2	0.3%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER		1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS		2	0.3%	1	0.9%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		8	1.0%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC		2	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		3	0.4%	0	0.0%
<b>OTHER</b>						
900.000	OTHER, UNSPECIFIED		8	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED		30	3.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		11	1.4%	4	3.7%
<b>NORMAL</b>						
.000	NORMAL GLOBE		659	85.1%	91	83.5%

## AMERICAN WATER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT AMERICAN WATER SPANIEL

Year Examined: Total # Dogs:		1993-2017 1,118		2018-2022 126	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110	MICROPTHALMIA	2	0.2%	0	0.0%
10.000	GLAUCOMA	3	0.3%	0	0.0%
<b>EYELIDS</b>					
20.160	MACROPALPEBRAL FISSURE	2	0.2%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	7	0.6%	1	0.8%
22.000	ECTROPION, UNSPECIFIED	2	0.2%	0	0.0%
25.110	DISTICHIASIS	362	32.4%	55	43.7%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.8%
<b>CORNEA</b>					
70.220	PIGMENTARY KERATITIS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	5	0.4%	3	2.4%
<b>UVEA</b>					
93.120	IRIS CYST	1	0.1%	0	0.0%
93.150	IRIS COLOBOMA	2	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	1.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	2	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	6	0.5%	4	3.2%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	5	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	40	3.6%	9	7.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	5	0.4%	1	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.6%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.2%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	10	0.9%	5	4.0%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.2%	1	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.3%	6	4.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.6%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	12	1.1%	6	4.8%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	7	0.6%	1	0.8%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.2%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.8%
100.328	Y-SUTURE TIP OPACITIES	5	0.4%	4	3.2%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	1	0.8%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	66	5.9%	22	17.5%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	0	0.0%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	2	1.6%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.1%	2	1.6%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	8	0.7%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.4%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%

# OCULAR DISORDERS REPORT AMERICAN WATER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,118		2018-2022 126	
			#	%	#	%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			2	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			5	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED			18	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	0.4%	5	4.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			688	61.5%	55	43.7%

## **ANATOLIAN SHEPHERD**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ANATOLIAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ANATOLIAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			46 #	%	34 #	%
<b>GLOBE</b> .110 MICROPHthalmia			1	2.2%	0	0.0%
<b>EYELIDS</b> 21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	2.9%
<b>CORNEA</b> 70.700 CORNEAL DYSTROPHY			0	0.0%	2	5.9%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	2.2%	0	0.0%
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	6.5%	3	8.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	1	2.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	2	5.9%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	2.2%	2	5.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	2.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			0	0.0%	1	2.9%
100.328 Y-SUTURE TIP OPACITIES			1	2.2%	1	2.9%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>2.2%</b>	<b>7</b>	<b>20.6%</b>
<b>FUNDUS</b> 130.110 MICROPAPILLA			0	0.0%	1	2.9%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	4.3%	1	2.9%
<b>NORMAL</b> .000 NORMAL GLOBE			39	84.8%	26	76.5%

## **ARMENIAN GAMPR**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ARMENIAN GAMPR breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## ARMENIAN GAMPR

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		4	100.0%	0	

# AUSTRALIAN CATTLE DOG

(Queensland Heeler or Blue Heeler)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2	NO	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Lens luxation	Autosomal recessive	3, 4	NO	Mutation in the <i>ADAMTS17</i> gene
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Autosomal recessive	5	NO	Mutation in the <i>prcd</i> gene
	- rod-cone dysplasia type 4 ( <i>rcd4</i> )	Autosomal recessive	1	NO	Mutation in the <i>C2orf71</i> gene
H.	Retinopathy	Not defined	1	Breeder option	

## Description and Comments

### A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy).

### B. Persistent pupillary membranes (PPMs)

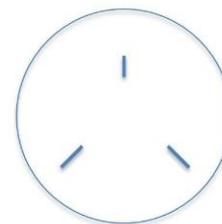
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



#### E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

#### F. Retinal atrophy

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### - *prcd*

Studies have shown that one form of PRA in the Australian Cattle Dog is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. However, in the Australian Cattle Dog the phenotype can be very variable in the age of onset. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

Other forms of retinal degeneration that are not *prcd* are recognized in the breed. The currently available genetic test will not detect these other forms of PRA.

##### - rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified also in the Australian Cattle Dog breed. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA

test is available. The test is accurate only for this mutation and is of no value in identifying other forms of PRA.

## H. Retinopathy

Any non-inflammatory condition of the retina. These conditions can usually be detected by ophthalmoscopic examination, but an electroretinogram (ERG) may be required in some instances (e.g. canine multifocal retinopathy).

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111. PMID: 14982589
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384. PMID: 22050825
4. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721. PMID: 20375329
5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

## OCULAR DISORDERS REPORT AUSTRALIAN CATTLE DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 4,871		2018-2022 532	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			1	0.0%	1	0.2%
<b>EYELIDS</b>						
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			16	0.3%	1	0.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	1	0.2%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			2	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			26	0.5%	4	0.8%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			12	0.2%	2	0.4%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			46	0.9%	6	1.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			6	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	3	0.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.0%	0	0.0%
95.120 CILIARY BODY CYST			2	0.0%	3	0.6%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			3	0.1%	0	0.0%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.4%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			35	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			298	6.1%	27	5.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			53	1.1%	13	2.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			40	0.8%	5	0.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			19	0.4%	3	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			7	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			32	0.7%	9	1.7%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.1%	2	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			5	0.1%	2	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			48	1.0%	14	2.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			71	1.5%	4	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			54	1.1%	6	1.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	4	0.8%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			19	0.4%	2	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			6	0.1%	2	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			5	0.1%	3	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	3	0.6%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.0%	1	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	2	0.4%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			3	0.1%	1	0.2%

## OCULAR DISORDERS REPORT AUSTRALIAN CATTLE DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 4,871		2018-2022 532	
		#	%	#	%
<b>LENS Continued</b>					
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	12	0.2%	19	3.6%
100.330	GENERALIZED/ COMPLETE CATARACT	23	0.5%	1	0.2%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>432</b>	<b>8.9%</b>	<b>79</b>	<b>14.8%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	8	0.2%	0	0.0%
110.135	PHPV/ PTVL	1	0.0%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	12	0.2%	2	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	38	0.8%	1	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.3%	2	0.4%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	252	5.2%	6	1.1%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.4%
120.960	RETINOPATHY	2	0.0%	6	1.1%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.2%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	20	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	126	2.6%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	52	1.1%	35	6.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	3,999	82.1%	412	77.4%

# AUSTRALIAN KELPIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	2-4	NO	Mutation in the <i>NHEJ1</i> gene

## Description and Comments

### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### B. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Kucharczyk, N., et al. (2019). "Collie Eye Anomaly in Australian Kelpie dogs in Poland." *BMC Vet Res* 15(1): 392. PMID: 31684941. \*\*reference derived from non-USA dog population\*\*
3. Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet*. 2018 Apr 30;14(4):e1007361. PMID: 29708978
4. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B,

Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT AUSTRALIAN KELPIE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			233		18	
			#	%	#	%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.4%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	5.6%
93.810 UVEAL MELANOMA			3	1.3%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.4%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			5	2.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			29	12.4%	4	22.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			8	3.4%	1	5.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			8	3.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.4%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.4%	3	16.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			9	3.9%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			7	3.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.9%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>44</b>	<b>18.9%</b>	<b>4</b>	<b>22.2%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.9%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.4%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			5	2.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			11	4.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			7	3.0%	0	0.0%
900.100 OTHER, NOT INHERITED			8	3.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	0.9%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			177	76.0%	13	72.2%

## AUSTRALIAN KOOLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1	NO	Mutation in the <i>NHEJ1</i> gene

### Description and Comments

- A. Choroidal hypoplasia (Collie Eye Anomaly)**  
 - staphyloma/coloboma  
 - retinal detachment  
 - retinal hemorrhage  
 - optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

### References

- Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

# OCULAR DISORDERS REPORT AUSTRALIAN KOOLIE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		4 #	%	9 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	2	22.2%
<b>NORMAL</b> .000 NORMAL GLOBE		4	100.0%	7	77.8%

# AUSTRALIAN LABRADOODLE

(Labradoodle, Australian Cobber Dog)

\*Due to the breed's ancestry, most of the references cited are for the Labrador Retriever or Standard Poodle. The examiner may also find the Labrador Retriever and Standard Poodle pages as a helpful resource for other conditions that may occur but are not yet reported in the Australian Labradoodle.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Imperforate lower nasolacrimal punctum	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Y- suture tip opacity	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Autosomal recessive	2, 3	NO	Mutation of the <i>prcd</i> gene
H.	Achromatopsia Type 2 (day blindness/retinal degeneration)	Autosomal recessive	1	NO	Mutation has not been published
I.	Retinal dysplasia				
	- folds	Presumed autosomal recessive	1	NO (Breeder option with Normal DNA test)	Mutation of the <i>COL9A3</i> gene
	- geographic (without skeletal defects)	Not defined	1, 4, 5	NO	
	- detached/generalized (without skeletal defects)	autosomal recessive	6, 7	NO	
J.	Retinal dysplasia - folds/detached (with skeletal defects)	Autosomal recessive	8-15	NO	Mutation of the <i>COL9A3</i> gene
K.	Limbal melanoma	Not defined	16	NO	

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Imperforate lower nasolacrimal punctum

Development anomaly resulting in an imperforate opening of the lacrimal puncta. An imperforate lower punctum may result in epiphora, an overflow of tears onto the face.

### C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In Labrador Retrievers in Europe, one form of corneal dystrophy, known as macular dystrophy, has been shown to be caused by accumulations of glycosaminoglycans in the corneal stroma. This form of corneal dystrophy is caused by a mutation in the CHST6 gene, and therefore it is recommended that dogs with this disease not be bred. This has not yet been reported in Australian Labradoodles but could potentially occur due to the breed's history.

### D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### E. Cataract

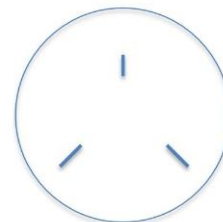
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most frequently reported cataracts in the Australian Labradoodle are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts, which usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

### F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## G. Retinal atrophy

### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

### - *prcd*

Unpublished data from Optigen Labs has shown that the principal form of PRA in the Australian Labradoodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## H. Achromatopsia Type 2 (ACHM – Type 2)

An autosomal recessive disorder of Standard Poodles and ‘doodles’ (where the mix-bred dogs are backcrossed to Standard Poodles that carry the genetic defect); the disease also has been referred to as day blindness/retinal degeneration. The salient clinical finding is profound visual difficulty in bright light (day blindness) with subjective normal night vision. In the early stages of the disease, fundus examination is normal with some dogs showing focal hyperreflectivity of the cone-rich fovea like region of the retina; the photopic ERG is not recordable. In some older dogs, there is progression resulting in poor/absent vision under both dim and bright light conditions, markedly abnormal or non-recordable ERG, and a fundus appearance indicative of late-stage retinal degeneration and indistinguishable from progressive retinal atrophy.

## I. Retinal dysplasia

### - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. In the Labrador Retriever, the presence of retinal folds may be seen in the heterozygous state of oculoskeletal dysplasia described below, thus the recommendation against breeding.

The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *COL9A3* mutation.

### - geographic, detached without skeletal defects

**Retinal dysplasia - geographic:** An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

**Retinal dysplasia - detached:** Abnormal development of the retina occurring in late gestation resulting in retinal detachment and blindness by 8 weeks of age. This disease was described in Sweden in the 1970s and appears to have been eliminated.

## J. Retinal dysplasia – folds, geographic or detachment with skeletal defects

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 1 (DRD1) in the Labrador Retriever. A similar condition, DRD2, occurs in the Samoyed. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1 base pair insertion of *COL9A3*. A DNA test is available.

## K. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition has been noted in the German Shepherd, Labrador and Golden Retriever.

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## OCULAR DISORDERS REPORT AUSTRALIAN LABRADOODLE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 14,348		2018-2022 20,803	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			6	0.0%	3	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			5	0.0%	9	0.0%
22.000 ECTROPION, UNSPECIFIED			2	0.0%	0	0.0%
25.110 DISTICHIASIS			272	1.9%	423	2.0%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	29	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			31	0.2%	21	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	2	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			6	0.0%	4	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			343	2.4%	236	1.1%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			5	0.0%	6	0.0%
93.120 IRIS CYST			0	0.0%	1	0.0%
93.150 IRIS COLOBOMA			2	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,044	7.3%	1,510	7.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			41	0.3%	17	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.0%	5	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			365	2.5%	920	4.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			10	0.1%	2	0.0%
93.810 UVEAL MELANOMA			5	0.0%	1	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			5	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	1	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	59	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	5	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	3	0.0%
130.110 MICROPAPILLA			0	0.0%	11	0.1%
130.150 OPTIC DISC COLOBOMA			0	0.0%	9	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			331	2.3%	536	2.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			111	0.8%	137	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			50	0.3%	65	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			15	0.1%	17	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			17	0.1%	21	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			139	1.0%	95	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			36	0.3%	31	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			148	1.0%	186	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			34	0.2%	37	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			33	0.2%	42	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			17	0.1%	19	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			6	0.0%	5	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			23	0.2%	38	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			24	0.2%	33	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			29	0.2%	70	0.3%

## OCULAR DISORDERS REPORT AUSTRALIAN LABRADOODLE

Year Examined: Total # Dogs:		1993-2017 14,348		2018-2022 20,803	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	10	0.1%	5	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	6	0.0%	6	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	4	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	2	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	14	0.1%	14	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	97	0.7%	213	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	23	0.2%	3	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	2	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	0	0.0%	10	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>743</b>	<b>5.2%</b>	<b>833</b>	<b>4.0%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	51	0.4%	98	0.5%
110.135	PHPV/ PTVL	6	0.0%	13	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.0%	4	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	26	0.2%	11	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	120	0.8%	57	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	2	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960	RETINOPATHY	14	0.1%	3	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	44	0.3%	23	0.1%
130.120	OPTIC NERVE HYPOPLASIA	10	0.1%	2	0.0%
130.150	OPTIC DISC COLOBOMA	4	0.0%	6	0.0%
<b>OTHER</b>					
900.100	OTHER, NOT INHERITED	24	0.2%	7	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	477	3.3%	720	3.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	9,370	65.3%	16,303	78.4%

## AUSTRALIAN SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	2-6	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Iris coloboma	Not defined	1	NO	
E.	Iris hypoplasia	Not defined	1	Breeder option	
F.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
G.	Cataract				
	- generalized	Not defined	1	NO	
	- <i>HSF4</i>	Autosomal dominant (possibly incomplete penetrance)	7, 8	NO	Mutation in the <i>HSF4</i> gene
H.	Y-suture tip opacity	Not defined	1	Breeder option	
I.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
J.	Persistent hyaloid artery remnant	Not defined	1, 13	Breeder option	
K.	Retinal atrophy				
	- generalized	Not defined	1		
	- ( <i>prcd</i> )	Autosomal recessive	14	NO	Mutation in the <i>prcd</i> gene

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
L.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	9, 15	NO (Breeder option with normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene
M.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
N.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	10-14	NO	Mutation in the <i>NHEJ1</i> gene
O.	Coloboma/staphyloma without microphthalmia	Not defined	1	NO	
P.	Micropapilla	Not defined	1	Breeder option	

## Description and Comments

### A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merle coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

### E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

### F. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### G. Cataract

#### - generalized

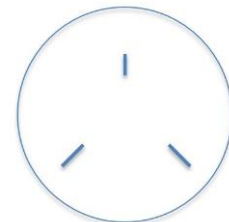
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### - *HSF4*

In the Australian Shepherd, a mutation in *HSF4* (heat shock transcription factor 4), the HSF4-2 mutation, has been shown to increase the likelihood of cataract formation. The mutation is inherited in a co-dominant manner. Dogs with one copy of the mutation develop bilateral posterior cataracts and homozygotes develop a nuclear cataract that typically progresses to a mature cataract. A DNA test is available for this mutation. Other genetic factors can contribute to cataract formation in this breed and will not be detected by this test.

### H. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

# **I. Vitreous degeneration - syneresis**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

# **J. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

# **K. Retinal atrophy**

## **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

## **- *prcd***

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Australian Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically at 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

# **L. Multifocal retinopathy – *cmr1***

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression in the initial serous lesions after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs initially exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas, though the retina will continue to degenerate over time thus eventually causing vision impairment.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, Mastiff, Australian Shepherd and other breeds.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

**M. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**N. Choroidal hypoplasia (Collie Eye Anomaly)**

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

**O. Coloboma/staphyloma (unassociated with microphthalmia)**

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

**P. Micropapilla**

Micropapilla refers to a small optic disc which is not associated with vision impairment.

Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

**References**

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15. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. *PLoS One.* 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

# OCULAR DISORDERS REPORT AUSTRALIAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 106,396		2018-2022 23,129	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			96	0.1%	16	0.1%
10.000 GLAUCOMA			8	0.0%	0	0.0%
<b>EYELIDS</b>						
20.110 EYELID DERMOID			1	0.0%	0	0.0%
20.140 ECTOPIC CILIA			5	0.0%	1	0.0%
20.160 MACROPALPEBRAL FISSURE			4	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			16	0.0%	1	0.0%
22.000 ECTROPION, UNSPECIFIED			6	0.0%	0	0.0%
25.110 DISTICHIASIS			1,704	1.6%	346	1.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	5	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			8	0.0%	4	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	1	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			4	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.0%	1	0.0%
<b>CORNEA</b>						
70.210 PANNUS			9	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			1	0.0%	1	0.0%
70.700 CORNEAL DYSTROPHY			533	0.5%	123	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			15	0.0%	1	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			266	0.3%	177	0.8%
93.120 IRIS CYST			39	0.0%	4	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1,522	1.4%	215	0.9%
93.170 ANTERIOR CHAMBER CYST			4	0.0%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			17	0.0%	6	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			5,309	5.0%	1,651	7.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			96	0.1%	22	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			45	0.0%	7	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			92	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			35	0.0%	28	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			22	0.0%	8	0.0%
93.810 UVEAL MELANOMA			8	0.0%	2	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			25	0.0%	6	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			166	0.2%	33	0.1%
97.120 COLOBOMA			96	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	52	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	2	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	3	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
130.110 MICROPAPILLA			0	0.0%	57	0.2%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	4	0.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	5	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			169	0.2%	0	0.0%

## OCULAR DISORDERS REPORT AUSTRALIAN SHEPHERD

Year Examined: Total # Dogs:		1993-2017 106,396		2018-2022 23,129	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,503	2.4%	447	1.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	340	0.3%	107	0.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	372	0.3%	62	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	118	0.1%	35	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	42	0.0%	14	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	345	0.3%	118	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	260	0.2%	82	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	150	0.1%	91	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	342	0.3%	68	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	783	0.7%	74	0.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	206	0.2%	26	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	26	0.0%	2	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	167	0.2%	15	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	226	0.2%	34	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	124	0.1%	40	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	18	0.0%	9	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	29	0.0%	27	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	8	0.0%	3	0.0%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	4	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	8	0.0%	10	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	3	0.0%	3	0.0%
100.328	Y-SUTURE TIP OPACITIES	103	0.1%	137	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	236	0.2%	6	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	18	0.0%	2	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>3,975</b>	<b>3.7%</b>	<b>832</b>	<b>3.6%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	562	0.5%	170	0.7%
110.135	PHPV/ PTVL	113	0.1%	16	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	47	0.0%	19	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	239	0.2%	43	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	1,041	1.0%	96	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	46	0.0%	3	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	10	0.0%	2	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	135	0.1%	3	0.0%
120.400	RETINAL HEMORRHAGE	13	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	61	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	14	0.0%	4	0.0%
120.960	RETINOPATHY	11	0.0%	7	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	243	0.2%	54	0.2%
130.120	OPTIC NERVE HYPOPLASIA	121	0.1%	13	0.1%
130.150	OPTIC DISC COLOBOMA	163	0.2%	15	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	545	0.5%	0	0.0%
900.100	OTHER, NOT INHERITED	1,279	1.2%	6	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	758	0.7%	440	1.9%
<b>NORMAL</b>					
.000	NORMAL GLOBE	92,687	87.1%	19,236	83.2%

## AUSTRALIAN STUMPY TAIL CATTLE DOG

DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A. Retinal atrophy				
- generalized	Not defined	1	NO	
- ( <i>prcd</i> )	Autosomal recessive	1	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Retinal atrophy

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### - *prcd*

Studies have shown that the principal form of PRA in the Australian Stumpy Tail Cattle Dog is *prcd*, which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Australian Stumpy Tail Cattle Dog. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425

## OCULAR DISORDERS REPORT AUSTRALIAN STUMPY TAIL CATTLE DOG

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	44		10	
		#	%	#	%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	4.5%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	2.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		1	2.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX		1	2.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		2	4.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX		2	4.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS		1	2.3%	0	0.0%
100.345 <i>SIGNIFICANT CATARACTS (SUMMARY)</i>		8	18.2%	0	0.0%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		1	2.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		1	2.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		3	6.8%	0	0.0%
<b>OTHER</b>					
900.100 OTHER, NOT INHERITED		1	2.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	2.3%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		38	86.4%	10	100.0%

# AUSTRALIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT AUSTRALIAN TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			2	0.2%	0	0.0%
25.110 DISTICHIASIS			3	0.3%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.5%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			4	0.4%	1	0.5%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			44	4.7%	18	9.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			9	1.0%	12	6.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	1	0.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			34	3.6%	5	2.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	0.7%	2	1.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.2%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.2%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			7	0.7%	2	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			6	0.6%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	0.5%	1	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.1%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.2%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	3	1.5%
100.330 GENERALIZED/ COMPLETE CATARACT			8	0.9%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>53</b>	<b>5.7%</b>	<b>7</b>	<b>3.5%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			3	0.3%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			3	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.3%	0	0.0%
120.400 RETINAL HEMORRHAGE			1	0.1%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			4	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED			8	0.9%	2	1.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	0.5%	10	5.1%

# OCULAR DISORDERS REPORT AUSTRALIAN TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		817	87.1%	153	77.3%

## AZAWAKH

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the AZAWAKH breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT AZAWAKH

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		13 #	%	8 #	%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	7.7%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	7.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>1</b>	<b>7.7%</b>	<b>0</b>	<b>0.0%</b>
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		1	7.7%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		12	92.3%	8	100.0%

## BARBET

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Y suture tip opacity	Not defined	1	Breeder option	
D.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Distichiasis

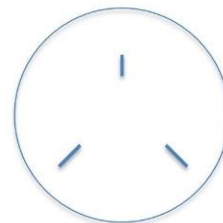
Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form

(3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **D. Retinal atrophy**

##### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### **- *prcd***

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Barbet is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically at 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Personal communication on data from Optigen with Sue Pearce-Kelling

## OCULAR DISORDERS REPORT BARBET

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			220		251	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			10	4.5%	15	6.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.5%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	0.4%
93.120 IRIS CYST			1	0.5%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			6	2.7%	3	1.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			8	3.6%	1	0.4%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.5%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			32	14.5%	9	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			6	2.7%	6	2.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.5%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	1.4%	1	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.5%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	1.8%	1	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			4	1.8%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.9%	2	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			4	1.8%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.5%	2	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.5%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.5%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			7	3.2%	8	3.2%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.5%	1	0.4%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>29</b>	<b>13.2%</b>	<b>18</b>	<b>7.2%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.5%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.8%
120.920 RETINAL DETACHMENT WITH DIALYSIS			1	0.5%	0	0.0%
120.960 RETINOPATHY			2	0.9%	1	0.4%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			0	0.0%	2	0.8%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			2	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			9	4.1%	8	3.2%
<b>NORMAL</b>						
.000 NORMAL GLOBE			167	75.9%	206	82.1%

# BASENJI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1, 2-5	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- iris to lens	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	- endothelial opacity/no strands	Not defined	1	NO	
C.	Cataract	Not defined	1	NO	
D.	Y suture tip opacity	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- generalized	Not defined	1, 6	NO	
	- Bas_PRA1	Autosomal recessive	7	NO	Mutation in the S-antigen (SAG)
F.	Optic nerve coloboma	Not defined	2	NO	

## Description and Comments

### A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Basenji, this is a particularly significant problem with many cases reported where the strands bridge between the iris and the cornea resulting in localized corneal opacities which may cause vision impairment. This has also been associated with optic nerve coloboma (see “F” below).

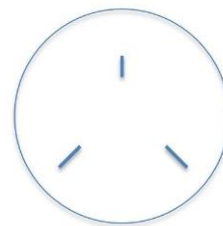
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### E. Retinal atrophy

#### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

#### - Bas\_PRA1

A specific mutation has been located in the S-antigen (SAG) gene that causes a late onset form of retinal degeneration in the Basenji. The condition is inherited in an autosomal recessive fashion. Initial thinning of the retina evidenced by irregular hypo and hyper-reflectivity of the tapetal fundus is typically noted at 5

years of age with retinal vascular attenuation noted by 6-7 years of age. Clinically the disease closely resembles *prcd*-PRA. The retinal degeneration progresses gradually and ultimately results in complete vision loss. This mutation is responsible for the majority, but not all cases of PRA within the Basenji breed.

#### **F. Optic nerve coloboma**

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

In the Basenji, this condition has been associated with persistent pupillary membranes (see above).

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Barnett KC and Knight CG. Persistent pupillary membrane and associated defects in the Basenji. *Vet Rec.* 1969 Aug 30;85:242-248. PMID: 4980462 \*\*reference derived from non-USA dog population\*\*
3. Roberts SR and Bistner SI. Persistent pupillary membrane in Basenji dogs. *J Am Vet Med Assoc.* 1968 Sep 1;153:533-542. PMID: 5691151
4. Mason TA. Persistent pupillary membrane in the Basenji. *Aust Vet J.* 1976 Aug;52:343-344. PMID: 985254 \*\*reference derived from non-USA dog population\*\*
5. Bistner SI, Rubin LF and Roberts SR. A review of persistent pupillary membranes in the Basenji dog. *J Am Anim Hosp Assoc.* 1971;7:143.
6. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research.* 1974;35:571-574.
7. Goldstein O, Jordan JA, Aguirre GD, et al. A non-stop S-antigen gene mutation is associated with late onset hereditary retinal degeneration in dogs. *Mol Vis.* 2013;19:1871-1884. PMID: 24019744

## OCULAR DISORDERS REPORT BASENJI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 11,124		2018-2022 1,569	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			8	0.1%	1	0.1%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			6	0.1%	2	0.1%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			68	0.6%	14	0.9%
<b>CORNEA</b>						
70.210 PANNUS			2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			335	3.0%	33	2.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			251	2.3%	10	0.6%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			0	0.0%	2	0.1%
93.120 IRIS CYST			2	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			18	0.2%	0	0.0%
93.150 IRIS COLOBOMA			9	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	6	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			5,719	51.4%	978	62.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			463	4.2%	51	3.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1,157	10.4%	130	8.3%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			42	0.4%	7	0.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			20	0.2%	37	2.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			222	2.0%	170	10.8%
93.810 UVEAL MELANOMA			0	0.0%	1	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
97.120 COLOBOMA			13	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	1	0.1%
130.150 OPTIC DISC COLOBOMA			0	0.0%	6	0.4%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			47	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			488	4.4%	40	2.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			53	0.5%	7	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			22	0.2%	9	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			11	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			5	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			93	0.8%	26	1.7%
100.306 PUNCTATE CATARACT, NUCLEUS			25	0.2%	10	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			79	0.7%	20	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			33	0.3%	2	0.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			28	0.3%	10	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			19	0.2%	2	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			36	0.3%	3	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			22	0.2%	4	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			24	0.2%	6	0.4%

## OCULAR DISORDERS REPORT BASENJI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 11,124		2018-2022 1,569	
		#	%	#	%
<b>LENS Continued</b>					
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	19	0.2%	38	2.4%
100.330	GENERALIZED/ COMPLETE CATARACT	22	0.2%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>523</b>	<b>4.7%</b>	<b>99</b>	<b>6.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	10	0.1%	6	0.4%
110.135	PHPV/ PTVL	8	0.1%	3	0.2%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.1%	2	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	25	0.2%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	20	0.2%	4	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	20	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	4	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	380	3.4%	1	0.1%
120.400	RETINAL HEMORRHAGE	5	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	7	0.1%	0	0.0%
120.960	RETINOPATHY	12	0.1%	1	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	3	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	103	0.9%	5	0.3%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	78	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	227	2.0%	2	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	284	2.6%	43	2.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,283	38.5%	359	22.9%

## BASSET FAUVE DE BRETAGNE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma				
	- POAG	Autosomal recessive	2	NO	Mutation in the <i>ADAMTS17</i> gene
B.	Persistent pupillary membranes				
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	

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### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

In the Basset Fauve de Bretagne, both closed angle (PCAG) and open angle (POAG) forms of glaucoma are present. Some Basset Fauve de Bretagnes have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmologic examination using an indirect ophthalmoscope or a slit-lamp microscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. It is suspected that mild to severe anterior uveitis impairs outflow of aqueous through the small perforations that are present in the sheet of tissue in the iridocorneal angle; this results in a secondary and often irreversible rise in intraocular pressure that causes blindness.

The inheritance of PCAG and goniodysgenesis in the Basset Fauve de Bretagne are not known. Until the inheritance is determined, control should be directed to removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny affected with glaucoma. Three genetic loci, *COL1A2*, *RAB22A*, and *NEB*, have been implicated as possible contributors to the development of PCAG in the Basset Fauve de Bretagne. One is an autosomal recessive missense mutation of a nebulin (*NEB*) residue on chromosome 19. Because 33% of unaffected animals were homozygous for the risk allele, it was hypothesized that modifying factors may be present. A genetic test is not yet available for PCAG.

POAG in the Basset Fauve de Bretagne is caused by a 19 base pair deletion in exon 2 of *ADAMTS17*. This deletion alters the reading frame and is suspected to cause a truncated protein. The trait shows an autosomal recessive mode of inheritance. A DNA test is available.

#### B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Oliver JA, Forman OP, Pettitt L, et al. Two independent mutations in ADAMTS17 are associated with primary open angle glaucoma in the Basset Hound and Basset Fauve de Bretagne breeds of dog. *PLoS one*. 2015;10:e0140436. PMID: 26474315

## OCULAR DISORDERS REPORT BASSET FAUVE DE BRETAGNE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		70 #	%	96 #	%
<b>GLOBE</b> 10.000 GLAUCOMA		2	2.9%	0	0.0%
<b>EYELIDS</b> 25.110 DISTICHIASIS		1	1.4%	0	0.0%
<b>CORNEA</b> 70.700 CORNEAL DYSTROPHY		0	0.0%	1	1.0%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS 93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		2 19	2.9% 27.1%	0 6	0.0% 6.3%
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN 100.302 PUNCTATE CATARACT, POSTERIOR CORTEX 100.305 PUNCTATE CATARACT, POSTERIOR SUTURES 100.306 PUNCTATE CATARACT, NUCLEUS 100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX 100.315 INCIPIENT CATARACT, POSTERIOR SUTURES 100.317 INCIPIENT CATARACT, CAPSULAR 100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX 100.328 Y-SUTURE TIP OPACITIES <b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		6 1 1 1 1 1 0 2 0 7	8.6% 1.4% 1.4% 1.4% 1.4% 0.0% 2.9% 0.0% <b>10.0%</b>	4 0 2 0 0 2 0 2 4	4.2% 0.0% 2.1% 0.0% 0.0% 2.1% 0.0% 2.1% <b>4.2%</b>
<b>VITREOUS</b> 110.120 PERSISTENT HYALOID ARTERY/ REMNANT		1	1.4%	1	1.0%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		4	5.7%	2	2.1%
<b>NORMAL</b> .000 NORMAL GLOBE		40	57.1%	83	86.5%

## BASSET HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma				
	- PCAG	Not defined	2-6,8-9,11	NO	
	- POAG	Autosomal recessive	7,10	NO	Mutation in the <i>ADAMTS17</i> gene
B.	Entropion	Not defined	1	Breeder option	
C.	Ectropion	Not defined	1, 12	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
E.	Cataract	Not defined	1	NO	

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

In the Basset Hound, both closed angle (PCAG) and open angle (POAG) forms of glaucoma are present. Some Basset Hounds have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmologic examination using an indirect ophthalmoscope or a slit-lamp microscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. It is suspected that mild to severe anterior uveitis impairs outflow of aqueous through the small perforations that are present in the sheet of tissue in the iridocorneal angle; this results in a secondary and often irreversible rise in intraocular pressure that causes blindness.

The inheritance of PCAG and goniodysgenesis in the Basset Hound are not known. Until the inheritance is determined, control should be directed to removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny affected with glaucoma. Three genetic loci, *COL1A2*, *RAB22A*, and *NEB*, have been implicated as possible contributors to the development of PCAG in the Basset Hound. One is an autosomal recessive missense mutation of a nebulin (*NEB*) residue on chromosome 19. Because 33% of unaffected animals were homozygous for the risk allele, it was hypothesized that modifying factors may be present. A genetic test is not yet available for PCAG.

POAG in the Basset Hound is caused by a 19 base pair deletion in exon 2 of *ADAMTS17*. This deletion alters the reading frame and is suspected to cause a truncated protein. The trait shows an autosomal recessive mode of inheritance. A DNA test is available.

## **B. Entropion**

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

## **C. Ectropion**

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Basset Hound, ectropion is associated with an exceptionally large palpebral fissure (macroblepharon) and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid segment. This causes severe ocular irritation.

It is acknowledged that factors other than genetics may play a role or be the cause of entropion and/or ectropion. However, when non-genetic factors can be ruled out, selection should be directed to a more normal head conformation that minimizes or eliminates the likelihood of the defects.

## **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

## **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

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## OCULAR DISORDERS REPORT BASSET HOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,853		2018-2022 187	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			17	0.9%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			24	1.3%	6	3.2%
22.000 ECTROPION, UNSPECIFIED			134	7.2%	17	9.1%
25.110 DISTICHIASIS			25	1.3%	2	1.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.5%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			6	0.3%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			21	1.1%	2	1.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			10	0.5%	3	1.6%
<b>CORNEA</b>						
70.210 PANNUS			3	0.2%	0	0.0%
70.220 PIGMENTARY KERATITIS			3	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY			4	0.2%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			5	0.3%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			4	0.2%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			54	2.9%	4	2.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			11	0.6%	2	1.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			28	1.5%	2	1.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	1	0.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.2%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			6	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			54	2.9%	10	5.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			19	1.0%	2	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			10	0.5%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.3%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			8	0.4%	2	1.1%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.2%	2	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR			9	0.5%	3	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			7	0.4%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			13	0.7%	1	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.1%	1	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.2%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR			4	0.2%	3	1.6%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.5%
100.326 INCOMPLETE CATARACT, NUCLEUS			2	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.1%	0	0.0%

## OCULAR DISORDERS REPORT BASSET HOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,853		2018-2022 187	
			#	%	#	%
<b>LENS Continued</b> <i>100.345 SIGNIFICANT CATARACTS (SUMMARY)</i>			107	5.8%	17	9.1%
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			7	0.4%	0	0.0%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			3	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			11	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE			1	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			2	0.1%	0	0.0%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			1	0.1%	2	1.1%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			19	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED			49	2.6%	1	0.5%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			103	5.6%	7	3.7%
<b>NORMAL</b> .000 NORMAL GLOBE			1,413	76.3%	135	72.2%

## BAVARIAN MOUNTAIN SCENT HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BAVARIAN MOUNTAIN SCENT HOUND breed. Therefore, there are no conditions listed with breeding advice.

# **OCULAR DISORDERS REPORT BAVARIAN MOUNTAIN SCENT HOUND**

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	1	1.9%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		0	0.0%	3	5.6%
<b>NORMAL</b>					
.000 NORMAL GLOBE		13	100.0%	50	92.6%

## BEAGLE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	See below	1, 2	NO	
B.	Glaucoma				
	- PCAG	Not defined	14	NO	
	- POAG	Presumed autosomal recessive	3-13,15-17	NO	Mutation in the <i>ADAMTS10</i> gene
C.	Distichiasis	Not defined	1	Breeder option	
D.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
E.	Corneal dystrophy				
	- epithelial/stromal	Not defined	18-23	Breeder option	
F.	Cataract	Not defined	1, 24, 25	NO	
G.	Tapetal degeneration	Presumed autosomal recessive	26-29	Breeder option	
H.	Retinal dysplasia				
	- folds	Not defined	1, 32	Breeder option	
I.	Congenital stationary night blindness	Autosomal recessive	30,31	NO	Mutation in the <i>LRIT3</i> gene

### Description and Comments

#### A. Microphthalmia with multiple congenital ocular defects

A developmental anomaly in which the eyeball is abnormally small. This is often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens, and/or retina.

In the Beagle, the condition may be present unilaterally or bilaterally and is characterized by a small globe and associated ocular defects which are variable. Several forms of the condition, all apparently different, are recognized:

1) In one study, complete lens opacities were noted by 5-6 months of age; the severity of the cataract correlated closely with the extent of microphthalmia. Severely microphthalmic eyes also had multiple retinal folds. The disorder appeared to be inherited; the exact mode was not fully defined, although an X-linked disorder could not be ruled out.

2) A different form of microphthalmia is recognized in association with microphakia and persistent pupillary

membrane (PPM). Based on a limited pedigree of one cross, a dominant inheritance was proposed; heterozygotes have PPM and microphakia/cataract and homozygous affected show microphthalmia and multiple congenital ocular anomalies.

3) A third form of microphthalmia is recognized in the breed. This condition is usually unilateral and the fellow eye is normal. The mode of inheritance has not been defined, but autosomal recessive inheritance is suspected.

#### **B. Glaucoma**

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Primary open angle glaucoma is present in the breed, and extensive breeding studies have demonstrated its inheritance as autosomal recessive. By one year of age, the intraocular pressure (IOP) is elevated, but the filtration angle is open (early glaucoma). Animals with moderate glaucoma show sustained elevations of IOP, focal disinsertions of the lens zonules and focal closures of the iridocorneal angle. Later the globe enlarges, the lens luxates and the eyes become blind and show the effects of chronic glaucoma. The causative mutation in *ADAMTS10* causes an arginine for glycine substitution at position 661. A DNA test is available.

Primary closed angle glaucoma has also been reported in the Beagle.

#### **C. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **D. Imperforate lacrimal punctum**

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

#### **E. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In the Beagle, corneal dystrophy has been described as an oval opacity located at the junction at the middle and inferior thirds of the cornea. The opacities are caused by accumulation of cholesterol and other lipids within the cornea. Progression was noted with possible vision impairment.

#### **F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Several different types of cataract (anterior capsular, posterior cortical, other) have been reported in the Beagle, but the mode of inheritance of the defects is unknown. When one considers that this breed, particularly the laboratory-bred Beagle, has been the subject of extensive ophthalmological examination, the relatively low incidence of cataracts is surprising.

#### **G. Tapetal degeneration**

The tapetum lucidum is a modified choroidal structure present in the eyes of many animals that have good night vision. In Beagles there is a recessively inherited defect of the tapetal layer. Absence of this layer is determined by ophthalmoscopy which shows that the fundus has a uniform reddish coloration. The degeneration of the tapetum occurs as a result of abnormal postnatal development of this structure. The degeneration of the tapetum does not affect vision and does not result in functional or structural damage to the retina. As such, the condition probably represents an insignificant inherited variation of no functional significance.

#### **H. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **I. Congenital stationary night blindness (CSNB)**

A non-progressive retinal disease characterized by night blindness; day vision is normal. This condition was initially described in a research colony in Japan, and in 2018 was documented in a Beagle obtained from a commercial breeding facility in the USA (Oh et al). Genomic analysis has concluded that this disease is rare in the wider Beagle population. The condition is inherited in an autosomal recessive manner. Affected dogs had normal retinas on clinical examination, but no detectable rod photoreceptor responses with an electroretinogram (ERG). A DNA test is available.

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# OCULAR DISORDERS REPORT BEAGLE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,754		2018-2022 606	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.2%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			4	0.2%	2	0.3%
22.000 ECTROPION, UNSPECIFIED			1	0.1%	0	0.0%
25.110 DISTICHIASIS			315	18.0%	98	16.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	3	0.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			6	0.3%	6	1.0%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.2%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			11	0.6%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			7	0.4%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	1	0.2%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.1%	2	0.3%
93.150 IRIS COLOBOMA			0	0.0%	1	0.2%
93.170 ANTERIOR CHAMBER CYST			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			20	1.1%	6	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	1	0.2%
95.120 CILIARY BODY CYST			1	0.1%	2	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			9	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			51	2.9%	16	2.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	0.7%	2	0.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			6	0.3%	1	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.1%	4	0.7%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	0.3%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.2%	2	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	0.2%	6	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			14	0.8%	2	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.4%	4	0.7%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.2%	2	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.1%	1	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT			19	1.1%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>97</b>	<b>5.5%</b>	<b>27</b>	<b>4.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT BEAGLE

	Year Examined: Total # Dogs:	1993-2017 1,754		2018-2022 606	
Diagnostic Name		#	%	#	%
<b>VITREOUS Continued</b>					
110.135 PHPV/ PTVL		1	0.1%	1	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS		5	0.3%	1	0.2%
<b>FUNDUS</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	3	0.5%
130.110 MICROPAPILLA		0	0.0%	1	0.2%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		34	1.9%	2	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		6	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		8	0.5%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		2	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		4	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA		1	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		18	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED		44	2.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		28	1.6%	24	4.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,291	73.6%	448	73.9%

## BEARDED COLLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO
D.	Y suture tip opacity	Not defined	1	Breeder option
E.	Retinal dysplasia  - folds	Not defined	1	Breeder option
F.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Not defined	1	NO

### Description and Comments

#### A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

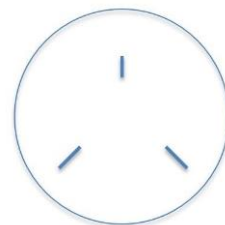
#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Y-suture tip opacity

These are prominent (or "highlighted" or "more dense") distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so

there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached), which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### F. Choroidal hypoplasia (Collie Eye Anomaly)

- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as “Collie Eye Anomaly.” A genetic mutation associated with this disorder in this breed has not been described.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BEARDED COLLIE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 4,014		2018-2022 392	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			29	0.7%	5	1.3%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			51	1.3%	5	1.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			6	0.1%	1	0.3%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			165	4.1%	16	4.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			9	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.0%	3	0.8%
93.810 UVEAL MELANOMA			0	0.0%	1	0.3%
95.120 CILIARY BODY CYST			3	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			22	0.5%	4	1.0%
97.120 COLOBOMA			4	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	5	1.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			12	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			406	10.1%	45	11.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			60	1.5%	15	3.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			16	0.4%	4	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			35	0.9%	6	1.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			6	0.1%	2	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			40	1.0%	10	2.6%
100.306 PUNCTATE CATARACT, NUCLEUS			9	0.2%	5	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR			22	0.5%	10	2.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			41	1.0%	3	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			36	0.9%	2	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			26	0.6%	8	2.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			14	0.3%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			16	0.4%	4	1.0%
100.317 INCIPIENT CATARACT, CAPSULAR			10	0.2%	3	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			2	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			20	0.5%	13	3.3%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			6	0.1%	1	0.3%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>357</b>	<b>8.9%</b>	<b>74</b>	<b>18.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			6	0.1%	1	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			6	0.1%	1	0.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			52	1.3%	0	0.0%

## OCULAR DISORDERS REPORT BEARDED COLLIE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 4,014		2018-2022 392	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.0%	1	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.2%	0	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	37	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	73	1.8%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	44	1.1%	17	4.3%
<b>NORMAL</b>					
.000	NORMAL GLOBE	3,203	79.8%	279	71.2%

# BEAUCERON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataracts	Not defined	1	NO

## Description and Comments

### A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BEAUCERON

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			242		582	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.4%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	0.8%	6	1.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			0	0.0%	1	0.2%
<b>CORNEA</b>						
70.210 PANNUS			1	0.4%	0	0.0%
70.700 CORNEAL DYSTROPHY			1	0.4%	1	0.2%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			7	2.9%	34	5.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	1	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			15	6.2%	50	8.6%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	2.9%	16	2.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.4%	4	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.4%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	1.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	1.2%	3	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.8%	10	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	0.8%	1	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	2	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.8%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.4%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.4%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			2	0.8%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.4%	1	0.2%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>16</b>	<b>6.6%</b>	<b>24</b>	<b>4.1%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			0	0.0%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS			6	2.5%	1	0.2%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.4%	3	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.4%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	1.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	2.5%	22	3.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			195	80.6%	450	77.3%

## BEDLINGTON TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BEDLINGTON TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,701		2018-2022 309	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	0.3%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			2	0.1%	0	0.0%
25.110 DISTICHIASIS			132	7.8%	12	3.9%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			13	0.8%	2	0.6%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			7	0.4%	1	0.3%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			145	8.5%	32	10.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.3%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.2%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			13	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			125	7.3%	11	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			16	0.9%	5	1.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			15	0.9%	1	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			34	2.0%	10	3.2%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	1	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			7	0.4%	2	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			39	2.3%	1	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			18	1.1%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			32	1.9%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			9	0.5%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			6	0.4%	3	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT			15	0.9%	1	0.3%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>219</b>	<b>12.9%</b>	<b>22</b>	<b>7.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	2	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			5	0.3%	1	0.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			10	0.6%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.1%	0	0.0%
120.960 RETINOPATHY			1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT BEDLINGTON TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		0	0.0%	2	0.6%
130.120 OPTIC NERVE HYPOPLASIA		1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA		5	0.3%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		13	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED		34	2.0%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		19	1.1%	9	2.9%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,255	73.8%	233	75.4%

## BELGIAN LAEKENOIS

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataracts	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT BELGIAN LAEKENOIS

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			5	2.9%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			0	0.0%	2	2.5%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.6%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	1.2%	1	1.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.6%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			17	9.8%	5	6.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	1.2%	3	3.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	1.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.6%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.6%	1	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	2	2.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	3	3.8%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.6%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	1.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	2	2.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>6</b>	<b>3.5%</b>	<b>14</b>	<b>17.5%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.6%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			4	2.3%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			6	3.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	1.3%
<b>FUNDUS</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	3	3.8%
120.960 RETINOPATHY			0	0.0%	2	2.5%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			4	2.3%	0	0.0%
900.100 OTHER, NOT INHERITED			4	2.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	1.2%	3	3.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			143	82.7%	60	75.0%

## BELGIAN MALINOIS

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B	Y suture tip opacity	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

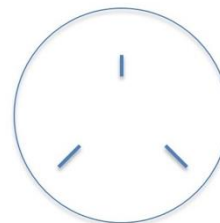
### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### **C.      Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Malinois, cataract most often occurs as a non-progressive, triangular opacity in the posterior cortex.

### **References**

1.      ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BELGIAN MALINOIS

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,926		2018-2022 1,021	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			2	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	0.1%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			3	0.1%	2	0.2%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	2	0.2%
<b>CORNEA</b>						
70.210 PANNUS			10	0.3%	3	0.3%
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			17	0.6%	6	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			9	0.3%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			33	1.1%	25	2.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			0	0.0%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.0%	2	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	1	0.1%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			3	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			129	4.4%	58	5.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			29	1.0%	23	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			13	0.4%	6	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.1%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			8	0.3%	4	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			23	0.8%	7	0.7%
100.306 PUNCTATE CATARACT, NUCLEUS			7	0.2%	10	1.0%
100.307 PUNCTATE CATARACT, CAPSULAR			5	0.2%	8	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			15	0.5%	8	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			24	0.8%	7	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.2%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			8	0.3%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			10	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			17	0.6%	9	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	3	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	2	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			8	0.3%	12	1.2%
100.330 GENERALIZED/ COMPLETE CATARACT			6	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>183</b>	<b>6.3%</b>	<b>93</b>	<b>9.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.1%	3	0.3%

# OCULAR DISORDERS REPORT BELGIAN MALINOIS

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,926		2018-2022 1,021	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.135	PHPV/ PTVL	2	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.1%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	20	0.7%	5	0.5%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	26	0.9%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	6	0.2%	1	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	13	0.4%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	4	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.0%	3	0.3%
<b>OPTIC NERVE</b>					
130.150	OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	21	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	78	2.7%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	1.4%	49	4.8%
<b>NORMAL</b>					
.000	NORMAL GLOBE	2,584	88.3%	848	83.1%

## BELGIAN SHEEPDOG

(BELGIAN SHEPHERD-GROENENDAEL)

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	1	NO
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO
D.	Achiasmic optic nerves with nystagmus	Autosomal recessive	2	NO

### Description and Comments

#### A. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Sheepdog, cataract most often occurs as a non-progressive, triangular opacity in the posterior cortex.

#### D. Achiasmatic optic nerves with nystagmus

Achiasmatic optic nerves with nystagmus have been described in a small family of black Belgian

Sheepdogs. Congenital nystagmus is the clinical sign most commonly noted. All retinal ganglion cell axons extend directly into the ipsilateral optic disc with no chiasmal decussation. No optic nerve hypoplasia/micropapilla was noted in the animals studied and reported.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Hogan D and Williams RW. Analysis of the retinas and optic nerves of achiasmatic Belgian sheepdogs. *The Journal of comparative neurology*. 1995 Feb 13;352:367-380. PMID: 7706558

## OCULAR DISORDERS REPORT BELGIAN SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 6,079		2018-2022 912	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			13	0.2%	1	0.1%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			6	0.1%	3	0.3%
51.100 THIRD EYELID CARTILAGE ANOMALY			3	0.0%	1	0.1%
<b>CORNEA</b>						
70.210 PANNUS			60	1.0%	11	1.2%
70.220 PIGMENTARY KERATITIS			3	0.0%	8	0.9%
70.700 CORNEAL DYSTROPHY			34	0.6%	5	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			3	0.0%	1	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			447	7.4%	71	7.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			14	0.2%	6	0.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			3	0.0%	0	0.0%
95.120 CILIARY BODY CYST			0	0.0%	1	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			13	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			213	3.5%	40	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			38	0.6%	13	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			48	0.8%	11	1.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			5	0.1%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			4	0.1%	3	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			22	0.4%	2	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			8	0.1%	2	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			18	0.3%	11	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			26	0.4%	6	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			60	1.0%	14	1.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			13	0.2%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			14	0.2%	4	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			11	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			6	0.1%	4	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	2	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			8	0.1%	5	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>300</b>	<b>4.9%</b>	<b>76</b>	<b>8.3%</b>

# OCULAR DISORDERS REPORT BELGIAN SHEEPDOG

Year Examined: Total # Dogs:		1993-2017 6,079		2018-2022 912	
Diagnostic Name		#	%	#	%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.0%	3	0.3%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	3	0.0%	1	0.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	38	0.6%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	29	0.5%	5	0.5%
130.120	OPTIC NERVE HYPOPLASIA	14	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	5	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	54	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	113	1.9%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	64	1.1%	53	5.8%
NORMAL					
.000	NORMAL GLOBE	5,166	85.0%	692	75.9%

## BELGIAN TERVUREN

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct, thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	1, 2	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans which may also occur independent of corneal disease.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Tervuren, cataract most often occurs as a non-progressive, triangular opacity in the posterior cortex.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Chavkin MJ, Roberts SM, Salman MD, et al. Risk factors for development of chronic superficial keratitis in dogs. *J Am Vet Med Assoc*. 1994 May 15;204:1630-1634. PMID: 8050943

## OCULAR DISORDERS REPORT BELGIAN TERVUREN

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 13,342		2018-2022 1,838	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			4	0.0%	0	0.0%
10.000 GLAUCOMA			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	2	0.1%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			3	0.0%	0	0.0%
25.110 DISTICHIASIS			117	0.9%	9	0.5%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			7	0.1%	8	0.4%
51.100 THIRD EYELID CARTILAGE ANOMALY			21	0.2%	3	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			100	0.7%	19	1.0%
70.220 PIGMENTARY KERATITIS			8	0.1%	3	0.2%
70.700 CORNEAL DYSTROPHY			73	0.5%	7	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			7	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			15	0.1%	0	0.0%
93.150 IRIS COLOBOMA			2	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,042	7.8%	208	11.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			13	0.1%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			14	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			40	0.3%	33	1.8%
93.810 UVEAL MELANOMA			2	0.0%	2	0.1%
95.120 CILIARY BODY CYST			1	0.0%	1	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
97.120 COLOBOMA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.1%
130.110 MICROPAPILLA			0	0.0%	7	0.4%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	2	0.1%
130.150 OPTIC DISC COLOBOMA			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			66	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			714	5.4%	134	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			146	1.1%	67	3.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			103	0.8%	32	1.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			21	0.2%	10	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			10	0.1%	12	0.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			50	0.4%	7	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			12	0.1%	11	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			49	0.4%	30	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			66	0.5%	15	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			146	1.1%	30	1.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			23	0.2%	9	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			6	0.0%	1	0.1%

# OCULAR DISORDERS REPORT BELGIAN TERVUREN

Year Examined: Total # Dogs:		1993-2017 13,342		2018-2022 1,838	
Diagnostic Name		#	%	#	%
LENS Continued					
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	30	0.2%	5	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.0%	1	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	20	0.1%	8	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	4	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	16	0.1%	11	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	12	0.1%	2	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	768	5.8%	246	13.4%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	12	0.1%	8	0.4%
110.135	PHPV/ PTVL	3	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	33	0.2%	9	0.5%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	42	0.3%	2	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	23	0.2%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	3	0.0%	3	0.2%
OPTIC NERVE					
130.110	MICROPAPILLA	131	1.0%	10	0.5%
130.120	OPTIC NERVE HYPOPLASIA	95	0.7%	1	0.1%
130.150	OPTIC DISC COLOBOMA	4	0.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	107	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	251	1.9%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	193	1.4%	108	5.9%
NORMAL					
.000	NORMAL GLOBE	10,988	82.4%	1,280	69.6%

## BERGAMASCO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BERGAMASCO breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## BERGAMASCO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		7 #	%	9 #	%
<b>CORNEA</b> 70.700 CORNEAL DYSTROPHY		1	14.3%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		6	85.7%	9	100.0%

## BERGER DE PYRENEES

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BERGER DE PYRENEES breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT BERGER DES PYRENEES

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		3 #	%	10 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	2	20.0%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	33.3%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		2	66.7%	8	80.0%

## BERGER PICARD

(PICARDY SHEPHERD, PICARDIE)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO
F.	Y suture tip opacity	Not defined	1	Breeder option
G.	Retinal atrophy			
	- generalized	Not defined	1	NO
H.	Retinal dysplasia	Not defined	1	Breeder option
	- folds			
I.	Retinopathy	Not defined	1	Breeder option

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

#### C. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### D. Persistent pupillary membranes (PPMs)

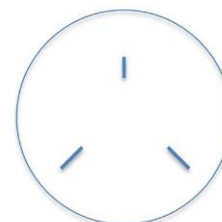
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### F. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality is also known as progressive retinal atrophy or PRA, and may be detected by electroretinogram (not part of a routine eye screening examination) before there are detectable fundusoscopic changes seen by ophthalmoscopy. There are multiple genetic types of PRA including the rod cone dysplasias described elsewhere.

#### H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### I. Retinopathy

A lesion similar to canine multifocal retinopathy has been noted in the Berger Picard. The lesions initially appear as multifocal sub-retinal fluid elevations that over time may become hyper-reflective lesions.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT BERGER PICARD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,107		2018-2022 733	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			0	0.0%	1	0.1%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			81	7.3%	49	6.7%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.2%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			21	1.9%	14	1.9%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			0	0.0%	3	0.4%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			19	1.7%	16	2.2%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.1%	0	0.0%
93.120 IRIS CYST			2	0.2%	1	0.1%
93.150 IRIS COLOBOMA			0	0.0%	1	0.1%
93.170 ANTERIOR CHAMBER CYST			1	0.1%	2	0.3%
93.180 IRIS SPHINCTER DYSPLASIA			0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			246	22.2%	54	7.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	2	0.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.1%	0	0.0%
95.120 CILIARY BODY CYST			1	0.1%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			126	11.4%	66	9.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	0.6%	13	1.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	0.5%	4	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.3%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	2	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			83	7.5%	46	6.3%
100.306 PUNCTATE CATARACT, NUCLEUS			6	0.5%	5	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			11	1.0%	13	1.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			4	0.4%	6	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			10	0.9%	9	1.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.2%	4	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			18	1.6%	16	2.2%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	2	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.2%	4	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.2%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			5	0.5%	2	0.3%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	3	0.4%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.1%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			69	6.2%	70	9.5%
100.330 GENERALIZED/ COMPLETE CATARACT			0	0.0%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>162</b>	<b>14.6%</b>	<b>133</b>	<b>18.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			7	0.6%	3	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.1%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	24	3.3%

## OCULAR DISORDERS REPORT BERGER PICARD

	Year Examined: Total # Dogs:	1993-2017 1,107		2018-2022 733	
Diagnostic Name		#	%	#	%
FUNDUS Continued					
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	3	0.4%
120.190 RETINAL DYSPLASIA, DETACHED		0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	6	0.8%
120.960 RETINOPATHY		0	0.0%	2	0.3%
120.970 CMR/ CMR-LIKE RETINOPATHY		0	0.0%	9	1.2%
130.110 MICROPAPILLA		0	0.0%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA		0	0.0%	1	0.1%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		197	17.8%	44	6.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		8	0.7%	3	0.4%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		20	1.8%	11	1.5%
120.960 RETINOPATHY		48	4.3%	21	2.9%
120.970 CMR/ CMR-LIKE RETINOPATY		0	0.0%	1	0.1%
OPTIC NERVE					
130.110 MICROPAPILLA		1	0.1%	1	0.1%
130.150 OPTIC DISC COLOBOMA		1	0.1%	0	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		25	2.3%	0	0.0%
900.100 OTHER, NOT INHERITED		21	1.9%	2	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		47	4.2%	46	6.3%
NORMAL					
.000 NORMAL GLOBE		510	46.1%	387	52.8%

## BERNESE MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Retinal atrophy			
	- generalized	Not defined	2	NO

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and

affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **E. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Bernese Mountain Dog, one French report found the early onset retinopathy to be functionally and electroretinographically similar to the retinal dystrophy seen in the Briard.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Chaudieu G and Molon-Noblot S. Early retinopathy in the Bernese Mountain Dog in France: preliminary observations. *Vet Ophthalmol.* 2004 May-Jun;7:175-184. PMID: 15091325 \*\*non-USA dog population\*\*

## OCULAR DISORDERS REPORT BERNESE MOUNTAIN DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 17,397		2018-2022 3,411	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			7	0.0%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			25	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			258	1.5%	46	1.3%
22.000 ECTROPION, UNSPECIFIED			111	0.6%	15	0.4%
25.110 DISTICHIASIS			164	0.9%	38	1.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	2	0.1%
51.100 THIRD EYELID CARTILAGE ANOMALY			43	0.2%	6	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	2	0.1%
<b>CORNEA</b>						
70.210 PANNUS			3	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			68	0.4%	15	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.0%	0	0.0%
93.120 IRIS CYST			50	0.3%	4	0.1%
93.150 IRIS COLOBOMA			8	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			4	0.0%	3	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			659	3.8%	177	5.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			15	0.1%	5	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.0%	5	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			27	0.2%	36	1.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			11	0.1%	2	0.1%
95.120 CILIARY BODY CYST			2	0.0%	1	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	5	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.0%
120.960 RETINOPATHY			0	0.0%	2	0.1%
130.110 MICROPAPILLA			0	0.0%	2	0.1%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	2	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			6	0.0%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1,027	5.9%	171	5.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			173	1.0%	70	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			110	0.6%	23	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			59	0.3%	17	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			23	0.1%	9	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			41	0.2%	14	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			50	0.3%	25	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			56	0.3%	44	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			61	0.4%	16	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			182	1.0%	23	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			111	0.6%	19	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			9	0.1%	2	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			30	0.2%	4	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			37	0.2%	20	0.6%

## OCULAR DISORDERS REPORT BERNESE MOUNTAIN DOG

Year Examined: Total # Dogs:		1993-2017 17,397		2018-2022 3,411	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.317	INCIPIENT CATARACT, CAPSULAR	60	0.3%	16	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	2	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.0%	3	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	4	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	4	0.0%	10	0.3%
100.327	INCOMPLETE CATARACT, CAPSULAR	3	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	8	0.0%	10	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	29	0.2%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	2	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	1	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>1,056</b>	<b>6.1%</b>	<b>319</b>	<b>9.4%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	27	0.2%	14	0.4%
110.135	PHPV/ PTVL	9	0.1%	5	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	23	0.1%	1	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	39	0.2%	5	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	8	0.0%	1	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	3	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	51	0.3%	0	0.0%
120.400	RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960	RETINOPATHY	6	0.0%	6	0.2%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	21	0.1%	7	0.2%
130.120	OPTIC NERVE HYPOPLASIA	32	0.2%	4	0.1%
130.150	OPTIC DISC COLOBOMA	22	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	193	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	457	2.6%	1	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	217	1.2%	105	3.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	14,826	85.2%	2,711	79.5%

## BICHON FRISE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1-3	NO
F.	Y suture tip opacity	Not defined	1	Breeder option
G.	Vitreous degeneration	Not defined	1	Breeder option
	- syneresis			

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### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Bichon Frise, many of these strands bridge between the iris and cornea where they may be associated with corneal opacities and vision impairment.

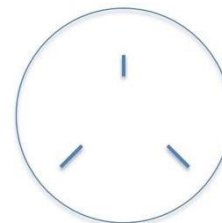
#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The range in age of animals affected with cataracts in one study was 1-2 years to 9-10 years old, with the peak age of 3 years old. The cataracts involved all regions of the lens, but in age groups of 2-4 years old, the predominant regions affected were the posterior cortex, and the anterior and posterior cortices combined. The earliest abnormalities usually consisted of small punctate opacities in the paracentral posterior cortex, independent of the posterior lens sutures.

#### **F. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **G. Vitreous degeneration - syneresis**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN, Wallace MR, Andrew SE, et al. Cataracts in the Bichon Frise. *Vet Ophthalmol*. 2003 Mar;6:3-9. PMID: 12641835
3. Schmidt GM and Vainisi SJ. Retrospective study of prophylactic random transscleral retinopexy in the Bichon Frise with cataract. *Vet Ophthalmol*. 2004 Sep-Oct;7:307-310. PMID: 15310289

## OCULAR DISORDERS REPORT BICHON FRISE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 10,522		2018-2022 1,748	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.1%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			8	0.1%	18	1.0%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			384	3.6%	78	4.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	3	0.2%
<b>CORNEA</b>						
70.210 PANNUS			2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			3	0.0%	2	0.1%
70.700 CORNEAL DYSTROPHY			369	3.5%	58	3.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			6	0.1%	1	0.1%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			2	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.0%	0	0.0%
93.150 IRIS COLOBOMA			4	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			250	2.4%	66	3.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			13	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			31	0.3%	2	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			3	0.0%	8	0.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			10	0.1%	2	0.1%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
120.960 RETINOPATHY			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			23	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			569	5.4%	63	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			146	1.4%	37	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			95	0.9%	17	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			16	0.2%	8	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			11	0.1%	2	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			52	0.5%	15	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS			19	0.2%	9	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			27	0.3%	15	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			94	0.9%	7	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			226	2.1%	16	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			35	0.3%	8	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			48	0.5%	4	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			10	0.1%	3	0.2%

## OCULAR DISORDERS REPORT BICHON FRISE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 10,522		2018-2022 1,748	
		#	%	#	%
<b>LENS Continued</b>					
100.317	INCIPIENT CATARACT, CAPSULAR	15	0.1%	6	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	3	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.0%	5	0.3%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	11	0.1%	35	2.0%
100.330	GENERALIZED/ COMPLETE CATARACT	149	1.4%	2	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.0%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>974</b>	<b>9.3%</b>	<b>158</b>	<b>9.0%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	26	0.2%	14	0.8%
110.135	PHPV/ PTVL	3	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	11	0.1%	8	0.5%
110.320	VITREOUS DEGENERATION SYNERESIS	108	1.0%	24	1.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	70	0.7%	3	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	59	0.6%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	3	0.0%	2	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	2	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	10	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	39	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	145	1.4%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	87	0.8%	82	4.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	8,609	81.8%	1,292	73.9%

## Biewer Terrier

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT BIEWER TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			64		336	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	1.6%	12	3.6%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	2	0.6%
<b>GLOBE</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.3%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	2	0.6%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			9	14.1%	32	9.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			0	0.0%	1	0.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	3.1%	1	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	1	0.3%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	1.6%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.6%
120.960 RETINOPATHY			0	0.0%	1	0.3%
130.110 MICROPAPILLA			0	0.0%	1	0.3%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	6.3%	3	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	6.3%	1	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	2	0.6%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	2	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT			1	1.6%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT			1	1.6%	0	0.0%
100.345 <b>SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>6</b>	<b>9.4%</b>	<b>7</b>	<b>2.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	1.6%	1	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			0	0.0%	1	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS			0	0.0%	2	0.6%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.6%
<b>OPTIC NERVE</b>						
130.150 OPTIC DISC COLOBOMA			1	1.6%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	6	1.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			52	81.3%	270	80.4%

## BLACK AND TAN COONHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO
B.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### B. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BLACK AND TAN COONHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 628		2018-2022 141	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.2%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			3	0.5%	1	0.7%
22.000 ECTROPION, UNSPECIFIED			7	1.1%	2	1.4%
25.110 DISTICHIASIS			6	1.0%	1	0.7%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.3%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.3%	0	0.0%
70.700 CORNEAL DYSTROPHY			0	0.0%	1	0.7%
<b>UVEA</b>						
93.170 ANTERIOR CHAMBER CYST			1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			5	0.8%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.5%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	2	1.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			8	1.3%	2	1.4%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.2%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	1.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			47	7.5%	7	5.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			6	1.0%	1	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.3%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	3	2.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			7	1.1%	4	2.8%
100.307 PUNCTATE CATARACT, CAPSULAR			4	0.6%	2	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.2%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			6	1.0%	2	1.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.6%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.2%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			3	0.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>41</b>	<b>6.5%</b>	<b>12</b>	<b>8.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	0	0.0%
110.135 PHPV/ PTVL			1	0.2%	1	0.7%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			52	8.3%	20	14.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED			11	1.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	1.3%	6	4.3%

# OCULAR DISORDERS REPORT BLACK AND TAN COONHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		476	75.8%	99	70.2%

## BLACK RUSSIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy  - ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene
E.	POANV (polyneuropathy, ocular abnormalities neuronal vacuolation) - Microphthalmia - Cataracts - PPM (iris to iris)	Autosomal recessive	3	NO	Mutation in the <i>RAB3GAP1: c.743delC</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A DNA test is available.

#### **E. POANV- Polyneuropathy with ocular abnormalities and neuronal vacuolation**

An autosomal recessive condition resulting in juvenile polyneuropathy that presents as laryngeal paralysis and weakness. Patients have concurrent ophthalmic abnormalities including microphthalmia, incomplete cataracts (primarily nuclear) and iris-to-iris PPMs. Neuronal vacuolation was identified on histopathology. Affected dogs were found to be homozygous for the RAB3GAP1: c.743delC mutation. Patients with this variant are not reported to survive past 6 months.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.
3. Mhlanga-Mutangadura T, Johnson GJ, Schnabel RD, et al. A mutation in the Warburg syndrome gene, RAB3GAP1, causes a similar syndrome with polyneuropathy and neuronal vacuolation in Black Russian Terrier dogs. *Neurobiology of Disease.* 2016;86:75-85. PMID: 26607784

## OCULAR DISORDERS REPORT BLACK RUSSIAN TERRIER

Year Examined: Total # Dogs:		1993-2017		2018-2022	
		688		343	
Diagnostic Name		#	%	#	%
EYELIDS					
21.000	ENTROPION, UNSPECIFIED	8	1.2%	4	1.2%
22.000	ECTROPION, UNSPECIFIED	4	0.6%	1	0.3%
25.110	DISTICHIASIS	7	1.0%	4	1.2%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.1%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	2	0.3%	5	1.5%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.1%	0	0.0%
93.120	IRIS CYST	4	0.6%	0	0.0%
93.150	IRIS COLOBOMA	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	15	2.2%	9	2.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	0	0.0%	1	0.3%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.3%	4	1.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	1	0.3%
93.810	UVEAL MELANOMA	1	0.1%	0	0.0%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	33	4.8%	24	7.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	15	2.2%	13	3.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	1.0%	2	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	2	0.6%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	3	0.9%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.3%	7	2.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.7%	8	2.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	11	1.6%	5	1.5%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	2	0.6%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	6	0.9%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	2	0.6%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	2	0.6%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	54	7.8%	46	13.4%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.6%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.3%	2	0.6%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	2	0.3%	1	0.3%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.3%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
130.110	MICROPAPILLA	0	0.0%	2	0.6%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.6%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT BLACK RUSSIAN TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		12	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED		8	1.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		10	1.5%	5	1.5%
<b>NORMAL</b>					
.000 NORMAL GLOBE		590	85.8%	265	77.3%

## BLOODHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
D.	Cataract	Not defined	1	NO
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

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### Description and Comment

#### A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except

in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**E. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BLOODHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			601		91	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.2%	1	1.1%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	1.1%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			75	12.5%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			132	22.0%	8	8.8%
22.000 ECTROPION, UNSPECIFIED			154	25.6%	11	12.1%
25.110 DISTICHIASIS			10	1.7%	1	1.1%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.5%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.2%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			6	1.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			5	0.8%	0	0.0%
70.220 PIGMENTARY KERATITIS			3	0.5%	0	0.0%
70.700 CORNEAL DYSTROPHY			0	0.0%	1	1.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.3%	1	1.1%
<b>UVEA</b>						
93.120 IRIS CYST			0	0.0%	1	1.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			18	3.0%	6	6.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	0.8%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			38	6.3%	2	2.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			3	0.5%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.2%	0	0.0%
95.120 CILIARY BODY CYST			1	0.2%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			15	2.5%	4	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			10	1.7%	2	2.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.5%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.5%	2	2.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			16	2.7%	2	2.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			6	1.0%	1	1.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.5%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			5	0.8%	2	2.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.2%	2	2.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.3%	1	1.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	1.1%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT			1	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>58</b>	<b>9.7%</b>	<b>13</b>	<b>14.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	1	1.1%
110.135 PHPV/ PTVL			1	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.2%	0	0.0%

## OCULAR DISORDERS REPORT BLOODHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			601		91	
			#	%	#	%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		33	5.5%	2	2.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		1	0.2%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.2%	0	0.0%
<b>FUNDUS</b>						
120.170	RETINAL DYSPLASIA, FOLDS		0	0.0%	3	3.3%
<b>OPTIC NERVE</b>						
130.150	OPTIC DISC COLOBOMA		1	0.2%	0	0.0%
<b>OTHER</b>						
900.000	OTHER, UNSPECIFIED		5	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED		12	2.0%	1	1.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		12	2.0%	6	6.6%
<b>NORMAL</b>						
.000	NORMAL GLOBE		276	45.9%	47	51.6%

## BLUE LACY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BLUE LACY breed. Therefore, there are no conditions listed with breeding advice.

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## BLUE MOUNTAIN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BLUE MOUNTAIN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT  
BLUE MOUNTAIN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## BLUETICK COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BLUETICK COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT BLUETICK COONHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
22.000 ECTROPION, UNSPECIFIED			1	3.4%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			0	0.0%	1	2.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	3.4%	1	2.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	3.4%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	6.9%	1	2.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	3.4%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	10.3%	0	0.0%
900.100 OTHER, NOT INHERITED			1	3.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	6.9%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			22	75.9%	42	93.3%

## BOERBOEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Multifocal retinopathy	Autosomal recessive	2	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene
B.	Cataract	Not defined	1	NO	
C.	Retinal dysplasia - folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

# OCULAR DISORDERS REPORT BOERBOEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			44		73	
			#	%	#	%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			1	2.3%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			0	0.0%	4	5.5%
22.000 ECTROPION, UNSPECIFIED			1	2.3%	0	0.0%
25.110 DISTICHIASIS			3	6.8%	1	1.4%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	2.3%	0	0.0%
70.700 CORNEAL DYSTROPHY			0	0.0%	1	1.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	2.3%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	2.3%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	2.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	4.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	1.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	4.5%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			0	0.0%	1	1.4%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	4.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	4.5%	2	2.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	1	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	1.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	2.3%	1	1.4%
100.306 PUNCTATE CATARACT, NUCLEUS			1	2.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	1.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	1.4%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	1.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	1.4%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	1.4%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>4.5%</b>	<b>7</b>	<b>9.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	2	2.7%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	4.5%	3	4.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	2.3%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	1.4%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	2.3%	5	6.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			34	77.3%	50	68.5%

## BOLOGNESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

# OCULAR DISORDERS REPORT BOLOGNESE

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	786		66	
			#	%	#	%
<b>EYELIDS</b>						
21.000	ENTROPION, UNSPECIFIED		3	0.4%	0	0.0%
25.110	DISTICHIASIS		108	13.7%	4	6.1%
<b>NASOLACRIMAL</b>						
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		2	0.3%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA		2	0.3%	0	0.0%
<b>NICTITANS</b>						
52.110	PROLAPSED GLAND OF THE THIRD EYELID		2	0.3%	1	1.5%
<b>CORNEA</b>						
70.700	CORNEAL DYSTROPHY		14	1.8%	2	3.0%
<b>UVEA</b>						
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		115	14.6%	15	22.7%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		6	0.8%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		4	0.5%	0	0.0%
<b>LENS</b>						
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		19	2.4%	1	1.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		1	0.1%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS		1	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR		0	0.0%	1	1.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		2	0.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		2	0.3%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		3	0.4%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES		1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES		7	0.9%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR		1	0.1%	1	1.5%
100.330	GENERALIZED/ COMPLETE CATARACT		4	0.5%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		22	2.8%	2	3.0%
<b>VITREOUS</b>						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT		1	0.1%	0	0.0%
110.135	PHPV/ PTVL		1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER		5	0.6%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS		9	1.1%	0	0.0%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		6	0.8%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC		1	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED		1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		1	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.1%	0	0.0%
<b>OPTIC NERVE</b>						
130.110	MICROPAPILLA		1	0.1%	0	0.0%
<b>OTHER</b>						
900.000	OTHER, UNSPECIFIED		19	2.4%	0	0.0%
900.100	OTHER, NOT INHERITED		20	2.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		8	1.0%	1	1.5%
<b>NORMAL</b>						
.000	NORMAL GLOBE		572	72.8%	42	63.6%

## BORDER COLLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Y suture tip opacity	Not defined	1	Breeder option	
E.	Lens luxation	Not defined	2	NO	
F.	Retinal atrophy				
	- generalized	Suggested X-linked	3	NO	
G.	Choroidal hypoplasia (Collie Eye Anomaly)	Autosomal recessive	1, 5-7	NO	Mutation in the <i>NHEJ1</i> gene
	- optic Nerve coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- staphyloma/coloboma				

### Description and Comments

#### A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### B. Persistent pupillary membranes (PPMs)

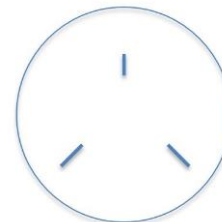
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness.

#### F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### G. Choroidal hypoplasia (Collie Eye Anomaly)

- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as “Collie Eye Anomaly.” The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

#### Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Foster SJ, Curtis R, Barnett KC. Primary lens luxation in the Border Collie. *J Small Anim Pract.* 1986;27:1-6.
3. Vilboux T, Chaudieu G, Jeannin P, et al. Progressive retinal atrophy in the Border Collie: a new XLPRA. *BMC Vet Res.* 2008;4:10.
4. Bedford PG. Collie eye anomaly in the Border Collie. *Vet Rec.* 1982;111:34-35.
5. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res.* 2007;17:1562-1571.
6. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003;82:86-95.
7. Marelli SP, Rizzi R, Paganelli A, Bagardi M, Minozzi G, Brambilla PG, Polli M. Genotypic and allelic frequency of a mutation in the *NHEJ1* gene associated with collie eye anomaly in dogs in Italy. *Vet Rec Open.* 2022 Jan 29;9(1):e26. doi: 10.1002/vro2.26. PMID: 35127102; PMCID: PMC8800487.

## OCULAR DISORDERS REPORT BORDER COLLIE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 26,867		2018-2022 3,051	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			13	0.0%	1	0.0%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			2	0.0%	0	0.0%
25.110 DISTICHIASIS			126	0.5%	21	0.7%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	1	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			7	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			22	0.1%	4	0.1%
70.220 PIGMENTARY KERATITIS			1	0.0%	1	0.0%
70.700 CORNEAL DYSTROPHY			225	0.8%	41	1.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			5	0.0%	0	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			1	0.0%	3	0.1%
93.120 IRIS CYST			9	0.0%	1	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.0%	0	0.0%
93.150 IRIS COLOBOMA			8	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,693	6.3%	207	6.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			34	0.1%	5	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			34	0.1%	1	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			15	0.1%	1	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			11	0.0%	15	0.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.0%	3	0.1%
93.810 UVEAL MELANOMA			1	0.0%	2	0.1%
95.120 CILIARY BODY CYST			2	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			3	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			441	1.6%	35	1.1%
97.120 COLOBOMA			48	0.2%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	3	0.1%
130.110 MICROPAPILLA			0	0.0%	2	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			57	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1,272	4.7%	173	5.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			164	0.6%	47	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			84	0.3%	12	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			59	0.2%	18	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			9	0.0%	4	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			220	0.8%	62	2.0%
100.306 PUNCTATE CATARACT, NUCLEUS			46	0.2%	21	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			63	0.2%	31	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			151	0.6%	12	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			112	0.4%	12	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			131	0.5%	24	0.8%

## OCULAR DISORDERS REPORT BORDER COLLIE

	Year Examined: Total # Dogs:	1993-2017 26,867		2018-2022 3,051	
Diagnostic Name		#	%	#	%
LENS Continued					
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES		14	0.1%	1	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES		67	0.2%	25	0.8%
100.316 INCIPIENT CATARACT, NUCLEUS		32	0.1%	15	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR		33	0.1%	10	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX		6	0.0%	9	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX		3	0.0%	9	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		4	0.0%	2	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES		1	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS		1	0.0%	4	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR		2	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		80	0.3%	120	3.9%
100.330 GENERALIZED/ COMPLETE CATARACT		29	0.1%	1	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT		0	0.0%	1	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		14	0.1%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		1,288	4.8%	321	10.5%
VITREOUS					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		67	0.2%	6	0.2%
110.135 PHPV/ PTVL		20	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		16	0.1%	3	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS		159	0.6%	24	0.8%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		199	0.7%	14	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		16	0.1%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		233	0.9%	11	0.4%
120.400 RETINAL HEMORRHAGE		6	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		18	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		0	0.0%	1	0.0%
120.960 RETINOPATHY		21	0.1%	2	0.1%
OPTIC NERVE					
130.110 MICROPAPILLA		22	0.1%	1	0.0%
130.120 OPTIC NERVE HYPOPLASIA		19	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA		96	0.4%	1	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		214	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED		607	2.3%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		286	1.1%	169	5.5%
NORMAL					
.000 NORMAL GLOBE		22,324	83.1%	2,208	72.4%

## BORDER TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Y suture tip opacity	Not defined	1	Breeder option

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

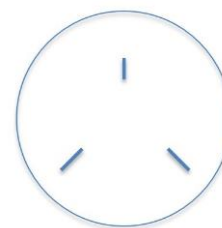
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either

be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BORDER TERRIER

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	6,594		1,583	
			#	%	#	%
<b>EYELIDS</b>						
21.000	ENTROPION, UNSPECIFIED		3	0.0%	0	0.0%
25.110	DISTICHIASIS		47	0.7%	19	1.2%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		0	0.0%	2	0.1%
<b>NICTITANS</b>						
52.110	PROLAPSED GLAND OF THE THIRD EYELID		1	0.0%	0	0.0%
<b>CORNEA</b>						
70.220	PIGMENTARY KERATITIS		0	0.0%	1	0.1%
70.700	CORNEAL DYSTROPHY		14	0.2%	2	0.1%
<b>UVEA</b>						
93.120	IRIS CYST		1	0.0%	0	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM		1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		187	2.8%	64	4.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		1	0.0%	1	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		3	0.0%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS		2	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		2	0.0%	2	0.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110	CHOROIDAL HYPOPLASIA		1	0.0%	0	0.0%
97.120	COLOBOMA		1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS		0	0.0%	2	0.1%
130.110	MICROPAPILLA		0	0.0%	1	0.1%
<b>LENS</b>						
100.200	CATARACT, UNSPECIFIED		9	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		433	6.6%	119	7.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		80	1.2%	45	2.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		36	0.5%	13	0.8%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX		34	0.5%	9	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES		8	0.1%	3	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		96	1.5%	46	2.9%
100.306	PUNCTATE CATARACT, NUCLEUS		10	0.2%	6	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR		30	0.5%	21	1.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		74	1.1%	24	1.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		61	0.9%	11	0.7%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		84	1.3%	15	0.9%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES		3	0.0%	1	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES		21	0.3%	4	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS		14	0.2%	3	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR		10	0.2%	6	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX		6	0.1%	5	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX		8	0.1%	4	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX		3	0.0%	3	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS		1	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR		1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES		66	1.0%	102	6.4%
100.330	GENERALIZED/ COMPLETE CATARACT		21	0.3%	1	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT		3	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED		1	0.0%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		613	9.3%	221	14.0%

## OCULAR DISORDERS REPORT BORDER TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 6,594		2018-2022 1,583	
		#	%	#	%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	8	0.1%	5	0.3%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	16	0.2%	5	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	58	0.9%	7	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	14	0.2%	3	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	0.2%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	0	0.0%	5	0.3%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	0	0.0%	1	0.1%
130.120	OPTIC NERVE HYPOPLASIA	1	0.0%	1	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	56	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	130	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	92	1.4%	57	3.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	5,742	87.1%	1,202	75.9%

# BORZOI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Retinopathy	Not defined	1, 2	Breeder option

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### C. Retinopathy

Patchy focal unilateral or bilateral hyper reflective tapetal lesions most frequently peripheral but occasionally central around a pigmented spot, usually non progressive. Not usually present prior to 3 months of age but usually present by 18 months of age.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Storey ES, Grahn BH and Alcorn J. Multifocal chorioretinal lesions in Borzoi dogs. *Vet Ophthalmol.* 2005 Sep-Oct;8:337-347. PMID: 16178845

## OCULAR DISORDERS REPORT BORZOI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,668		2018-2022 1,065	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			7	0.2%	1	0.1%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
25.110 DISTICHIASIS			9	0.2%	2	0.2%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	3	0.3%
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.1%	2	0.2%
<b>CORNEA</b>						
70.210 PANNUS			17	0.5%	7	0.7%
70.220 PIGMENTARY KERATITIS			1	0.0%	1	0.1%
70.700 CORNEAL DYSTROPHY			16	0.4%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			7	0.2%	1	0.1%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	2	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			76	2.1%	17	1.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			6	0.2%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			11	0.3%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.1%	2	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	0	0.0%
93.810 UVEAL MELANOMA			2	0.1%	4	0.4%
95.120 CILIARY BODY CYST			1	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			113	3.1%	28	2.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	0.4%	3	0.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			14	0.4%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.0%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			15	0.4%	3	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	3	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			9	0.2%	17	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			13	0.4%	3	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			19	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.2%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.1%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			10	0.3%	2	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	2	0.2%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			7	0.2%	5	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT			8	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT			1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			4	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>124</b>	<b>3.4%</b>	<b>38</b>	<b>3.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			13	0.4%	1	0.1%

# OCULAR DISORDERS REPORT BORZOI

	Year Examined: Total # Dogs:	1993-2017 3,668		2018-2022 1,065	
Diagnostic Name		#	%	#	%
<b>VITREOUS Continued</b>					
110.135 PHPV/ PTVL		11	0.3%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		4	0.1%	3	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS		9	0.2%	3	0.3%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		8	0.2%	2	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		8	0.2%	2	0.2%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		27	0.7%	1	0.1%
120.400 RETINAL HEMORRHAGE		2	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		5	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		2	0.1%	0	0.0%
120.960 RETINOPATHY		30	0.8%	12	1.1%
<b>FUNDUS</b>					
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	2	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	3	0.3%
120.960 RETINOPATHY		0	0.0%	13	1.2%
120.970 CMR/ CMR-LIKE RETINOPATHY		0	0.0%	3	0.3%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		13	0.4%	5	0.5%
130.120 OPTIC NERVE HYPOPLASIA		16	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA		4	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		44	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED		109	3.0%	3	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		92	2.5%	82	7.7%
<b>NORMAL</b>					
.000 NORMAL GLOBE		3,169	86.4%	872	81.9%

## BOSTON TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2,3	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
	- endothelial	Not defined	4	NO	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
F.	Cataract				
	- generalized	Not defined	1, 5, 6	NO	
	- <i>HSF4</i>	Autosomal recessive	6-7	NO	Mutation in the <i>HSF4</i> gene ( <i>HSF4-1</i> )
G.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	

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### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**C. Imperforate lacrimal punctum**

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

**D. Corneal dystrophy****- epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**- endothelial**

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

In the Boston Terrier, this is a primary degenerative endothelial disease leading to progressive and permanent corneal edema. It is not known if this disease is an inherited disorder. There is no sex predilection. The condition is observed in older dogs, 6 to 13 years of age with a mean of 9.5 years. The corneal edema starts asymptotically in the dorsal temporal corneal quadrant of one eye and slowly progresses medially, eventually involving the entire cornea. Typically, it becomes bilateral. In the later stages, discomfort, intracorneal bullae with subsequent ulceration and keratoconus may develop.

**F. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally during the first three months of life. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**G. Cataract****- generalized**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**- HSF4**

The Boston Terrier has at least two distinct forms of inherited cataract. One type has an onset before 6 months of age with rapid progression to complete opacity prior to 2 years old. The early onset cataract is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available. A second type of cataract occurs after 4-5 years of age with variable progression. The genetic mutation responsible for this cataract is not yet known.

**H. Vitreous degeneration - syneresis**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc.* 1986;188:1028-1030.
3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004;7:97-111.
4. Martin CL, Dice PF. Corneal Endothelial Dystrophy in the Dog. *J Am Anim Hosp Assoc.* 1982;18:327-336.
5. Curtis R. Late-onset cataract in the Boston terrier. *Vet Rec.* 1984;115:577-578.
6. Mellersh CS, Graves KT, McLaughlin B, et al. Mutation in HSF4 associated with early but not late-onset hereditary cataract in the Boston Terrier. *J Hered.* 2007;98:531-533.
7. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006;9:369-378.

## OCULAR DISORDERS REPORT BOSTON TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 15,000		2018-2022 4,137	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	3	0.1%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			5	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			12	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			44	0.3%	14	0.3%
22.000 ECTROPION, UNSPECIFIED			2	0.0%	0	0.0%
25.110 DISTICHIASIS			521	3.5%	114	2.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	47	1.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			52	0.3%	45	1.1%
40.910 KERATOCONJUNCTIVITIS SICCA			13	0.1%	1	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			2	0.0%	2	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			11	0.1%	3	0.1%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			21	0.1%	7	0.2%
70.700 CORNEAL DYSTROPHY			349	2.3%	90	2.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			27	0.2%	6	0.1%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			6	0.0%	2	0.0%
93.120 IRIS CYST			25	0.2%	2	0.0%
93.150 IRIS COLOBOMA			8	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			6	0.0%	3	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			570	3.8%	160	3.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			14	0.1%	2	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.0%	2	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.0%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	2	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			4	0.0%	7	0.2%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	3	0.1%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			81	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			345	2.3%	72	1.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			214	1.4%	52	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			56	0.4%	14	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			89	0.6%	24	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			49	0.3%	14	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			33	0.2%	7	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			17	0.1%	2	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			45	0.3%	20	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			695	4.6%	130	3.1%

## OCULAR DISORDERS REPORT BOSTON TERRIER

Year Examined: Total # Dogs:		1993-2017 15,000		2018-2022 4,137	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	165	1.1%	27	0.7%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	311	2.1%	48	1.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	92	0.6%	8	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	38	0.3%	3	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	22	0.1%	3	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	20	0.1%	1	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	47	0.3%	57	1.4%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	18	0.1%	20	0.5%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	20	0.1%	10	0.2%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	3	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	2	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	15	0.1%	7	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	99	0.7%	5	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	1	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	16	0.1%	2	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>2,117</b>	<b>14.1%</b>	<b>449</b>	<b>10.9%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	51	0.3%	27	0.7%
110.135	PHPV/ PTVL	9	0.1%	4	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	46	0.3%	5	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	152	1.0%	25	0.6%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	36	0.2%	3	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	12	0.1%	5	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	11	0.1%	0	0.0%
120.400	RETINAL HEMORRHAGE	3	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960	RETINOPATHY	4	0.0%	1	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.0%	1	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	165	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	380	2.5%	4	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	256	1.7%	205	5.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	12,010	80.1%	3,205	77.5%

## BOUVIER DES FLANDRES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2-3	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option
E.	Persistent hyperplastic primary vitreous / Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	4	NO

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

In this breed, primary glaucoma is associated with narrowed iridocorneal angles and various degrees of congenital angle malformations varying from mild to severe. Dysplastic pectinate ligaments and subsequent narrowed angles are similar to those described in the Basset Hound and American and English Cocker Spaniels. The occurrence of glaucoma is related to the most severe abnormalities of the pectinate ligaments. The relationship between glaucoma development and the anomaly of the pectinate ligament is not clear.

A recent study evaluated risk factors for development of glaucoma in the Bouvier des Flandres. A narrow angle with dysplastic pectinate ligaments on gonioscopy and/or presence of a narrow or closed ciliary cleft on high resolution ultrasound were associated with development of primary glaucoma in the breed.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

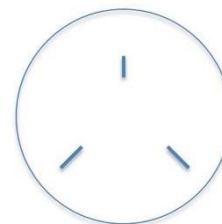
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

In the Bouvier des Flandres, the condition is associated with retinal dysplasia and detachment, optic nerve hypoplasia, lenticonus, cataract and congenital blindness.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. van der Linde-Sipman JS. Dysplasia of the pectinate ligament and primary glaucoma in the Bouvier

- des Flandres dog. *Vet Pathol.* 1987;24:201-206. PMID: 3603960
3. Dubin AJ, Bentley E, Buhr KA, et al. Evaluation of potential risk factors for primary angle-closure glaucoma in Bouvier des Flandres. *J Am Vet Med Assoc.* 2017;250: 60-67. PMID: 28001106
  4. Van Rensburg IBJ, Petrick S, Van der Lagt J, et al. Multiple inherited eye anomalies including persistent hyperplastic tunica vasculosa lentis in the Bouvier des Flanders. *Prog Vet Comp Ophthalmol.* 1992;2: 193

## OCULAR DISORDERS REPORT BOUVIER DES FLANDRES

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 5,404		2018-2022 784	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.0%	1	0.1%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			30	0.6%	4	0.5%
22.000 ECTROPION, UNSPECIFIED			6	0.1%	0	0.0%
25.110 DISTICHIASIS			45	0.8%	4	0.5%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			33	0.6%	4	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			15	0.3%	4	0.5%
93.170 ANTERIOR CHAMBER CYST			2	0.0%	1	0.1%
93.180 IRIS SPHINCTER DYSPLASIA			1	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			454	8.4%	73	9.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			11	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			22	0.4%	14	1.8%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.0%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			5	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			461	8.5%	87	11.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			67	1.2%	31	4.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			47	0.9%	6	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.1%	4	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			13	0.2%	3	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			65	1.2%	20	2.6%
100.306 PUNCTATE CATARACT, NUCLEUS			22	0.4%	11	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR			36	0.7%	19	2.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			20	0.4%	6	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			109	2.0%	9	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			24	0.4%	5	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			26	0.5%	5	0.6%
100.316 INCIPIENT CATARACT, NUCLEUS			39	0.7%	4	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR			17	0.3%	6	0.8%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.1%	5	0.6%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			4	0.1%	3	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			2	0.0%	2	0.3%
100.328 Y-SUTURE TIP OPACITIES			39	0.7%	64	8.2%
100.330 GENERALIZED/ COMPLETE CATARACT			31	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>536</b>	<b>9.9%</b>	<b>141</b>	<b>18.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			11	0.2%	4	0.5%
110.135 PHPV/ PTVL			6	0.1%	0	0.0%

# OCULAR DISORDERS REPORT BOUVIER DES FLANDRES

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 5,404		2018-2022 784	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	10	0.2%	2	0.3%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	35	0.6%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	14	0.3%	0	0.0%
120.960	RETINOPATHY	1	0.0%	0	0.0%
<b>FUNDUS</b>					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	3	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	3	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	64	1.2%	0	0.0%
900.100	OTHER, NOT INHERITED	136	2.5%	2	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	160	3.0%	42	5.4%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,163	77.0%	511	65.2%

## BOXER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1, 2	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Spontaneous chronic corneal epithelial defect (SCCED)	Not defined	3-6	Breeder option**	Mutation in the <i>NOG</i> gene
E.	Cataract	Not defined	1	NO	

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

In the Boxer, because there is significant clinical disease associated with the abnormal hairs, breeding affected animals should be discouraged.

#### B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### D. Corneal dystrophy - epithelial erosion

A general group of corneal ulcerative conditions (e.g. erosions, indolent or persistent ulcers, epithelial bonding defects) is recognized as a common problem in older Boxers (as well as other older animals). It has been commonly referred to as Boxer corneal ulceration. Animals that are affected are usually 7-8 years

of age or older. The ulceration can be a very difficult lesion to heal, and it is often recurrent. The chronic form stimulates eventual scarring, with vascularization, fibrosis and pigmentation of the lesion site. The lesion can cause vision impairment. A genetic mutation in the NOG gene has been identified as related to this condition in Boxers. \*\*Although this current recommendation is breeder option, if further studied and heritability defined, this recommendation could be modified\*\*

## E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases" Abstracts: Annual Scientific Meeting of the European College of Veterinary Ophthalmologists, Online, May 20-23, 2021. *Vet Ophthalmol.* 2022 Mar;25(2):e1-e43. doi: 10.1111/vop.12979. Epub 2022 Mar 14. PMID: 35285574.
3. Roberts SR. Superficial indolent ulcer in the cornea of Boxer dogs. *J Small Anim Pract.* 1965;6:111.
4. Gelatt KN and Samuelson DA. Recurrent corneal erosions and epithelial dystrophy in the Boxer dog. *J Am Anim Hosp Assoc.* 1982;18:453.
5. Kirschner SE, Niyo Y and Betts DM. Idiopathic persistent corneal erosions: clinical and pathological findings in 18 dogs. *J Am Anim Hosp Assoc.* 1989;25:84.
6. Meurs KM, Montgomery K, Friedenbergs SG, Williams B, Gilger BC. A defect in the NOG gene increases susceptibility to spontaneous superficial chronic corneal epithelial defects (SCCED) in boxer dogs. *BMC Vet Res.* 2021 Jul 26;17(1):254. doi: 10.1186/s12917-021-02955-1. PMID: 34311726; PMCID: PMC8314488.

## OCULAR DISORDERS REPORT BOXER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,809		2018-2022 208	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	0.3%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			3	0.2%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			9	0.5%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			7	0.4%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			69	3.8%	3	1.4%
25.110 DISTICHIASIS			217	12.0%	18	8.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			149	8.2%	18	8.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.2%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.1%	1	0.5%
93.150 IRIS COLOBOMA			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			4	0.2%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.2%	1	0.5%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			11	0.6%	2	1.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	0.3%	2	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.3%	1	0.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			47	2.6%	7	3.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	0.2%	1	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.2%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.2%	2	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			18	1.0%	5	2.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	0.1%	2	1.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.4%	1	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.1%	1	0.5%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.2%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	1	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			3	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>71</b>	<b>3.9%</b>	<b>16</b>	<b>7.7%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			3	0.2%	0	0.0%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			0	0.0%	1	0.5%

# OCULAR DISORDERS REPORT BOXER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,809		2018-2022 208	
			#	%	#	%
<b>VITREOUS Continued</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			11	0.6%	1	0.5%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			5	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	1	0.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE			1	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.1%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA			3	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			13	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED			44	2.4%	0	0.0%
900.110 OTHER, SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			26	1.4%	12	5.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1,317	72.8%	145	69.7%

## BOYKIN SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Y suture tip opacity	Not defined	1	Breeder option	
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
H.	Choroidal hypoplasia (Collie Eye Anomaly)	Autosomal recessive	1, 2	NO	Mutation in the <i>NHEJ1</i> <i>gene</i>
	- staphyloma/coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- optic nerve coloboma				

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

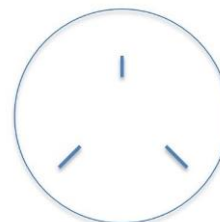
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **E. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **F. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

#### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **H. Choroidal hypoplasia (Collie Eye Anomaly)**

- Staphyloma/coloboma
- Retinal detachment

- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

1. ACVO Genetics Committee, 1999 and/or Data from OFA All-Breeds Report, 1991-1998.
2. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571. PMID: 17916641 PMCID: PMC2045139

## OCULAR DISORDERS REPORT BOYKIN SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 4,107		2018-2022 1,746	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	1	0.1%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			2	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			1	0.0%	1	0.1%
25.110 DISTICHIASIS			550	13.4%	236	13.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	2	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			4	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			54	1.3%	25	1.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			4	0.1%	2	0.1%
93.120 IRIS CYST			1	0.0%	2	0.1%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			118	2.9%	30	1.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.0%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			18	0.4%	35	2.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	2	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			2	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			52	1.3%	6	0.3%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	8	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	4	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
120.960 RETINOPATHY			0	0.0%	3	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	3	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			7	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			246	6.0%	155	8.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			53	1.3%	67	3.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			54	1.3%	16	0.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			8	0.2%	4	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			12	0.3%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			30	0.7%	16	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS			29	0.7%	38	2.2%
100.307 PUNCTATE CATARACT, CAPSULAR			45	1.1%	51	2.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			20	0.5%	11	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			54	1.3%	40	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			8	0.2%	8	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT BOYKIN SPANIEL

Year Examined: Total # Dogs:		1993-2017 4,107		2018-2022 1,746	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.2%	6	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	13	0.3%	9	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	15	0.4%	21	1.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	3	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.1%	1	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	15	0.4%	19	1.1%
100.330	GENERALIZED/ COMPLETE CATARACT	11	0.3%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>376</b>	<b>9.2%</b>	<b>297</b>	<b>17.0%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	42	1.0%	34	1.9%
110.135	PHPV/ PTVL	5	0.1%	4	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	9	0.2%	2	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	72	1.8%	9	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	9	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	31	0.8%	2	0.1%
120.400	RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	2	0.1%
120.960	RETINOPATHY	14	0.3%	2	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	4	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	32	0.8%	6	0.3%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	73	1.8%	0	0.0%
900.100	OTHER, NOT INHERITED	86	2.1%	4	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	88	2.1%	102	5.8%
<b>NORMAL</b>					
.000	NORMAL GLOBE	3,005	73.2%	1,115	63.9%

## BOZ SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BOZ SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT BOZ SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## BRACCO ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BRACCO ITALIANO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			149		108	
			#	%	#	%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			1	0.7%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			7	4.7%	9	8.3%
25.110 DISTICHIASIS			14	9.4%	10	9.3%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	1.3%	1	0.9%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.7%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	1.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	2	1.9%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			10	6.7%	5	4.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	2.0%	1	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			4	2.7%	2	1.9%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.7%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	1.3%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	2	1.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	1.3%	1	0.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	6.0%	3	2.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			4	2.7%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.9%
100.316 INCIPIENT CATARACT, NUCLEUS			2	1.3%	2	1.9%
100.317 INCIPIENT CATARACT, CAPSULAR			2	1.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	1.3%	2	1.9%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>29</b>	<b>19.5%</b>	<b>12</b>	<b>11.1%</b>
<b>VITREOUS</b>						
110.135 PHPV/ PTVL			2	1.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	1.3%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			8	5.4%	2	1.9%
120.960 RETINOPATHY			2	1.3%	0	0.0%
<b>FUNDUS</b>						
120.960 RETINOPATHY			0	0.0%	1	0.9%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED			3	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	2.0%	4	3.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			95	63.8%	74	68.5%

## **BRAQUE D'Auvergne**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BRAQUE D'Auvergne breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT BRAQUE D'AUVERGNE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			35 #	%	15 #	%
<b>GLOBE</b> .110 MICROPHTHALMIA			1	2.9%	0	0.0%
<b>EYELIDS</b> 25.110 DISTICHIASIS			0	0.0%	1	6.7%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS 93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS 93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			4 1 1	11.4% 2.9% 2.9%	2 0 0	13.3% 0.0% 0.0%
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN 100.301 PUNCTATE CATARACT, ANTERIOR CORTEX 100.302 PUNCTATE CATARACT, POSTERIOR CORTEX 100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX 100.306 PUNCTATE CATARACT, NUCLEUS 100.312 INCIPIENT CATARACT, POSTERIOR CORTEX 100.317 INCIPIENT CATARACT, CAPSULAR <b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			6 3 0 2 2 1 2 <b>10</b>	17.1% 8.6% 0.0% 5.7% 5.7% 2.9% 5.7% <b>28.6%</b>	1 0 1 0 0 0 0 <b>1</b>	6.7% 0.0% 6.7% 0.0% 0.0% 0.0% 0.0% <b>6.7%</b>
<b>RETINA</b> 120.170 RETINAL DYSPLASIA, FOLDS			1	2.9%	0	0.0%
<b>OTHER</b> 900.100 OTHER, NOT INHERITED 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1 2	2.9% 5.7%	0 4	0.0% 26.7%
<b>NORMAL</b> .000 NORMAL GLOBE			20	57.1%	9	60.0%

## **BRAQUE DU BOURBONNAIS**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BRAQUE DU BOURBONNAIS breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT BRAQUE DU BOURBONNAIS

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		6 #	%	6 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	1	16.7%
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	16.7%
100.306 PUNCTATE CATARACT, NUCLEUS		0	0.0%	1	16.7%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>0</b>	<b>0.0%</b>	<b>1</b>	<b>16.7%</b>
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	16.7%
<b>NORMAL</b> .000 NORMAL GLOBE		6	100.0%	3	50.0%

## BRAQUE FRANCAIS

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BRAQUE FRANCAIS

Diagnostic Name		Year Examined: Total # Dogs:	1993-2017		2018-2022	
			53 #	%	68 #	%
<b>EYELIDS</b>						
25.110	DISTICHIASIS		2	3.8%	2	2.9%
<b>UVEA</b>						
93.120	IRIS CYST		0	0.0%	1	1.5%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	2	2.9%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		1	1.9%	3	4.4%
<b>LENS</b>						
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		5	9.4%	3	4.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		1	1.9%	2	2.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		0	0.0%	1	1.5%
100.306	PUNCTATE CATARACT, NUCLEUS		0	0.0%	1	1.5%
100.307	PUNCTATE CATARACT, CAPSULAR		1	1.9%	2	2.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		0	0.0%	1	1.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		1	1.9%	1	1.5%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES		0	0.0%	1	1.5%
100.317	INCIPIENT CATARACT, CAPSULAR		2	3.8%	1	1.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX		0	0.0%	1	1.5%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX		1	1.9%	2	2.9%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX		0	0.0%	1	1.5%
100.326	INCOMPLETE CATARACT, NUCLEUS		0	0.0%	2	2.9%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		6	11.3%	16	23.5%
<b>VITREOUS</b>						
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER		0	0.0%	1	1.5%
<b>FUNDUS</b>						
120.170	RETINAL DYSPLASIA, FOLDS		0	0.0%	1	1.5%
<b>OTHER</b>						
900.100	OTHER, SUSPECT INHERITED		0	0.0%	2	2.9%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		4	7.5%	6	8.8%
<b>NORMAL</b>						
.000	NORMAL GLOBE		42	79.2%	43	63.2%

## **BRAQUE FRANCAIS PYRENEES**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BRAQUE FRANCAIS PYRENEES breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT BRAQUE FRANCAIS PYRENEES

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		5		22	
		#	%	#	%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	2	9.1%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	4.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		0	0.0%	1	4.5%
100.316 INCIPIENT CATARACT, NUCLEUS		0	0.0%	1	4.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>0</b>	<b>0.0%</b>	<b>2</b>	<b>9.1%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		0	0.0%	1	4.5%
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	4.5%
<b>NORMAL</b>					
.000 NORMAL GLOBE		4	80.0%	17	77.3%

## BRAZILIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	1	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

### Description and Comments

#### A. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Brazilian Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

## OCULAR DISORDERS REPORT BRAZILIAN TERRIER

**There are no statistics available for this breed**

## BRIARD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1	NO	
D.	Retinal dystrophy formerly Congenital stationary night blindness (CSNB)	Autosomal recessive	2	NO	Mutation in the <i>RPE65</i> gene

### Description and Comments

#### A. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Retinal dystrophy formerly Congenital stationary night blindness (CSNB)

A non-progressive retinal function defect characterized primarily by night blindness; day vision is normal to severely compromised. CSNB is an autosomal recessive trait caused by a mutation in the *RPE65* gene.

The condition is detected by 5-6 weeks of age, after the postnatal maturation of the retina is completed. Nystagmus is present in some dogs, particularly in those having night blindness and severely compromised day vision. Ophthalmoscopic examination shows no abnormalities. Abnormalities in serum lipids (mild hypercholesterolemia) and elevated arachidonic acid have been noted in some animals. The ERG results are specific and diagnostic for the disorder. ERG testing is essential to distinguish this disorder from more central visual pathway defects which may appear clinically similar.

The gene mutation RPE65 has been identified. This is the same mutation as causes Leber's congenital amaurosis, also sometimes called juvenile retinitis pigmentosa (RP), in humans. A DNA test is available.

#### **Historical Note:**

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

#### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Veske A, Nilsson SE, Narfström K, Gal A. Retinal dystrophy of Swedish briard/briard-beagle dogs is due to a 4-bp deletion in RPE65. *Genomics*. 1999 Apr 1;57(1):57-61. doi: 10.1006/geno.1999.5754. PMID: 10191083.

# OCULAR DISORDERS REPORT BRIARD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,309		2018-2022 214	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			9	0.4%	5	2.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.1%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.1%	2	0.9%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			32	1.4%	7	3.3%
<b>UVEA</b>						
93.120 IRIS CYST			10	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			26	1.1%	6	2.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.1%	1	0.5%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			9	0.4%	6	2.8%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			9	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			74	3.2%	9	4.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			8	0.3%	1	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.0%	1	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	0.2%	2	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS			6	0.3%	1	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			5	0.2%	8	3.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			6	0.3%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	0.4%	2	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			7	0.3%	2	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.1%	2	0.9%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			3	0.1%	1	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT			3	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>70</b>	<b>3.0%</b>	<b>20</b>	<b>9.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.0%	2	0.9%
110.135 PHPV/ PTVL			3	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.1%	1	0.5%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			7	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT BRIARD

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,309		2018-2022 214	
		#	%	#	%
<b>RETINA Continued</b>					
120.400 RETINAL HEMORRHAGE		1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		2	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.120 OPTIC NERVE HYPOPLASIA		1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA		3	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		37	1.6%	0	0.0%
900.100 OTHER, NOT INHERITED		58	2.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		35	1.5%	11	5.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		2,108	91.3%	169	79.0%

## BRITTANY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membrane			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The exact frequency and significance of cataracts in the Brittany is not known, although it is probably low.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT BRITTANY

Year Examined: Total # Dogs:		1993-2017 2,587		2018-2022 886	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	1	0.1%
25.110	DISTICHIASIS	61	2.4%	10	1.1%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.0%	0	0.0%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	5	0.2%	2	0.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.1%	0	0.0%
<b>UVEA</b>					
93.120	IRIS CYST	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	41	1.6%	9	1.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	16	0.6%	22	2.5%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	10	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	120	4.6%	38	4.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	25	1.0%	20	2.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	34	1.3%	13	1.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.2%	1	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	12	0.5%	2	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	9	0.3%	6	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	19	0.7%	14	1.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	14	0.5%	6	0.7%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	44	1.7%	13	1.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.5%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.3%	3	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	8	0.3%	3	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	6	0.2%	4	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.1%	2	0.2%
100.328	Y-SUTURE TIP OPACITIES	3	0.1%	3	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.2%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.2%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	223	8.6%	88	9.9%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	6	0.2%	6	0.7%
110.135	PHPV/ PTVL	1	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	3	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	16	0.6%	4	0.5%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	8	0.3%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.3%	2	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	21	0.8%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%

# OCULAR DISORDERS REPORT BRITTANY

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,587		2018-2022 886	
		#	%	#	%
<b>RETINA Continued</b>					
120.920 RETINAL DETACHMENT WITH DIALYSIS		1	0.0%	0	0.0%
120.960 RETINOPATHY		2	0.1%	1	0.1%
<b>FUNDUS</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	1	0.1%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA		1	0.0%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		17	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED		62	2.4%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		34	1.3%	53	6.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		2,209	85.4%	710	80.1%

## BRUSSELS GRIFFON

	DISORDER	INHERITANCE	REFERENCES	BREEDING ADVICE
A.	Exposure keratopathy syndrome	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Vitreous degeneration			
	- anterior chamber	Not defined	1, 2	Breeder option
	- syneresis	Not defined	1, 2	Breeder option
F.	Retinal atrophy			
	- generalized	Not defined	1	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
	- geographic	Not defined	1	NO

### Description and Comments

#### A. Exposure keratopathy syndrome

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

**D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**E. Vitreous degeneration**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

**F. Retinal atrophy****- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

**G. Retinal dysplasia****- folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**- geographic**

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." Vet Ophthalmol 23(2): 219-224. PMID: 31464365.

## OCULAR DISORDERS REPORT BRUSSELS GRIFFON

Year Examined: Total # Dogs:		1993-2017 1,486		2018-2022 393	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	8	0.5%	2	0.5%
21.000	ENTROPION, UNSPECIFIED	6	0.4%	0	0.0%
25.110	DISTICHIASIS	34	2.3%	11	2.8%
<b>NASOLACRIMAL</b>					
40.910	KERATOCONJUNCTIVITIS SICCA	3	0.2%	0	0.0%
<b>CORNEA</b>					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	26	1.7%	4	1.0%
70.700	CORNEAL DYSTROPHY	10	0.7%	6	1.5%
<b>UVEA</b>					
93.110	IRIS HYPOPLASIA	2	0.1%	0	0.0%
93.120	IRIS CYST	2	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	131	8.8%	52	13.2%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.1%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	11	0.7%	16	4.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	4	0.3%	1	0.3%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.1%	1	0.3%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	2	0.1%	0	0.0%
97.120	COLOBOMA	2	0.1%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.5%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.3%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.3%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	8	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	59	4.0%	6	1.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	34	2.3%	3	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	11	0.7%	2	0.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.4%	1	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.2%	1	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.3%	1	0.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	85	5.7%	11	2.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	35	2.4%	5	1.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	44	3.0%	8	2.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.5%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	5	0.3%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	5	0.3%	2	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	3	0.8%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.2%	4	1.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.3%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	29	2.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>284</b>	<b>19.1%</b>	<b>44</b>	<b>11.2%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	10	0.7%	1	0.3%

## OCULAR DISORDERS REPORT BRUSSELS GRIFFON

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,486		2018-2022 393	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.135	PHPV/ PTVL	2	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	91	6.1%	12	3.1%
110.320	VITREOUS DEGENERATION SYNERESIS	261	17.6%	26	6.6%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	28	1.9%	7	1.8%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.9%	3	0.8%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	23	1.5%	1	0.3%
120.400	RETINAL HEMORRHAGE	2	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	3	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	19	1.3%	1	0.3%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	26	1.7%	0	0.0%
900.100	OTHER, NOT INHERITED	29	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	30	2.0%	18	4.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	893	60.1%	259	65.9%

## BULL TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the BULL TERRIER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT BULL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	1.2%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			2	0.8%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			1	0.4%	0	0.0%
25.110 DISTICHIASIS			5	2.0%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.4%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			5	2.0%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			8	3.2%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			4	1.6%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			12	4.9%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.4%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.4%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	2.4%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	1.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.8%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.8%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.4%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.4%	1	4.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	1.2%	1	4.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			3	1.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			7	2.8%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>20</b>	<b>8.1%</b>	<b>2</b>	<b>9.1%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			4	1.6%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	4.5%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			2	0.8%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			3	1.2%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			3	1.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			5	2.0%	0	0.0%
900.100 OTHER, NOT INHERITED			8	3.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	1.2%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			194	78.5%	19	86.4%

## BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	6	NO	
B.	Entropion	Not defined	1	Breeder option	
C.	Ectropion	Not defined	1	Breeder option	
D.	Distichiasis	Not defined	1, 2	Breeder option	
E.	Ectopic cilia	Not defined	1	Breeder option	
F.	Prolapsed gland of third eyelid	Not defined	1, 3-6	Breeder option	
G.	Keratitis	Not defined	1	Passes with no notation	
H.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
I.	Cataract	Not defined	1	NO	
J.	Retinal dysplasia  - folds	Not defined	1	Breeder option	
K.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	7, 8	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

### Description and Comments

#### A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation due to

exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Bulldog, ectropion is associated with an exceptionally large palpebral fissure and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid. This causes severe ocular irritation.

#### **D. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

In the Bulldog, these abnormal eyelashes may be associated with significant clinical disease and breeding of affected animals should be discouraged.

#### **E. Ectopic cilia**

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

#### **F. Prolapse of the gland of the third eyelid**

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated and severe chronic inflammation or keratoconjunctivitis sicca/dry eye syndrome may ensue. Commonly referred to as "cherry eye."

Bulldogs were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 100% of the prolapsed glands in Bulldogs occurred before 1 year of age. Bulldogs were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

#### **G. Keratitis**

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write "keratitis".

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. Often associated with entropion or a combination of entropion and ectropion.

#### **H. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **I. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

#### **J. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **K. Multifocal Retinopathy**

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write multifocal retinopathy.

Canine Multifocal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog. The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas. Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Abstracts: "Epidemiology and Clinical Significance of Canine Distichiasis: A Retrospective Study of 291 Cases" Annual Scientific Meeting of the European College of Veterinary Ophthalmologists, Online, May 20-23, 2021. *Vet Ophthalmol.* 2022 Mar;25(2):e1-e43. doi: 10.1111/vop.12979. Epub 2022 Mar 14. PMID: 35285574.
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7. Guziewicz KE, Slavik J, Lindauer SP et al. Molecular consequences of BEST1 gene mutations in canine multifocal retinopathy predict functional implications for human bestrophinopathies. *IOVS*

52(7) 2011; 4497-505.

8. Donner J, Kaukonen M, Anderson H et al. Genetic panel screening of nearly 100 mutations reveals new insights into the breed distribution of risk variants for canine hereditary disorders. PLOS One Aug 2016 11 (8): 1-18.

## OCULAR DISORDERS REPORT BULLDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,376		2018-2022 392	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	1	0.3%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.3%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			12	0.9%	2	0.5%
20.160 MACROPALPEBRAL FISSURE			16	1.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			203	14.8%	49	12.5%
22.000 ECTROPION, UNSPECIFIED			69	5.0%	12	3.1%
25.110 DISTICHIASIS			314	22.8%	93	23.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	3	0.8%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			4	0.3%	2	0.5%
40.910 KERATOCONJUNCTIVITIS SICCA			10	0.7%	2	0.5%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			22	1.6%	1	0.3%
<b>CORNEA</b>						
70.210 PANNUS			10	0.7%	3	0.8%
70.220 PIGMENTARY KERATITIS			29	2.1%	4	1.0%
70.700 CORNEAL DYSTROPHY			11	0.8%	6	1.5%
<b>UVEA</b>						
93.120 IRIS CYST			8	0.6%	4	1.0%
93.170 ANTERIOR CHAMBER CYST			1	0.1%	1	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			11	0.8%	4	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
95.120 CILIARY BODY CYST			2	0.1%	1	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			35	2.5%	6	1.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	0.5%	3	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.1%	1	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.1%	3	0.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	0.4%	1	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.1%	2	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	0.4%	4	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	0.1%	1	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			4	0.3%	2	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	1	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.3%
100.328 Y-SUTURE TIP OPACITIES			6	0.4%	4	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>42</b>	<b>3.1%</b>	<b>21</b>	<b>5.4%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.1%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			84	6.1%	6	1.5%

# OCULAR DISORDERS REPORT BULLDOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,376		2018-2022 392	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.3%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	8	2.0%
130.110	MICROPAPILLA	0	0.0%	1	0.3%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.3%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	7	0.5%	0	0.0%
900.100	OTHER, NOT INHERITED	40	2.9%	1	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	58	4.2%	24	6.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	779	56.6%	210	53.6%

## BULLMASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy ( <i>RHO</i> )	Autosomal dominant	2	NO	Mutation in the <i>RHO</i> gene
G.	Retinal dysplasia  - folds	Not defined	1	Breeder option	
H.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	3	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

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### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Bullmastiff, the palpebral fissures may become vertical and/or shaped like a "pagoda." Entropion in the Bullmastiff is severe and may require multiple surgical corrections.

#### B. Ectropion

A conformational defect resulting in eversion (rolling-out) of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **F. Retinal atrophy - *RHO***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA in the Bullmastiff is inherited as an autosomal dominant trait. A DNA test is available.

#### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **H. Multifocal retinopathy**

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid, or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Kijas JW, Cideciyan AV, Aleman TS, et al. Naturally occurring rhodopsin mutation in the dog causes retinal dysfunction and degeneration mimicking human dominant retinitis pigmentosa. *Proc Natl Acad Sci U S A*. 2002 Apr 30;99:6328-6333. PMID: 11972042
3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967. PMID: 17460247

# OCULAR DISORDERS REPORT BULLMASTIFF

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,926		2018-2022 670	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	0.3%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			16	0.8%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			108	5.6%	48	7.2%
22.000 ECTROPION, UNSPECIFIED			29	1.5%	7	1.0%
25.110 DISTICHIASIS			54	2.8%	9	1.3%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.1%	1	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			5	0.3%	4	0.6%
70.700 CORNEAL DYSTROPHY			2	0.1%	3	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			9	0.5%	5	0.7%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.1%	0	0.0%
93.150 IRIS COLOBOMA			3	0.2%	1	0.1%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	6	0.9%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			76	3.9%	27	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			10	0.5%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			25	1.3%	4	0.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.4%	1	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.3%	4	0.6%
95.120 CILIARY BODY CYST			1	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			61	3.2%	13	1.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			11	0.6%	5	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	0.3%	2	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	0.3%	2	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	1	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.2%	3	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			12	0.6%	5	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			13	0.7%	4	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			11	0.6%	3	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			5	0.3%	3	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.1%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			4	0.2%	1	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			3	0.2%	3	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT			8	0.4%	0	0.0%

## OCULAR DISORDERS REPORT BULLMASTIFF

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,926		2018-2022 670	
			#	%	#	%
<b>LENS Continued</b> 100.345 SIGNIFICANT CATARACTS (SUMMARY)			91	4.7%	31	4.6%
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	2	0.3%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.1%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	4	0.6%
120.960 RETINOPATHY			0	0.0%	1	0.1%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			96	5.0%	25	3.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			3	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.2%	0	0.0%
120.960 RETINOPATHY			6	0.3%	1	0.1%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			8	0.4%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			7	0.4%	1	0.1%
130.150 OPTIC DISC COLOBOMA			2	0.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			25	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED			42	2.2%	2	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			31	1.6%	23	3.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1,458	75.7%	500	74.6%

## CA DE BOU

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CA DE BOU breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT CA DE BOU

**There are no statistics available for this breed**

## CAIRN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ocular melanosis with and without glaucoma	Presumed autosomal dominant	1, 2	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option
E.	Persistent hyaloid artery remnant	Not defined	1	Breeder option

### Description and Comments

#### A. Ocular melanosis with and without glaucoma (Previously ocular melanosis with secondary glaucoma, previously pigmentary glaucoma)

A proliferation of melanocytes within the uveal tract associated with an elevation in intraocular pressure. Obstruction of the aqueous outflow pathways occurs resulting in glaucoma. This condition has been identified most commonly in the Cairn Terrier. The condition is familial but the exact mode of inheritance is unknown (pedigree analysis has ruled out a sex-linked disorder). In the Cairn Terrier, the disease is very slowly progressive and blindness ultimately results. Some dogs develop episodes of anterior uveitis associated with the shedding of large amounts of pigment from the iris surface. There is a long pre-glaucomatous phase of the disease in which diagnosis of the condition is possible. Age of onset varies from 2-14 years.

#### B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**D. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

**E. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Petersen-Jones SM, Forcier J, Mentzer AL. Ocular melanosis in the Cairn Terrier: clinical description and investigation of mode of inheritance. *Vet Ophthalmol.* 2007;10 Suppl 1:63-69. PMID: 17973836

## OCULAR DISORDERS REPORT CAIRN TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 4,238		2018-2022 683	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	0	0.0%
10.000 GLAUCOMA			3	0.1%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			17	0.4%	4	0.6%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	2	0.3%
40.910 KERATOCONJUNCTIVITIS SICCA			8	0.2%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	1	0.1%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			7	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY			28	0.7%	1	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.1%	0	0.0%
<b>UVEA</b>						
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			2	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			374	8.8%	126	18.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			13	0.3%	3	0.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			39	0.9%	21	3.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			11	0.3%	5	0.7%
93.810 UVEAL MELANOMA			1	0.0%	1	0.1%
93.930 OCULAR MELANOCYTOSIS			9	0.2%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	0	0.0%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			11	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			252	5.9%	52	7.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			65	1.5%	35	5.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			46	1.1%	7	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			36	0.8%	9	1.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			11	0.3%	4	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.1%	2	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			23	0.5%	10	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			41	1.0%	14	2.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			67	1.6%	14	2.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			34	0.8%	3	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			10	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			5	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			6	0.1%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			13	0.3%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			14	0.3%	3	0.4%

## OCULAR DISORDERS REPORT CAIRN TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		4,238		683	
		#	%	#	%
<b>LENS Continued</b>					
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		3	0.1%	1	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES		0	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES		0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS		3	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		1	0.0%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT		37	0.9%	2	0.3%
100.340 RESORBING/ HYPERMATURE CATARACT		2	0.0%	2	0.3%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		1	0.0%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>434</b>	<b>10.2%</b>	<b>110</b>	<b>16.1%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		47	1.1%	9	1.3%
110.135 PHPV/ PTVL		6	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		4	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS		48	1.1%	11	1.6%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		21	0.5%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		8	0.2%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		23	0.5%	0	0.0%
120.960 RETINOPATHY		1	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		8	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA		11	0.3%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		76	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED		128	3.0%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		132	3.1%	29	4.2%
<b>NORMAL</b>					
.000 NORMAL GLOBE		3,233	76.3%	423	61.9%

## CANAAN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT CANAAN DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			15	2.8%	1	1.3%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			4	0.7%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.2%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			21	3.9%	3	3.8%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.2%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.2%	1	1.3%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			20	3.7%	6	7.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	0.4%	1	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.7%	1	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.2%	1	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	0.6%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			7	1.3%	3	3.8%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			12	2.2%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.2%	1	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT			13	2.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>50</b>	<b>9.2%</b>	<b>6</b>	<b>7.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.4%	1	1.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			9	1.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED			18	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	1.1%	3	3.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			444	81.6%	65	82.3%

## CANADIAN ESKIMO DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT CANADIAN ESKIMO DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			42 #	%	15 #	%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	2.4%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			9	21.4%	4	26.7%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	6.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	6.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	1	6.7%
100.307 PUNCTATE CATARACT, CAPSULAR			1	2.4%	1	6.7%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>2.4%</b>	<b>3</b>	<b>20.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	2.4%	0	0.0%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	2.4%	0	0.0%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	4.8%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			32	76.2%	8	53.3%

## CANE CORSO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Ectropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Dental-skeletal-retinal anomaly (DSRA)	Autosomal recessive	2	NO	Mutation in <i>MIA3</i>

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### Description and Comments

#### A. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Dental-skeletal-retinal anomaly (DSRA)

Dental-Skeletal-Retinal-Anomaly (DSRA) is a syndromic condition documented in the Cane Corso. This condition is associated with a *MIA3* splice defect that has been identified in all affected dogs with an autosomal recessive inheritance pattern. Clinically affected dogs present with dwarfism, dental abnormalities including loss of enamel and tooth discoloration, as well as early onset retinal atrophy.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breed Report.
2. Christen M, Booij-Vrieling H, Oksa-Minalto J, de Vries C, Kehl A, Jagannathan V, Leeb T. *MIA3* Splice Defect in Cane Corso Dogs with Dental-Skeletal-Retinal Anomaly (DSRA). *Genes* (Basel). 2021 Sep 25;12(10):1497. doi: 10.3390/genes12101497. PMID: 34680893; PMCID: PMC8535341.

# OCULAR DISORDERS REPORT CANE CORSO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			179		180	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			5	2.8%	3	1.7%
22.000 ECTROPION, UNSPECIFIED			11	6.1%	4	2.2%
25.110 DISTICHIASIS			8	4.5%	10	5.6%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.6%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	1.7%	1	0.6%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.6%	3	1.7%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.6%	0	0.0%
93.120 IRIS CYST			2	1.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.6%	1	0.6%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3	1.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	1	0.6%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	1.1%	2	1.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	4.5%	4	2.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	1.7%	1	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	1.1%	1	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	1.1%	1	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.6%	2	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR			2	1.1%	1	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.6%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.6%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.6%	1	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.6%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>13</b>	<b>7.3%</b>	<b>6</b>	<b>3.3%</b>
<b>VITREOUS</b>						
110.135 PHPV/ PTVL			1	0.6%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			0	0.0%	1	0.6%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.6%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.6%	1	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.6%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.6%
120.960 RETINOPATHY			1	0.6%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED			0	0.0%	1	0.6%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	1.1%	7	3.9%
<b>NORMAL</b>						
.000 NORMAL GLOBE			141	78.8%	144	80.0%

## CAO DE CASTRO LABOREIRO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CAO DE CASTRO LABOREIRO breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT CAO DE CASTRO LABOREIRO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	0	

## CARDIGAN WELSH CORGI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy - rod-cone dysplasia type 3 ( <i>rcd3</i> )	Presumed autosomal recessive	2-4	NO	Mutation in the <i>PDE6A</i> gene

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin that may cause ocular irritation. Distichiasis may occur any time in the life of the dog. It is difficult to make a strong recommendation about breeding dogs with this entity. The hereditary basis is not known although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

#### D. Retinal atrophy - rod-cone dysplasia type 3 (*rcd3*)

PRA in the Cardigan Welsh Corgi is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (*rcd3*). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

### Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Petersen-Jones SM, Entz DD, Sargan DR. cGMP phosphodiesterase-alpha mutation causes progressive retinal atrophy in the Cardigan Welsh Corgi dog. *Invest Ophthalmol Vis Sci*. 1999;40:1637-1644. PMID: 10393029
3. Petersen-Jones SM, Entz DD. An improved DNA-based test for detection of the codon 616 mutation in the alpha cyclic GMP phosphodiesterase gene that causes progressive retinal atrophy in the Cardigan Welsh Corgi. *Vet Ophthalmol*. 2002;5:103-106. PMID: 12071867 DOI: 10.1046/j.1463-5224.2002.00223.x
4. Keep JM. Clinical aspects of progressive retinal atrophy in the Cardigan Welsh Corgi. *Aust Vet J*. 1972;48:197-199. PMID: 5082485 DOI: 10.1111/j.1751-0813.1972.tb09275.x

## OCULAR DISORDERS REPORT CARDIGAN WELSH CORGI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,927		2018-2022 639	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			2	0.1%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			146	3.7%	22	3.4%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			17	0.4%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	1	0.2%
<b>UVEA</b>						
93.120 IRIS CYST			0	0.0%	1	0.2%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			112	2.9%	13	2.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.1%	1	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			9	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.2%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			3	0.1%	0	0.0%
97.120 COLOBOMA			2	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			15	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			128	3.3%	20	3.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	0.3%	8	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			14	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			17	0.4%	4	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	0.1%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			7	0.2%	3	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			16	0.4%	5	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			34	0.9%	5	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			19	0.5%	5	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			16	0.4%	2	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	1	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.1%	3	0.5%
100.316 INCIPIENT CATARACT, NUCLEUS			7	0.2%	2	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.1%	2	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.2%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			3	0.1%	1	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT			8	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>184</b>	<b>4.7%</b>	<b>43</b>	<b>6.7%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			5	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			5	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			5	0.1%	1	0.2%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			24	0.6%	1	0.2%

# OCULAR DISORDERS REPORT CARDIGAN WELSH CORGI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 3,927		2018-2022 639	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	6	0.2%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	3	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	16	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	39	1.0%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	24	0.6%	20	3.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	3,440	87.6%	545	85.3%

## CAROLINA DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CAROLINA DOG breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## CAROLINA DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0		11	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		0		11	100.0%

## CATALAN SHEEPDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CATALAN SHEEPDOG breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## CATALAN SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
<b>UVEA</b> 93.150 IRIS COLOBOMA		1	100.0%	0	

## CAUCASIAN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CAUCASIAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT CAUCASIAN SHEPHERD

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	13		7	
		#	%	#	%
<b>EYELIDS</b>					
21.000 ENTROPION, UNSPECIFIED		1	7.7%	0	0.0%
22.000 ECTROPION, UNSPECIFIED		1	7.7%	0	0.0%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	7.7%	1	14.3%
<b>LENS</b>					
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX		1	7.7%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		1	7.7%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX		1	7.7%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX		1	7.7%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		1	7.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>5</b>	<b>38.5%</b>	<b>0</b>	<b>0.0%</b>
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	14.3%
<b>NORMAL</b>					
.000 NORMAL GLOBE		9	69.2%	5	71.4%

## CAVALIER KING CHARLES SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	2	NO
B.	Keratoconjunctivitis sicca	Not defined	3	NO
C.	Congenital KCS and ichthyosiform dermatosis	Autosomal recessive	4, 5	NO
D.	Entropion	Not defined	1	Breeder option
E.	Distichiasis	Not defined	1, 8	Breeder option
F.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1, 6	Breeder option
G.	Exposure/pigmentary keratitis	Not defined	1	Breeder option
H.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
I.	Cataract	Not defined	1, 2, 7	NO
J.	Y-suture tip opacity	Not defined	1	Breeder option
K.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option
L.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
	- geographic	Not defined	1	NO

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### Description and Comments

#### A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina.

**B. Keratoconjunctivitis sicca (KCS)**

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

**C. Congenital KCS and ichthyosiform dermatosis**

A syndrome in which dogs are born with severe to absolute keratoconjunctivitis sicca (KCS) which is poorly responsive to lacrimostimulant treatment. Co-morbid congenital dermatopathy affecting haircoat, skin and footpads is severe and requires intensive life-long care. Clinical signs are so devastating that affected dogs are often euthanized.

**D. Entropion**

A conformational defect resulting in "in-rolling" of one or both of the eyelids, which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

**E. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**F. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In the Cavalier King Charles Spaniel, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

**G. Exposure/pigmentary keratitis**

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

**H. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**I. Cataract**

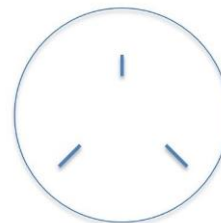
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

In the Cavalier King Charles Spaniel, onset is at an early age (less than 6 months), affecting the cortex and nucleus with rapid progression to complete cataract, resulting in blindness.

#### **J. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **K. Vitreous degeneration**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

#### **L. Retinal dysplasia**

##### **- folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

##### **- geographic**

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

## **References**

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4. Hartley C, Donaldson D, Smith KC, et al. Congenital keratoconjunctivitis sicca and ichthyosiform dermatosis in 25 Cavalier King Charles spaniel dogs – part I: clinical signs, histopathology, and inheritance. *Vet Ophthalmol.* 2012;15:315-326. PMID: 22212237 DOI:10.1111/j.1463-5224.2011.00986.x
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## OCULAR DISORDERS REPORT CAVALIER KING CHARLES SPANIEL

	Year Examined: Total # Dogs:	1993-2017 56,382		2018-2022 17,258	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110 MICROPHTHALMIA		84	0.1%	17	0.1%
10.000 GLAUCOMA		3	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA		0	0.0%	10	0.1%
<b>EYELIDS</b>					
20.140 ECTOPIC CILIA		3	0.0%	1	0.0%
20.160 MACROPALPEBRAL FISSURE		126	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED		226	0.4%	70	0.4%
22.000 ECTROPION, UNSPECIFIED		11	0.0%	0	0.0%
25.110 DISTICHIASIS		5,124	9.1%	1,560	9.0%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		0	0.0%	22	0.1%
<b>NASOLACRIMAL</b>					
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		51	0.1%	28	0.2%
40.910 KERATOCONJUNCTIVITIS SICCA		106	0.2%	19	0.1%
<b>NICTITANS</b>					
50.210 PLASMOMA/ ATYPICAL PANNUS		1	0.0%	1	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY		7	0.0%	2	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID		20	0.0%	5	0.0%
<b>CORNEA</b>					
70.210 PANNUS		16	0.0%	3	0.0%
70.220 PIGMENTARY KERATITIS		299	0.5%	123	0.7%
70.700 CORNEAL DYSTROPHY		4,972	8.8%	1,329	7.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION		56	0.1%	11	0.1%
<b>UVEA</b>					
90.250 PIGMENTARY UVEITIS		0	0.0%	1	0.0%
93.110 IRIS HYPOPLASIA		4	0.0%	3	0.0%
93.120 IRIS CYST		20	0.0%	6	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM		7	0.0%	0	0.0%
93.150 IRIS COLOBOMA		4	0.0%	1	0.0%
93.170 ANTERIOR CHAMBER CYST		5	0.0%	1	0.0%
93.180 IIRIS SPHINCTER DYSPLASIA		2	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		616	1.1%	225	1.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		37	0.1%	6	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		35	0.1%	1	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS		44	0.1%	1	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		49	0.1%	45	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		11	0.0%	2	0.0%
95.120 CILIARY BODY CYST		1	0.0%	3	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL		7	0.0%	5	0.0%
<b>FUNDUS</b>					
97.110 CHOROIDAL HYPOPLASIA		9	0.0%	3	0.0%
97.120 COLOBOMA		4	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	216	1.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	100	0.6%
120.190 RETINAL DYSPLASIA, DETACHED		0	0.0%	8	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	8	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		0	0.0%	4	0.0%
120.960 RETINOPATHY		0	0.0%	2	0.0%
130.110 MICROPAPILLA		0	0.0%	2	0.0%
130.120 OPTIC NERVE HYPOPLASIA		0	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA		0	0.0%	10	0.1%
<b>LENS</b>					
100.200 CATARACT, UNSPECIFIED		57	0.1%	0	0.0%

## OCULAR DISORDERS REPORT CAVALIER KING CHARLES SPANIEL

Year Examined: Total # Dogs:		1993-2017 56,382		2018-2022 17,258	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,048	3.6%	484	2.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	486	0.9%	237	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	170	0.3%	54	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	161	0.3%	53	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	70	0.1%	26	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	237	0.4%	90	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	182	0.3%	82	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	104	0.2%	50	0.3%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	420	0.7%	121	0.7%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	312	0.6%	79	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	177	0.3%	49	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	32	0.1%	9	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	89	0.2%	38	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	260	0.5%	69	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	75	0.1%	38	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	38	0.1%	27	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	51	0.1%	43	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	10	0.0%	8	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	7	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	28	0.0%	23	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	12	0.0%	6	0.0%
100.328	Y-SUTURE TIP OPACITIES	91	0.2%	176	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	223	0.4%	22	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	10	0.0%	4	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	16	0.0%	2	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>3,211</b>	<b>5.7%</b>	<b>1,128</b>	<b>6.5%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	92	0.2%	37	0.2%
110.135	PHPV/ PTVL	32	0.1%	3	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	40	0.1%	8	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	233	0.4%	52	0.3%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	3,888	6.9%	355	2.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1,596	2.8%	148	0.9%
120.190	RETINAL DYSPLASIA, DETACHED	172	0.3%	15	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	159	0.3%	8	0.0%
120.400	RETINAL HEMORRHAGE	6	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	20	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	3	0.0%	1	0.0%
120.960	RETINOPATHY	35	0.1%	24	0.1%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	27	0.0%	4	0.0%
130.120	OPTIC NERVE HYPOPLASIA	15	0.0%	3	0.0%
130.150	OPTIC DISC COLOBOMA	35	0.1%	18	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	596	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	1,159	2.1%	11	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	894	1.6%	763	4.4%
<b>NORMAL</b>					
.000	NORMAL GLOBE	40,548	71.9%	12,032	69.7%

## **CENTRAL ASIAN SHEPHERD**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CENTRAL ASIAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT CENTRAL ASIAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			7		12	
			#	%	#	%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			0	0.0%	1	8.3%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	8.3%
<b>UVEA</b>						
93.120 IRIS CYST			0	0.0%	1	8.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	14.3%	2	16.7%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	28.6%	1	8.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	14.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	14.3%	1	8.3%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>14.3%</b>	<b>0</b>	<b>0.0%</b>
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	8.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			4	57.1%	6	50.0%

## CESKY TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CESKY TERRIER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT CESKY TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			123		24	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			19	15.4%	0	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.8%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			8	6.5%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			4	3.3%	2	8.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	2	8.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.8%	1	4.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	1	4.2%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.8%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.8%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.8%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.8%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			2	1.6%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.8%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.8%	1	4.2%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>6</b>	<b>4.9%</b>	<b>1</b>	<b>4.2%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			8	6.5%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.8%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.8%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED			4	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.8%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			84	68.3%	18	75.0%

## CHART POLSKI

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CHART POLSKI breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## CHART POLSKI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		10 #	%	5 #	%
<b>EYELIDS</b> 25.110 DISTICHIASIS		1	10.0%	0	0.0%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	10.0%	0	0.0%
<b>FUNDUS</b> 97.110 CHOROIDAL HYPOPLASIA		2	20.0%	0	0.0%
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	10.0%	0	0.0%
<b>VITREOUS</b> 110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		1	10.0%	0	0.0%
<b>OPTIC NERVE</b> 130.150 OPTIC DISC COLOBOMA		1	10.0%	0	0.0%
<b>OTHER</b> 900.000 OTHER, UNSPECIFIED		3	30.0%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		3	30.0%	5	100.0%

## CHESAPEAKE BAY RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1, 2	NO	
D.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	3	NO	Mutation in the <i>prcd</i> gene

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located in the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Hereditary cataracts have been described in the Chesapeake Bay Retriever and affect the young adult dog. They appear as posterior cortical, axial, triangular opacities and the Y suture tips can be affected in both the anterior and

posterior cortices. Extension of the cataract into the posterior cortex and progression to impair vision can occur. An autosomal dominant inheritance with incomplete penetrance has been proposed; however, the genetics have not been completely defined and additional studies will be required.

#### **D. Retinal atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Chesapeake Bay Retriever is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

A second, less common form of PRA is also present in the Chesapeake Bay Retriever with ophthalmoscopic abnormalities characteristic of mid-stage disease found in dogs between 8-12 months of age. The lesions are progressive and end-stage lesions are evident by 2-3 years of age. A DNA test is available.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN. Cataracts in Chesapeake Bay retrievers. *J Am Vet Med Assoc*. 1979;175:1176-1178. PMID: 511742
3. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

## OCULAR DISORDERS REPORT CHESAPEAKE BAY RETRIEVER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 13,513		2018-2022 1,739	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			7	0.1%	1	0.1%
10.000 GLAUCOMA			4	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			3	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			56	0.4%	2	0.1%
22.000 ECTROPION, UNSPECIFIED			7	0.1%	0	0.0%
25.110 DISTICHIASIS			997	7.4%	156	9.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			3	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			84	0.6%	10	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	1	0.1%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	0.1%
93.120 IRIS CYST			23	0.2%	9	0.5%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			3	0.0%	4	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			241	1.8%	58	3.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			11	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			14	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			57	0.4%	61	3.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.0%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	1	0.1%
95.120 CILIARY BODY CYST			2	0.0%	1	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			3	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.1%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	0.1%
120.960 RETINOPATHY			0	0.0%	1	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	2	0.1%
130.110 MICROPAPILLA			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			74	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			584	4.3%	93	5.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			74	0.5%	33	1.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			132	1.0%	25	1.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			51	0.4%	9	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			16	0.1%	5	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			58	0.4%	6	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			15	0.1%	12	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			55	0.4%	30	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			66	0.5%	18	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			235	1.7%	37	2.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			59	0.4%	13	0.7%

# OCULAR DISORDERS REPORT CHESAPEAKE BAY RETRIEVER

Year Examined: Total # Dogs:		1993-2017 13,513		2018-2022 1,739	
Diagnostic Name		#	%	#	%
LENS Continued					
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	8	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	53	0.4%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	24	0.2%	2	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	25	0.2%	7	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.0%	5	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.0%	2	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	4	0.0%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	14	0.1%	8	0.5%
100.330	GENERALIZED/ COMPLETE CATARACT	43	0.3%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.1%	2	0.1%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		1,003	7.4%	208	12.0%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	21	0.2%	2	0.1%
110.135	PHPV/ PTVL	10	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	54	0.4%	17	1.0%
110.320	VITREOUS DEGENERATION SYNERESIS	48	0.4%	7	0.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	84	0.6%	3	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	50	0.4%	4	0.2%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	93	0.7%	3	0.2%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	8	0.1%	3	0.2%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	1	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	127	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	336	2.5%	2	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	201	1.5%	101	5.8%
NORMAL					
.000	NORMAL GLOBE	10,962	81.1%	1,230	70.7%

## CHIHUAHUA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- endothelial	Not defined	2	NO	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Vitreous degeneration				
	- anterior chamber	Not defined	1	Breeder option	
	- syneresis	Not defined	1	Breeder option	
F.	Retinal atrophy ( <i>prcd</i> )	Autosomal recessive	3, 4	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal dystrophy - endothelial

An abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

In the Chihuahua, this is a primary degenerative endothelial disease leading to progressive and permanent corneal edema. It is suspected to be a heritable disorder. There is no sex predilection. The condition is observed in older dogs, 6 to 13 years of age with a mean of 9.5 years. The corneal edema starts asymptotically in the dorsal temporal corneal quadrant of one eye and slowly progresses medially, eventually involving the entire cornea. Typically, it becomes bilateral. In the later stages,

discomfort, intracorneal bullae with subsequent ulceration and keratoconus may develop. Histologically, the primary endothelial disease appears slightly different from the clinically similar disorder of the Boston Terrier.

### **C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **E. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

### **F. Retinal atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Chihuahua is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Martin CL and Dice PF. Corneal endothelial dystrophy in the dog. *J Am Anim Hosp Assoc*. 1982;18:327.
3. Hyama M, Tada N, Mitsui H, et al. Real-time PCR genotyping in assay for canine progressive rod-cone degeneration and mutant allele frequency in Toy Poodles, Chihuahuas, and Miniature Dachshunds in Japan. *J Vet Med Sci* 2016; 78(3): 481. PMID: 26549343
4. Downs LM, Hitti R, Pregnotato S, et al. Genetic screening for PRA-associated mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds. *Vet Ophthalmol*. 2014;17:126-130. PMID: 24255994

## OCULAR DISORDERS REPORT CHIHUAHUA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,844		2018-2022 1,542	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	2	0.1%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			4	0.2%	4	0.3%
25.110 DISTICHIASIS			93	5.0%	50	3.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	2	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			3	0.2%	3	0.2%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.2%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			5	0.3%	4	0.3%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			5	0.3%	3	0.2%
70.700 CORNEAL DYSTROPHY			5	0.3%	4	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			7	0.4%	2	0.1%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			134	7.3%	62	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			4	0.2%	3	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.4%	7	0.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			3	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			50	2.7%	32	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			19	1.0%	11	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.2%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	0.2%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.1%	6	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.1%	6	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			33	1.8%	11	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			21	1.1%	7	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			9	0.5%	5	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			7	0.4%	4	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.2%	4	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			4	0.2%	3	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	3	0.2%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.1%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			4	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	2	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT			12	0.7%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.1%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>132</b>	<b>7.2%</b>	<b>66</b>	<b>4.3%</b>

## OCULAR DISORDERS REPORT CHIHUAHUA

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,844		2018-2022 1,542	
		#	%	#	%
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		2	0.1%	2	0.1%
110.135 PHPV/ PTVL		2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		17	0.9%	19	1.2%
110.320 VITREOUS DEGENERATION SYNERESIS		51	2.8%	20	1.3%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		7	0.4%	2	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		3	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		11	0.6%	1	0.1%
120.960 RETINOPATHY		1	0.1%	1	0.1%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		1	0.1%	1	0.1%
130.120 OPTIC NERVE HYPOPLASIA		0	0.0%	1	0.1%
130.150 OPTIC DISC COLOBOMA		1	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		21	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED		23	1.2%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		41	2.2%	48	3.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,476	80.0%	1,287	83.5%

## CHINESE CRESTED

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	4	NO	
C.	Lens luxation	Autosomal recessive	2, 3	NO	Mutation in the <i>ADAMTS17</i> gene
D.	Vitreous degeneration  - anterior chamber  - syneresis	Not defined  Not defined	1  1	Breeder option  Breeder option	
E.	Retinal atrophy ( <i>prcd</i> )	Autosomal recessive	4	NO	Mutation in the <i>prcd</i> gene
F.	Retinal atrophy - rod-cone dysplasia type 3 ( <i>rcd3</i> )	Autosomal recessive	5, 6	NO	Mutation in the <i>PDE6A</i> gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Lens luxation

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

#### D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

#### E. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Chinese Crested is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

In the Chinese Crested, a second, but very infrequency type of PRA has been identified that is caused by the mutation in the *PDE6A* gene that causes PRA in Cardigan Welsh Corgis. However, most cases of PRA that test normal for the *prcd* gene defect likely results from a gene defect that is still to be identified.

#### F. Retinal atrophy - rod-cone dysplasia type 3 (*rcd3*)

PRA in the Chinese Crested is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (*rcd3*). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

#### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721. PMID: 20375329
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384. PMID: 22050825
4. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425
5. Downs LM, Hitti R, Pregnotato S, et al. Genetic screening for PRA-associated mutations in multiple dog breeds shows that PRA is heterogeneous within and between breeds. *Vet Ophthalmol*. 2014; 17:126-130. PMID: 24255994
6. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. *PLoS One*. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650; PMCID: PMC4985128.



## OCULAR DISORDERS REPORT CHINESE CRESTED

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 6,741		2018-2022 535	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.1%	0	0.0%
10.000 GLAUCOMA			2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	2	0.4%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			3	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			4	0.1%	0	0.0%
25.110 DISTICHIASIS			41	0.6%	4	0.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			5	0.1%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			18	0.3%	1	0.2%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			5	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			8	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			36	0.5%	3	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			5	0.1%	0	0.0%
93.120 IRIS CYST			3	0.0%	0	0.0%
93.150 IRIS COLOBOMA			2	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			179	2.7%	10	1.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			11	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			10	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			3	0.0%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			3	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			3	0.0%	0	0.0%
97.120 COLOBOMA			2	0.0%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	0.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			161	2.4%	18	3.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			44	0.7%	12	2.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			22	0.3%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			16	0.2%	2	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			5	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			9	0.1%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			12	0.2%	5	0.9%
100.307 PUNCTATE CATARACT, CAPSULAR			9	0.1%	3	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			44	0.7%	4	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			31	0.5%	2	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			31	0.5%	1	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			6	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			5	0.1%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.0%	2	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.0%	2	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			4	0.1%	3	0.6%

## OCULAR DISORDERS REPORT CHINESE CRESTED

	Year Examined: Total # Dogs:	1993-2017 6,741		2018-2022 535	
Diagnostic Name		#	%	#	%
LENS Continued					
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		1	0.0%	1	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS		1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR		0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES		4	0.1%	2	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT		26	0.4%	3	0.6%
100.340 RESORBING/ HYPERMATURE CATARACT		1	0.0%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		28	0.4%	3	0.6%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		274	4.1%	46	8.6%
VITREOUS					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		6	0.1%	4	0.7%
110.135 PHPV/ PTVL		2	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		247	3.7%	18	3.4%
110.320 VITREOUS DEGENERATION SYNERESIS		540	8.0%	26	4.9%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		32	0.5%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		6	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		96	1.4%	3	0.6%
120.400 RETINAL HEMORRHAGE		4	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		8	0.1%	0	0.0%
120.960 RETINOPATHY		2	0.0%	0	0.0%
OPTIC NERVE					
130.110 MICROPAPILLA		4	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		13	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA		8	0.1%	0	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		68	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED		152	2.3%	2	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		54	0.8%	25	4.7%
NORMAL					
.000 NORMAL GLOBE		5,699	84.5%	433	80.9%

## CHINESE FOO DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the <i>ADAMTS17</i> gene

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### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Chinese Foo Dog. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Genetic Test Available; No Reference

## OCULAR DISORDERS REPORT CHINESE FOO DOG

**There are no statistics available for this breed**

## CHINESE SHAR-PEI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma – POAG	Autosomal recessive	2,3	NO	Mutation in the <i>ADAMTS17</i> gene
B.	Entropion	Not defined	1, 4-7	NO	
C.	Secondary keratitis - chronic	Not defined	1	Breeder option	
D.	Lens luxation	Autosomal recessive	2, 8,9	NO	Mutation in the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

A 6 base pair deletion in exon 22 of *ADAMTS17* has been found in some affected Chinese Shar-Pei. Results supported phenotype is an autosomal recessive trait. A genetic test is available.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

The condition is a particularly severe problem in the Chinese Shar-Pei and is compounded by breeder selection for facial conformation with heavy skin folds which encourages formation of entropion.

#### C. Secondary keratitis - chronic

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write secondary keratitis – chronic.

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. Often associated with entropion or a combination of entropion and ectropion.

#### D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may

result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

A 6 base pair deletion in exon 22 of *ADAMTS17* has been found in some affected Chinese Shar-Pei. Results supported phenotype is an autosomal recessive trait. A genetic test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Oliver, JAC, Rustidge S, Pettit L, et al. Evaluation of *ADAMTS17* in Chinese Shar-Pei with primary open-angle glaucoma, primary lens luxation, or both. *Am J Vet Res*. 2018 Jan;79(1): 98-106. PMID: 29287154
3. Jeanes EC, Oliver JAC, Ricketts SL, Gould DJ, Mellersh CS. Glaucoma-causing *ADAMTS17* mutations are also reproducibly associated with height in two domestic dog breeds: selection for short stature may have contributed to increased prevalence of glaucoma. *Canine Genet Epidemiol*. 2019 May 17;6:5. doi: 10.1186/s40575-019-0071-6. PMID: 31131111; PMCID: PMC6524303
4. Lenarduzzi R. Management of eyelid problems in Chinese Shar-Pei puppies. *Vet Med Small Anim Clin*. 1983;78:548-550.
5. Bedford PGC. Entropion in Shar-Peis (Correspondence). *Vet Rec*. 1984;115:666. PMID: 6523717
6. Startup FG. Entropion in the Shar-Pei (Correspondence). *Vet Rec*. 1985;116:57. PMID: 3976141
7. Barnett KC. Inherited eye disease in the dog and cat. *J Small Anim Pract*. 1988;29:462-475.
8. Lazarus JA, Pickett JP, Champagne ES. Primary lens luxation in the Chinese Shar-Pei: clinical and hereditary characteristics. *Vet Ophthalmol*. 1998;1:101-107. PMID: 11397217
9. Gould D, Pettitt L, McLaughlin B, Holmes N, Forman O, Thomas A, Ahonen S, Lohi H, O'Leary C, Sargan D, Mellersh C. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14(6):378-84. doi: 10.1111/j.1463-5224.2011.00892.x. Epub 2011 Aug 3. PMID: 22050825.

# OCULAR DISORDERS REPORT CHINESE SHAR-PEI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.3%	1	0.8%
10.000 GLAUCOMA			0	0.0%	2	1.7%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			312	50.6%	40	33.6%
22.000 ECTROPION, UNSPECIFIED			12	1.9%	0	0.0%
25.110 DISTICHIASIS			3	0.5%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.3%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.5%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			29	4.7%	0	0.0%
70.220 PIGMENTARY KERATITIS			11	1.8%	11	9.2%
70.700 CORNEAL DYSTROPHY			4	0.6%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			7	1.1%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			15	2.4%	1	0.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	0.8%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.8%	3	2.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.3%	4	3.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.2%	0	0.0%
93.810 UVEAL MELANOMA			1	0.2%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.6%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			15	2.4%	1	0.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	0.3%	1	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	1	0.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.5%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.2%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	0.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			6	1.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			9	1.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>28</b>	<b>4.5%</b>	<b>2</b>	<b>1.7%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			4	0.6%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	0.3%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.2%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.8%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			1	0.2%	0	0.0%

## OCULAR DISORDERS REPORT CHINESE SHAR-PEI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		617 #	%	119 #	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		9	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED		17	2.8%	1	0.8%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		21	3.4%	11	9.2%
<b>NORMAL</b>					
.000 NORMAL GLOBE		291	47.2%	64	53.8%

## CHINOOK

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes	Not defined	1	Breeder option	
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
D.	Choroidal hypoplasia (Collie Eye Anomaly)	Autosomal recessive	2	NO	Mutation in the <i>NHEJ1</i> gene
	- optic nerve coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- staphyloma/ coloboma				

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### D. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

# OCULAR DISORDERS REPORT CHINOOK

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,535		2018-2022 251	
			#	%	#	%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
25.110 DISTICHIASIS			5	0.3%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			4	0.3%	2	0.8%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			2	0.1%	1	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			93	6.1%	3	1.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.1%	1	0.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.1%	1	0.4%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.4%
130.150 OPTIC DISC COLOBOMA			0	0.0%	1	0.4%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			83	5.4%	12	4.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			8	0.5%	4	1.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	0.3%	3	1.2%
100.306 PUNCTATE CATARACT, NUCLEUS			10	0.7%	3	1.2%
100.307 PUNCTATE CATARACT, CAPSULAR			4	0.3%	5	2.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			10	0.7%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			17	1.1%	1	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			8	0.5%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			9	0.6%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			8	0.5%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			5	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.2%	1	0.4%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			4	0.3%	4	1.6%
100.330 GENERALIZED/ COMPLETE CATARACT			9	0.6%	1	0.4%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	1	0.4%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>108</b>	<b>7.0%</b>	<b>20</b>	<b>8.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.1%	1	0.4%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			18	1.2%	2	0.8%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			64	4.2%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT CHINOOK

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,535		2018-2022 251	
			#	%	#	%
<b>RETINA Continued</b>						
120.920 RETINAL DETACHMENT WITH DIALYSIS			1	0.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			19	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED			41	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			17	1.1%	10	4.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1,284	83.6%	209	83.3%

## CHOW CHOW

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Autosomal recessive	2, 3	NO
B.	Entropion	Not defined	1	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
	- endothelial opacity/no strands	Not defined	1	NO
D.	Cataract	Not defined	1, 4	NO

### DESCRIPTION AND COMMENTS

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

Age of onset in the Chow Chow appears to be anywhere between 3-6 years of age and has been observed as a bilateral condition. Gonioscopy has shown extremely narrow iridocorneal angles and in many regions no evidence of trabecular meshwork.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

Entropion in the Chow Chow has been observed for decades and is definitely related to the amount of skin covering the head and face. Because of the conformation admired by both fanciers and the judges, it is doubtful that we will see a significant change in the incidence of entropion as folds are, in many cases, desired by these individuals. Entropion requires surgical correction in the Chow Chow to return comfort and decrease chances for vision loss.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Major PPM's have been observed in the Chow Chow. Many ophthalmologists have observed puppies so severely affected that they are temporarily or permanently blind. The blindness is due to adherence of the membranes to the cornea and/or lens.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Chow Chow, the only reported cataract is congenital. The clinical appearance is variable, ranging from small nuclear or capsular opacities to generalized opacity. The central lens (nucleus) is most consistently affected with variable involvement of the peripheral lens (cortex). Concurrent ocular anomalies may include entropion, microphthalmia, persistent pupillary membranes, and retinal folds, although any direct relationship of these latter conditions to the cataract is unclear.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004;7:97-111. PMID: 14982589
3. Corcaran KA, Koch SA. Primary glaucoma in the Chow chows. *Prog Vet Comp Ophthalmol.* 1994;4:193-197.
4. Collins BK, Collier LL, Johnson GS, et al. Familial cataracts and concurrent ocular anomalies in chow chows. *J Am Vet Med Assoc.* 1992;200:1485-1491. PMID:1612983

## OCULAR DISORDERS REPORT CHOW CHOW

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,427		2018-2022 245	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.3%	1	0.4%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			3	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			380	26.6%	50	20.4%
22.000 ECTROPION, UNSPECIFIED			25	1.8%	5	2.0%
25.110 DISTICHIASIS			9	0.6%	1	0.4%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			9	0.6%	0	0.0%
70.220 PIGMENTARY KERATITIS			26	1.8%	3	1.2%
70.700 CORNEAL DYSTROPHY			8	0.6%	1	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			17	1.2%	0	0.0%
<b>UVEA</b>						
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			5	0.4%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			497	34.8%	73	29.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			17	1.2%	2	0.8%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			60	4.2%	8	3.3%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.6%	1	0.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			16	1.1%	11	4.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.3%	12	4.9%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			31	2.2%	4	1.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	0.1%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	2	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	0.4%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	0.6%	1	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.1%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.3%	2	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	2	0.8%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.1%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	1	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>37</b>	<b>2.6%</b>	<b>10</b>	<b>4.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			5	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			3	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.1%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			8	0.6%	0	0.0%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT CHOW CHOW

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		17	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED		22	1.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		24	1.7%	8	3.3%
<b>NORMAL</b>					
.000 NORMAL GLOBE		642	45.0%	109	44.5%

## CIRNECO DELL'ETNA

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CIRNECO DELL'ETNA breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT CIRNECO DELL ETNA

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		42 #	%	56 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		1	2.4%	3	5.4%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	2	3.6%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		0	0.0%	3	5.4%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	4.8%	2	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	2.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR		0	0.0%	1	1.8%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES		1	2.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>2</b>	<b>4.8%</b>	<b>1</b>	<b>1.8%</b>
<b>OPTIC NERVE</b>					
130.120 OPTIC NERVE HYPOPLASIA		0	0.0%	1	1.8%
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	2.4%	1	1.8%
<b>NORMAL</b>					
.000 NORMAL GLOBE		38	90.5%	45	80.4%

## CLUMBER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1, 2	Breeder option
B.	Ectropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Keratoconjunctivitis sicca	Not defined	1	NO
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

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### Description and Comments

#### A. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids, which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### D. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

#### **E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447-456.

## OCULAR DISORDERS REPORT CLUMBER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,795		2018-2022 329	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			6	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	3	0.9%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			167	6.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			603	21.6%	73	22.2%
22.000 ECTROPION, UNSPECIFIED			444	15.9%	47	14.3%
25.110 DISTICHIASIS			206	7.4%	41	12.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			5	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			18	0.6%	3	0.9%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			13	0.5%	0	0.0%
70.220 PIGMENTARY KERATITIS			11	0.4%	1	0.3%
70.700 CORNEAL DYSTROPHY			5	0.2%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			0	0.0%	1	0.3%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			69	2.5%	1	0.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.1%	0	0.0%
97.120 COLOBOMA			3	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	6	1.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			15	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			89	3.2%	19	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			21	0.8%	11	3.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			29	1.0%	2	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.2%	2	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			17	0.6%	2	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			7	0.3%	2	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.0%	3	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			15	0.5%	4	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			42	1.5%	8	2.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			16	0.6%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			9	0.3%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			5	0.2%	1	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	2	0.6%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	2	0.6%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT CLUMBER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>LENS Continued</b>					
100.328	Y-SUTURE TIP OPACITIES	4	0.1%	2	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	5	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>201</b>	<b>7.2%</b>	<b>41</b>	<b>12.5%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	6	0.2%	1	0.3%
110.135	PHPV/ PTVL	3	0.1%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	182	6.5%	2	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	9	0.3%	1	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	15	0.5%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	1	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.150	OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	25	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	64	2.3%	1	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.1%	7	2.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,480	53.0%	159	48.3%

## COCKER SPANIEL

(\*American)

\*The official breed name is Cocker Spaniel. The designation "American" has been used to avoid confusion and emphasize the distinction from the English Cocker Spaniel breed.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	1, 2	NO	
B.	Glaucoma	Not defined	3, 4	NO	
C.	Ectropion	Not defined	1	Breeder option	
D.	Distichiasis	Not defined	1, 2, 5, 15	Breeder option	
E.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
F.	Prolapsed gland of the third eyelid	Not defined	6	Breeder option	
G.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
H.	Keratitis	Not defined	1	Passes with no notation	
I.	Cataract	Not defined	1, 2, 7-10	NO	
J.	Retinal atrophy ( <i>prcd</i> )	Autosomal recessive	1, 11-13	NO	Mutation in the <i>prcd</i> gene
K.	Retinal dysplasia				
	- folds	Not defined	1, 14	Breeder option	

### Description and Comments

#### A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

#### B. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

**C. Ectropion**

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

**D. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**E. Imperforate lacrimal punctum**

A developmental anomaly resulting in failure of opening of the lacrimal duct adjacent to the eye. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

**F. Prolapsed gland of the third eyelid**

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye."

**G. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**H. Keratitis**

A specific designation does not exist on the CAER form for this condition. We ask examiners to mark other – unlisted conditions suspected as inherited. Then in the comments box please write "keratitis".

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. Often associated with entropion or a combination of entropion and ectropion.

**I. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, the onset of cataract may occur at an early age (less than 2 years) with rapid progression to maturity and associated with significant lens-induced inflammation.

**J. Retinal atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Cocker Spaniel is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **K. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### **References**

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## OCULAR DISORDERS REPORT COCKER SPANIEL

	Year Examined: Total # Dogs:	1993-2017 59,903		2018-2022 6,215	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110 MICROPHTHALMIA		35	0.1%	6	0.1%
10.000 GLAUCOMA		36	0.1%	7	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA		0	0.0%	34	0.5%
<b>EYELIDS</b>					
20.110 EYELID DERMOID		2	0.0%	0	0.0%
20.140 ECTOPIC CILIA		56	0.1%	1	0.0%
20.160 MACROPALPEBRAL FISSURE		179	0.3%	0	0.0%
21.000 ENTROPION, UNSPECIFIED		159	0.3%	12	0.2%
22.000 ECTROPION, UNSPECIFIED		996	1.7%	27	0.4%
25.110 DISTICHIASIS		30,111	50.3%	3,069	49.4%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		0	0.0%	123	2.0%
<b>NASOLACRIMAL</b>					
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		559	0.9%	155	2.5%
40.910 KERATOCONJUNCTIVITIS SICCA		384	0.6%	53	0.9%
<b>NICTITANS</b>					
50.210 PLASMOMA/ ATYPICAL PANNUS		0	0.0%	3	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY		8	0.0%	2	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID		228	0.4%	28	0.5%
<b>CORNEA</b>					
70.210 PANNUS		498	0.8%	0	0.0%
70.220 PIGMENTARY KERATITIS		542	0.9%	121	1.9%
70.700 CORNEAL DYSTROPHY		1,648	2.8%	137	2.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION		42	0.1%	1	0.0%
<b>UVEA</b>					
90.250 PIGMENTARY UVEITIS		1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA		3	0.0%	1	0.0%
93.120 IRIS CYST		22	0.0%	1	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM		2	0.0%	0	0.0%
93.150 IRIS COLOBOMA		9	0.0%	1	0.0%
93.170 ANTERIOR CHAMBER CYST		0	0.0%	1	0.0%
93.180 IIRIS SPHINCTER DYSPLASIA		1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		174	0.3%	25	0.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		32	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		35	0.1%	1	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS		28	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		47	0.1%	38	0.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		6	0.0%	2	0.0%
93.810 UVEAL MELANOMA		1	0.0%	0	0.0%
95.120 CILIARY BODY CYST		1	0.0%	1	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL		6	0.0%	0	0.0%
<b>FUNDUS</b>					
97.110 CHOROIDAL HYPOPLASIA		33	0.1%	0	0.0%
97.120 COLOBOMA		14	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	85	1.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	3	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	1	0.0%
120.960 RETINOPATHY		0	0.0%	7	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY		0	0.0%	1	0.0%
130.110 MICROPAPILLA		0	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA		0	0.0%	3	0.0%

## OCULAR DISORDERS REPORT COCKER SPANIEL

Year Examined: Total # Dogs:		1993-2017 59,903		2018-2022 6,215	
Diagnostic Name		#	%	#	%
LENS					
100.200	CATARACT, UNSPECIFIED	1,023	1.7%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	3,567	6.0%	393	6.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1,246	2.1%	272	4.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	613	1.0%	71	1.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	179	0.3%	42	0.7%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	188	0.3%	35	0.6%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	262	0.4%	86	1.4%
100.306	PUNCTATE CATARACT, NUCLEUS	106	0.2%	16	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	137	0.2%	45	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1,126	1.9%	112	1.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1,275	2.1%	116	1.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	342	0.6%	47	0.8%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	115	0.2%	5	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	193	0.3%	23	0.4%
100.316	INCIPIENT CATARACT, NUCLEUS	211	0.4%	22	0.4%
100.317	INCIPIENT CATARACT, CAPSULAR	99	0.2%	22	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	84	0.1%	43	0.7%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	82	0.1%	55	0.9%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	16	0.0%	11	0.2%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	2	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	5	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	22	0.0%	15	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	3	0.0%
100.328	Y-SUTURE TIP OPACITIES	50	0.1%	61	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1,043	1.7%	40	0.6%
100.340	RESORBING/ HYPERMATURE CATARACT	27	0.0%	19	0.3%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	83	0.1%	10	0.2%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	8,397	14.0%	1,103	17.7%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	43	0.1%	15	0.2%
110.135	PHPV/ PTVL	9	0.0%	1	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	23	0.0%	2	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	144	0.2%	11	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	6,957	11.6%	166	2.7%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	171	0.3%	4	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	9	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	466	0.8%	8	0.1%
120.400	RETINAL HEMORRHAGE	7	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	14	0.0%	0	0.0%
120.960	RETINOPATHY	34	0.1%	11	0.2%
OPTIC NERVE					
130.110	MICROPAPILLA	4	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	10	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	113	0.2%	1	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	451	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	1,066	1.8%	20	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,024	1.7%	297	4.8%
NORMAL					
.000	NORMAL GLOBE	24,474	40.9%	2,247	36.2%

## COLLIE

(Rough and Smooth varieties)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia	Not defined	1, 2	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
E.	Cataract	Not defined	1	NO	
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- Rod/cone dysplasia type 2- ( <i>rcd2</i> )	Autosomal recessive	3-6	NO	Mutation in the <i>RD3</i> gene
H.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
I.	Choroidal hypoplasia (Collie Eye Anomaly)	Autosomal recessive	1, 7-31	NO	Mutation in the <i>NHEJ1</i> gene
	- staphyloma/coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- optic nerve coloboma				

### Description and Comments

#### A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina. An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of

canine breeds including the Collie. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

## **B. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. In the Collie, because there is significant clinical disease associated with the abnormal hairs, breeding of affected animals should be discouraged.

## **C. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

## **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Collie, this is a particularly serious problem noted frequently on routine screening examination. The majority of persistent pupillary membranes identified on routine screening examinations include iris sheets, and bridging from the iris to cornea and the iris to lens. These may result in vision impairment.

## **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## **F. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

## **G. Retinal atrophy**

### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds. In the Collie, the rod/cone degeneration occurs very rarely and in those cases has not been caused by any of the known genetic mutations.

### **- Rod-cone dysplasia type 2- (*rcd2*)**

An inherited retinal disease characterized by abortive or abnormal development of rods and cones. The disease can be detected histologically by 6 weeks. Clinical night blindness is observed as early as 6 weeks with total blindness by 1 year of age. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. This form of retinal dysplasia is clinically similar to, but genetically distinct from that seen in the Irish Setter. This condition is caused by an insertion in *RD3*. A DNA test is available.

#### **H. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **I. Choroidal hypoplasia (Collie Eye Anomaly)**

- **staphyloma/coloboma**
- **retinal detachment**
- **retinal hemorrhage**
- **optic nerve coloboma**

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

#### **Historical Note:**

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

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## OCULAR DISORDERS REPORT COLLIE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 59,304		2018-2022 8,224	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			974	1.6%	280	3.4%
10.000 GLAUCOMA			7	0.0%	0	0.0%
<b>EYELIDS</b>						
20.110 EYELID DERMOID			1	0.0%	0	0.0%
20.140 ECTOPIC CILIA			5	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			57	0.1%	4	0.0%
22.000 ECTROPION, UNSPECIFIED			8	0.0%	0	0.0%
25.110 DISTICHIASIS			1,107	1.9%	138	1.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			9	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			5	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			13	0.0%	1	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			7	0.0%	1	0.0%
70.700 CORNEAL DYSTROPHY			411	0.7%	16	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			12	0.0%	0	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			5	0.0%	3	0.0%
93.120 IRIS CYST			19	0.0%	11	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			24	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			4	0.0%	8	0.1%
93.180 IRIS SPHINCTER DYSPLASIA			2	0.0%	2	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			9,988	16.8%	1,973	24.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			514	0.9%	99	1.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			128	0.2%	14	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			65	0.1%	9	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			45	0.1%	16	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			12	0.0%	2	0.0%
93.810 UVEAL MELANOMA			4	0.0%	1	0.0%
95.120 CILIARY BODY CYST			1	0.0%	2	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			306	0.5%	215	2.6%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			40,753	68.7%	6,252	76.0%
97.120 COLOBOMA			2,298	3.9%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	231	2.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	8	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	32	0.4%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	1	0.0%
130.110 MICROPAPILLA			0	0.0%	30	0.4%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	10	0.1%
130.150 OPTIC DISC COLOBOMA			0	0.0%	299	3.6%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			114	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			587	1.0%	90	1.1%

# OCULAR DISORDERS REPORT COLLIE

Year Examined: Total # Dogs:		1993-2017 59,304		2018-2022 8,224	
Diagnostic Name		#	%	#	%
LENS Continued					
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	107	0.2%	15	0.2%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	27	0.0%	3	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	6	0.0%	1	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	32	0.1%	2	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	26	0.0%	5	0.1%
100.306	PUNCTATE CATARACT, NUCLEUS	217	0.4%	58	0.7%
100.307	PUNCTATE CATARACT, CAPSULAR	49	0.1%	14	0.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	105	0.2%	13	0.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	113	0.2%	13	0.2%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	39	0.1%	5	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	39	0.1%	4	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	28	0.0%	3	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	159	0.3%	47	0.6%
100.317	INCIPIENT CATARACT, CAPSULAR	34	0.1%	8	0.1%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	5	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	5	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	9	0.0%	2	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	5	0.0%	2	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	49	0.1%	1	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.0%	1	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	1,156	1.9%	206	2.5%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	394	0.7%	54	0.7%
110.135	PHPV/ PTVL	51	0.1%	3	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	46	0.1%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	4,068	6.9%	370	4.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	58	0.1%	4	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	105	0.2%	11	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	814	1.4%	1	0.0%
120.400	RETINAL HEMORRHAGE	105	0.2%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	823	1.4%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	121	0.2%	55	0.7%
120.960	RETINOPATHY	1	0.0%	2	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	160	0.3%	22	0.3%
130.120	OPTIC NERVE HYPOPLASIA	252	0.4%	16	0.2%
130.150	OPTIC DISC COLOBOMA	4,727	8.0%	409	5.0%
OTHER					
900.000	OTHER, UNSPECIFIED	132	0.2%	0	0.0%
900.100	OTHER, NOT INHERITED	297	0.5%	10	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	631	1.1%	31	0.4%
NORMAL					
.000	NORMAL GLOBE	14,818	25.0%	1,312	16.0%

## COTON DE TULEAR

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
B.	Prolapsed gland of third eyelid	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Y-suture tip opacity	Not defined	1	Breeder option	
G.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
H.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Not defined	2, 3	NO	Mutation in the <i>prcd</i> gene
I.	Multifocal retinopathy	Autosomal recessive	4, 5	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene
	- <i>cmr2</i>				

### Description and Comments

#### A. Imperforate Lacrimal Punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

#### B. Prolapse of the gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated and severe chronic inflammation or keratoconjunctivitis

sicca/dry eye syndrome may ensue. Commonly referred to as "cherry eye."

### **C. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### **D. Persistent pupillary membranes (PPMs)**

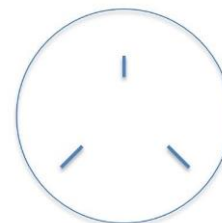
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **F. Y-suture tip opacity**

These are prominent (or "highlighted" or "more dense") distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a "peace sign" as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the "Lens" section of the CAER form. The newest version of the form (3/16/21) has boxes that say, "posterior Y-suture tip opacities" which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: "punctate posterior sutures" AND ALSO MARK "suspect not inherited/significance unknown" (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: "E2" or "posterior suture tip opacities." This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### **G. Vitreous degeneration - syneresis**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

### **H. Retinal atrophy**

**- generalized**

An umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative diseases of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

#### - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Coton de Tulear is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### I. Multifocal retinopathy – *cmr2*

Canine Multifocal Retinopathy type 2 (*cmr2*) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There is typically a serous sub-retinal fluid in the Coton de Tulear, although there may be accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 15 weeks to 1 year of age. The lesions typically remain static in size and color beyond 1 year of age. The bullae appear to gradually lose the serous sub-retinal fluid after 4-5 years of age. Discrete areas of tapetal hyper-reflectivity might also be seen. Most dogs exhibit no noticeable problem with vision despite their abnormal appearing retinas. Electroretinograms reveal significant differences in photopic flickers in affected dogs.

Canine Multifocal Retinopathy type 2 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Coton du Tulear. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650
3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS

Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

4. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007;48:1959-1967. PMID: 17460247
5. Grahn BH, Sandmeyer LL, Breau C. Retinopathy of Coton de Tulear dogs: clinical manifestations, electroretinographic, ultrasonographic, fluorescein and indocyanine green angiographic, and optical coherence tomographic findings. *Vet Ophthalmol*. 2008;11:242-249. PMID: 18638350

## OCULAR DISORDERS REPORT COTON DE TULEAR

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 5,399		2018-2022 635	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			4	0.1%	2	0.3%
25.110 DISTICHIASIS			46	0.9%	4	0.6%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	3	0.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			4	0.1%	7	1.1%
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			19	0.4%	5	0.8%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			58	1.1%	4	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			2	0.0%	0	0.0%
93.120 IRIS CYST			4	0.1%	0	0.0%
93.150 IRIS COLOBOMA			2	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			457	8.5%	70	11.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			8	0.1%	1	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.0%	2	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			8	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			190	3.5%	32	5.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			15	0.3%	4	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			7	0.1%	4	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			5	0.1%	5	0.8%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			26	0.5%	2	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.1%	1	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			20	0.4%	9	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			15	0.3%	4	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			18	0.3%	2	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			10	0.2%	2	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			7	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			6	0.1%	2	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			7	0.1%	4	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			19	0.4%	14	2.2%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.1%	1	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT COTON DE TULEAR

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 5,399		2018-2022 635	
		#	%	#	%
<b>LENS Continued</b>					
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	157	2.9%	41	6.5%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	8	0.1%	1	0.2%
110.135	PHPV/ PTVL	1	0.0%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	6	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	48	0.9%	6	0.9%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	21	0.4%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	11	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	3	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	34	0.6%	2	0.3%
120.370	MULTIFOCAL RETINOPATHY	2	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	1	0.0%	3	0.5%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	3	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	44	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	152	2.8%	2	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	68	1.3%	26	4.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,588	85.0%	479	75.4%

## CURLY-COATED RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1, 2	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membrane (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

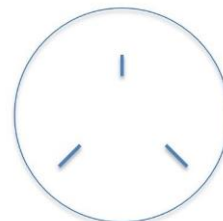
In the Curly-Coated Retriever the following cataracts have been reported:

1. Anterior cortical subcapsular cataract: Anterior subcapsular striate cortical cataracts usually occur bilaterally, slowly progress and usually occur between 5-8 years of age.

2. Posterior subcapsular cataract: Posterior polar subcapsular opacities occur at 2-4 years of age and progress slowly.

#### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67. PMID: 827198

## OCULAR DISORDERS REPORT CURLY-COATED RETRIEVER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,993		2018-2022 196	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			4	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			11	0.6%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			3	0.2%	0	0.0%
25.110 DISTICHIASIS			152	7.6%	16	8.2%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			3	0.2%	1	0.5%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			14	0.7%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.1%	0	0.0%
93.120 IRIS CYST			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			77	3.9%	9	4.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			4	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.3%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			17	0.9%	10	5.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			13	0.7%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.5%
120.960 RETINOPATHY			0	0.0%	1	0.5%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	1	0.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			19	1.0%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			122	6.1%	22	11.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			18	0.9%	2	1.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			17	0.9%	4	2.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.2%	3	1.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			29	1.5%	10	5.1%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.1%	4	2.0%
100.307 PUNCTATE CATARACT, CAPSULAR			15	0.8%	2	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			12	0.6%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			13	0.7%	2	1.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			11	0.6%	1	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	1	0.5%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			7	0.4%	1	0.5%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.2%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.5%
100.328 Y-SUTURE TIP OPACITIES			15	0.8%	19	9.7%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>156</b>	<b>7.8%</b>	<b>32</b>	<b>16.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			3	0.2%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			17	0.9%	0	0.0%

## OCULAR DISORDERS REPORT CURLY-COATED RETRIEVER

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	1,993		196	
		#	%	#	%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		21	1.1%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		3	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		12	0.6%	0	0.0%
120.960 RETINOPATHY		1	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		1	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		3	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA		13	0.7%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		16	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED		35	1.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		31	1.6%	13	6.6%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,581	79.3%	118	60.2%

## **CZECHOSLOVAKIAN VLCAK**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the CZECHOSLOVAKIAN VLCAK breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT CZECHOSLOVAKIAN VLCAK

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			30		68	
			#	%	#	%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	6.7%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	3.3%	1	1.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			0	0.0%	2	2.9%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	10.0%	3	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	2	2.9%
100.306 PUNCTATE CATARACT, NUCLEUS			1	3.3%	1	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	2	2.9%
100.316 INCIPIENT CATARACT, NUCLEUS			2	6.7%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	1.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>3</b>	<b>10.0%</b>	<b>6</b>	<b>8.8%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	3.3%	0	0.0%
<b>FUNDUS</b>						
130.110 MICROPAPILLA			0	0.0%	2	2.9%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	3.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	6.7%	4	5.9%
<b>NORMAL</b>						
.000 NORMAL GLOBE			32	106.7%	56	82.4%

## DACHSHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia and multiple ocular defects	Not defined	2,3	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Superficial punctate keratitis	Not defined	4	Breeder option	
D.	Corneal dystrophy				
	- endothelial	Not defined	5, 6	NO	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
F.	Cataract	Not defined	1	NO	
G.	Retinal atrophy		1	NO	
	- generalized	Not defined	1	NO	
	- CORD1	Autosomal recessive	7-15, 17,18	NO	Mutation in the <i>RPGRIP</i> gene in the Miniature Long Haired Dachshund
	- cone-rod dystrophy	Autosomal recessive	16	NO	Mutation in the <i>NPHP4</i> gene in the Standard Wire Haired Dachshund
H.	Retinopathy	Autosomal recessive	19-20	NO	Mutation in the <i>TPP1</i> gene
	- associated with ceroid lipofuscinosis				
I.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Microphthalmia and multiple ocular anomalies

Microphthalmia is a congenital defect characterized by a small eye often with associated defects of the cornea, anterior chamber, lens and/or retina. An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of canine breeds including the Dachshund. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### **C. Superficial punctate keratitis**

Superficial punctate keratitis is characterized by multiple sites of discrete corneal inflammation and/or ulceration and which is suspected to be immune-mediated in etiology. Lesions are typically oval to circular, well-defined and may be associated with an arborizing vascular response.

### **D. Corneal dystrophy - endothelial**

An abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision.

### **E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### **F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **G. Retinal atrophy\***

#### **- generalized**

An umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative diseases of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

#### **- CORD1**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram before it is apparent clinically.

In Miniature Dachshunds there is a recessively inherited disorder caused by a 44 base pair insertion in the *RPGRIP1* gene. The insertion presumably truncates the protein and its major C-terminal RPGR binding domain. The resulting disease is called cone-rod dystrophy 1 (CORD1) as the salient clinical abnormalities are a cone ERG dysfunction which does not correlate with photopic vision defects. The onset of the disease is variable, and is influenced by a second modifier locus which also is located on canine chromosome 15. Dogs homozygous for both defects have retinal abnormalities on ophthalmoscopy before 1-2 years of age. Dogs homozygous only for the *RPGRIP1* insertion may have a late onset (>6 years) retinal degeneration diagnosed by ophthalmoscopy. Although the *RPGRIP1* molecular defect can be identified by means of a DNA test, questions have been raised about its validity given the poor genotype-phenotype correlation. A DNA test is available.

In a previous study using an inbred research colony, a 44-nucleotide insertion (ins44) in exon 2 of RPGRIP1 was associated with retinal degeneration. Despite concordance of ins44 with retinal degeneration, evidence indicate that there was phenotype-genotype discordance within the miniature long-haired dachshunds that were not directly related to the experimental colony as not all dogs that were homozygous for ins44 were developing early onset retinal degeneration, but were developing retinal degeneration at a much later stage or not at all. In this investigation MAP9 deletion associated with early retinal degeneration onset was identified. Given the new genome assembly, the nominal title is CanFam3.1MAP9 corrected. Deletion was confirmed in early onset retinal degeneration cases and not late onset retinal degeneration cases, there is a variable age of onset and demonstrate the interaction of two independent loci that contribute to the phenotype. This study has shown that RPGRIP1 ins44/ins44 dogs with early onset retinal degeneration has several polymorphisms in MAP9, some of them potentially harmful, when compared with MAP9 in late onset retinal degeneration dogs. Detection of the presence or absence of MAP early onset retinal degeneration by qPCR can be used to specify early onset or late onset status for ins44 homozygotes. The story, however, is not as straightforward as suggested by the Forman et al. 2016 paper. Unpublished work by K. Miyadera and G. Aguirre in a research colony in which one of the founders originated from a MLHD at the Animal Health Trust finds that dogs that are homozygous for the RPGRIP1 ins 44 and the newly identified MAP9 deletion still do not show early-onset retinal degeneration. This suggests that there probably is a third genetic locus that interacts with MAP9 and RPGRIP1 in determining the age of disease onset and severity of the phenotype. Regardless, the identification of the MAP9 deletion is a major finding that will help unravel the complex genetics of this retinal disorder.

#### - NPHP4

This is an early onset cone-rod dystrophy with disease onset documented between 10 months to 3 years of age, with complete retinal atrophy noted by 6 years of age in affected animals. On ERG, cone dysfunction can be noted as early as 5 weeks of age.

\*\* note these forms of retinal degeneration are clinically indistinguishable from other forms of PRA, and can only be differentiated by genetic test or functional studies.

### H. Retinopathy associated with ceroid lipofuscinosis

Progressive, multifocal serous retinal detachments first appear in Longhaired Dachshunds with late infantile neuronal ceroid lipofuscinosis at age 5-10 months. Late infantile ceroid neuronal lipofuscinosis in Miniature Dachshunds is a fatal, autosomal recessive, inherited lysosomal storage disease characterized by progressive neurodegeneration. The disease results from a defect in the *TPP1* (Tripeptidyl peptidase) gene. Inheritance of the retinopathy is linked to the gene causing late infantile neuronal ceroid lipofuscinosis.

### I. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and the more severe forms of retinal dysplasia is undetermined.

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## OCULAR DISORDERS REPORT DACHSHUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 6,683		2018-2022 2,037	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			24	0.4%	0	0.0%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			7	0.1%	2	0.1%
25.110 DISTICHIASIS			421	6.3%	186	9.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	3	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			5	0.1%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			9	0.1%	3	0.1%
<b>CORNEA</b>						
70.210 PANNUS			3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.0%
70.700 CORNEAL DYSTROPHY			34	0.5%	2	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			9	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			9	0.1%	8	0.4%
93.120 IRIS CYST			4	0.1%	0	0.0%
93.150 IRIS COLOBOMA			25	0.4%	2	0.1%
93.180 IRIS SPHINCTER DYSPLASIA			0	0.0%	2	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			283	4.2%	101	5.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			26	0.4%	8	0.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			31	0.5%	9	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			4	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			101	1.5%	142	7.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			13	0.2%	9	0.4%
95.120 CILIARY BODY CYST			0	0.0%	1	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			2	0.0%	2	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			5	0.1%	2	0.1%
97.120 COLOBOMA			14	0.2%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	9	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	4	0.2%
130.110 MICROPAPILLA			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			43	0.6%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			271	4.1%	42	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			43	0.6%	16	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			17	0.3%	6	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			14	0.2%	2	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			9	0.1%	3	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			13	0.2%	8	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			17	0.3%	4	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			23	0.3%	12	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			51	0.8%	10	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			23	0.3%	1	0.0%

## OCULAR DISORDERS REPORT DACHSHUND

Year Examined: Total # Dogs:		1993-2017 6,683		2018-2022 2,037	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	18	0.3%	3	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.3%	1	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	10	0.1%	3	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	9	0.1%	5	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	3	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	0	0.0%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	4	0.1%	10	0.5%
100.330	GENERALIZED/ COMPLETE CATARACT	40	0.6%	1	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	3	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>358</b>	<b>5.4%</b>	<b>78</b>	<b>3.8%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	39	0.6%	14	0.7%
110.135	PHPV/ PTVL	15	0.2%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.0%	3	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	38	0.6%	5	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	58	0.9%	15	0.7%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	125	1.9%	2	0.1%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	5	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	1	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	21	0.3%	3	0.1%
130.120	OPTIC NERVE HYPOPLASIA	40	0.6%	0	0.0%
130.150	OPTIC DISC COLOBOMA	26	0.4%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	89	1.3%	0	0.0%
900.100	OTHER, NOT INHERITED	200	3.0%	4	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	120	1.8%	95	4.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	5,182	77.5%	1,470	72.2%

## DALMATIAN

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris hypoplasia/sphincter dysplasia\*\*.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	3	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Iris hypoplasia/iris sphincter dysplasia	Not defined	1	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Not defined	1, 2	NO
G.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option

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### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**D. Iris Hypoplasia**

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

**\*\*Historical note:** Previously described iris sphincter dysplasia: a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality has been noted in the Dalmatian breed.

**E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**G. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

**\*\*Note:** Iris sphincter dysplasia is a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality was historically listed on this breed's page, however, it is no longer reported consistently in this breed, so it was removed from the breed page. As this condition may result in discomfort, examiners should still be aware that this has historically affected this breed and perform a pre-dilation exam to screen for this condition.

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## OCULAR DISORDERS REPORT DALMATIAN

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,151		2018-2022 1,273	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			5	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			150	4.8%	53	4.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	4	0.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.1%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			83	2.6%	33	2.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			53	1.7%	20	1.6%
93.120 IRIS CYST			3	0.1%	0	0.0%
93.150 IRIS COLOBOMA			16	0.5%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			18	0.6%	3	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			26	0.8%	15	1.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.1%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.2%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.1%	2	0.2%
95.120 CILIARY BODY CYST			0	0.0%	1	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.2%
120.960 RETINOPATHY			0	0.0%	2	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.0%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			62	2.0%	27	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			21	0.7%	9	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			8	0.3%	3	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			11	0.3%	3	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.1%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			6	0.2%	4	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.1%	2	0.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			26	0.8%	8	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			14	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			14	0.4%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			6	0.2%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.1%	4	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			4	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.1%	1	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	1	0.1%

## OCULAR DISORDERS REPORT DALMATIAN

	Year Examined: Total # Dogs:	1993-2017 3,151		2018-2022 1,273	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.327 INCOMPLETE CATARACT, CAPSULAR		1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		1	0.0%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT		6	0.2%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT		1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		4	0.1%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		136	4.3%	39	3.1%
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		1	0.0%	5	0.4%
110.135 PHPV/ PTVL		2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		9	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS		22	0.7%	6	0.5%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		14	0.4%	5	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	4	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		7	0.2%	1	0.1%
120.400 RETINAL HEMORRHAGE		1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.0%	0	0.0%
120.960 RETINOPATHY		2	0.1%	3	0.2%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		2	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		43	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED		90	2.9%	2	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		130	4.1%	40	3.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		2,594	82.3%	1,064	83.6%

## DANDIE DINMONT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2, 3	NO
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

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### Description and Comments

#### A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

In the Dandie Dinmont terrier a 9.5 Mb susceptibility locus has been identified on canine chromosome 8. The definitive mutation has not been determined. A genetic test is not yet available.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### References

1. ACVO Genetics Committee and/or Data from /OFA All-Breeds Report.
2. Ahonen SJ, Pietila E, Mellersh CS, et al. Genome-wide association study identifies a novel canine glaucoma locus. *PLoS one*. 2013;8:e70903. PMID: 23951034
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## OCULAR DISORDERS REPORT DANDIE DINMONT TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.4%	0	0.0%
10.000 GLAUCOMA			1	0.4%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			21	7.6%	2	2.2%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			6	2.2%	2	2.2%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.4%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			28	10.1%	6	6.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	1.8%	2	2.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			30	10.8%	5	5.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			5	1.8%	1	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	1.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.7%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			5	1.8%	4	4.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	1.8%	1	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			5	1.8%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>32</b>	<b>11.5%</b>	<b>6</b>	<b>6.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			3	1.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	2.2%	0	0.0%
900.100 OTHER, NOT INHERITED			7	2.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	2.5%	1	1.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			189	68.0%	74	80.4%

## DANISH BROHOLMER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DANISH BROHOLMER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT DANISH BROHOLMER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		2	100.0%	0	

## DANISH SWEDISH FARMDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DANISH SWEDISH FARMDOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT DANISH SWEDISH FARMDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3	10.3%	3	4.5%
<b>LENS</b> 100.316 INCIPIENT CATARACT, NUCLEUS			1	3.4%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	1.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>3.4%</b>	<b>0</b>	<b>0.0%</b>
<b>FUNDUS</b> 130.110 MICROPAPILLA			0	0.0%	1	1.5%
<b>OTHER</b> 900.100 OTHER, NOT INHERITED			1	3.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	3.4%	1	1.5%
<b>NORMAL</b> .000 NORMAL GLOBE			24	82.8%	60	90.9%

## DOBERMAN PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	2-5	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1-5	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Persistent hyperplastic primary vitreous/ Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Presumed dominant/ incomplete penetrance	6-14	NO
F.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
G.	Ligneous conjunctivitis	Not defined	15	NO

### Description and Comments

#### A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia). Note that this syndrome is distinct from "E," PHPV/PHTVL, which may also be associated with microphthalmia.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **D. Cataract**

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

Cataracts have been infrequently observed in the Doberman Pinscher and there is no specific location attributed to cataracts within the Doberman lens. Most cataracts are bilateral, usually observed within the first two years of life, and may cause significant vision loss.

#### **E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)**

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The condition in the Doberman includes a spectrum of malformations ranging from spots of pigment on the posterior surface of the lens to posterior lenticonus, cataract and a dense fibrous plaque on the posterior surface of the lens. In the more severe forms, partial or complete vision impairment occurs. PHPV has been extensively studied in the Doberman in Europe. This disorder has been observed occasionally in the Doberman in the United States.

#### **F. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **G. Ligneous conjunctivitis**

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease.

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## OCULAR DISORDERS REPORT DOBERMAN PINSCHER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 5,780		2018-2022 1,304	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			7	0.1%	0	0.0%
10.000 GLAUCOMA			0	0.0%	1	0.1%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			7	0.1%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			96	1.7%	20	1.5%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	1	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			8	0.1%	2	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			7	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			10	0.2%	3	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.0%	1	0.1%
93.120 IRIS CYST			12	0.2%	3	0.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			127	2.2%	23	1.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			34	0.6%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			10	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			4	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			133	2.3%	194	14.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.1%	3	0.2%
93.810 UVEAL MELANOMA			4	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			0	0.0%	1	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	0	0.0%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
130.110 MICROPAPILLA			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			32	0.6%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			323	5.6%	52	4.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			23	0.4%	8	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			6	0.1%	6	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			5	0.1%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			4	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			22	0.4%	5	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			21	0.4%	10	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR			46	0.8%	24	1.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			13	0.2%	4	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			18	0.3%	5	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			8	0.1%	3	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			10	0.2%	2	0.2%

## OCULAR DISORDERS REPORT DOBERMAN PINSCHER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 5,780		2018-2022 1,304	
		#	%	#	%
<b>LENS Continued</b>					
100.316	INCIPIENT CATARACT, NUCLEUS	21	0.4%	12	0.9%
100.317	INCIPIENT CATARACT, CAPSULAR	12	0.2%	7	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	2	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	3	0.2%
100.328	Y-SUTURE TIP OPACITIES	6	0.1%	8	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	15	0.3%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.0%	3	0.2%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>258</b>	<b>4.5%</b>	<b>95</b>	<b>7.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	19	0.3%	12	0.9%
110.135	PHPV/ PTVL	45	0.8%	13	1.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	10	0.2%	2	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	98	1.7%	4	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	12	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	0.2%	3	0.2%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.2%
120.960	RETINOPATHY	1	0.0%	0	0.0%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.1%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	3	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	57	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	169	2.9%	3	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	123	2.1%	86	6.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,796	83.0%	894	68.6%

## DOGO ARGENTINO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DOGO ARGENTINO breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT DOGO ARGENTINO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			134		64	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	1.6%
25.110 DISTICHIASIS			1	0.7%	2	3.1%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.7%	3	4.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.7%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			14	10.4%	1	1.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.7%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.7%	1	1.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.7%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	2	3.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	2.2%	1	1.6%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	1.6%
100.316 INCIPIENT CATARACT, NUCLEUS			2	1.5%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>8</b>	<b>6.0%</b>	<b>4</b>	<b>6.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.7%	0	0.0%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			1	0.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.7%	6	9.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			113	84.3%	50	78.1%

## DOGUE DE BORDEAUX

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	2	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion in the Mastiff is severe and may require multiple surgical corrections.

#### B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

## E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## F. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid, or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Zangerl B, Wickström K, Slavik J, Lindauer SJ, Ahonen S, Schelling C, Lohi H, Guziewicz KE, Aguirre GD. Assessment of canine BEST1 variations identifies new mutations and establishes an independent bestrophinopathy model (cmr3). *Mol Vis*. 2010 Dec 16;16:2791-804. PMID: 21197113; PMCID: PMC3008713.

## OCULAR DISORDERS REPORT DOGUE DE BORDEAUX

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			335		97	
			#	%	#	%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			9	2.7%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			22	6.6%	19	19.6%
22.000 ECTROPION, UNSPECIFIED			38	11.3%	12	12.4%
25.110 DISTICHIASIS			32	9.6%	9	9.3%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.3%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			7	2.1%	5	5.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.3%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.6%	2	2.1%
93.170 ANTERIOR CHAMBER CYST			1	0.3%	1	1.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			16	4.8%	1	1.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.3%	1	1.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			4	1.2%	1	1.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	1.5%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.3%	1	1.0%
95.120 CILIARY BODY CYST			2	0.6%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			9	2.7%	2	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.3%	1	1.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS			4	1.2%	2	2.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			0	0.0%	2	2.1%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.3%	1	1.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	1.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>8</b>	<b>2.4%</b>	<b>8</b>	<b>8.2%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.3%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			6	1.8%	1	1.0%
120.960 RETINOPATHY			1	0.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED			10	3.0%	2	2.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	2.4%	2	2.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			225	67.2%	52	53.6%

## **DRENTSCH PARTRIJSHOND**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DRENTSCH PARTRIJSHOND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT DRENTSCHE PATRIJSHOND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			17		35	
			#	%	#	%
<b>UVEA</b>						
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	5.9%	2	5.7%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	5.9%	2	5.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	5.9%	1	2.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	5.9%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	5.9%	1	2.9%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	2.9%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>3</b>	<b>17.6%</b>	<b>3</b>	<b>8.6%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	2.9%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	11.8%	2	5.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			13	76.5%	29	82.9%

## DREVER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the DREVER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT DREVER

**There are no statistics available for this breed**

## DUTCH SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT DUTCH SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			81 #	%	120 #	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			3	3.7%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	1	0.8%
<b>CORNEA</b>						
70.210 PANNUS			0	0.0%	1	0.8%
70.700 CORNEAL DYSTROPHY			1	1.2%	3	2.5%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			0	0.0%	6	5.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	2.5%	2	1.7%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			11	13.6%	9	7.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	2.5%	1	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	4	3.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	2.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	1.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	2	1.7%
100.306 PUNCTATE CATARACT, NUCLEUS			5	6.2%	2	1.7%
100.307 PUNCTATE CATARACT, CAPSULAR			3	3.7%	3	2.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	2.5%	1	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	1.2%	2	1.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	1.2%	1	0.8%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	2	1.7%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>17</b>	<b>21.0%</b>	<b>16</b>	<b>13.3%</b>
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	1.7%
120.960 RETINOPATHY			0	0.0%	1	0.8%
<b>RETINA</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	1.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	3.7%	0	0.0%
900.100 OTHER, NOT INHERITED			0	0.0%	1	0.8%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	4.9%	8	6.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			65	80.2%	86	71.7%

## ECT LANDSEER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ECT LANDSEER breed. Therefore, there are no conditions listed with breeding advice.

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## ENGLISH COCKER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	2	NO	
B.	Glaucoma	Not defined	3, 4	NO	
C.	Distichiasis	Not defined	1, 5, 15	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1, 6	Breeder option	
	- iris to cornea	Not defined	1, 6	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1, 6-9	NO	
F.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Autosomal recessive	10-14	NO	Mutation in <i>prcd</i> gene
G.	Retinal dysplasia				
	- folds	Presumed autosomal recessive	1	Breeder option	

### Description and Comments

#### A. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

#### B. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

Glaucoma in the English Cocker Spaniel is recognized in England. The frequency and significance of this disease in the breed in the United States is not known, but is probably low.

#### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the English Cocker Spaniel, this is a particularly serious problem as the majority of PPMs identified on routine screening examination bridge from the iris to the cornea and are associated with corneal opacities which may result in vision impairment. Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Congenital cataracts have been reported in Red Cocker Spaniels, presumably English Cocker Spaniels, in Denmark. The cataracts affected the anterior capsule; in some cases the cortex and/or nucleus were opaque. Associated findings in some dogs were persistent pupillary membrane (PPM) and/or microphthalmia. It is likely that these cataracts are part of a syndrome characterized by multiple congenital ocular anomalies. The condition is familial, but a specific mode of inheritance has not been defined.

#### **F. Retinal atrophy**

##### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### **- *prcd***

Studies have shown that the principal form of PRA in the English Cocker Spaniel is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. However, in the English Cocker Spaniel, the phenotype can be very variable in the age of onset. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

Other forms of retinal degeneration that are not *prcd* are recognized in the breed. The currently available genetic test will not detect these other forms of PRA.

#### Historical Note:

Central progressive retinal atrophy/retinal pigment epithelial dystrophy (CPRA/RPED) was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere. In the English Cocker Spaniel, retinal lesions of CPRA have been related to an underlying abnormal metabolism of Vitamin E resulting in a systemic deficiency

#### G. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

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## OCULAR DISORDERS REPORT ENGLISH COCKER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 11,380		2018-2022 1,269	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			14	0.1%	1	0.1%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.110 EYELID DERMOID			1	0.0%	0	0.0%
20.140 ECTOPIC CILIA			6	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			3	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			49	0.4%	6	0.5%
22.000 ECTROPION, UNSPECIFIED			97	0.9%	1	0.1%
25.110 DISTICHIASIS			2,025	17.8%	205	16.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	7	0.6%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			22	0.2%	4	0.3%
40.910 KERATOCONJUNCTIVITIS SICCA			12	0.1%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			6	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			10	0.1%	1	0.1%
70.220 PIGMENTARY KERATITIS			11	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			100	0.9%	11	0.9%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			37	0.3%	0	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.120 IRIS CYST			5	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			6	0.1%	0	0.0%
93.150 IRIS COLOBOMA			2	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			145	1.3%	27	2.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			43	0.4%	4	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			186	1.6%	8	0.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			10	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			53	0.5%	46	3.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			18	0.2%	11	0.9%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			0	0.0%	1	0.1%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	7	0.6%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	3	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	3	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			172	1.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			697	6.1%	65	5.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			121	1.1%	36	2.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			57	0.5%	7	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			24	0.2%	7	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			15	0.1%	4	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			38	0.3%	6	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			28	0.2%	9	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			18	0.2%	18	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			134	1.2%	6	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			136	1.2%	1	0.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			86	0.8%	7	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			8	0.1%	0	0.0%

## OCULAR DISORDERS REPORT ENGLISH COCKER SPANIEL

Year Examined: Total # Dogs:		1993-2017 11,380		2018-2022 1,269	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	27	0.2%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	64	0.6%	2	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	20	0.2%	1	0.1%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	5	0.0%	2	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.0%	3	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	5	0.0%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.0%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	4	0.0%	8	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	101	0.9%	2	0.2%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	2	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>1,067</b>	<b>9.4%</b>	<b>116</b>	<b>9.1%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	9	0.1%	4	0.3%
110.135	PHPV/ PTVL	4	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	2	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	23	0.2%	4	0.3%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	168	1.5%	14	1.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	15	0.1%	1	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	424	3.7%	0	0.0%
120.400	RETINAL HEMORRHAGE	3	0.0%	0	0.0%
120.960	RETINOPATHY	3	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	2	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.0%	1	0.1%
130.150	OPTIC DISC COLOBOMA	15	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	47	0.4%	0	0.0%
900.100	OTHER, NOT INHERITED	242	2.1%	4	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	189	1.7%	60	4.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	7,706	67.7%	856	67.5%

## ENGLISH COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ENGLISH COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ENGLISH COONHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## ENGLISH FOXHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ENGLISH FOXHOUND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ENGLISH FOXHOUND

Diagnostic Name	Year Examined:		1993-2017		2018-2022	
	Total # Dogs:		3		0	
			#	%	#	%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	33.3%	0	
<b>NORMAL</b> .000 NORMAL GLOBE			2	66.7%	0	

## ENGLISH JACK RUSSELL TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ENGLISH JACK RUSSELL TERRIER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ENGLISH JACK RUSSELL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	1 #	%
NORMAL .000 NORMAL GLOBE		2	100.0%	1	100.0%

## ENGLISH SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy  - rod-cone dysplasia recessive type 1 ( <i>rcd4</i> )	Autosomal recessive	2, 3	NO	Mutation in the <i>C2orf71</i> gene
E.	Retinal dysplasia  - folds	Not defined	1	Breeder option	
F.	Ceroid lipofuscinosis	Autosomal recessive	4-9	NO	Mutation in the <i>CLN8</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Retinal atrophy - Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

#### **E. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **F. Ceroid lipofuscinosis**

An inherited disease of humans and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's Disease.) A DNA test is available.

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## OCULAR DISORDERS REPORT ENGLISH SETTER

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	1,759		88	
			#	%	#	%
<b>EYELIDS</b>						
21.000	ENTROPION, UNSPECIFIED		8	0.5%	3	3.4%
22.000	ECTROPION, UNSPECIFIED		3	0.2%	0	0.0%
25.110	DISTICHIASIS		71	4.0%	1	1.1%
<b>NICTITANS</b>						
52.110	PROLAPSED GLAND OF THE THIRD EYELID		2	0.1%	0	0.0%
<b>CORNEA</b>						
70.700	CORNEAL DYSTROPHY		14	0.8%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION		3	0.2%	0	0.0%
<b>UVEA</b>						
93.120	IRIS CYST		1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		64	3.6%	4	4.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		5	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		7	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		0	0.0%	3	3.4%
93.810	UVEAL MELANOMA		1	0.1%	0	0.0%
<b>LENS</b>						
100.200	CATARACT, UNSPECIFIED		5	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		64	3.6%	7	8.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		6	0.3%	2	2.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		11	0.6%	2	2.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX		1	0.1%	1	1.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		5	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS		2	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR		2	0.1%	1	1.1%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		5	0.3%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		8	0.5%	1	1.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		2	0.1%	2	2.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES		2	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS		2	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR		2	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX		1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX		1	0.1%	1	1.1%
100.326	INCOMPLETE CATARACT, NUCLEUS		0	0.0%	1	1.1%
100.328	Y-SUTURE TIP OPACITIES		4	0.2%	1	1.1%
100.330	GENERALIZED/ COMPLETE CATARACT		4	0.2%	1	1.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED		1	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		59	3.4%	12	13.6%
<b>VITREOUS</b>						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT		7	0.4%	0	0.0%
110.135	PHPV/ PTVL		1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS		4	0.2%	1	1.1%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		35	2.0%	3	3.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC		15	0.9%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED		1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		22	1.3%	0	0.0%
<b>OPTIC NERVE</b>						
130.110	MICROPAPILLA		1	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA		1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT ENGLISH SETTER

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	#	%	#	%
OTHER					
900.000 OTHER, UNSPECIFIED		6	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED		53	3.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		5	0.3%	3	3.4%
NORMAL					
.000 NORMAL GLOBE		1,482	84.3%	61	69.3%

## ENGLISH SHEPHERD

**It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris hypoplasia/iris coloboma.**

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Retinal atrophy ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene
B.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1, 3-4	NO	Mutation in the <i>NHEJ1</i> gene

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### Description and Comments

#### A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the English Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### B. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

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2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425
3. Barnett KC, Stades FC. Collie eye anomaly in the Shetland Sheepdog in the Netherlands. *J Small Anim Pract*. 1979;20:321-329. PMID: 120471
4. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res*. 2007;17:1562-1571. PMID: 17916641

# OCULAR DISORDERS REPORT ENGLISH SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			138		26	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	1.4%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			5	3.6%	0	0.0%
25.110 DISTICHIASIS			1	0.7%	2	7.7%
<b>CORNEA</b>						
70.210 PANNUS			1	0.7%	0	0.0%
70.700 CORNEAL DYSTROPHY			1	0.7%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			6	4.3%	1	3.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.7%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	2.2%	3	11.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	1.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.7%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.7%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.7%	2	7.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			0	0.0%	1	3.8%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.7%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	1.4%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	2.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			4	2.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>16</b>	<b>11.6%</b>	<b>3</b>	<b>11.5%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	1.4%	0	0.0%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			4	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			9	6.5%	3	11.5%
<b>NORMAL</b>						
.000 NORMAL GLOBE			107	77.5%	19	73.1%

## ENGLISH SPRINGER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- <i>cord-1</i>	Autosomal recessive	1, 3	NO	Mutation in the <i>RPGRIP1</i> gene
H.	Retinal dysplasia				
	- folds	Presumed autosomal recessive	1, 4-6, 9	NO	
	- geographic	Not defined	4-6	NO	
I.	Refractive error	Not defined	7, 8	Breeder option	

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the English Springer Spaniel this usually involves the lower lateral lid margin.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **C. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted

#### **E. Cataract**

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies.

Cataract in the English Springer Spaniel is reported to be a familial trait usually involving the posterior subcapsular region of the lens that progresses slowly.

#### **F. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

#### **G. Retinal atrophy - *cord-1***

*Cord-1* PRA in the English Springer Spaniel has an onset of clinical signs at 2 to 9 years of age leading to blindness in most affected dogs. *Cord1* PRA in the English Springer Spaniel has been described as beginning with increased granularity of the fundus or tiny hyporeflective brown or grey patches in the far peripheral tapetum. Over time, these abnormalities become more diffuse with mottling over much of the tapetum. Vessel attenuation accompanies the more diffuse changes. In advanced cases, there is generalized tapetal hyperreflectivity and vessel attenuation. Pedigree analysis has shown *cord-1* in the English Springer Spaniel to be an autosomal recessive trait. A mutation in the *RPGRIP1* gene in cone-rod dystrophy (*cord1*) was found through genetic testing to be associated with one form of PRA in English Springer Spaniels, but not all clinically affected dogs have the *RPGRIP1* mutation, implying that other mutations have yet to be identified. A DNA test is available. The test is accurate only for this mutation and will not identify other forms of PRA. Not all dogs homozygous for the *RPGRIP1* genotype demonstrate the phenotype clinically.

#### **H. Retinal dysplasia – folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

The relationship between folds and geographic/detached lesions has been a topic of dispute for many years. It is the consensus of the English Springer Spaniel Field Trial Association Heritable Defects Committee (the parent breed club in the United States) that none of the forms of retinal dysplasia are desirable in a breeding animal.

Clinically the retinal dysplasia observed in this breed is unique and distinct from the classical "folds" or "geographic" forms of dysplasia.

#### **- geographic**

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

Clinically the retinal dysplasia observed in this breed is unique and distinct from the classical "folds" or "geographic" forms of dysplasia.

#### **J. Refractive Myopia**

A condition of the eye where the light that comes in does not directly focus on the retina but in front of it. In common terminology, "near-sighted." This condition has been shown to have a genetic component in English Springer Spaniels, although the exact mode of inheritance has not been determined.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Lheriteau E, Petit L, Weber M, et al. Successful gene therapy in the RPGRIP1-deficient dog: a large model of cone-rod dystrophy. *Mol Ther*. 2014;22:265-277. PMID: 24091916
3. Narfstrom K, Jeong M, Hyman J, et al. Assessment of hereditary retinal degeneration in the English Springer Spaniel dog and disease relationship to an RPGRIP1 mutation. *Stem Cells Int*. 2012;2012:685901. PMID: 22550515
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6. Toole DO. Retinal dysplasia in English Springer Spaniel dogs: Light microscopy of the postnatal lesions. *Veterinary pathology*. 1983;20:298-311. PMID: 6879955
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8. Kubai MA, Labelle AL, Hamor RE, et al. Heritability of lenticular myopia in English Springer Spaniels. *Invest Ophthalmol Vis Sci.* 2013;54:7324-7328. PMID: 24071952
9. Historical breed club request.

## OCULAR DISORDERS REPORT ENGLISH SPRINGER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 49,866		2018-2022 6,621	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			28	0.1%	1	0.0%
10.000 GLAUCOMA			7	0.0%	0	0.0%
<b>EYELIDS</b>						
20.110 EYELID DERMOID			2	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			3	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			293	0.6%	56	0.8%
22.000 ECTROPION, UNSPECIFIED			59	0.1%	4	0.1%
25.110 DISTICHIASIS			396	0.8%	50	0.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			8	0.0%	3	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			11	0.0%	1	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			8	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			6	0.0%	1	0.0%
70.220 PIGMENTARY KERATITIS			4	0.0%	2	0.0%
70.700 CORNEAL DYSTROPHY			615	1.2%	108	1.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			12	0.0%	1	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			0	0.0%	1	0.0%
93.110 IRIS HYPOPLASIA			12	0.0%	4	0.1%
93.120 IRIS CYST			15	0.0%	3	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			4	0.0%	0	0.0%
93.150 IRIS COLOBOMA			30	0.1%	1	0.0%
93.170 ANTERIOR CHAMBER CYST			3	0.0%	2	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3,817	7.7%	556	8.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			125	0.3%	4	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			90	0.2%	5	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			48	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			89	0.2%	63	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			16	0.0%	2	0.0%
93.810 UVEAL MELANOMA			2	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	1	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			4	0.0%	0	0.0%
97.120 COLOBOMA			5	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	42	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	23	0.3%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	2	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	8	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.0%
120.960 RETINOPATHY			0	0.0%	4	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	2	0.0%
130.110 MICROPAPILLA			0	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			97	0.2%	0	0.0%

## OCULAR DISORDERS REPORT ENGLISH SPRINGER SPANIEL

Year Examined: Total # Dogs:		1993-2017 49,866		2018-2022 6,621	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,245	2.5%	203	3.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	254	0.5%	91	1.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	123	0.2%	18	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	60	0.1%	18	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	26	0.1%	7	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	101	0.2%	20	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	68	0.1%	26	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	77	0.2%	45	0.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	220	0.4%	35	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	215	0.4%	25	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	111	0.2%	11	0.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	25	0.1%	4	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	42	0.1%	9	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	73	0.1%	12	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	35	0.1%	19	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	10	0.0%	4	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	7	0.0%	8	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	3	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	6	0.0%	1	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	5	0.0%	2	0.0%
100.328	Y-SUTURE TIP OPACITIES	21	0.0%	15	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	91	0.2%	2	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	3	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	27	0.1%	3	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	1,649	3.3%	363	5.5%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	255	0.5%	85	1.3%
110.135	PHPV/ PTVL	42	0.1%	1	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	8	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	212	0.4%	24	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	1,942	3.9%	101	1.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	734	1.5%	29	0.4%
120.190	RETINAL DYSPLASIA, DETACHED	126	0.3%	3	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	491	1.0%	17	0.3%
120.400	RETINAL HEMORRHAGE	8	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	57	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	1	0.0%
120.960	RETINOPATHY	21	0.0%	4	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	12	0.0%	2	0.0%
130.120	OPTIC NERVE HYPOPLASIA	9	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	13	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	336	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	729	1.5%	6	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	500	1.0%	176	2.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	40,881	82.0%	5,197	78.5%

## ENGLISH TOY SPANIEL

(King Charles, Prince Charles, Ruby, Blenheim)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Pigmentary keratitis	Not defined	1	Breeder option
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membrane			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Persistent hyperplastic primary vitreous / Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Presumed dominant/incomplete penetrance	1	NO
H.	Persistent hyaloid artery remnant	Not defined	1	Breeder option
I.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

### Description and Comments

#### A. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures, which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**C. Exposure/pigmentary keratitis**

A condition characterized by variable degrees of superficial vascularization, fibrosis, and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos, and macropalpebral fissure.

**D. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Onset of cataract in the English Toy Spaniel is at an early age (less than 6 months), affecting the cortex and nucleus with rapid progression to complete cataract, resulting in blindness.

**G. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)**

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

**H. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**I. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT ENGLISH TOY SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,222		2018-2022 416	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.3%	3	0.7%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			10	0.8%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			58	4.7%	7	1.7%
22.000 ECTROPION, UNSPECIFIED			3	0.2%	0	0.0%
25.110 DISTICHIASIS			136	11.1%	32	7.7%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.2%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			0	0.0%	1	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			20	1.6%	5	1.2%
70.700 CORNEAL DYSTROPHY			163	13.3%	74	17.8%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.3%	3	0.7%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			13	1.1%	15	3.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.2%	1	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.1%	1	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	0.4%	4	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			0	0.0%	1	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			10	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			68	5.6%	12	2.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			24	2.0%	8	1.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			21	1.7%	1	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			7	0.6%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	0.5%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			9	0.7%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			29	2.4%	3	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			28	2.3%	10	2.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			25	2.0%	6	1.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	0.4%	3	0.7%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			14	1.1%	3	0.7%
100.317 INCIPIENT CATARACT, CAPSULAR			16	1.3%	2	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			5	0.4%	3	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			4	0.3%	5	1.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			2	0.2%	1	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS			4	0.3%	2	0.5%
100.327 INCOMPLETE CATARACT, CAPSULAR			2	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			3	0.2%	1	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT			20	1.6%	2	0.5%
100.340 RESORBING/ HYPERMATURE CATARACT			3	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>235</b>	<b>19.2%</b>	<b>50</b>	<b>12.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			101	8.3%	47	11.3%

## OCULAR DISORDERS REPORT ENGLISH TOY SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,222		2018-2022 416	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.135	PHPV/ PTVL	15	1.2%	5	1.2%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	1	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	21	1.7%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	9	2.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
120.960	RETINOPATHY	0	0.0%	1	0.2%
130.110	MICROPAPILLA	0	0.0%	1	0.2%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	61	5.0%	14	3.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	8	0.7%	3	0.7%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	6	0.5%	1	0.2%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	55	4.5%	0	0.0%
900.100	OTHER, NOT INHERITED	38	3.1%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	66	5.4%	14	3.4%
<b>NORMAL</b>					
.000	NORMAL GLOBE	611	50.0%	196	47.1%

## ENTLEBUCHER MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	2	NO	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Presumed autosomal recessive	2, 3	NO	
D.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 2, 4	NO	Mutation in the <i>prcd</i> gene
F.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

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### Description and Comments

#### A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Cataracts in the Entlebucher Mountain Dog generally become evident in young to middle-aged dogs (5.5 +/- 2.6 years). The opacities typically begin in the posterior subcapsular/capsular polar region along the suture lines as early as 1-2 years of age. Most dogs are affected with bilaterally symmetrical cataracts, which may or may not progress. Pedigree analysis suggests an autosomal recessive mode of inheritance.

#### **D. Vitreous degeneration - syneresis**

Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

#### **E. Retinal atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Entlebucher Mountain Dog is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **F. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Spiess BM. [Inherited eye diseases in the Entlebucher Mountain Dog]. *Schweizer Archiv fur Tierheilkunde*. 1994;136:105-110. Vererbte Augenkrankheiten beim Entlebucher Sennenhund. PMID: 8171308
3. Heitmann M, Hamann H, Brahm R, et al. Analysis of prevalence of presumed inherited eye diseases in Entlebucher Mountain Dogs. *Vet Ophthalmol*. 2005;8:145-151. PMID: 15910366
4. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

## OCULAR DISORDERS REPORT ENTLEBUCHER MOUNTAIN DOG

Year Examined: Total # Dogs:		1993-2017 1,115		2018-2022 288	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	11	1.0%	2	0.7%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.3%	0	0.0%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	5	0.4%	1	0.3%
<b>UVEA</b>					
93.120	IRIS CYST	2	0.2%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	53	4.8%	8	2.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.4%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	2	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	10	0.9%	11	3.8%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	70	6.3%	24	8.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	7	0.6%	11	3.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	41	3.7%	10	3.5%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.7%	1	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	3	0.3%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.4%	1	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.4%	3	1.0%
100.307	PUNCTATE CATARACT, CAPSULAR	17	1.5%	12	4.2%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	14	1.3%	1	0.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	76	6.8%	21	7.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	9	0.8%	5	1.7%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.4%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.4%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	11	1.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.4%	2	0.7%
100.330	GENERALIZED/ COMPLETE CATARACT	9	0.8%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	216	19.4%	69	24.0%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.7%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	3	1.0%
110.320	VITREOUS DEGENERATION SYNERESIS	8	0.7%	7	2.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	29	2.6%	2	0.7%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.6%	1	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	30	2.7%	0	0.0%
120.960	RETINOPATHY	2	0.2%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.3%
120.960	RETINOPATHY	0	0.0%	1	0.3%

## OCULAR DISORDERS REPORT ENTLEBUCHER MOUNTAIN DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,115		2018-2022 288	
			#	%	#	%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			2	0.2%	1	0.3%
130.120 OPTIC NERVE HYPOPLASIA			1	0.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			20	1.8%	0	0.0%
900.100 OTHER, NOT INHERITED			41	3.7%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			35	3.1%	17	5.9%
<b>NORMAL</b>						
.000 NORMAL GLOBE			816	73.2%	196	68.1%

## EPAGNEUL BRETON

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the EPAGNEUL BRETON breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT EPAGNEUL BRETON

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	11.8%	1	4.8%
<b>LENS</b>						
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	5.9%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	5.9%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	4.8%
100.328 Y-SUTURE TIP OPACITIES			1	5.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>11.8%</b>	<b>1</b>	<b>4.8%</b>
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	11.8%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			12	70.6%	19	90.5%

## ESTRELA MOUNTAIN DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the ESTRELA MOUNTAIN DOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT ESTRELA MOUNTAIN DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		3 #	%	1 #	%
NORMAL .000 NORMAL GLOBE		3	100.0%	1	100.0%

# EURASIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2-4	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Cataracts	Not defined	1	NO

## Description and Comments

### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### C. Cataracts

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Boillot T, Rosolen SG, Dulaurent T, Goulle F, Thomas P, Isard PF, Azoulay T, Lafarge-Beurlet S, Woods M, Lavillegrand S, Ivkovic I, Neveux N, Sahel JA, Picaud S, Froger N. Determination of morphological, biometric and biochemical susceptibilities in healthy Eurasier dogs with suspected inherited glaucoma. *PLoS One*. 2014 Nov 7;9(11):e1111873. doi: 10.1371/journal.pone.01111873. PMID: 25380252
3. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol*. 2011;14:121-126. Epub 2011/03/04. PMID: 21366828

4. Rosolen SG, Boillot T, Dulaurent T, et al. Morphological, biometrical and biochemical susceptibilities for glaucoma in a healthy Eurasier dog - ECVO 2014 abstract #44. *Vet Ophthalmol.* 2014;17:E23.

# OCULAR DISORDERS REPORT EURASIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			132		102	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			42	31.8%	24	23.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	1.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			3	2.3%	3	2.9%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3	2.3%	2	2.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.8%	1	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	1	1.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	5.3%	4	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	2	2.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	1.5%	1	1.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	4.5%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	1.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.8%	1	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	1.5%	2	2.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.8%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	1.5%	1	1.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>12</b>	<b>9.1%</b>	<b>7</b>	<b>6.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.8%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.8%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			0	0.0%	1	1.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			5	3.8%	0	0.0%
900.100 OTHER, NOT INHERITED			5	3.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	3.0%	2	2.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			81	61.4%	63	61.8%

## FIELD SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 2	NO	Mutation in the <i>prcd</i> gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

#### C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

**E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**F. Retinal atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Field Spaniel is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

**G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT FIELD SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,738		2018-2022 751	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	1	0.1%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			6	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			10	0.4%	2	0.3%
22.000 ECTROPION, UNSPECIFIED			11	0.4%	1	0.1%
25.110 DISTICHIASIS			170	6.2%	35	4.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	3	0.4%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			13	0.5%	4	0.5%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			30	1.1%	4	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			188	6.9%	24	3.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			6	0.2%	2	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.3%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			27	1.0%	25	3.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.2%	2	0.3%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	18	2.4%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			3	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			134	4.9%	33	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			25	0.9%	10	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.1%	4	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			5	0.2%	3	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			8	0.3%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.1%	3	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			15	0.5%	6	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			20	0.7%	8	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			8	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.1%	3	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	2	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			5	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			8	0.3%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			6	0.2%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			9	0.3%	7	0.9%
100.330 GENERALIZED/ COMPLETE CATARACT			3	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>121</b>	<b>4.4%</b>	<b>42</b>	<b>5.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			4	0.1%	1	0.1%
110.135 PHPV/ PTVL			4	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.0%	3	0.4%

# OCULAR DISORDERS REPORT FIELD SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,738		2018-2022 751	
			#	%	#	%
<b>VITREOUS Continued</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.1%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			276	10.1%	17	2.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			12	0.4%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			4	0.1%	1	0.1%
120.400 RETINAL HEMORRHAGE			4	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.0%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.1%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	2	0.3%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			47	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED			61	2.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			76	2.8%	23	3.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1,967	71.8%	571	76.0%

## FILA BRASILEIRO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the FILA BRASILEIRO breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## FILA BRASILEIRO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OTHER</b> 900.000 OTHER, UNSPECIFIED		1	25.0%	0	
<b>NORMAL</b> .000 NORMAL GLOBE		4	100.0%	0	

## FINNISH LAPPHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene
D.	Multifocal retinopathy - <i>cmr3</i>	Autosomal recessive	3, 4	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the form of PRA in the Finnish Lapphund is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the

disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **D. Multifocal retinopathy (*cmr3*)**

Canine Multifocal Retinopathy type 3 (*cmr3*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Clinically the disease is similar to that seen in the Bullmastiff and Coton deTulear, but the mutation in the Bestrophin 1 gene (*BEST1* alias *VMD2*) is different. The multifocal retinopathy seen in the Lapponian Herder is caused by a deletion at position 1,388 and a substitution at position 1,466 and is therefore called *cmr3*. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425
3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967. PMID: 17460247
4. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstilä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. *PLoS One*. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650; PMCID: PMC4985128.

## OCULAR DISORDERS REPORT FINNISH LAPPHUND

Year Examined: Total # Dogs:		1993-2017		2018-2022	
		602		238	
Diagnostic Name		#	%	#	%
EYELIDS					
25.110	DISTICHIASIS	1	0.2%	1	0.4%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.4%
CORNEA					
70.220	PIGMENTARY KERATITIS	1	0.2%	0	0.0%
UVEA					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	62	10.3%	19	8.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	6	1.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	4	0.7%	7	2.9%
LENS					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	40	6.6%	14	5.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	6	1.0%	2	0.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	10	1.7%	3	1.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.2%	3	1.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.4%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.7%	3	1.3%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.5%	1	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.7%	4	1.7%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1	0.2%	1	0.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1	0.2%	5	2.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.3%	1	0.4%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.4%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	3	1.3%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.3%	2	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	0.4%
100.328	Y-SUTURE TIP OPACITIES	1	0.2%	2	0.8%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.2%	1	0.4%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	35	5.8%	32	13.4%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.2%	0	0.0%
FUNDUS					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.4%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	10	1.7%	1	0.4%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.2%	0	0.0%
120.960	RETINOPATHY	1	0.2%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	10	1.7%	0	0.0%
900.100	OTHER, NOT INHERITED	14	2.3%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10	1.7%	6	2.5%
NORMAL					
.000	NORMAL GLOBE	488	81.1%	179	75.2%

## FINNISH SPITZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - lens pigment foci/no strands	Not defined	1	Passes with no notation

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT FINNISH SPITZ

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		250 #	%	25 #	%
<b>EYELIDS</b>					
20.140 ECTOPIC CILIA		1	0.4%	0	0.0%
<b>CORNEA</b>					
70.700 CORNEAL DYSTROPHY		2	0.8%	0	0.0%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		2	0.8%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		3	1.2%	8	32.0%
<b>LENS</b>					
100.200 CATARACT, UNSPECIFIED		1	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		33	13.2%	3	12.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		2	0.8%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		1	0.4%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES		1	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR		2	0.8%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX		1	0.4%	3	12.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		1	0.4%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		0	0.0%	1	4.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>9</b>	<b>3.6%</b>	<b>4</b>	<b>16.0%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		4	1.6%	1	4.0%
110.320 VITREOUS DEGENERATION SYNERESIS		3	1.2%	1	4.0%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		2	0.8%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		6	2.4%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		3	1.2%	0	0.0%
900.100 OTHER, NOT INHERITED		8	3.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	0.8%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		197	78.8%	13	52.0%

## FLAT-COATED RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2-4	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option

### Description and Comments

#### A. Glaucoma (with pectinate ligament abnormality)

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

Flat-Coated Retrievers have been shown to have a higher prevalence of pectinate ligament abnormalities compared with other breeds. There is a significant association between pectinate ligament abnormalities and glaucoma in this breed. The heritability of pectinate ligament abnormalities in Flat-Coated Retrievers is estimated at 0.7. Since glaucoma and pectinate ligament abnormalities are closely associated, glaucoma may also be heritable.

In a recent report, pectinate ligament abnormalities were prevalent and significantly associated with age in a population of Flat-Coated Retrievers in the UK.

Due to the incidence of PLD in the breed and the increased progression observed with age, it may be prudent to perform repeated gonioscopy examinations over time.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

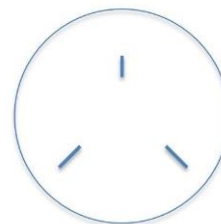
Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The exact frequency and significance of cataracts in the breed is not known.

#### **E. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Read RA, Wood JL, Lakhani KH, Read RA. Pectinate ligament dysplasia (PLD) and glaucoma in Flat-Coated Retrievers. I. Objectives, technique and results of a PLD survey. *Vet Ophthalmol.* 1998;1:85-90. PMID: 11397215
3. Read RA, Wood JL, Lakhani KH, Read RA. Pectinate ligament dysplasia (PLD) and glaucoma in Flat-Coated Retrievers. II. Assessment of prevalence and heritability. *Vet Ophthalmol.* 1998;1:91-99. PMID: 11397216

4. Oliver JA, Ekiri A, Mellersh CS. Prevalence of pectinate ligament dysplasia and associations with age, sex and intraocular pressure in the Basset Hound, Flat-Coated Retriever and Dandie Dinmont Terrier. *Can Genet Epidemiol* 2016 March 12;3:1doi: 10.1186/s40575-016-0033-1. PMID: 26973793

## OCULAR DISORDERS REPORT FLAT-COATED RETRIEVER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 9,513		2018-2022 1,857	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	0.0%	0	0.0%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			9	0.1%	2	0.1%
20.160 MACROPALPEBRAL FISSURE			2	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			19	0.2%	6	0.3%
22.000 ECTROPION, UNSPECIFIED			35	0.4%	1	0.1%
25.110 DISTICHIASIS			1,194	12.6%	261	14.1%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			0	0.0%	1	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			4	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			0	0.0%	1	0.1%
70.220 PIGMENTARY KERATITIS			2	0.0%	1	0.1%
70.700 CORNEAL DYSTROPHY			58	0.6%	11	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.0%	1	0.1%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			2	0.0%	0	0.0%
93.120 IRIS CYST			28	0.3%	3	0.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			2	0.0%	3	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			250	2.6%	66	3.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			14	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			90	0.9%	67	3.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.1%	0	0.0%
93.810 UVEAL MELANOMA			4	0.0%	0	0.0%
95.120 CILIARY BODY CYST			0	0.0%	2	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
120.960 RETINOPATHY			0	0.0%	2	0.1%
130.110 MICROPAPILLA			0	0.0%	3	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	4	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			16	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1,103	11.6%	284	15.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			301	3.2%	182	9.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			31	0.3%	8	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			14	0.1%	8	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			41	0.4%	25	1.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			69	0.7%	50	2.7%
100.306 PUNCTATE CATARACT, NUCLEUS			24	0.3%	30	1.6%
100.307 PUNCTATE CATARACT, CAPSULAR			58	0.6%	26	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			50	0.5%	17	0.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			25	0.3%	6	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			21	0.2%	10	0.5%

## OCULAR DISORDERS REPORT FLAT-COATED RETRIEVER

Year Examined: Total # Dogs:		1993-2017 9,513		2018-2022 1,857	
Diagnostic Name		#	%	#	%
LENS Continued					
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.1%	4	0.2%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	13	0.1%	5	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	10	0.1%	6	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	9	0.1%	6	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	59	0.6%	66	3.6%
100.330	GENERALIZED/ COMPLETE CATARACT	8	0.1%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.0%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	703	7.4%	383	20.6%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	15	0.2%	9	0.5%
110.135	PHPV/ PTVL	5	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	2	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.0%	4	0.2%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	21	0.2%	5	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.1%	2	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	54	0.6%	2	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	2	0.1%
120.960	RETINOPATHY	23	0.2%	9	0.5%
OPTIC NERVE					
130.110	MICROPAPILLA	8	0.1%	1	0.1%
130.120	OPTIC NERVE HYPOPLASIA	3	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	26	0.3%	4	0.2%
OTHER					
900.000	OTHER, UNSPECIFIED	160	1.7%	0	0.0%
900.100	OTHER, NOT INHERITED	272	2.9%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	226	2.4%	131	7.1%
NORMAL					
.000	NORMAL GLOBE	7,049	74.1%	1,106	59.6%

## FRENCH BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Imperforate lacrimal punctum	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- endothelial opacity/no strands	Not defined	1	NO	
F.	Cataract	Autosomal recessive	1, 2	NO	Mutation in the <i>HSF4</i> gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

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### Description and Comments

#### Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

#### C. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid

margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

#### **D. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### **E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the French Bulldog, the condition is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available.

#### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol*. 2006;9:369-378. PMID: 16939467

## OCULAR DISORDERS REPORT FRENCH BULLDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 4,742		2018-2022 3,010	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	5	0.2%
20.160 MACROPALPEBRAL FISSURE			3	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			47	1.0%	46	1.5%
22.000 ECTROPION, UNSPECIFIED			7	0.1%	1	0.0%
25.110 DISTICHIASIS			310	6.5%	155	5.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	23	0.8%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			49	1.0%	26	0.9%
40.910 KERATOCONJUNCTIVITIS SICCA			4	0.1%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			2	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			7	0.1%	5	0.2%
<b>CORNEA</b>						
70.210 PANNUS			4	0.1%	1	0.0%
70.220 PIGMENTARY KERATITIS			28	0.6%	13	0.4%
70.700 CORNEAL DYSTROPHY			36	0.8%	31	1.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			6	0.1%	1	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	3	0.1%
93.120 IRIS CYST			9	0.2%	2	0.1%
93.150 IRIS COLOBOMA			1	0.0%	3	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			130	2.7%	69	2.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.1%	1	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			64	1.3%	17	0.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			11	0.2%	4	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			45	0.9%	47	1.6%
93.810 UVEAL MELANOMA			2	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			105	2.2%	49	1.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			24	0.5%	20	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			12	0.3%	4	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			16	0.3%	6	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.1%	2	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	0.1%	2	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			12	0.3%	10	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			7	0.1%	19	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			46	1.0%	23	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			16	0.3%	6	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			21	0.4%	5	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			4	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			14	0.3%	5	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			8	0.2%	8	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.0%	8	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	3	0.1%

## OCULAR DISORDERS REPORT FRENCH BULLDOG

Year Examined: Total # Dogs:		1993-2017 4,742		2018-2022 3,010	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.1%	5	0.2%
100.328	Y-SUTURE TIP OPACITIES	2	0.0%	4	0.1%
100.330	GENERALIZED/ COMPLETE CATARACT	18	0.4%	2	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	216	4.6%	131	4.4%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	24	0.5%	17	0.6%
110.135	PHPV/ PTVL	1	0.0%	2	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	12	0.3%	6	0.2%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	17	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	5	0.2%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	109	2.3%	24	0.8%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.3%	7	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	1	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	65	1.4%	0	0.0%
900.100	OTHER, NOT INHERITED	92	1.9%	7	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	93	2.0%	120	4.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	3,826	80.7%	2,367	78.6%

## FRENCH POINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the FRENCH POINTER breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## FRENCH POINTER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	3 #	%
<b>LENS</b> 100.328 Y-SUTURE TIP OPACITIES		1	100.0%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		0	0.0%	3	100.0%

## FRENCH SPANIEL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the FRENCH SPANIEL breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT FRENCH SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			2 #	%	28 #	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	50.0%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			0	0.0%	2	7.1%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	3.6%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			0	0.0%	2	7.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	50.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	3.6%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	2	7.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	50.0%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	50.0%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	50.0%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	50.0%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	50.0%	1	3.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	3.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			0	0.0%	2	7.1%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	3.6%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>5</b>	<b>250.0%</b>	<b>5</b>	<b>17.9%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			1	50.0%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	150.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	3.6%
<b>NORMAL</b>						
.000 NORMAL GLOBE			0	0.0%	19	67.9%

## GERMAN LONGHAIRED POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Cataracts

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Boillot T, Rosolen SG, Dulaurent T, Goulle F, Thomas P, Isard PF, Azoulay T, Lafarge-Beurlet S, Woods M, Lavillegrand S, Ivkovic I, Neveux N, Sahel JA, Picaud S, Froger N. Determination of morphological, biometric and biochemical susceptibilities in healthy Eurasier dogs with suspected inherited glaucoma. *PLoS One*. 2014 Nov 7;9(11):e111873. doi: 10.1371/journal.pone.0111873. PMID: 25380252
3. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol*. 2011;14:121-126. Epub 2011/03/04. PMID: 21366828
4. Rosolen SG, Boillot T, Dulaurent T, et al. Morphological, biometrical and biochemical susceptibilities for glaucoma in a healthy Eurasier dog - ECVO 2014 abstract #44. *Vet Ophthalmol*. 2014;17:E23.

## OCULAR DISORDERS REPORT GERMAN LONGHAIRD POINTER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		12 #	%	24 #	%
<b>EYELIDS</b>					
21.000 ENTROPION, UNSPECIFIED		0	0.0%	1	4.2%
<b>UVEA</b>					
93.120 IRIS CYST		1	8.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		2	16.7%	1	4.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		1	8.3%	1	4.2%
<b>LENS</b>					
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		0	0.0%	2	8.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		0	0.0%	2	8.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX		0	0.0%	2	8.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		1	8.3%	1	4.2%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>1</b>	<b>8.3%</b>	<b>7</b>	<b>29.2%</b>
<b>VITREOUS</b>					
110.320 VITREOUS DEGENERATION SYNERESIS		0	0.0%	1	4.2%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		1	8.3%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		8	66.7%	17	70.8%

## GERMAN PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder Option
B.	Persistent pupillary membranes - lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Persistent hyperplastic tunica vasculosa lentis (PHTVL)	Not defined	2, 3	NO
E.	Micropapilla	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

There may be more than one type of inherited cataract in German Pinschers. One form is reported in Finland with a later age of onset in which a pedigree analysis suggested autosomal recessive or incomplete dominant inheritance (4). Another form is reported in Germany with an earlier age of onset in which a pedigree analysis suggested autosomal recessive inheritance (5). Cataracts may involve the lens completely (diffuse) or in a localized region.

**D. Persistent hyperplastic tunica vasculosa lentis (PHTVL)**

Persistent tunica vasculosa lentis results from the failure of regression of the embryologic vascular network which surrounds the developing lens. This disorder has been observed in German Pinschers in Finland and Germany. A pedigree analysis suggested recessive or incomplete dominant inheritance (4).

**E. Micropapilla**

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

**References**

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## OCULAR DISORDERS REPORT GERMAN PINSCHER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,330		2018-2022 341	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			8	0.6%	6	1.8%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	2	0.6%
70.700 CORNEAL DYSTROPHY			20	1.5%	1	0.3%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			10	0.8%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			19	1.4%	7	2.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			89	6.7%	25	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			29	2.2%	12	3.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			32	2.4%	6	1.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.1%	1	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			9	0.7%	2	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			11	0.8%	2	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			10	0.8%	7	2.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			29	2.2%	4	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			42	3.2%	6	1.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			9	0.7%	5	1.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			6	0.5%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			9	0.7%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			8	0.6%	2	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR			10	0.8%	4	1.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	3	0.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.2%	4	1.2%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.1%	1	0.3%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.3%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	2	0.6%
100.328 Y-SUTURE TIP OPACITIES			6	0.5%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			9	0.7%	1	0.3%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>223</b>	<b>16.8%</b>	<b>64</b>	<b>18.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.2%	0	0.0%
110.135 PHPV/ PTVL			4	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			16	1.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE			1	0.1%	0	0.0%
120.960 RETINOPATHY			2	0.2%	0	0.0%
<b>FUNDUS</b>						
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	1	0.3%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			11	0.8%	4	1.2%
130.120 OPTIC NERVE HYPOPLASIA			7	0.5%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			26	2.0%	0	0.0%
900.100 OTHER, NOT INHERITED			32	2.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			32	2.4%	24	7.0%

# OCULAR DISORDERS REPORT

## GERMAN PINSCHER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		1,062	79.8%	252	73.9%

## GERMAN SHEPHERD DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Plasmoma/atypical pannus	Not defined	1	NO	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1, 2	Breeder option	
D.	Chronic superficial keratitis/pannus	Not defined	1, 3-9	NO	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
F.	Cataract				
	- cortical	Presumed autosomal recessive	1, 10	NO	
G.	Y-suture tip opacities	Not defined	1	Breeder option	
H.	Cone degeneration - achromatopsia	Autosomal recessive	11	NO	Mutation in the <i>CNGA3</i> gene
I.	Retinal dysplasia				
	- folds	Not defined	1, 12	Breeder option	
J.	Micropapilla	Not defined	1	Breeder option	
K.	Limbal melanoma	Not defined	13	NO	

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**B. Plasmoma/atypical pannus**

Bilateral lymphocytic/plasmocytic infiltration of the nictitating membranes which may occur independent of corneal Pannus.

**C. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**D. Chronic superficial keratitis/pannus**

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans which may also occur independent of corneal disease.

The German Shepherd Dog has a higher incidence of pannus than any other breed. The MHC class II risk haplotype has been shown. Although there are likely several other genes and environmental factors that contribute to CSK, a recent paper suggested that MHC class II is a major genetic risk factor. Dogs with the risk haplotype were 2.7 times more likely to develop CSK. Homozygosity of the risk haplotype increased the risk of CSK to over eightfold.

**E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

**F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**- cortical**

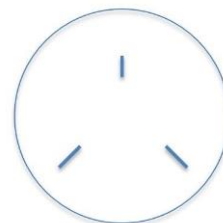
Reported by Barnett in Great Britain, opacities are first apparent at 8-12 weeks of age, in the posterior cortex and progress to involve the Y-sutures and nucleus. The equatorial subcapsular cortex is unaffected. No progression is noted after 1-2 years of age. Test breeding suggests an autosomal recessive mode of inheritance.

**G. Y-suture tip opacity**

These are prominent (or "highlighted" or "more dense") distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a "peace sign" as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above)

suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.

These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.



#### **H. Cone degeneration - achromatopsia**

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness and color blindness. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A single, 5-month-old German Shepherd puppy with vision loss during daylight hours was identified with a mutation in the *CNGA3* gene.

#### **I. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **J. Micropapilla**

Micropapilla refers to a congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

#### **K. Limbal melanoma**

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
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11. Tanaka N, Dutrow EV, Miyadera K, et al. Canine CNGA3 gene mutations provide novel insights into human achromatopsia-associated channelopathies and treatment. *PLoS One.* 2015;10:e0138943. PMID: 26407004
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## OCULAR DISORDERS REPORT GERMAN SHEPHERD DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 5,099		2018-2022 1,060	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			9	0.2%	0	0.0%
10.000 GLAUCOMA			3	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			3	0.1%	3	0.3%
22.000 ECTROPION, UNSPECIFIED			4	0.1%	0	0.0%
25.110 DISTICHIASIS			56	1.1%	5	0.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.1%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			15	0.3%	12	1.1%
51.100 THIRD EYELID CARTILAGE ANOMALY			4	0.1%	1	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			116	2.3%	17	1.6%
70.220 PIGMENTARY KERATITIS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			234	4.6%	56	5.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			23	0.5%	2	0.2%
93.170 ANTERIOR CHAMBER CYST			2	0.0%	3	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			70	1.4%	25	2.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			16	0.3%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			9	0.2%	4	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.1%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			16	0.3%	10	0.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	2	0.2%
93.810 UVEAL MELANOMA			2	0.0%	1	0.1%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	5	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	2	0.2%
130.110 MICROPAPILLA			0	0.0%	7	0.7%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	2	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	2	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			28	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			273	5.4%	87	8.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			46	0.9%	16	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			17	0.3%	2	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			19	0.4%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.0%	3	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			28	0.5%	21	2.0%
100.306 PUNCTATE CATARACT, NUCLEUS			56	1.1%	37	3.5%
100.307 PUNCTATE CATARACT, CAPSULAR			19	0.4%	11	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			39	0.8%	6	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			34	0.7%	7	0.7%

## OCULAR DISORDERS REPORT GERMAN SHEPHERD DOG

Year Examined: Total # Dogs:		1993-2017 5,099		2018-2022 1,060	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	21	0.4%	5	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	5	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	8	0.2%	2	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	76	1.5%	20	1.9%
100.317	INCIPIENT CATARACT, CAPSULAR	8	0.2%	9	0.8%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.0%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	2	0.0%	2	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	14	0.3%	21	2.0%
100.330	GENERALIZED/ COMPLETE CATARACT	22	0.4%	4	0.4%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.2%	1	0.1%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>436</b>	<b>8.6%</b>	<b>151</b>	<b>14.2%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	8	0.2%	1	0.1%
110.135	PHPV/ PTVL	3	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	11	0.2%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	97	1.9%	5	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	19	0.4%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	21	0.4%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	31	0.6%	6	0.6%
130.120	OPTIC NERVE HYPOPLASIA	35	0.7%	2	0.2%
130.150	OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	58	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	146	2.9%	4	0.4%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	105	2.1%	59	5.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	3,876	76.0%	750	70.8%

## GERMAN SHORTHAIRED POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1	NO	
D.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	
E.	Cone degeneration - (achromatopsia)	Autosomal recessive	2, 3	NO	Mutation in the <i>CNGB3</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **E. Cone degeneration - hemeralopia/achromatopsia**

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness, color blindness, and photophobia between 8 and 12 weeks of age. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A missense mutation in the same gene (CNGB3) that has been identified in CD-affected Alaskan Malamute-derived dogs has been detected in German Shorthaired Pointers affected with a clinically identical allelic disorder. A DNA test is available.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Sidjanin DJ, Lowe JK, McElwee JL, et al. Canine CNGB3 mutations establish cone degeneration as orthologous to the human achromatopsia locus ACHM3. *Human Molecular Genetics*. 2002;11:1823-1833. PMID: 12140184
3. Yeh CY, Goldstein O, Kukekova AV, Holley D, Knollinger AM, Huson HJ, Pearce-Kelling SE, Acland GM, Komáromy AM. Genomic deletion of CNGB3 is identical by descent in multiple canine breeds and causes achromatopsia. *BMC Genet*. 2013 Apr 20;14:27. doi: 10.1186/1471-2156-14-27. PMID: 23601474

## OCULAR DISORDERS REPORT GERMAN SHORTHAIRED POINTER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 7,003		2018-2022 2,185	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			10	0.1%	9	0.4%
22.000 ECTROPION, UNSPECIFIED			4	0.1%	1	0.0%
25.110 DISTICHIASIS			273	3.9%	108	4.9%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			3	0.0%	2	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	1	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			20	0.3%	2	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			2	0.0%	1	0.0%
93.120 IRIS CYST			7	0.1%	2	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			2	0.0%	1	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			475	6.8%	153	7.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			18	0.3%	1	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.1%	2	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			30	0.4%	24	1.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	14	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			9	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			351	5.0%	89	4.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			54	0.8%	26	1.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			56	0.8%	19	0.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			17	0.2%	7	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			6	0.1%	6	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			27	0.4%	10	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			42	0.6%	32	1.5%
100.307 PUNCTATE CATARACT, CAPSULAR			28	0.4%	20	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			20	0.3%	6	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			99	1.4%	19	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			21	0.3%	5	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.0%	0	0.0%

## OCULAR DISORDERS REPORT GERMAN SHORTHAIRED POINTER

Year Examined: Total # Dogs:		1993-2017 7,003		2018-2022 2,185	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	18	0.3%	5	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	25	0.4%	11	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	15	0.2%	8	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	2	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	8	0.1%	1	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	2	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	11	0.2%	14	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	14	0.2%	2	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.0%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>468</b>	<b>6.7%</b>	<b>182</b>	<b>8.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	19	0.3%	21	1.0%
110.135	PHPV/ PTVL	15	0.2%	2	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	23	0.3%	9	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	137	2.0%	11	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	26	0.4%	1	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	3	0.0%	0	0.0%
120.960	RETINOPATHY	7	0.1%	1	0.0%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	3	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	5	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	99	1.4%	0	0.0%
900.100	OTHER, NOT INHERITED	136	1.9%	2	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	105	1.5%	93	4.3%
<b>NORMAL</b>					
.000	NORMAL GLOBE	5,631	80.4%	1,644	75.2%

## GERMAN SPANIEL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the GERMAN SPANIEL breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## GERMAN SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	0	

## GERMAN SPITZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent hyaloid artery remnant	Not defined	1	Breeder option

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### Description and Comments

#### A. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT GERMAN SPITZ

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		6 #	%	53 #	%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	1	16.7%	1	1.9%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	1	1.9%
<b>LENS</b>					
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.9%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	1.9%
100.330	GENERALIZED/ COMPLETE CATARACT	0	0.0%	1	1.9%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	0	0.0%	3	5.7%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	9	17.0%
110.135	PHPV/ PTVL	0	0.0%	1	1.9%
<b>RETINA</b>					
120.960	RETINOPATHY	1	16.7%	0	0.0%
<b>OTHER</b>					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	1.9%
<b>NORMAL</b>					
.000	NORMAL GLOBE	5	83.3%	39	73.6%

# GERMAN WIREHAired POINTER

(Drathaar, Deutsch Drathaar)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT GERMAN WIREHAired POINTER

Year Examined: Total # Dogs:		1993-2017 845		2018-2022 393	
Diagnostic Name		#	%	#	%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	1	0.1%	0	0.0%
25.110	DISTICHIASIS	13	1.5%	4	1.0%
CORNEA					
70.730	CORNEAL ENDOTHELIAL DEGENERATION	0	0.0%	1	0.3%
UVEA					
93.110	IRIS HYPOPLASIA	1	0.1%	1	0.3%
93.120	IRIS CYST	0	0.0%	1	0.3%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	17	2.0%	19	4.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	0	0.0%	2	0.5%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
93.810	UVEAL MELANOMA	0	0.0%	1	0.3%
LENS					
100.200	CATARACT, UNSPECIFIED	5	0.6%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	26	3.1%	14	3.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.2%	4	1.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	0.8%	1	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.4%	2	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.6%	3	0.8%
100.307	PUNCTATE CATARACT, CAPSULAR	7	0.8%	2	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.4%	3	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	12	1.4%	6	1.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	3	0.4%	2	0.5%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.2%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	2	0.2%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	53	6.3%	25	6.4%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	2	0.5%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	3	0.4%	0	0.0%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.4%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	9	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED	8	0.9%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	2.1%	12	3.1%
NORMAL					
.000	NORMAL GLOBE	735	87.0%	339	86.3%

## GIANT SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
D.	Retinal atrophy				
D.	- ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene
	- <i>NECAP1</i>	Autosomal recessive	3	NO	Mutation in the <i>NECAP1</i> gene
E.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**D. Retinal atrophy****- *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A genetic test is available.

**- *NECAP1***

In addition, another mutation in the *NECAP1* gene has been identified in Giant Schnauzers with PRA. Proposed mode of inheritance is autosomal recessive, and affected animals presented with clinical signs of PRA at 4-5 years of age.

**E. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Personal communication on data from Optigen with Sue Pearce-Kelling
3. Hitti, R. J., et al. (2019). "Whole Genome Sequencing of Giant Schnauzer Dogs with Progressive Retinal Atrophy Establishes *NECAP1* as a Novel Candidate Gene for Retinal Degeneration." Genes (Basel) 10(5). PMID: 31117272

## OCULAR DISORDERS REPORT GIANT SCHNAUZER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,285		2018-2022 488	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	2	0.4%
25.110 DISTICHIASIS			6	0.5%	2	0.4%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	1	0.2%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			11	0.9%	2	0.4%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.1%	3	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.2%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			60	4.7%	12	2.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			4	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.5%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			0	0.0%	1	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			12	0.9%	17	3.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
95.120 CILIARY BODY CYST			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			5	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			62	4.8%	25	5.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			10	0.8%	9	1.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			9	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	0.4%	4	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.2%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			19	1.5%	13	2.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	0.2%	2	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			26	2.0%	4	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			8	0.6%	2	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			4	0.3%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.2%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			4	0.3%	4	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			6	0.5%	4	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>102</b>	<b>7.9%</b>	<b>43</b>	<b>8.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			6	0.5%	7	1.4%
110.135 PHPV/ PTVL			5	0.4%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.2%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.4%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.4%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			27	2.1%	2	0.4%

## OCULAR DISORDERS REPORT GIANT SCHNAUZER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,285		2018-2022 488	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.2%	1	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	8	0.6%	0	0.0%
120.960	RETINOPATHY	2	0.2%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	26	2.0%	0	0.0%
900.100	OTHER, NOT INHERITED	19	1.5%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	17	1.3%	23	4.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,073	83.5%	396	81.1%

## GLEN OF IMAAL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy				
	- Cone rod dystrophy ( <i>crd3</i> )	Autosomal recessive	2, 3	NO	Mutation in the <i>ADAM9</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Cone rod dystrophy

A form of late-onset PRA identified in Glen of Imaal Terriers. Ophthalmoscopic lesions are typically diagnosed by 5 years of age, however lesions may be present as early as 3 years of age in affected dogs. Two distinct phenotypes are observed in affected Glen of Imaal Terriers. The most common phenotype is subtle but generalized tapetal hyperreflectivity and retinal vascular attenuation that progresses over 1 - 2 years after initial examination. The less common phenotype is a focal mid-temporal (area centralis) area of distinct tapetal hyperreflectivity without generalized retinal disease. This lesion may remain unchanged for over a year but will progress to generalized retinal atrophy by 2 - 4 years after initial examination. ERG dysfunction can be observed as early as 15 weeks of age. The disorder is caused by a mutation present in the *ADAM9* gene. A DNA test is available that will unequivocally identify normal, affected, and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

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## OCULAR DISORDERS REPORT GLEN OF IMAAL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			2	0.3%	0	0.0%
25.110 DISTICHIASIS			25	3.6%	9	4.8%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.5%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.3%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	2	1.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.1%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			60	8.7%	3	1.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			10	1.4%	2	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.9%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.3%	1	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			4	0.6%	1	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			8	1.2%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			6	0.9%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>51</b>	<b>7.4%</b>	<b>4</b>	<b>2.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.3%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.5%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			7	1.0%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			4	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			24	3.5%	0	0.0%
120.960 RETINOPATHY			1	0.1%	0	0.0%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA			5	0.7%	0	0.0%

# **OCULAR DISORDERS REPORT GLEN OF IMAAL TERRIER**

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		691 #	%	187 #	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		12	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED		13	1.9%	1	0.5%
900.110 OTHER, SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		31	4.5%	4	2.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		552	79.9%	168	89.8%

## GOLDEN RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmos	Autosomal recessive	2	NO	
B.	Entropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
E.	Uveal cysts	Not defined	1, 3-5	Breeder option	
F.	Pigmentary uveitis	Not defined	1, 3-6	NO	
G.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	7	Passes with no notation	
H.	Cataract	Not defined	1, 7-12	NO	
I.	Y-suture tip opacity	Not defined	1	Breeder option	
J.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
K.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
L.	Retinal Atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 12, 13	NO	Mutation in the <i>prcd</i> gene
	- <i>PRA 1</i>	Autosomal recessive	14	NO	Mutation in the <i>SLC4A3</i> gene
	- <i>PRA 2</i>	Autosomal recessive	15, 16	NO	Mutation in the <i>TTC8</i> gene
M.	Retinal dysplasia				
	- folds	Not defined	1, 17	Breeder option	

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
	- geographic	Not defined	1, 17	NO	
N.	Limbal melanoma	Not defined	18	NO	

## Description and Comments

### A. Microphthalmos

A congenital anomaly in which the globe is abnormally small. Commonly associated with multiple ocular malformations and when severe, may affect vision.

### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### E. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

### F. Pigmentary uveitis

A unique uveitis observed in the Golden Retriever that is not associated with other ocular or systemic disorders. Adhesions develop between iris and lens and the peripheral iris and cornea. Pigment dispersion (exfoliation) occurs across the anterior lens capsule from the pigmented cells of the posterior iris. Other complications include secondary cataract and obstructive glaucoma. Onset is usually between 5-10 years of age.

### G. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

## **H. Cataract**

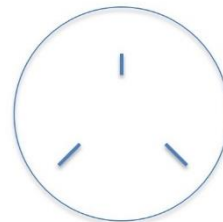
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most common cataract reported in the Golden Retriever is a posterior polar (posterior cortical) cataract. These are generally bilateral, although an occasional unilateral affliction may be observed. These focal opacities will occasionally remain stationary. These cataracts are usually observed between 9 months and 3 years of age. A more generalized cataract is also observed in this breed and is not always associated with the previously mentioned polar cataract. There are also cataract changes involving the Y sutures which may or may not progress.

The existence of cataracts in the Golden Retriever, often with limited clinical significance, presents problems with breeder recognition as the majority of these dogs do not evidence visual impairment. It is strongly recommended that all Golden Retrievers that are used in breeding programs be examined annually as cataract changes have been observed in multiple locations of the lens and variable age of onset.

## **I. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless misdiagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

**J. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**K. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

**L. Retinal atrophy**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

**- *prcd***

Studies have shown that one form of PRA in the Golden Retriever is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

**- PRA1 & PRA2**

In addition, two other known mutations that cause PRA are present in the breed. Golden Retriever PRA 1 (GR PRA1) is an autosomal recessive trait and is the predominant form in European lines of Golden Retrievers. Golden Retriever PRA 2 (GR PRA2) has also been identified within the breed. Therefore three different DNA tests are available. However these tests will only detect these three mutations. Syndromic effects in Golden Retrievers seems to be mild.

**M. Retinal dysplasia****- folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**- geographic**

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

**N. Limbal melanoma**

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predispositions have been noted in the German Shepherd Dog, and Labrador and Golden Retrievers.

#### Historical Note:

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

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## OCULAR DISORDERS REPORT GOLDEN RETRIEVER

Year Examined: Total # Dogs:		1993-2017 174,428		2018-2022 47,979	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110	MICROPHTHALMIA	54	0.0%	8	0.0%
10.000	GLAUCOMA	33	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
<b>EYELIDS</b>					
20.110	EYELID DERMOID	3	0.0%	0	0.0%
20.140	ECTOPIC CILIA	55	0.0%	7	0.0%
20.160	MACROPALPEBRAL FISSURE	22	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	397	0.2%	92	0.2%
22.000	ECTROPION, UNSPECIFIED	107	0.1%	14	0.0%
25.110	DISTICHIASIS	18,458	10.6%	4,141	8.6%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	17	0.0%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	52	0.0%	21	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	5	0.0%	2	0.0%
<b>NICTITANS</b>					
50.210	PLASMOMA/ ATYPICAL PANNUS	2	0.0%	0	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	18	0.0%	7	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	42	0.0%	1	0.0%
<b>CORNEA</b>					
70.210	PANNUS	11	0.0%	1	0.0%
70.220	PIGMENTARY KERATITIS	24	0.0%	10	0.0%
70.700	CORNEAL DYSTROPHY	729	0.4%	259	0.5%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	42	0.0%	5	0.0%
<b>UVEA</b>					
90.250	PIGMENTARY UVEITIS	1,191	0.7%	552	1.2%
93.110	IRIS HYPOPLASIA	6	0.0%	3	0.0%
93.120	IRIS CYST	7,270	4.2%	2,026	4.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	17	0.0%	0	0.0%
93.150	IRIS COLOBOMA	21	0.0%	2	0.0%
93.170	ANTERIOR CHAMBER CYST	1,161	0.7%	1,376	2.9%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3,892	2.2%	1,324	2.8%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	120	0.1%	22	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	88	0.1%	11	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	111	0.1%	1	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	642	0.4%	781	1.6%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	49	0.0%	23	0.0%
93.810	UVEAL MELANOMA	32	0.0%	19	0.0%
95.120	CILIARY BODY CYST	841	0.5%	376	0.8%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	2	0.0%	1	0.0%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	9	0.0%	0	0.0%
97.120	COLOBOMA	8	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	182	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	96	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.0%
120.960	RETINOPATHY	0	0.0%	12	0.0%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	3	0.0%
130.110	MICROPAPILLA	0	0.0%	2	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	2	0.0%

## OCULAR DISORDERS REPORT GOLDEN RETRIEVER

Year Examined: Total # Dogs:		1993-2017 174,428		2018-2022 47,979	
Diagnostic Name		#	%	#	%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	952	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10,723	6.1%	3,583	7.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1,778	1.0%	1,190	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	2,847	1.6%	750	1.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1,077	0.6%	712	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	211	0.1%	111	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1,083	0.6%	264	0.6%
100.306	PUNCTATE CATARACT, NUCLEUS	567	0.3%	456	1.0%
100.307	PUNCTATE CATARACT, CAPSULAR	826	0.5%	531	1.1%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1,195	0.7%	561	1.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3,566	2.0%	912	1.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1,328	0.8%	734	1.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	85	0.0%	22	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	807	0.5%	156	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	485	0.3%	341	0.7%
100.317	INCIPIENT CATARACT, CAPSULAR	413	0.2%	227	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	69	0.0%	76	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	131	0.1%	126	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	42	0.0%	50	0.1%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	2	0.0%	3	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	16	0.0%	21	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	40	0.0%	43	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	23	0.0%	28	0.1%
100.328	Y-SUTURE TIP OPACITIES	244	0.1%	268	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	364	0.2%	35	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	8	0.0%	11	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	33	0.0%	1	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	17,915	10.3%	7,360	15.3%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	185	0.1%	105	0.2%
110.135	PHPV/ PTVL	38	0.0%	15	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	21	0.0%	10	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	291	0.2%	85	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	2,158	1.2%	290	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	872	0.5%	138	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	40	0.0%	3	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	178	0.1%	7	0.0%
120.400	RETINAL HEMORRHAGE	18	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	28	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	4	0.0%	2	0.0%
120.960	RETINOPATHY	54	0.0%	25	0.1%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	14	0.0%	8	0.0%
130.120	OPTIC NERVE HYPOPLASIA	39	0.0%	5	0.0%
130.150	OPTIC DISC COLOBOMA	57	0.0%	11	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	1,783	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	3,049	1.7%	54	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,897	1.7%	2,033	4.2%

OCULAR DISORDERS REPORT  
GOLDEN RETRIEVER

Diagnostic Name	Year Examined:		1993-2017		2018-2022	
	Total # Dogs:		#	%	#	%
NORMAL .000 NORMAL GLOBE			129,799	74.4%	31,712	66.1%

## GORDON SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Ectropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- rod-cone dysplasia type 4 ( <i>rcd4</i> )	Autosomal recessive	2	NO	Mutation in the <i>C2orf71</i> gene
F.	Cone degeneration - achromatopsia	Not defined	3	NO	
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision

impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### E. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

#### F. Cone degeneration - achromatopsia

Suspected inherited retinal disease characterized by degeneration of the cone receptors and loss of vision in bright light. Age of onset is variable. Ophthalmoscopic examination is normal. The ERG abnormalities are more suggestive of a cone-rod dystrophy. The mode of inheritance and genetic mutation are not yet known.

**Commented [1]:** EW make sure that hemeralopia is removed.

**Commented [2]:** EW change this blurb for every reference to this condition?

#### G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012;44:169-177. PMID: 22686255
3. Good KL, Komaromy AM, Kass PH, et al. Novel retinopathy in related Gordon Setters: a clinical, behavioral, electrophysiological, and genetic investigation. *Vet Ophthalmol*. 2015;1-11. PMID: 26417729

## OCULAR DISORDERS REPORT GORDON SETTER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,355		2018-2022 299	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			9	0.4%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			17	0.7%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			55	2.3%	1	0.3%
25.110 DISTICHIASIS			44	1.9%	4	1.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.3%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.1%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	1	0.3%
<b>CORNEA</b>						
70.210 PANNUS			3	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			8	0.3%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			19	0.8%	1	0.3%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			115	4.9%	52	17.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.3%	1	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			4	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			17	0.7%	17	5.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.2%	2	0.7%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			9	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			88	3.7%	9	3.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			12	0.5%	4	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			12	0.5%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	0.2%	1	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			10	0.4%	2	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			10	0.4%	3	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			7	0.3%	1	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			15	0.6%	2	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			9	0.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			6	0.3%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			7	0.3%	1	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	1	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT			10	0.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>119</b>	<b>5.1%</b>	<b>15</b>	<b>5.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			15	0.6%	1	0.3%
110.135 PHPV/ PTVL			7	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			5	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			37	1.6%	2	0.7%

## OCULAR DISORDERS REPORT GORDON SETTER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,355		2018-2022 299	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	18	0.8%	1	0.3%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	8	0.3%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	8	0.3%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	40	1.7%	0	0.0%
900.100	OTHER, NOT INHERITED	59	2.5%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	36	1.5%	10	3.3%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,913	81.2%	212	70.9%

## GRAND BASSET GRIFFON VENDEEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT GRAND BASSET GRIFFON VENDEEN

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			107		93	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	0.9%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			6	5.6%	3	3.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	4.7%	2	2.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.9%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			6	5.6%	3	3.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	6.5%	1	1.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.9%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.9%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	1.1%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.9%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	1.9%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.9%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			2	1.9%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	1.9%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.9%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.9%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>12</b>	<b>11.2%</b>	<b>2</b>	<b>2.2%</b>
<b>VITREOUS</b>						
110.135 PHPV/ PTVL			1	0.9%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.9%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.9%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	1.9%	0	0.0%
900.100 OTHER, NOT INHERITED			1	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.9%	1	1.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			78	72.9%	82	88.2%

## GREAT DANE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects associated with partial albinism	Presumed autosomal dominant	2	NO
B.	Glaucoma	Not defined	1, 3	NO
C.	Entropion	Not defined	1	Breeder option
D.	Ectropion	Not defined	1	Breeder option
E.	Distichiasis	Not defined	1	Breeder option
F.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
G.	Prolapsed gland of the third eyelid	Not defined	4	Breeder option
H.	Uveal cysts	Not defined	1, 5	Breeder option
I.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
J.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Microphthalmia with multiple ocular defects associated with partial albinism

Multiple ocular defects are seen associated with partial albinism (white or light coat color) and deafness in Great Danes. The abnormalities are thought to stem from a common developmental defect. Ocular defects are anterior segment dysgenesis, equatorial staphylomas, microphthalmia, cortical cataracts, lens luxation, spherophakia, iris coloboma, and blue irides. An autosomal dominant mode of inheritance is suspected. The hearing loss is attributable to cochlea-saccular degeneration.

#### B. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

#### C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion and ectropion often occur together in this breed, associated with an abnormally large palpebral fissure.

#### **D. Ectropion**

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### **E. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **F. Nictitans cartilage anomaly/eversion**

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

#### **G. Prolapsed gland of the third eyelid**

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye."

Great Danes were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 83% of the prolapsed glands in Great Danes occurred before 1 year of age. Great Danes were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

#### **H. Uveal cysts**

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs. In the Great Dane, pigmented cysts may also arise from pigmented epithelial cells of the ciliary body. Ciliary body cysts may predispose to glaucoma in the Great Dane.

#### **I. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **J. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic

diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gwin RM, Wyman M, Lim DJ, et al. Multiple ocular defects associated with partial albinism and deafness in the dog. *J Am Anim Hosp Assoc*. 1981;17:401-408.
3. Wood JL, Lakhani KH, Mason IK, et al. Relationship of the degree of goniodysgenesis and other ocular measurements to glaucoma in Great Danes. *Am J Vet Res*. 2001;62:1493-1499. PMID: 11560283
4. Mazzucchelli S, Vaillant MD, Weverberg F, et al. Retrospective study of 155 cases of prolapse of the nictitating membrane gland in dogs. *Vet Rec*. 2012;170:443. PMID: 22472538
5. Spiess BM, Bolliger JO, Guscetti F, et al. Multiple ciliary body cysts and secondary glaucoma in the Great Dane: a report of nine cases. *Vet Ophthalmol*. 1998;1:41-45. PMID: 11397208

## OCULAR DISORDERS REPORT GREAT DANE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 7,832		2018-2022 2,764	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			25	0.3%	3	0.1%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			124	1.6%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			213	2.7%	127	4.6%
22.000 ECTROPION, UNSPECIFIED			307	3.9%	114	4.1%
25.110 DISTICHIASIS			426	5.4%	134	4.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	2	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			6	0.1%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			172	2.2%	88	3.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			20	0.3%	11	0.4%
<b>CORNEA</b>						
70.210 PANNUS			2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			5	0.1%	3	0.1%
70.700 CORNEAL DYSTROPHY			30	0.4%	7	0.3%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	2	0.1%
93.110 IRIS HYPOPLASIA			8	0.1%	7	0.3%
93.120 IRIS CYST			84	1.1%	32	1.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.0%	0	0.0%
93.150 IRIS COLOBOMA			19	0.2%	5	0.2%
93.170 ANTERIOR CHAMBER CYST			18	0.2%	32	1.2%
93.180 IRIS SPHINCTER DYSPLASIA			1	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			83	1.1%	23	0.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			16	0.2%	4	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			8	0.1%	4	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			4	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			24	0.3%	29	1.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.0%	2	0.1%
93.810 UVEAL MELANOMA			4	0.1%	2	0.1%
95.120 CILIARY BODY CYST			9	0.1%	1	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	3	0.1%
97.120 COLOBOMA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.1%
120.960 RETINOPATHY			0	0.0%	2	0.1%
130.110 MICROPAPILLA			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			15	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			273	3.5%	89	3.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			48	0.6%	23	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			91	1.2%	30	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			23	0.3%	13	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			5	0.1%	2	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			29	0.4%	3	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			22	0.3%	10	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			47	0.6%	37	1.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			82	1.0%	29	1.0%

## OCULAR DISORDERS REPORT GREAT DANE

Year Examined: Total # Dogs:		1993-2017 7,832		2018-2022 2,764	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	170	2.2%	40	1.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	49	0.6%	19	0.7%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.1%	1	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	22	0.3%	8	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	34	0.4%	13	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	30	0.4%	15	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	7	0.1%	7	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	11	0.1%	10	0.4%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	2	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.0%	3	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	3	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	6	0.1%	2	0.1%
100.330	GENERALIZED/ COMPLETE CATARACT	53	0.7%	2	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	14	0.2%	1	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>751</b>	<b>9.6%</b>	<b>269</b>	<b>9.7%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	14	0.2%	13	0.5%
110.135	PHPV/ PTVL	16	0.2%	5	0.2%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	17	0.2%	6	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	29	0.4%	10	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	25	0.3%	3	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.0%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	7	0.1%	1	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.0%	2	0.1%
130.120	OPTIC NERVE HYPOPLASIA	4	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	60	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	144	1.8%	8	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	125	1.6%	123	4.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	6,094	77.8%	1,968	71.2%

## GREAT PYRENEES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	2-4	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>BEST1</i> gene

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous sub-retinal fluid, or accumulation of sub-retinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007;48:1959-1967. PMID: 17460247
3. Grahn BH, Philibert H, Cullen CL, et al. Multifocal retinopathy of Great Pyrenees dogs. *Vet Ophthalmol*. 1998;1:211-221. PMID: 11397233
4. Grahn BH, Cullen CL. Retinopathy of Great Pyrenees dogs: fluorescein angiography, light microscopy and transmitting and scanning electron microscopy. *Vet Ophthalmol*. 2001;4:191-199. PMID: 11722783

## OCULAR DISORDERS REPORT GREAT PYRENEES

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,294		2018-2022 145	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.2%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			3	0.2%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			15	1.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			3	0.2%	0	0.0%
25.110 DISTICHIASIS			16	1.2%	1	0.7%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			16	1.2%	1	0.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.2%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.1%	0	0.0%
93.120 IRIS CYST			7	0.5%	0	0.0%
93.150 IRIS COLOBOMA			1	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.1%	2	1.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			327	25.3%	34	23.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			13	1.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.2%	0	0.0%
93.810 UVEAL MELANOMA			1	0.1%	0	0.0%
95.120 CILIARY BODY CYST			0	0.0%	1	0.7%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.2%	0	0.0%
97.120 COLOBOMA			1	0.1%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.7%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	3	2.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			3	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			55	4.3%	4	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	1.0%	1	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			14	1.1%	1	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			7	0.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.3%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	1	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			26	2.0%	2	1.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			21	1.6%	2	1.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			23	1.8%	3	2.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			6	0.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			5	0.4%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.7%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT GREAT PYRENEES

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,294		2018-2022 145	
			#	%	#	%
<b>LENS Continued</b> <i>100.345 SIGNIFICANT CATARACTS (SUMMARY)</i>			138	10.7%	11	7.6%
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	1	0.7%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			0	0.0%	1	0.7%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			9	0.7%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			16	1.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			2	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			5	0.4%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			4	0.3%	0	0.0%
120.960 RETINOPATHY			8	0.6%	3	2.1%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			6	0.5%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			5	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA			2	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			7	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED			35	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			18	1.4%	2	1.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			846	65.4%	93	64.1%

## GREATER SWISS MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT GREATER SWISS MOUNTAIN DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,322		2018-2022 648	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			21	0.6%	3	0.5%
22.000 ECTROPION, UNSPECIFIED			3	0.1%	0	0.0%
25.110 DISTICHIASIS			1,081	32.5%	141	21.8%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			5	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			13	0.4%	2	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			5	0.2%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			113	3.4%	18	2.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			6	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.0%	1	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			291	8.8%	30	4.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			83	2.5%	17	2.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			60	1.8%	13	2.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			38	1.1%	6	0.9%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			8	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			13	0.4%	4	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			7	0.2%	4	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			20	0.6%	9	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			63	1.9%	15	2.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			94	2.8%	23	3.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			79	2.4%	16	2.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	1	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			13	0.4%	3	0.5%
100.316 INCIPIENT CATARACT, NUCLEUS			9	0.3%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			11	0.3%	2	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.1%	2	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	8	1.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			2	0.1%	4	0.6%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			4	0.1%	2	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>515</b>	<b>15.5%</b>	<b>128</b>	<b>19.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			13	0.4%	3	0.5%
110.135 PHPV/ PTVL			4	0.1%	0	0.0%

## OCULAR DISORDERS REPORT GREATER SWISS MOUNTAIN DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 3,322		2018-2022 648	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	2	0.1%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	17	0.5%	2	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	7	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.1%	2	0.3%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	7	0.2%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	5	0.2%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	29	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	71	2.1%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.0%	19	2.9%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,922	57.9%	397	61.3%

## GREENLAND DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the GREENLAND DOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT GREENLAND DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0 #	%	2 #	%
UVEA 90.250 PIGMENTARY UVEITIS		0		1	50.0%
NORMAL .000 NORMAL GLOBE		0		1	50.0%

## GREYHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	2	NO
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Chronic superficial keratitis/Pannus

A bilateral disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Peiffer RL, Jr., Gelatt KN, Gwin RM. Chronic superficial keratitis. *Vet Med Small Anim Clin.* 1977;72:35-37. PMID: 584092

## OCULAR DISORDERS REPORT GREYHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 703		2018-2022 155	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	0.3%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.1%	1	0.6%
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.3%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			21	3.0%	1	0.6%
70.700 CORNEAL DYSTROPHY			6	0.9%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.3%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			24	3.4%	14	9.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	1.0%	2	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			4	0.6%	1	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.3%	1	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.4%	3	1.9%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.3%	5	3.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			6	0.9%	1	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			10	1.4%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			6	0.9%	2	1.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			2	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.3%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.3%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>51</b>	<b>7.3%</b>	<b>16</b>	<b>10.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.3%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	0.4%	1	0.6%
110.320 VITREOUS DEGENERATION SYNERESIS			13	1.8%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			3	0.4%	2	1.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			6	0.9%	1	0.6%
120.920 RETINAL DETACHMENT WITH DIALYSIS			1	0.1%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	1.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.6%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			2	0.3%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			2	0.3%	0	0.0%

# OCULAR DISORDERS REPORT GREYHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		703		155	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		8	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED		14	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		31	4.4%	10	6.5%
<b>NORMAL</b>					
.000 NORMAL GLOBE		571	81.2%	124	80.0%

## HANOVERIAN HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the HANOVERIAN HOUND breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT HANOVERIAN HOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	25 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	25	100.0%

## HARRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the HARRIER breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT HARRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			412		37	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			1	0.2%	0	0.0%
25.110 DISTICHIASIS			2	0.5%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	2.7%
<b>CORNEA</b>						
70.210 PANNUS			1	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY			1	0.2%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			12	2.9%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.2%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.2%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	1.9%	1	2.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.5%	1	2.7%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.2%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			4	1.0%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.2%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>12</b>	<b>2.9%</b>	<b>1</b>	<b>2.7%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	2.7%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.7%	0	0.0%
<b>OPTIC NERVE</b>						
130.150 OPTIC DISC COLOBOMA			1	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED			11	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	1.2%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			379	92.0%	34	91.9%

## HAVANA SILK DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

Any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT HAVANA SILK DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			32	5.0%	3	3.1%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.3%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			9	1.4%	1	1.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			33	5.1%	3	3.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.2%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.2%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			12	1.9%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	0.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.5%	1	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	0.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.6%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			4	0.6%	4	4.1%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>20</b>	<b>3.1%</b>	<b>1</b>	<b>1.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.3%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	0.5%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			3	0.5%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			7	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED			1	0.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	0.9%	1	1.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			564	87.3%	88	89.8%

## HAVANESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 3	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1, 2	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option
E.	Vitreous degeneration - syneresis	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

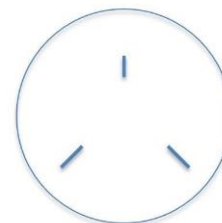
#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The exact frequency and significance of cataracts in the breed is not known.

#### D. Y-suture tip opacity

These are prominent (or "highlighted" or "more dense") distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a "peace sign" as

diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless misdiagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### E. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Starr AN, Famula TR, Markward NJ, et al. Hereditary evaluation of multiple developmental abnormalities in the Havanese dog breed. *J Hered.* 2007;98:510-517. PMID: 17621585
3. Bellamy KKL, Lingaas F, Madsen P. Heritability of distichiasis in Havanese dogs in Norway. *Canine Med Genet.* 2021; 8(1):11. PMID: 34784963. \*\*reference derived from non-USA dog population\*\*

## OCULAR DISORDERS REPORT HAVANESE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 30,221		2018-2022 5,651	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			6	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			10	0.0%	3	0.1%
21.000 ENTROPION, UNSPECIFIED			18	0.1%	3	0.1%
22.000 ECTROPION, UNSPECIFIED			4	0.0%	0	0.0%
25.110 DISTICHIASIS			1,508	5.0%	271	4.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			9	0.0%	4	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			10	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.0%	1	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			141	0.5%	30	0.5%
<b>CORNEA</b>						
70.210 PANNUS			2	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			7	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			122	0.4%	32	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.0%	1	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			1	0.0%	1	0.0%
93.120 IRIS CYST			5	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			3	0.0%	0	0.0%
93.150 IRIS COLOBOMA			3	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,849	6.1%	291	5.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			30	0.1%	3	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			14	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			18	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			38	0.1%	36	0.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.0%	2	0.0%
93.810 UVEAL MELANOMA			3	0.0%	1	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	0	0.0%
97.120 COLOBOMA			4	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	8	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.0%
120.960 RETINOPATHY			0	0.0%	2	0.0%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			22	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1,779	5.9%	302	5.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			248	0.8%	91	1.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			151	0.5%	58	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			57	0.2%	11	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			49	0.2%	18	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			451	1.5%	143	2.5%
100.306 PUNCTATE CATARACT, NUCLEUS			28	0.1%	14	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			109	0.4%	55	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			134	0.4%	31	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			236	0.8%	49	0.9%

# OCULAR DISORDERS REPORT HAVANESE

Year Examined: Total # Dogs:		1993-2017 30,221		2018-2022 5,651	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	55	0.2%	15	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	18	0.1%	3	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	105	0.3%	17	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	21	0.1%	4	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	55	0.2%	18	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	7	0.0%	4	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	17	0.1%	10	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	5	0.0%	3	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	2	0.0%	1	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	2	0.0%
100.328	Y-SUTURE TIP OPACITIES	241	0.8%	287	5.1%
100.330	GENERALIZED/ COMPLETE CATARACT	125	0.4%	6	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	3	0.0%	2	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	13	0.0%	3	0.1%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>1,900</b>	<b>6.3%</b>	<b>556</b>	<b>9.8%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	30	0.1%	5	0.1%
110.135	PHPV/ PTVL	3	0.0%	2	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	55	0.2%	22	0.4%
110.320	VITREOUS DEGENERATION SYNERESIS	492	1.6%	65	1.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	141	0.5%	8	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	25	0.1%	3	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	107	0.4%	5	0.1%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	12	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	2	0.0%
120.960	RETINOPATHY	19	0.1%	6	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	3	0.0%	1	0.0%
130.150	OPTIC DISC COLOBOMA	8	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	257	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	563	1.9%	1	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	295	1.0%	165	2.9%
<b>NORMAL</b>					
.000	NORMAL GLOBE	24,848	82.2%	4,218	74.6%

## HOKKAIDO KEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
B.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	1, 2	NO	Mutation in the <i>NHEJ1</i> gene
C.	Cataract	Not defined	1	NO	

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

#### C. Cataract

Any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Mizukami K, Chang H, Ota M, et al. Collie eye anomaly in Hokkaido dogs: case study. *Vet Ophthalmol.* 2012;15:128-32. PMID: 22051190 \*\*reference derived from non-USA dog population\*\*

## OCULAR DISORDERS REPORT HOKKAIDO KEN

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			3	%	35	%
			#		#	
<b>EYELIDS</b>						
25.110 DISTICHIASIS			0	0.0%	2	5.7%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	2.9%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			0	0.0%	9	25.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			0	0.0%	1	2.9%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	2	5.7%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			0	0.0%	10	28.6%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	33.3%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	33.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	2.9%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	2	5.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	7	20.0%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	2.9%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	3	8.6%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	2.9%
100.330 GENERALIZED/ COMPLETE CATARACT			0	0.0%	2	5.7%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>33.3%</b>	<b>17</b>	<b>48.6%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	5.7%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			1	33.3%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1	33.3%	11	31.4%

# HOVAWART

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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## Description and Comments

### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT HOVAWART

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			42 #	%	25 #	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	4.8%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			0	0.0%	2	8.0%
93.170 ANTERIOR CHAMBER CYST			1	2.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	4.8%	2	8.0%
95.120 CILIARY BODY CYST			0	0.0%	1	4.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	4.8%	1	4.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	4.8%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	2.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	1	4.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	2.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	4.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	4.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	1	4.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	4.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>4</b>	<b>9.5%</b>	<b>4</b>	<b>16.0%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			1	2.4%	0	0.0%
<b>FUNDUS</b>						
130.110 MICROPAPILLA			0	0.0%	1	4.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	1	4.0%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			0	0.0%	1	4.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	2.4%	1	4.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			33	78.6%	18	72.0%

# IBIZAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO
C.	Y-suture tip opacities	Not defined	1	Breeder option

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

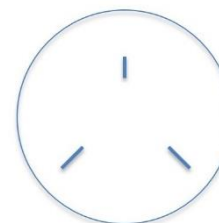
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### C. Y-suture tip opacities

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate

posterior sutures" AND ALSO MARK "suspect not inherited/significance unknown" (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: "E2" or "posterior suture tip opacities." This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT IBIZAN HOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,501		2018-2022 531	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.3%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			4	0.3%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.1%	1	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			10	0.7%	1	0.2%
<b>UVEA</b>						
93.120 IRIS CYST			3	0.2%	1	0.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.1%	0	0.0%
93.150 IRIS COLOBOMA			1	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			183	12.2%	44	8.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.1%	1	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			14	0.9%	10	1.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.3%	0	0.0%
95.120 CILIARY BODY CYST			1	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			85	5.7%	31	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			9	0.6%	9	1.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			4	0.3%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.2%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.2%	5	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS			13	0.9%	10	1.9%
100.307 PUNCTATE CATARACT, CAPSULAR			6	0.4%	4	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			6	0.4%	3	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	0.6%	4	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	0.3%	3	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	1	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			27	1.8%	11	2.1%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.2%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.2%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	7	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>98</b>	<b>6.5%</b>	<b>55</b>	<b>10.4%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			3	0.2%	3	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			6	0.4%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS			11	0.7%	1	0.2%

## OCULAR DISORDERS REPORT IBIZAN HOUND

Year Examined: Total # Dogs:		1993-2017 1,501		2018-2022 531	
Diagnostic Name		#	%	#	%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	11	0.7%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.3%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%
OPTIC NERVE					
130.150	OPTIC DISC COLOBOMA	3	0.2%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	24	1.6%	0	0.0%
900.100	OTHER, NOT INHERITED	20	1.3%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	1.4%	15	2.8%
NORMAL					
.000	NORMAL GLOBE	1,189	79.2%	415	78.2%

## ICELANDIC SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT ICELANDIC SHEEPDOG

Year Examined: Total # Dogs:		1993-2017 2,270		2018-2022 887	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	5	0.2%	0	0.0%
25.110	DISTICHIASIS	21	0.9%	4	0.5%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
<b>NICTITANS</b>					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	1	0.1%
<b>CORNEA</b>					
70.210	PANNUS	0	0.0%	2	0.2%
70.220	PIGMENTARY KERATITIS	1	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	9	0.4%	0	0.0%
<b>UVEA</b>					
93.110	IRIS HYPOPLASIA	2	0.1%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	0	0.0%	1	0.1%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	113	5.0%	29	3.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.0%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	2	0.1%	2	0.2%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	56	2.5%	40	4.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	14	0.6%	8	0.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	8	0.4%	2	0.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.1%	2	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	15	0.7%	4	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.1%	5	0.6%
100.307	PUNCTATE CATARACT, CAPSULAR	7	0.3%	16	1.8%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.1%	1	0.1%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	14	0.6%	1	0.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	4	0.2%	3	0.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.4%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	5	0.6%
100.317	INCIPIENT CATARACT, CAPSULAR	3	0.1%	4	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.1%	3	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.2%	1	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	6	0.3%	5	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.0%	2	0.2%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	91	4.0%	61	6.9%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.1%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	4	0.2%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	9	0.4%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
120.960	RETINOPATHY	0	0.0%	3	0.3%
<b>FUNDUS</b>					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.3%
120.960	RETINOPATHY	0	0.0%	1	0.1%

# OCULAR DISORDERS REPORT ICELANDIC SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,270		2018-2022 887	
			#	%	#	%
<b>OPTIC NERVE</b>						
130.150 OPTIC DISC COLOBOMA			2	0.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			25	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED			31	1.4%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			43	1.9%	46	5.2%
<b>NORMAL</b>						
.000 NORMAL GLOBE			2,056	90.6%	755	85.1%

## IRISH RED AND WHITE SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- rod-cone dysplasia, type 1 ( <i>rcd1</i> )	Autosomal recessive	2-21	NO	Mutation of the <i>PDE6B</i> gene
	- rod-cone dysplasia, type 4 ( <i>rcd4</i> )	Autosomal recessive	22	NO	mutation of the <i>C2orf71</i> gene
B.	Cataract	Not defined	1	NO	

### Description and Comments

#### A. Retinal atrophy

##### - rod-cone dysplasia, type 1 (*rcd1*)

A form of PRA identified in Irish Setters and Irish Red and White Setters. Clinical night blindness is observed as early as 6 weeks of age progressing to total blindness by one year. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. The disorder is caused by a mutation present in exon 21/codon 807 of the *PDE6B* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

##### - rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

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1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
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11. Schmidt SY, Aguirre GD. Reductions in taurine secondary to photoreceptor loss in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci*. 1985;26:679-683. PMID: 3997418
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## OCULAR DISORDERS REPORT IRISH RED & WHITE SETTER

Year Examined: Total # Dogs:		1993-2017 556		2018-2022 197	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	1	0.2%	0	0.0%
25.110	DISTICHIASIS	23	4.1%	2	1.0%
<b>CORNEA</b>					
70.210	PANNUS	2	0.4%	0	0.0%
70.700	CORNEAL DYSTROPHY	1	0.2%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.2%	0	0.0%
<b>UVEA</b>					
93.120	IRIS CYST	2	0.4%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	8	1.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.2%	3	1.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.2%	0	0.0%
95.120	CILIARY BODY CYST	1	0.2%	0	0.0%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	22	4.0%	14	7.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	6	1.1%	5	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	7	1.3%	3	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.2%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.4%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	3	1.5%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.5%	5	2.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	6	1.1%	1	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	8	1.4%	1	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.4%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	3	0.5%	1	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.2%	2	1.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.2%	1	0.5%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.2%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	2	1.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.2%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.2%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	43	7.7%	24	12.2%
<b>VITREOUS</b>					
110.135	PHPV/ PTVL	1	0.2%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.2%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	4	0.7%	2	1.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	4	0.7%	1	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.4%	1	0.5%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.5%	0	0.0%
120.960	RETINOPATHY	1	0.2%	0	0.0%
<b>FUNDUS</b>					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.5%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	5	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	7	1.3%	1	0.5%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	3.2%	21	10.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	468	84.2%	152	77.2%

## IRISH SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Not defined	22	NO	
	- rod-cone dysplasia, type 1 ( <i>rcd1</i> )	Autosomal recessive	1, 2-21	NO	Mutation of the <i>PDE6B</i> gene
	- rod-cone dysplasia type 4 ( <i>rcd4</i> )	Autosomal recessive	23	NO	Mutation of the <i>C2orf71</i> gene
F.	Amblyopia with quadriplegia	Autosomal recessive	24, 25	NO	

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Irish Setter, the entropion usually involves the lower eyelids.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision

impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **E. Retinal atrophy**

##### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Irish Setter, a later form of progressive retinal atrophy has been observed by several ophthalmologists at 4-5 years of age. Cases seen in this category appear to advance more rapidly than those with rod-cone dysplasia.

##### **- rod-cone dysplasia, type 1 (*rcd1*)**

A form of PRA identified in Irish Setters. Clinical night blindness is observed as early as 6 weeks of age progressing to total blindness by one year. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. The disorder is caused by a mutation present in exon 21/codon 807 of the *PDE6B* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

##### **- rod-cone dysplasia, type 4 (*rcd4*)**

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

#### **F. Amblyopia with quadriplegia**

A congenital quadriplegia and amblyopia. The main symptoms include inability to stand or walk, amblyopia, tremor, nystagmus and possible seizures. Pathologic lesions are confined to the cerebellum. The condition was shown to be due to a fully penetrant autosomal recessive gene that is post-natally lethal in the homozygote.

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17. Clements PJ, Gregory CY, Peterson-Jones SM, et al. Confirmation of the rod cGMP phosphodiesterase beta subunit (PDE beta) nonsense mutation in affected rcd-1 Irish Setters in the UK and development of a diagnostic test. *Curr Eye Res*. 1993;12:861-866. PMID: 8261797
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## OCULAR DISORDERS REPORT IRISH SETTER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,177		2018-2022 303	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.1%	0	0.0%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			2	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			54	2.5%	3	1.0%
22.000 ECTROPION, UNSPECIFIED			9	0.4%	0	0.0%
25.110 DISTICHIASIS			124	5.7%	14	4.6%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.1%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			6	0.3%	1	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.1%	2	0.7%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	1	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			92	4.2%	18	5.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			30	1.4%	11	3.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.2%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			0	0.0%	1	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			31	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			108	5.0%	13	4.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			14	0.6%	7	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			18	0.8%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.1%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.2%	2	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			16	0.7%	3	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			22	1.0%	4	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			21	1.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	0.2%	1	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.2%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			4	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			8	0.4%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			7	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	1	0.3%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	1	0.3%
100.328 Y-SUTURE TIP OPACITIES			1	0.0%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			18	0.8%	0	0.0%

# OCULAR DISORDERS REPORT IRISH SETTER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,177		2018-2022 303	
		#	%	#	%
<b>LENS Continued</b>					
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>184</b>	<b>8.5%</b>	<b>21</b>	<b>6.9%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	24	1.1%	9	3.0%
110.135	PHPV/ PTVL	10	0.5%	2	0.7%
110.320	VITREOUS DEGENERATION SYNERESIS	4	0.2%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	4	1.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	2	0.7%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	11	0.5%	1	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	18	0.8%	0	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.3%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	4	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	19	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	38	1.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	45	2.1%	17	5.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,655	76.0%	218	71.9%

## IRISH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT IRISH TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			95 #	%	39 #	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	1.1%	1	2.6%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	1	2.6%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	1.1%	1	2.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	1.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	2.6%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			9	9.5%	6	15.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	1	2.6%
100.306 PUNCTATE CATARACT, NUCLEUS			3	3.2%	4	10.3%
100.307 PUNCTATE CATARACT, CAPSULAR			1	1.1%	1	2.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	2.1%	2	5.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	1.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	1.1%	2	5.1%
100.317 INCIPIENT CATARACT, CAPSULAR			3	3.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	1.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>12</b>	<b>12.6%</b>	<b>10</b>	<b>25.6%</b>
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	3.2%	0	0.0%
900.100 OTHER, NOT INHERITED			1	1.1%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	2	5.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			79	83.2%	26	66.7%

## IRISH WATER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO
D.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Corneal dystrophy – epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report

## OCULAR DISORDERS REPORT IRISH WATER SPANIEL

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	1,182		195	
			#	%	#	%
<b>EYELIDS</b>						
20.140	ECTOPIC CILIA		1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED		10	0.8%	0	0.0%
22.000	ECTROPION, UNSPECIFIED		3	0.3%	0	0.0%
25.110	DISTICHIASIS		302	25.5%	48	24.6%
<b>CORNEA</b>						
70.700	CORNEAL DYSTROPHY		4	0.3%	5	2.6%
<b>UVEA</b>						
93.120	IRIS CYST		2	0.2%	1	0.5%
93.150	IRIS COLOBOMA		1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		53	4.5%	15	7.7%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		2	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		3	0.3%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		1	0.1%	0	0.0%
<b>LENS</b>						
100.200	CATARACT, UNSPECIFIED		3	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		109	9.2%	19	9.7%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		31	2.6%	11	5.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		12	1.0%	6	3.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX		8	0.7%	1	0.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES		2	0.2%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		3	0.3%	1	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS		4	0.3%	1	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR		4	0.3%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		15	1.3%	1	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		23	1.9%	4	2.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		10	0.8%	1	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES		2	0.2%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES		2	0.2%	1	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS		6	0.5%	1	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR		5	0.4%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX		1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX		0	0.0%	1	0.5%
100.326	INCOMPLETE CATARACT, NUCLEUS		1	0.1%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES		1	0.1%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT		1	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		133	11.3%	31	15.9%
<b>VITREOUS</b>						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT		2	0.2%	3	1.5%
110.320	VITREOUS DEGENERATION SYNERESIS		2	0.2%	0	0.0%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		5	0.4%	1	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC		1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		5	0.4%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS		0	0.0%	2	1.0%
120.960	RETINOPATHY		2	0.2%	1	0.5%
<b>OTHER</b>						
900.000	OTHER, UNSPECIFIED		20	1.7%	0	0.0%
900.100	OTHER, NOT INHERITED		15	1.3%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		15	1.3%	7	3.6%

OCULAR DISORDERS REPORT  
IRISH WATER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
NORMAL .000 NORMAL GLOBE		794	67.2%	109	55.9%

## IRISH WOLFHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
C.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
E.	Uveal cysts	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
H.	Optic nerve hypoplasia	Not defined	1	NO
I.	Micropapilla	Not defined	1	Breeder option

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

#### C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **E. Uveal cysts**

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

#### **F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

#### **H. Optic nerve hypoplasia**

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

#### **I. Micropapilla**

A congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT IRISH WOLFHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,065		2018-2022 506	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			6	0.3%	0	0.0%
25.110 DISTICHIASIS			101	4.9%	30	5.9%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.2%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			20	1.0%	9	1.8%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			38	1.8%	3	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			94	4.6%	21	4.2%
93.170 ANTERIOR CHAMBER CYST			16	0.8%	29	5.7%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			21	1.0%	9	1.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			11	0.5%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.2%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			5	0.2%	1	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			12	0.6%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			94	4.6%	37	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			16	0.8%	1	0.2%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			28	1.4%	5	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			5	0.2%	3	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			11	0.5%	2	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			9	0.4%	10	2.0%
100.307 PUNCTATE CATARACT, CAPSULAR			13	0.6%	6	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			15	0.7%	8	1.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			39	1.9%	12	2.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			9	0.4%	6	1.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			15	0.7%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			10	0.5%	7	1.4%
100.317 INCIPIENT CATARACT, CAPSULAR			6	0.3%	10	2.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>202</b>	<b>9.8%</b>	<b>72</b>	<b>14.2%</b>

## OCULAR DISORDERS REPORT IRISH WOLFHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,065		2018-2022 506	
		#	%	#	%
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		6	0.3%	1	0.2%
110.135 PHPV/ PTVL		0	0.0%	1	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS		7	0.3%	2	0.4%
<b>FUNDUS</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	1	0.2%
130.110 MICROPAPILLA		0	0.0%	1	0.2%
130.120 OPTIC NERVE HYPOPLASIA		0	0.0%	2	0.4%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		28	1.4%	5	1.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		11	0.5%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		2	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE		1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.0%	0	0.0%
120.960 RETINOPATHY		1	0.0%	1	0.2%
120.970 CMR/ CMR-LIKE RETINOPATY		0	0.0%	1	0.2%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		12	0.6%	7	1.4%
130.120 OPTIC NERVE HYPOPLASIA		29	1.4%	1	0.2%
130.150 OPTIC DISC COLOBOMA		2	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		22	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED		59	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		51	2.5%	24	4.7%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,566	75.8%	340	67.2%

## ITALIAN GREYHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Imperforate lower nasolacrimal punctum	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Vitreous degeneration			
	- syneresis	Not defined	1, 2	Breeder option
	- anterior chamber	Not defined	1, 2	Breeder option
D.	Retinal atrophy			
	- generalized	Not defined	1	NO
	- IG-PRA1**	Autosomal recessive	3	NO

### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Italian Greyhound, posterior subcapsular and cortical cataracts at two to three years of age appear to be the more common location of occurrence, with progression noted in an undetermined percentage of dogs.

#### B. Vitreous degeneration - syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment, but in this breed, it was shown not to be associated (Krishnan et al reference)

#### C. Retinal atrophy

##### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### - IG-PRA1

Italian Greyhound PRA (*IG-PRA1*) is considered a "late onset" PRA with clinical signs detected between 3-5 years of age. Dogs initially lose night vision followed by decreased vision in bright light conditions. Clinically increases in tapetal reflectivity and retinal vessel attenuation are noted. The risk allele is known, but the genetic mutation has not been determined. The disease has been presumed to be inherited as an autosomal recessive trait. However some affected dogs had only one copy of the risk allele suggesting an autosomal dominant with incomplete penetrance mode of inheritance.

At least one other form of PRA appears to be present in the breed and will not be detected with this test.

\*\*A DNA test is available for the risk allele, but is multilocus and no mutation is described.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." Vet Ophthalmol 23(2): 219-224. PMID: 31464365
3. Goldstein O, Pearce-Kelling, SE, Aguirre GD, Acland GM. Adult onset autosomal recessive hereditary retinal degeneration in Italian Greyhound dogs. *IOVS*, April 2011, Vol 52, 4351. ARVO abstract. (Only reference available for this condition)

## OCULAR DISORDERS REPORT ITALIAN GREYHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 7,898		2018-2022 536	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	1	0.2%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	0.2%
25.110 DISTICHIASIS			22	0.3%	1	0.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			8	0.1%	1	0.2%
<b>CORNEA</b>						
70.210 PANNUS			7	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			19	0.2%	2	0.4%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.0%	0	0.0%
93.120 IRIS CYST			3	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			3	0.0%	0	0.0%
93.150 IRIS COLOBOMA			6	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			52	0.7%	3	0.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			6	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			5	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.1%	2	0.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.1%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			22	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	5	0.9%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			17	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			351	4.4%	21	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			119	1.5%	18	3.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			97	1.2%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			35	0.4%	4	0.7%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			6	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			20	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			9	0.1%	2	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			19	0.2%	3	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			182	2.3%	9	1.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			185	2.3%	6	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			107	1.4%	5	0.9%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			9	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			18	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			16	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			18	0.2%	2	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			12	0.2%	2	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			11	0.1%	6	1.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			3	0.0%	4	0.7%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			2	0.0%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			49	0.6%	2	0.4%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			36	0.5%	0	0.0%

## OCULAR DISORDERS REPORT ITALIAN GREYHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 7,898		2018-2022 536	
			#	%	#	%
<b>LENS Continued</b> <i>100.345 SIGNIFICANT CATARACTS (SUMMARY)</i>			<b>933</b>	<b>11.8%</b>	<b>67</b>	<b>12.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			22	0.3%	3	0.6%
110.135 PHPV/ PTVL			3	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1,069	13.5%	97	18.1%
110.320 VITREOUS DEGENERATION SYNERESIS			1,718	21.8%	64	11.9%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			26	0.3%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			4	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.0%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			250	3.2%	2	0.4%
120.400 RETINAL HEMORRHAGE			19	0.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			8	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			1	0.0%	2	0.4%
120.960 RETINOPATHY			7	0.1%	2	0.4%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			20	0.3%	3	0.6%
130.120 OPTIC NERVE HYPOPLASIA			35	0.4%	2	0.4%
130.150 OPTIC DISC COLOBOMA			4	0.1%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			63	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED			138	1.7%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			108	1.4%	21	3.9%
<b>NORMAL</b> .000 NORMAL GLOBE			5,151	65.2%	354	66.0%

# JACK RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	1, 2-7	NO	Mutation of the <i>ADAMTS17</i> gene
E.	Vitreous degeneration  - syneresis	Not defined	1, 2	Breeder option	
F.	Retinal atrophy  - ( <i>prcd</i> )	Autosomal recessive	1, 8	NO	Mutation of the <i>prcd</i> gene
G.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	8	NO	Mutation in the <i>NHEJ1</i> gene

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except

in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **D. Lens luxation**

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

#### **E. Vitreous degeneration**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

#### **F. Retinal Atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that one form of PRA in the Jack Russell Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **G. Choroidal hypoplasia (Collie Eye Anomaly)**

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Lawson DD. Luxation of the crystalline lens in the dog. J Small Anim Pract. 1969;10:461-463. PMID: 5387868

3. Curtis R, Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract.* 1980;21:657-668. PMID: 6969820
4. Curtis R, Barnett KC, Lewis SJ. Clinical and pathological observations concerning the aetiology of primary lens luxation in the dog. *Vet Rec.* 1983;112:238-246. PMID: 6601878
5. Oberbauer AM, Hollingsworth SR, Belanger JM, et al. Inheritance of cataracts and primary lens luxation in Jack Russell Terriers. *Am J Vet Res.* 2008;69:222-227. PMID: 18241019
6. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010;51:4716-4721. PMID: 20375329
7. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384. PMID: 22050825
8. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT JACK RUSSELL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 16,049		2018-2022 1,438	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	0.0%	0	0.0%
10.000 GLAUCOMA			3	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			3	0.0%	0	0.0%
25.110 DISTICHIASIS			365	2.3%	23	1.6%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	1	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			0	0.0%	1	0.1%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	1	0.1%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			9	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			63	0.4%	6	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			10	0.1%	1	0.1%
<b>UVEA</b>						
93.120 IRIS CYST			5	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			4	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			731	4.6%	58	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			40	0.2%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			18	0.1%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			10	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			12	0.1%	13	0.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			6	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.0%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			551	3.4%	56	3.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			96	0.6%	24	1.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			87	0.5%	15	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			24	0.1%	7	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			16	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			62	0.4%	12	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			30	0.2%	11	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR			23	0.1%	7	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			193	1.2%	15	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			384	2.4%	33	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			67	0.4%	10	0.7%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			8	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			143	0.9%	10	0.7%
100.316 INCIPIENT CATARACT, NUCLEUS			32	0.2%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			27	0.2%	4	0.3%

# OCULAR DISORDERS REPORT

## JACK RUSSELL TERRIER

Year Examined: Total # Dogs:		1993-2017 16,049		2018-2022 1,438	
Diagnostic Name		#	%	#	%
LENS Continued					
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	3	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	6	0.0%	10	0.7%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	9	0.1%	8	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	95	0.6%	3	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	82	0.5%	1	0.1%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	1,301	8.1%	166	11.5%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	19	0.1%	2	0.1%
110.135	PHPV/ PTVL	4	0.0%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	25	0.2%	4	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	213	1.3%	13	0.9%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	58	0.4%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	20	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	85	0.5%	0	0.0%
120.400	RETINAL HEMORRHAGE	4	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	8	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	7	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	12	0.1%	1	0.1%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	113	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	645	4.0%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	145	0.9%	64	4.5%
NORMAL					
.000	NORMAL GLOBE	13,264	82.6%	1,148	79.8%

## JAGDTERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation of the <i>ADAMTS17</i> gene

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### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Jagdterrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384. PMID: 22050825

# OCULAR DISORDERS REPORT

## JAGDTERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	1 #	%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	100.0%
<b>NORMAL</b> .000 NORMAL GLOBE		2	100.0%	0	0.0%

# JAMTHUND

(Swedish Elkhound)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Retinal atrophy - generalized	Not defined	1	NO

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## Description and Comments

### A. Retinal atrophy, generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

## References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Jamthund.

1. Hertel E, Bergström T, Kell U, Karlstam L, Ekman S, Ekestén B. Retinal degeneration in nine Swedish Jämthund dogs. *Vet Ophthalmol*. 2010 Mar;13(2):110-6. doi: 10.1111/j.1463-5224.2010.00761.x. PMID: 20447030.

# OCULAR DISORDERS REPORT

## JAMTHUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0 #	%	1 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		0		1	100.0%

## JAPANESE AKITA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Corneal dystrophy – epithelial/stromal	Not defined	1	Breeder option
D.	Cataract	Not defined	1	NO
E.	Y suture tip opacities	Not defined	1	Breeder option
F.	Persistent hyaloid artery remnant	Not defined	1	Breeder option

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**Commented [1]:** add blurbs for distichia and Y suture tip o

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

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## OCULAR DISORDERS REPORT JAPANESE AKITA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			104		223	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	1.0%	5	2.2%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	1.0%	6	2.7%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			7	6.7%	25	11.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	1.0%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	5.8%	16	7.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	1.0%	1	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	1.9%	3	1.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			0	0.0%	2	0.9%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	3.8%	4	1.8%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	3	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR			1	1.0%	4	1.8%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	6	2.7%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			3	2.9%	9	4.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>8</b>	<b>7.7%</b>	<b>26</b>	<b>11.7%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	8	3.6%
110.320 VITREOUS DEGENERATION SYNERESIS			1	1.0%	1	0.4%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	4	1.8%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	1.0%	1	0.4%
120.920 RETINAL DETACHMENT WITH DIALYSIS			1	1.0%	0	0.0%
120.960 RETINOPATHY			0	0.0%	2	0.9%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			3	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	7.7%	17	7.6%
<b>NORMAL</b>						
.000 NORMAL GLOBE			77	74.0%	151	67.7%

# JAPANESE CHIN

(JAPANESE SPANIEL)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Exposure keratopathy syndrome	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation of the <i>prcd</i> gene

## Description and Comments

### A. Entropion

A conformational defect resulting in an "in-rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### C. Exposure keratopathy syndrome

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

**D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**F. Vitreous degeneration - syneresis**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

**G. Retinal atrophy - *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that one form of PRA in the Japanese Chin is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT JAPANESE CHIN

Year Examined: Total # Dogs:		1993-2017 1,285		2018-2022 224	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.160	MACROPALPEBRAL FISSURE	13	1.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	99	7.7%	19	8.5%
22.000	ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	56	4.4%	11	4.9%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.1%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.1%	2	0.9%
<b>GLOBE</b>					
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.4%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.2%	0	0.0%
<b>CORNEA</b>					
70.210	PANNUS	9	0.7%	2	0.9%
70.220	PIGMENTARY KERATITIS	47	3.7%	10	4.5%
70.700	CORNEAL DYSTROPHY	3	0.2%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	3	0.2%	1	0.4%
<b>UVEA</b>					
93.150	IRIS COLOBOMA	1	0.1%	1	0.4%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	138	10.7%	11	4.9%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	6	0.5%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	7	0.5%	1	0.4%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	6	0.5%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	0	0.0%
<b>FUNDUS</b>					
97.120	COLOBOMA	1	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.4%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.4%
120.960	RETINOPATHY	0	0.0%	1	0.4%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.4%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	60	4.7%	9	4.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	25	1.9%	3	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	11	0.9%	1	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	8	0.6%	2	0.9%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	5	0.4%	3	1.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	4	0.3%	4	1.8%
100.306	PUNCTATE CATARACT, NUCLEUS	1	0.1%	1	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.3%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	46	3.6%	12	5.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	30	2.3%	3	1.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	26	2.0%	3	1.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.2%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	9	0.7%	1	0.4%
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.5%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	12	0.9%	3	1.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	6	0.5%	2	0.9%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	2	0.9%
100.328	Y-SUTURE TIP OPACITIES	1	0.1%	2	0.9%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.5%	1	0.4%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.4%

## OCULAR DISORDERS REPORT JAPANESE CHIN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1,285		224	
		#	%	#	%
<b>LENS Continued</b>					
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		6	0.5%	2	0.9%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		204	15.9%	42	18.8%
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		15	1.2%	5	2.2%
110.135 PHPV/ PTVL		13	1.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		11	0.9%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS		52	4.0%	11	4.9%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		2	0.2%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		2	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		15	1.2%	1	0.4%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		1	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		1	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA		2	0.2%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		28	2.2%	0	0.0%
900.100 OTHER, NOT INHERITED		46	3.6%	1	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		46	3.6%	21	9.4%
<b>NORMAL</b>					
.000 NORMAL GLOBE		815	63.4%	114	50.9%

## JINDO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the JINDO breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## JINDO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		8 #	%	17 #	%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	1	5.9%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	5.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	12.5%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS		0	0.0%	1	5.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX		1	12.5%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		0	0.0%	1	5.9%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>2</b>	<b>25.0%</b>	<b>1</b>	<b>5.9%</b>
<b>NORMAL</b>					
.000 NORMAL GLOBE		7	87.5%	15	88.2%

# KAI KEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - lens pigment foci/no strands	Not defined	1	Passes with no notation

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## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT KAI KEN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		8 #	%	33 #	%
<b>CORNEA</b>					
70.700 CORNEAL DYSTROPHY		0	0.0%	1	3.0%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	12.5%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		4	50.0%	10	30.3%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	2	6.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX		0	0.0%	1	3.0%
100.307 PUNCTATE CATARACT, CAPSULAR		0	0.0%	1	3.0%
100.317 INCIPIENT CATARACT, CAPSULAR		0	0.0%	1	3.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>0</b>	<b>0.0%</b>	<b>3</b>	<b>9.1%</b>
<b>RETINA</b>					
120.960 RETINOPATHY		0	0.0%	1	3.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		4	50.0%	19	57.6%

## KARELIAN BEAR DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1	NO	Mutation of the <i>prcd</i> gene

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### Description and Comments

#### A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited. A genetic test is available to detect the progressive rod cone degeneration form of PRA caused by a mutation in the *prcd*-gene. A second form of PRA is also present in the Karelian Bear Dog for which the causative mutation is not yet known.

### References

1. Ahonen S, Lohi H, editors. Progressive retinal atrophy in the Karelian Bear Dog: A large animal model for retinitis pigmentosa. ARVO Abstract 2014 Annual Meeting; 2014; Orlando, FL. Program number: 3270.

## OCULAR DISORDERS REPORT KARELIAN BEAR DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	1.9%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	5.9%
70.700 CORNEAL DYSTROPHY			4	3.7%	1	5.9%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.9%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			10	9.3%	2	11.8%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	2.8%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	1.9%	1	5.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	5.9%
100.307 PUNCTATE CATARACT, CAPSULAR			2	1.9%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	2.8%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			4	3.7%	1	5.9%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			0	0.0%	1	5.9%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.9%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.9%	1	5.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	2	11.8%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>11</b>	<b>10.2%</b>	<b>6</b>	<b>35.3%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			4	3.7%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.9%	0	0.0%
120.960 RETINOPATHY			1	0.9%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			1	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.9%	2	11.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			82	75.9%	8	47.1%

## KEESHOND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Y-suture tip opacity	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

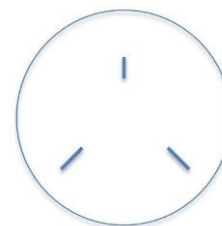
Eyelashes abnormally located in the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either

be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT KEESHOND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,447		2018-2022 641	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			9	0.3%	2	0.3%
25.110 DISTICHIASIS			200	5.8%	20	3.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			12	0.3%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.1%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			30	0.9%	5	0.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.1%	1	0.2%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.2%
130.110 MICROPAPILLA			0	0.0%	1	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			18	0.5%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			314	9.1%	49	7.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			17	0.5%	6	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			21	0.6%	3	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			12	0.3%	1	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			135	3.9%	37	5.8%
100.306 PUNCTATE CATARACT, NUCLEUS			8	0.2%	9	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR			20	0.6%	8	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			7	0.2%	2	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			39	1.1%	2	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			9	0.3%	1	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			23	0.7%	12	1.9%
100.316 INCIPIENT CATARACT, NUCLEUS			15	0.4%	2	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			11	0.3%	3	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	1	0.2%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	1	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			74	2.1%	103	16.1%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.2%	1	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT			1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>352</b>	<b>10.2%</b>	<b>91</b>	<b>14.2%</b>

## OCULAR DISORDERS REPORT KEESHOND

	Year Examined: Total # Dogs:	1993-2017 3,447		2018-2022 641	
Diagnostic Name		#	%	#	%
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		1	0.0%	2	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS		9	0.3%	2	0.3%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		6	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		2	0.1%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		10	0.3%	1	0.2%
120.400 RETINAL HEMORRHAGE		1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		2	0.1%	0	0.0%
120.960 RETINOPATHY		4	0.1%	1	0.2%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		8	0.2%	1	0.2%
130.120 OPTIC NERVE HYPOPLASIA		13	0.4%	0	0.0%
130.150 OPTIC DISC COLOBOMA		1	0.0%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		21	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED		45	1.3%	3	0.5%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		33	1.0%	35	5.5%
<b>NORMAL</b>					
.000 NORMAL GLOBE		2,757	80.0%	450	70.2%

## KERRY BLUE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT KERRY BLUE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			757		111	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			12	1.6%	4	3.6%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			3	0.4%	3	2.7%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			11	1.5%	4	3.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	1	0.9%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			6	0.8%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			30	4.0%	1	0.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			16	2.1%	1	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	1	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			4	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	0.4%	1	0.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			6	0.8%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>44</b>	<b>5.8%</b>	<b>3</b>	<b>2.7%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	0.4%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			7	0.9%	1	0.9%
<b>RETINA</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	0.3%	1	0.9%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.1%	0	0.0%
900.100 OTHER, NOT INHERITED			21	2.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	0.5%	3	2.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			668	88.2%	95	85.6%

## KISHU-KEN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KISHU-KEN breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## KISHU KEN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	11 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	2	18.2%
<b>LENS</b> 100.328 Y-SUTURE TIP OPACITIES		0	0.0%	2	18.2%
<b>NORMAL</b> .000 NORMAL GLOBE		2	100.0%	7	63.6%

## KOMONDOR

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Appears to be relatively young age for onset in the Komondor (<4yr) and mainly anterior cortical.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT KOMONDOR

Year Examined: Total # Dogs:		1993-2017 361		2018-2022 44	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	1	0.3%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.3%	0	0.0%
25.110	DISTICHIASIS	0	0.0%	1	2.3%
<b>NICTITANS</b>					
51.100	THIRD EYELID CARTILAGE ANOMALY	1	0.3%	0	0.0%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	1	0.3%	0	0.0%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	5	1.4%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.6%	0	0.0%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	14	3.9%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	28	7.8%	1	2.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	2	0.6%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	5	1.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.8%	1	2.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.8%	2	4.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	1.4%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.3%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	4	1.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	5	1.4%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.3%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.3%	1	2.3%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.3%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>46</b>	<b>12.7%</b>	<b>3</b>	<b>6.8%</b>
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	1	0.3%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	7	1.9%	0	0.0%
900.100	OTHER, NOT INHERITED	6	1.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	0.3%	0	0.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	296	82.0%	40	90.9%

## KOREAN POONGSAN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KOREAN POONGSAN breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT  
KOREAN POONGSAN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## KROMFORHLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KROMFORHLANDER breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT  
KROMFOHRLANDER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
NORMAL .000 NORMAL GLOBE		6	100.0%	10	100.0%

# KUVASZ

DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A. Retinal atrophy				
- ( <i>prcd</i> )	Autosomal recessive	1	NO	Mutation of the <i>prcd</i> gene

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## Description and Comments

### A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the form of PRA in the Kuvasz is *prcd*, which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## References

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

## OCULAR DISORDERS REPORT KUVASZ

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			2	0.4%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.2%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			2	0.4%	0	0.0%
25.110 DISTICHIASIS			21	3.8%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			6	1.1%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.2%	0	0.0%
<b>UVEA</b>						
93.150 IRIS COLOBOMA			2	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			23	4.2%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.5%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.5%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			15	2.7%	1	14.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	14.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.5%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	14.3%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>16</b>	<b>2.9%</b>	<b>1</b>	<b>14.3%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.2%	0	0.0%
<b>RETINA</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			4	0.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.2%	0	0.0%
900.100 OTHER, NOT INHERITED			12	2.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	0.7%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			461	83.8%	5	71.4%

## KYI-LEO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the KYI-LEO breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT KYI-LEO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>RETINA</b> 120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	50.0%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE			1	50.0%	1	100.0%

# LABRADOR RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1-3	Breeder option	
	- macular	Autosomal recessive	1-3	NO	
E.	Uveal cysts	Not defined	1	Breeder option	
F.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
G.	Cataract				
	- generalized	Not defined	1, 5	NO	
	- posterior polar/posterior cortical/subcapsular	Presumed dominant with incomplete penetrance	1-4	NO	
H.	Y-suture tip opacity	Not defined	1	Breeder option	
I.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
J.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
K.	Retinal degeneration				
	- ( <i>prcd</i> )	Autosomal recessive	1, 6-8	NO	Mutation of the <i>prcd</i> gene
	- Stargardt's disease	Autosomal recessive	1, 9-10	NO	Mutation of the <i>ABCA4</i> gene
L.	Achromatopsia Type 2 ( <i>ACHM</i> – Type 2)	Autosomal recessive	11, 12	NO	Mutation of the <i>CNGA3</i> gene
M.	Retinal dysplasia				
	- folds	Not defined	1	NO (Breeder option with normal DNA test for mutation in the <i>CNGA3</i> gene)	Mutation of the <i>COL9A3</i> gene for some cases, otherwise unknown
	- geographic	Not defined	1, 22, 23	NO	
	- detached/generalized	Autosomal recessive	13, 14	NO	
N.	Retinal dysplasia				
	- folds/retinal detachment (with skeletal defects)	Autosomal recessive	15-22, 24	NO	Mutation of the <i>COL9A3</i> gene
O.	Limbal melanoma	Not defined	25	NO	

## Description and Comments

### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

#### **B. Ectropion**

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### **C. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **D. Corneal dystrophy - epithelial/stromal/macular**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In Labrador Retrievers in Europe, macular corneal dystrophy (MCD) has been shown to be caused by accumulations of glycosaminoglycans in the corneal stroma. This form of corneal dystrophy is caused by a mutation in the CHST6 gene.

#### **E. Uveal cysts**

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

#### **F. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Labrador Retriever, this is a potentially serious problem as many of the PPMs identified on routine screening examinations bridge from the iris to the cornea and/or from iris sheets bridging the pupils. These forms may cause vision impairment.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **G. Cataract**

### - generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

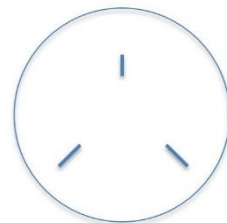
### - posterior polar/posterior cortical/subcapsular

The most frequently reported cataracts in the Labrador Retriever are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts which usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

### H. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### I. Persistent hyaloid artery remnant (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

### J. Vitreous degeneration

Liquefaction of the vitreous gel, which may predispose to retinal detachment.

### K. Retinal degeneration-

#### - prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as

progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Labrador Retriever is prcd which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (prcd) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **- Stargardt's Disease**

Degenerative disease of visual cells and RPE caused by an autosomal recessive mutation in the gene ABCA4. While the retina does degenerate with progression of the disease, the ophthalmoscopic findings are different from PRA. Focal atrophy of the center of the area centralis occurs in young dogs, as well as markedly reduced or absent cone ERG responses.

#### **L.      Achromatopsia Type 2 (ACHM – Type 2)**

A congenital form of day blindness. Visual deficits become apparent between 8-10 weeks of age. Normal vision is present in low light conditions. Clinical examination is normal. Cone responses are absent on an electroretinogram. The causative genetic mutation has been determined, but not yet published. A DNA test is available.

#### **M.      Retinal dysplasia**

##### **- folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown.

In the Labrador Retriever, the presence of retinal folds may be seen in the heterozygous state of oculoskeletal dysplasia (described below), thus the recommendation against breeding.

The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the COL9A3 mutation.

##### **- geographic**

An irregularly shaped area of retinal development containing areas of retinal thickening and disorganization. These lesions can take up to 1.5 years after birth to develop and be ophthalmoscopically visible. As a result, some dogs with this disease may have had normal prior eye examinations.

##### **- detached/generalized:**

Abnormal development of the retina occurring in late gestation resulting in retinal detachment and blindness by 8 weeks of age. This disease was described in Sweden in the 1970s and appears to have been eliminated.

#### **N.      Retinal dysplasia - folds or detachment with skeletal defects**

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 1 (DRD1) in the Labrador Retriever. A similar condition, DRD2, occurs in the Samoyed. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They

have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1 base pair insertion of COL9A3. A DNA test is available.

## **O. Limbal melanoma**

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

### **Historical Note:**

Central progressive retinal atrophy was previously a condition listed for Labrador Retriever. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

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## OCULAR DISORDERS REPORT LABRADOR RETRIEVER

Year Examined: Total # Dogs:		1993-2017 246,533		2018-2022 37,176	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110	MICROPTHALMIA	62	0.0%	5	0.0%
10.000	GLAUCOMA	28	0.0%	3	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	2	0.0%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	16	0.0%	2	0.0%
20.160	MACROPALPEBRAL FISSURE	86	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	1,069	0.4%	202	0.5%
22.000	ECTROPION, UNSPECIFIED	516	0.2%	47	0.1%
25.110	DISTICHIASIS	2,407	1.0%	369	1.0%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	12	0.0%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	32	0.0%	12	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	8	0.0%	2	0.0%
<b>NICTITANS</b>					
50.210	PLASMOMA/ ATYPICAL PANNUS	0	0.0%	2	0.0%
51.100	THIRD EYELID CARTILAGE ANOMALY	11	0.0%	2	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	38	0.0%	2	0.0%
<b>CORNEA</b>					
70.210	PANNUS	9	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	19	0.0%	9	0.0%
70.700	CORNEAL DYSTROPHY	2,422	1.0%	387	1.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	84	0.0%	10	0.0%
<b>UVEA</b>					
90.250	PIGMENTARY UVEITIS	2	0.0%	2	0.0%
93.110	IRIS HYPOPLASIA	6	0.0%	1	0.0%
93.120	IRIS CYST	381	0.2%	90	0.2%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	12	0.0%	0	0.0%
93.150	IRIS COLOBOMA	12	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	42	0.0%	17	0.0%
93.180	IIRIS SPHINCTER DYSPLASIA	1	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	7,485	3.0%	1,295	3.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	154	0.1%	13	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	162	0.1%	7	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	176	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	415	0.2%	430	1.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	33	0.0%	10	0.0%
93.810	UVEAL MELANOMA	67	0.0%	22	0.1%
95.120	CILIARY BODY CYST	32	0.0%	16	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	1	0.0%	0	0.0%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	14	0.0%	0	0.0%
97.120	COLOBOMA	11	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	121	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	65	0.2%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.0%
120.960	RETINOPATHY	0	0.0%	13	0.0%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.0%
130.110	MICROPAPILLA	0	0.0%	10	0.0%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	2	0.0%

## OCULAR DISORDERS REPORT LABRADOR RETRIEVER

Year Examined: Total # Dogs:		1993-2017 246,533		2018-2022 37,176	
Diagnostic Name		#	%	#	%
LENS					
100.200	CATARACT, UNSPECIFIED	728	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	10,775	4.4%	1,726	4.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1,903	0.8%	923	2.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1,486	0.6%	241	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	274	0.1%	79	0.2%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	210	0.1%	64	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1,109	0.4%	329	0.9%
100.306	PUNCTATE CATARACT, NUCLEUS	345	0.1%	158	0.4%
100.307	PUNCTATE CATARACT, CAPSULAR	617	0.3%	325	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	795	0.3%	165	0.4%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2,037	0.8%	315	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	562	0.2%	107	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	68	0.0%	9	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	509	0.2%	76	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	352	0.1%	73	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	309	0.1%	141	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	20	0.0%	24	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	76	0.0%	52	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	22	0.0%	11	0.0%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	11	0.0%	10	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	16	0.0%	16	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	14	0.0%	17	0.0%
100.328	Y-SUTURE TIP OPACITIES	364	0.1%	389	1.0%
100.330	GENERALIZED/ COMPLETE CATARACT	357	0.1%	5	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	5	0.0%	5	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	55	0.0%	4	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	11,826	4.8%	3,145	8.5%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	632	0.3%	134	0.4%
110.135	PHPV/ PTVL	156	0.1%	14	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	48	0.0%	17	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	844	0.3%	170	0.5%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	5,221	2.1%	233	0.6%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2,067	0.8%	96	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	186	0.1%	10	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	994	0.4%	8	0.0%
120.400	RETINAL HEMORRHAGE	34	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	73	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	8	0.0%	5	0.0%
120.960	RETINOPATHY	70	0.0%	31	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	109	0.0%	14	0.0%
130.120	OPTIC NERVE HYPOPLASIA	89	0.0%	2	0.0%
130.150	OPTIC DISC COLOBOMA	45	0.0%	4	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	1,697	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	4,335	1.8%	18	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2,592	1.1%	1,405	3.8%
NORMAL					
.000	NORMAL GLOBE	211,437	85.8%	29,883	80.4%

# LAGOTTO ROMAGNOLO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1, 4	NO	
D.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	2, 3	NO	Mutation of the <i>prcd</i> gene

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### D. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

#### E. Retinal atrophy – prcd

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Lagotto Romagnolo is prcd which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (prcd) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

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# OCULAR DISORDERS REPORT LAGOTTO ROMAGNOLO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 514		2018-2022 1,262	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			0	0.0%	1	0.1%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			45	8.8%	115	9.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.2%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	0.1%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			14	2.7%	116	9.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			4	0.8%	25	2.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	1	0.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			10	1.9%	37	2.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			6	1.2%	18	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	6	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.8%	3	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	3	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.2%	8	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.2%	1	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	7	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	6	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	3	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.4%	3	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	5	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.4%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.4%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.2%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	11	0.9%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			0	0.0%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>22</b>	<b>4.3%</b>	<b>67</b>	<b>5.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	17	1.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			4	0.8%	2	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
120.960 RETINOPATHY			0	0.0%	1	0.1%
<b>FUNDUS</b>						
120.960 RETINOPATHY			0	0.0%	2	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	1	0.1%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			2	0.4%	4	0.3%

## OCULAR DISORDERS REPORT LAGOTTO ROMAGNOLO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		514		1,262	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		3	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED		0	0.0%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		13	2.5%	30	2.4%
<b>NORMAL</b>					
.000 NORMAL GLOBE		428	83.3%	940	74.5%

## LAKELAND TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder Option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Lens luxation	Autosomal recessive	2	NO	Mutation of the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384. PMID: 22050825

## OCULAR DISORDERS REPORT LAKELAND TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			250		36	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			9	3.6%	3	8.3%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.4%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.8%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			36	14.4%	3	8.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.8%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			4	1.6%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			8	3.2%	6	16.7%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	2.0%	1	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	2	5.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	1.2%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			4	1.6%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	2.8%
100.330 GENERALIZED/ COMPLETE CATARACT			3	1.2%	1	2.8%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>11</b>	<b>4.4%</b>	<b>3</b>	<b>8.3%</b>
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.4%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED			6	2.4%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			191	76.4%	25	69.4%

# LANCASHIRE HEELER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membrane				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/ no strands		1	Passes with no notation	
B.	Lens luxation	Autosomal recessive	2-4	NO	Mutation of the <i>ADAMTS17</i> gene
C.	Choroidal hypoplasia (Collie Eye Anomaly)	Autosomal recessive	5-7	NO	Deletion in the <i>NHEJ1</i> gene
	- staphyloma/coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- optic nerve coloboma				
D.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	8, 9	NO	Mutation of the <i>prcd</i> gene

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### C. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is

caused by a 7799 base pair deletion with the gene NHEJ1. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

#### **D. Retinal Atrophy – prcd**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Lancashire Heeler is prcd which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (prcd) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Sargan DR, Withers D, Pettitt L, et al. Mapping the mutation causing lens luxation in several terrier breeds. *J Hered.* 2007;98:534-538. PMID: 17573382 \*\*reference derived from non-USA dog population\*\*
3. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010;51:4716-4721. PMID: 20375329
4. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384. PMID: 22050825
5. Bedford PG. Collie eye anomaly in the Lancashire Heeler. *Vet Rec.* 1998;143:354-356. PMID: 9800301 \*\*reference derived from non-USA dog population\*\*
6. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res.* 2007;17:1562-1571. PMID: 17916641
7. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. *Genomics.* 2003;82:86-95. PMID: 12809679
8. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. *PLoS One.* 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650
9. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT LANCASHIRE HEELER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	0.7%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	2	3.4%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			59	38.8%	7	12.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	1.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	10	17.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.7%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>0.7%</b>	<b>0</b>	<b>0.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	1.3%	1	1.7%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	2.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	1.3%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.7%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.7%	0	0.0%
<b>OTHER</b>						
900.100 OTHER, SUSPECT INHERITED			0	0.0%	1	1.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.7%	3	5.2%
<b>NORMAL</b>						
.000 NORMAL GLOBE			102	67.1%	36	62.1%

## LAPPONIAN HERDER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>prcd</i>	Autosomal recessive	2	NO	Mutation of the <i>prcd</i> gene
	- <i>IFT122</i>	Autosomal recessive	3	NO	Mutation in <i>IFT122</i> gene
B.	Multifocal retinopathy - <i>cmr3</i>	Autosomal recessive	4	NO (Breeder option with Normal DNA test for CMR)	Mutation of the <i>BEST1</i> gene
C.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	5	NO	Mutation in the <i>NHEJ1</i> gene

### Description and Comments

#### A. Retinal atrophy

##### – generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### - *prcd*

Studies have shown that the principal form of PRA in the Lapponian Herder is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

##### - *IFT122*

Retinal atrophy in the Lapponian Herder also occurs as an autosomal recessive disorder due to a mutation in the gene *IFT122*. The disease is late onset, occurring at 1-5 years of age and possible later, but usually definitively evident by 9 years of age. Progression is slow, with some dogs retaining vision for up to 13 years. Clinical findings include nyctalopia, diffuse tapered hyper-reflectivity and retinal vessel attenuation.

## B. Multifocal retinopathy (*cmr3*)

Canine Multifocal Retinopathy type 3 (*cmr3*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Clinically the disease is similar to that seen in the Bullmastiff and Coton de Tulear, but the mutation in the Bestrophin 1 gene (*BEST1* alias *VMD2*) is different. The multifocal retinopathy seen in the Lapponian Herder is caused by a deletion at position 1,388 and a substitution at position 1,466 and is therefore called *cmr3*. A DNA test is available.

The breeding advice for Coton de Tulear, Lapponian Herders, and Mastiffs diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

## C. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Lapponian Herder. The conditions listed above are currently noted solely due to the availability of a genetic test for the disease.

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425
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- JA, Yoshihara M, Kere J, Lohi H. A missense variant in IFT122 associated with a canine model of retinitis pigmentosa. *Hum Genet.* 2021 Nov;140(11):1569-1579. doi: 10.1007/s00439-021-02266-3. Epub 2021 Feb 19. PMID: 33606121 \*\*reference derived from non-USA dog population\*\*
4. Zangerl B, Wickstrom K, Slavik J, et al. Assessment of canine BEST1 variations identifies new mutations and establishes an independent bestrophinopathy model (cmr3). *Mol Vis.* 2010;16:2791-2804. PMID: 21197113
5. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

# **OCULAR DISORDERS REPORT** **LAPPONIAN HERDER**

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	2 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	1	50.0%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	1	50.0%

## **LARGE MUNSTERLANDER**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the LARGE MUNSTERLANDER breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## LARGE MUNSTERLANDER

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	0		2	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		0		2	100.0%

## LEONBERGER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
E.	Uveal cysts	Not defined	1	Breeder option
F.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined		Passes with no notation
G.	Cataract	Not defined	1, 2	NO
H.	Persistent hyaloid artery remnant	Not defined	1	Breeder option
I.	Retinal dysplasia			
	– folds	Not defined	1	Breeder option

### Description and Comments

#### A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding

dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **D. Nictitans cartilage anomaly/eversion**

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

#### **E. Uveal cysts**

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

#### **F. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **G. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **H. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

#### **I. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Heinrich CL, Lakhani KH, Featherstone HJ, et al. Cataract in the UK Leonberger population. *Vet*

*Ophthalmol.* 2006 Sep-Oct;9:350-356. PMID: [16939464](#) \*\*reference derived from non-USA dog population\*\*

## OCULAR DISORDERS REPORT LEONBERGER

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	2,078		726	
		#	%	#	%	
EYELIDS						
20.160	MACROPALPEBRAL FISSURE	35	1.7%	0	0.0%	
21.000	ENTROPION, UNSPECIFIED	70	3.4%	33	4.5%	
22.000	ECTROPION, UNSPECIFIED	29	1.4%	13	1.8%	
25.110	DISTICHIASIS	51	2.5%	16	2.2%	
NASOLACRIMAL						
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	1	0.0%	0	0.0%	
NICTITANS						
51.100	THIRD EYELID CARTILAGE ANOMALY	30	1.4%	15	2.1%	
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	1	0.1%	
CORNEA						
70.700	CORNEAL DYSTROPHY	5	0.2%	0	0.0%	
UVEA						
93.110	IRIS HYPOPLASIA	1	0.0%	1	0.1%	
93.120	IRIS CYST	17	0.8%	4	0.6%	
93.170	ANTERIOR CHAMBER CYST	1	0.0%	4	0.6%	
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	446	21.5%	179	24.7%	
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.1%	1	0.1%	
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.0%	0	0.0%	
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%	
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	14	0.7%	7	1.0%	
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.0%	1	0.1%	
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%	
95.120	CILIARY BODY CYST	0	0.0%	1	0.1%	
LENS						
100.200	CATARACT, UNSPECIFIED	2	0.1%	0	0.0%	
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	166	8.0%	69	9.5%	
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	38	1.8%	32	4.4%	
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	31	1.5%	9	1.2%	
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.2%	1	0.1%	
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	11	0.5%	2	0.3%	
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	17	0.8%	5	0.7%	
100.306	PUNCTATE CATARACT, NUCLEUS	19	0.9%	22	3.0%	
100.307	PUNCTATE CATARACT, CAPSULAR	26	1.3%	21	2.9%	
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	11	0.5%	8	1.1%	
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	36	1.7%	7	1.0%	
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	2	0.1%	1	0.1%	
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	5	0.2%	1	0.1%	
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.5%	4	0.6%	
100.316	INCIPIENT CATARACT, NUCLEUS	22	1.1%	17	2.3%	
100.317	INCIPIENT CATARACT, CAPSULAR	8	0.4%	6	0.8%	
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.1%	
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	3	0.4%	
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%	
100.328	Y-SUTURE TIP OPACITIES	8	0.4%	3	0.4%	
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.2%	0	0.0%	
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.3%	1	0.1%	
100.345	SIGNIFICANT CATARACTS (SUMMARY)	249	12.0%	141	19.4%	
VITREOUS						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	4	0.2%	8	1.1%	
110.135	PHPV/ PTVL	5	0.2%	0	0.0%	
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%	

## OCULAR DISORDERS REPORT LEONBERGER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,078		2018-2022 726	
			#	%	#	%
<b>VITREOUS Continued</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			4	0.2%	2	0.3%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	6	0.8%
130.110 MICROPAPILLA			0	0.0%	1	0.1%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			13	0.6%	4	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			4	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			5	0.2%	0	0.0%
120.960 RETINOPATHY			1	0.0%	1	0.1%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA			1	0.0%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			32	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED			53	2.6%	3	0.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			32	1.5%	47	6.5%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1,335	64.2%	375	51.7%

## LHASA APSO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Cataract	Not defined	2	NO	
C.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>IMPG2</i>	Autosomal recessive	3	NO	Mutation in the <i>IMPG2</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Retinal atrophy

##### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### - *IMPG2*

An autosomal recessive mutation in *IMPG2*, previously known as PRA-type 4, has been described in Lhasa Apsos with retinal atrophy in the United Kingdom. The exact age of onset is unknown and clinical progression has not yet been described. Diagnosed cases ranged in age from 1-12 years, with a median of 7 years of age. Dogs with this mutation have bilateral tapetal hyper-reflectivity with vascular attenuation. Secondary cataracts are also possible. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005;8:101-111. PMID: 32894063
3. Hitti-Malin RJ, Burmeister LM, Ricketts SL, Lewis TW, Pettitt L, Boursnell M, Schofield EC, Sargan D, Mellersh CS. A LINE-1 insertion situated in the promoter of IMPG2 is associated with autosomal recessive progressive retinal atrophy in Lhasa Apso dogs. *BMC Genet*. 2020 Sep 7;21(1):100. doi: 10.1186/s12863-020-00911-w. PMID: 32894063; PMCID: PMC7487703. \*\*reference derived from non-USA dog population\*\*

## OCULAR DISORDERS REPORT LHASA APSO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			1	0.1%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			3	0.4%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			12	1.4%	2	1.7%
25.110 DISTICHIASIS			33	4.0%	2	1.7%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.4%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			4	0.5%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			8	1.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			21	2.5%	2	1.7%
70.700 CORNEAL DYSTROPHY			16	1.9%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.1%	0	0.0%
93.120 IRIS CYST			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			10	1.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	1	0.8%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.8%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			6	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			28	3.4%	1	0.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	0.8%	1	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	0.6%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.1%	1	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			13	1.6%	3	2.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			15	1.8%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			4	0.5%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.5%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.4%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	2	1.7%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.1%	1	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT			18	2.2%	1	0.8%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>83</b>	<b>10.0%</b>	<b>8</b>	<b>6.8%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			4	0.5%	1	0.8%
110.320 VITREOUS DEGENERATION SYNERESIS			6	0.7%	1	0.8%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			5	0.6%	2	1.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			3	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			7	0.8%	0	0.0%

## OCULAR DISORDERS REPORT LHASA APSO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		833		118	
		#	%	#	%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.100	OTHER, NOT INHERITED	12	1.4%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	21	2.5%	3	2.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	641	77.0%	96	81.4%

# LLEWELLYN SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	2	NO

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## Description and Comments

### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT LLEWELLYN SETTER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	30 #	%
<b>EYELIDS</b>					
22.000	ECTROPION, UNSPECIFIED	0	0.0%	1	3.3%
25.110	DISTICHIASIS	0	0.0%	1	3.3%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	1	3.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	0	0.0%	2	6.7%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	0	0.0%	1	3.3%
100.306	PUNCTATE CATARACT, NUCLEUS	0	0.0%	1	3.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	3.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	0	0.0%	1	3.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	0	0.0%	1	3.3%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	5	16.7%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	0	0.0%	9	30.0%
<b>OTHER</b>					
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	0	0.0%	2	6.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1	100.0%	19	63.3%

## LOUISIANA CATAHOULA LEOPARD DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT LOUISIANA CATAHOULA LEOPARD DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 397		2018-2022 89	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	1.3%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			3	0.8%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	1.1%
70.700 CORNEAL DYSTROPHY			1	0.3%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			4	1.0%	1	1.1%
93.150 IRIS COLOBOMA			12	3.0%	1	1.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			41	10.3%	10	11.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	1	1.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.3%	2	2.2%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.3%	1	1.1%
97.120 COLOBOMA			2	0.5%	0	0.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	2	2.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	1.3%	2	2.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	1	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.3%	2	2.2%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			4	1.0%	2	2.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	0.8%	1	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	1.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.3%	1	1.1%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.3%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>13</b>	<b>3.3%</b>	<b>10</b>	<b>11.2%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.5%	0	0.0%
110.135 PHPV/ PTVL			0	0.0%	1	1.1%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.5%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			9	2.3%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			2	0.5%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			1	0.3%	0	0.0%
<b>OPTIC NERVE</b>						
130.150 OPTIC DISC COLOBOMA			2	0.5%	2	2.2%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			4	1.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			12	3.0%	3	3.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			325	81.9%	65	73.0%

## LOWCHEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Not defined	1	NO
D.	Vitreous degeneration			
	- syneresis	Not defined	1	Breeder option
E.	Retinal atrophy			
	- generalized	Not defined	1	NO

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**D. Vitreous degeneration - syneresis**

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma.

**E. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT LOWCHEN

Year Examined: Total # Dogs:		1993-2017 1,786		2018-2022 527	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	82	4.6%	46	8.7%
<b>NASOLACRIMAL</b>					
40.910	KERATOCONJUNCTIVITIS SICCA	1	0.1%	0	0.0%
<b>CORNEA</b>					
70.210	PANNUS	1	0.1%	0	0.0%
70.700	CORNEAL DYSTROPHY	0	0.0%	1	0.2%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	2	0.1%	0	0.0%
<b>UVEA</b>					
93.120	IRIS CYST	1	0.1%	0	0.0%
93.150	IRIS COLOBOMA	1	0.1%	2	0.4%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	139	7.8%	88	16.7%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	3	0.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	9	0.5%	16	3.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	2	0.1%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	0.4%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	21	1.2%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	58	3.2%	16	3.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	13	0.7%	7	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	13	0.7%	1	0.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	4	0.2%	3	0.6%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	2	0.1%	1	0.2%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.4%	1	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.2%	2	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	22	1.2%	4	0.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	24	1.3%	3	0.6%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.4%	2	0.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	2	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	4	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	1	0.1%	1	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	2	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	2	0.1%	2	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	16	0.9%	1	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	2	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	147	8.2%	27	5.1%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.2%	3	0.6%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.2%	2	0.4%
110.320	VITREOUS DEGENERATION SYNERESIS	49	2.7%	8	1.5%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.2%	0	0.0%

## OCULAR DISORDERS REPORT LOWCHEN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,786		2018-2022 527	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	40	2.2%	1	0.2%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	5	0.3%	1	0.2%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	13	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	39	2.2%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	12	0.7%	9	1.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,425	79.8%	351	66.6%

## LUCAS TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1, 2	NO	Mutation of the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Lucas Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.
2. Gould D, Pettitt L, McLaughlin B, Holmes N, Forman O, Thomas A, Ahonen S, Lohi H, O'Leary C, Sargan D, Mellersh C. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011 Nov;14(6):378-84. doi: 10.1111/j.1463-5224.2011.00892.x. Epub 2011 Aug 3. PMID: 22050825.

## OCULAR DISORDERS REPORT LUCAS TERRIER

**There are no statistics available for this breed**

## MAGYAR AGAR

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the MAGYAR AGAR breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT  
MAGYAR AGAR

Diagnostic Name	Year Examined:		1993-2017		2018-2022	
	Total # Dogs:		#	%	#	%
NORMAL			4		2	
.000 NORMAL GLOBE			5	125.0%	2	100.0%

## MALTESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Cataract	Not defined	2	NO

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### Description and Comments

#### A. Entropion

A conformational defect resulting in inversion of the eyelid margin which may cause ocular irritation. It is likely that entropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents, and conformation of the skull.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005 Mar-Apr;8(2):101-11. doi: 10.1111/j.1463-5224.2005.00352.x. PMID: 15762923.

## OCULAR DISORDERS REPORT MALTESE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 420		2018-2022 286	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.2%	2	0.7%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.3%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			6	1.4%	7	2.4%
25.110 DISTICHIASIS			12	2.9%	5	1.7%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.5%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.5%	2	0.7%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			3	0.7%	2	0.7%
70.700 CORNEAL DYSTROPHY			2	0.5%	1	0.3%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			19	4.5%	4	1.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	1	0.3%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.3%
95.120 CILIARY BODY CYST			1	0.2%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			17	4.0%	6	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			5	1.2%	5	1.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	1.2%	2	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.7%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	1.0%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.2%	1	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.2%	1	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			9	2.1%	12	4.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	2.1%	2	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	0.7%	1	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.2%	2	0.7%
100.316 INCIPIENT CATARACT, NUCLEUS			2	0.5%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.2%	1	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.2%	1	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.2%	1	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.5%	2	0.7%
100.330 GENERALIZED/ COMPLETE CATARACT			4	1.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>52</b>	<b>12.4%</b>	<b>30</b>	<b>10.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	1	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.5%	1	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS			12	2.9%	2	0.7%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			3	0.7%	1	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			5	1.2%	1	0.3%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	0.3%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			5	1.2%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.3%

# OCULAR DISORDERS REPORT MALTESE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		8	1.9%	0	0.0%
900.100 OTHER, NOT INHERITED		6	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		8	1.9%	9	3.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		324	77.1%	226	79.0%

# MANCHESTER TERRIER

Standard & Toy Varieties

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - lens pigment foci/ no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy - ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation of the <i>prcd</i> gene

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### C. Retinal Atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Manchester Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and

distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT MANCHESTER TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			255		169	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	0.4%	0	0.0%
<b>CORNEA</b>						
70.730 CORNEAL ENDOTHELIAL DEGENERATION			0	0.0%	1	0.6%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.4%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			17	6.7%	2	1.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	2.0%	11	6.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.8%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			10	3.9%	6	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.4%	3	1.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	1.2%	1	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.8%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.8%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	1.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.8%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.4%	4	2.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	0.8%	1	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			4	1.6%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.4%	1	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR			4	1.6%	1	0.6%
100.328 Y-SUTURE TIP OPACITIES			2	0.8%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>25</b>	<b>9.8%</b>	<b>12</b>	<b>7.1%</b>
<b>VITREOUS</b>						
110.135 PHPV/ PTVL			3	1.2%	1	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	1.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			4	1.6%	1	0.6%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.8%	0	0.0%
120.960 RETINOPATHY			1	0.4%	0	0.0%
<b>FUNDUS</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.6%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	2.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	1.6%	8	4.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			210	82.4%	140	82.8%

## MAREMMA SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
C.	Chronic superficial keratitis/pannus	Not defined	1	NO
D.	Cataract	Not defined	1	NO
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans. This has been reported in the Italian population of the breed.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. This has been reported in the Italian population of the breed.

**E. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined. This has been reported in the Italian population of the breed.

**References**

1. Guandalini A, Di Girolamo N, Santillo D, Andreani V, Corvi R, Bandini M, and Peruccio C. (2017) Epidemiology of ocular disorders presumed to be inherited in three large Italian dog breeds in Italy. *Vet Ophthalmol*, 20: 420-426. doi:10.1111/vop.12442. \*\*This single reference is from non-USA dog population. \*\*

## OCULAR DISORDERS REPORT MAREMMA SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	7.4%	1	10.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	11.1%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	3.7%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	3.7%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	10.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>7.4%</b>	<b>0</b>	<b>0.0%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			1	3.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	3.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	10.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			21	77.8%	8	80.0%

## MARKIESJE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1	NO	Mutation of the <i>prcd</i> gene

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### Description and Comments

#### A. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Markiesje is *prcd*, which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Markiesje breed. The condition listed above is currently noted solely due to the availability of a genetic test for the disease. \*\*Genetic test available; no references\*\*

## OCULAR DISORDERS REPORT MARKIESJE

**There are no statistics available for this breed**

# MASTIFF

(English)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Ectropion	Not defined	1	Breeder option	
C.	Distichiasis	Not defined	1	Breeder option	
D.	Uveal cysts	Not defined	1	Breeder option	
E.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- endothelial opacity/no strands	Not defined	1	NO	
F.	Cataract	Not defined	1	NO	
G.	Retinal atrophy ( <i>RHO</i> )	Autosomal dominant	1, 2, 3	NO	Mutation of the <i>RHO</i> gene
H.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	4	NO (Breeder option with Normal DNA test for CMR)	Mutation of the <i>BEST1</i> gene
I.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

## Description and Comments

### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion in the Mastiff is severe and may require multiple surgical corrections.

### B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures

which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

### **C. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### **D. Uveal cysts**

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

### **E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Mastiff, the strands often bridge from the iris to the cornea and may potentially cause vision impairment. Thus, the strong recommendations against breeding animals with any form of this abnormality.

### **F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **G. Retinal atrophy - *RHO***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. The ERG is normal at 3-6 months of age, but abnormal by 13 months of age. Increased exposure to bright light causes more rapid loss of neurons. PRA in the Mastiff is inherited as an autosomal dominant trait. The mutation is a single nucleotide transversion of the *RHO* gene. A DNA test is available.

### **H. Multifocal retinopathy**

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

### **I. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Kijas JW, Miller BJ, Pearce-Kelling SE, et al. Canine models of ocular disease: outcross breedings define a dominant disorder present in the English mastiff and bull mastiff dog breeds. *J Hered.* 2003;94:27-30.
3. Miyadera K, Acland GM, Aguirre GD. Genetic and phenotypic variations of inherited retinal diseases in dogs: the power of within- and across-breed studies. *Mamm Genome.* 2012;23:40-61.
4. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci.* 2007;48:1959-1967.

# OCULAR DISORDERS REPORT MASTIFF

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 9,196		2018-2022 750	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			22	0.2%	0	0.0%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			344	3.7%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			401	4.4%	76	10.1%
22.000 ECTROPION, UNSPECIFIED			652	7.1%	64	8.5%
25.110 DISTICHIASIS			93	1.0%	5	0.7%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			4	0.0%	3	0.4%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			12	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			19	0.2%	2	0.3%
<b>CORNEA</b>						
70.210 PANNUS			3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			4	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			39	0.4%	2	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			51	0.6%	2	0.3%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.120 IRIS CYST			88	1.0%	9	1.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			7	0.1%	0	0.0%
93.150 IRIS COLOBOMA			3	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			10	0.1%	4	0.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			285	3.1%	30	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			61	0.7%	3	0.4%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			468	5.1%	20	2.7%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			19	0.2%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			8	0.1%	3	0.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			51	0.6%	10	1.3%
93.810 UVEAL MELANOMA			3	0.0%	0	0.0%
95.120 CILIARY BODY CYST			4	0.0%	2	0.3%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	23	3.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			19	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			423	4.6%	28	3.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			99	1.1%	22	2.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			16	0.2%	3	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			8	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			15	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			16	0.2%	2	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			20	0.2%	6	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR			23	0.3%	7	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			77	0.8%	4	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			43	0.5%	2	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			23	0.3%	3	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			8	0.1%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			6	0.1%	2	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			41	0.4%	10	1.3%
100.317 INCIPIENT CATARACT, CAPSULAR			11	0.1%	4	0.5%

## OCULAR DISORDERS REPORT MASTIFF

Year Examined: Total # Dogs:		1993-2017 9,196		2018-2022 750	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	3	0.4%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	2	0.3%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	7	0.1%	3	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	40	0.4%	1	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	5	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>475</b>	<b>5.2%</b>	<b>73</b>	<b>9.7%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	9	0.1%	2	0.3%
110.135	PHPV/ PTVL	5	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	10	0.1%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	668	7.3%	21	2.8%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	51	0.6%	2	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	5	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	151	1.6%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	4	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	9	0.1%	1	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	4	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	2	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	4	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	59	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	169	1.8%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	107	1.2%	32	4.3%
<b>NORMAL</b>					
.000	NORMAL GLOBE	6,262	68.1%	469	62.5%

## MC NAB

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the MC NAB breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT MC NAB

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0 #	%	9 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0		1	11.1%
<b>FUNDUS</b> 97.110 CHOROIDAL HYPOPLASIA		0		1	11.1%
<b>NORMAL</b> .000 NORMAL GLOBE		0		8	88.9%

## MI-KI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
	- anterior chamber	Not defined	1	Breeder option	
E.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 2	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

### E. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Mi-Ki is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

# OCULAR DISORDERS REPORT

## MI-KI

Year Examined: Total # Dogs:		1993-2017 1,587		2018-2022 256	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	2	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	11	0.7%	0	0.0%
25.110	DISTICHIASIS	223	14.1%	35	13.7%
<b>NASOLACRIMAL</b>					
40.910	KERATOCONJUNCTIVITIS SICCA	4	0.3%	0	0.0%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	3	0.2%	1	0.4%
<b>CORNEA</b>					
70.210	PANNUS	1	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	3	0.2%	3	1.2%
70.700	CORNEAL DYSTROPHY	27	1.7%	1	0.4%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	185	11.7%	16	6.3%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	3	0.2%	0	0.0%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	1	0.1%	0	0.0%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	133	8.4%	10	3.9%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	10	0.6%	1	0.4%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	8	0.5%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	51	3.2%	3	1.2%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	2	0.1%	1	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	0.3%	3	1.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	7	0.4%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.8%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	23	1.4%	3	1.2%
100.316	INCIPIENT CATARACT, NUCLEUS	4	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	13	0.8%	0	0.0%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	132	8.3%	11	4.3%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	2	0.8%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	40	2.5%	3	1.2%
110.320	VITREOUS DEGENERATION SYNERESIS	105	6.6%	9	3.5%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	13	0.8%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	9	0.6%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	7	0.4%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	12	0.8%	0	0.0%

## OCULAR DISORDERS REPORT MI-KI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		2	0.1%	1	0.4%
130.120 OPTIC NERVE HYPOPLASIA		2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA		2	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		24	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED		57	3.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		48	3.0%	19	7.4%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,003	63.2%	176	68.8%

## MINIATURE AMERICAN SHEPHERD (AKC)/MINIATURE AUSTRALIAN SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

**\*\*Due to the breed's ancestry, most of the references cited here are for the Australian Shepherd. The examiner may also find the Australian Shepherd page as a helpful reference for other conditions that may occur but are not yet reported in the Miniature American Shepherd/Miniature Australian Shepherd.**

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	2-6	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Iris Coloboma	Not defined	1	NO	
E.	Iris hypoplasia	Not defined	1	Breeder option	
F.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
G.	Cataract				
	- <i>HSF4</i>	Autosomal co-dominant	1, 7, 8	NO	Mutation of the <i>HSF4</i> gene
H.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- ( <i>prcd</i> )	Autosomal recessive	1, 9	NO	Mutation of the <i>prcd</i> gene
I.	Cone degeneration	Autosomal recessive		NO	Mutation of the <i>CNGB3</i> gene
	- day blindness				

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
J.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	10, 11	NO (Breeder option with Normal DNA test for CMR)	Mutation of the <i>BEST1</i> gene
K.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/coloboma	Autosomal recessive	1, 12-14	NO	Mutation of the <i>NHEJ1</i> gene
L.	Coloboma/staphyloma without microphthalmia	Not defined	1	NO	

## Description and Comments

### A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of the closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the eye certification form.

### E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the eye certification form.

## **F. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

## **G. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Australian Shepherd, a mutation in *HSF4* (heat shock transcription factor 4), the HSF4-2 mutation, has been shown to increase the likelihood of cataract formation. The mutation is inherited in a co-dominant manner. Dogs with one copy of the mutation develop bilateral posterior cataracts and homozygotes develop a nuclear cataract that typically progresses to a mature cataract. A DNA test is available for this mutation. Other genetic factors can contribute to cataract formation in this breed and will not be detected by this test.

## **H. Retinal atrophy**

### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

### **- *prcd***

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Australian Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## **I. Cone degeneration - day blindness or hemeralopia**

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day blindness, color blindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. Genetically, the condition results from a mutation in the *CNGB3* gene. A DNA test is available.

## **J. Multifocal retinopathy**

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These

lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression in the initial serous lesions after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs initially exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas, though the retina will continue to degenerate over time thus eventually causing vision impairment.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, Mastiff, Australian Shepherd and other breeds.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e., not a homozygous mutant, for the *BEST1* mutation.

#### **K. Choroidal hypoplasia (Collie Eye Anomaly)**

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

#### **L. Coloboma/staphyloma (unassociated with microphthalmia)**

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

## **References**

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15. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol*. 2007;10:19-22. \*\*reference derived from non-USA dog population\*\*

## OCULAR DISORDERS REPORT

### MINIATURE AMERICAN(AKC)/MINIATURE AUSTRALIAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 15,561		2018-2022 6,487	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			24	0.2%	5	0.1%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			0	0.0%	1	0.0%
25.110 DISTICHIASIS			695	4.5%	206	3.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.0%	2	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.0%	1	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			0	0.0%	1	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			142	0.9%	81	1.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			5	0.0%	2	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			83	0.5%	102	1.6%
93.120 IRIS CYST			0	0.0%	2	0.0%
93.150 IRIS COLOBOMA			303	1.9%	119	1.8%
93.180 IRIS SPHINCTER DYSPLASIA			9	0.1%	9	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,499	9.6%	810	12.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			24	0.2%	13	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			7	0.0%	2	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			9	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.0%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.0%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			6	0.0%	2	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			27	0.2%	17	0.3%
97.120 COLOBOMA			8	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	8	0.1%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.0%
130.110 MICROPAPILLA			0	0.0%	7	0.1%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	2	0.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	5	0.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			180	1.2%	86	1.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			30	0.2%	38	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			14	0.1%	7	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			8	0.1%	9	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			6	0.0%	1	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			35	0.2%	9	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			12	0.1%	21	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			17	0.1%	13	0.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			30	0.2%	17	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			31	0.2%	4	0.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			8	0.1%	9	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.0%	0	0.0%

# OCULAR DISORDERS REPORT

## MINIATURE AMERICAN(AKC)/MINIATURE AUSTRALIAN SHEPHERD

Year Examined: Total # Dogs:		1993-2017 15,561		2018-2022 6,487	
Diagnostic Name		#	%	#	%
LENS Continued					
100.316	INCIPIENT CATARACT, NUCLEUS	7	0.0%	2	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	6	0.0%	14	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	2	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.0%	2	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	1	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	0	0.0%	3	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	1	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	13	0.1%	25	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	6	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		218	1.4%	153	2.4%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	61	0.4%	69	1.1%
110.135	PHPV/ PTVL	15	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	14	0.1%	12	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	63	0.4%	19	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	50	0.3%	9	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.0%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	28	0.2%	1	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	4	0.0%	1	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	75	0.5%	4	0.1%
130.120	OPTIC NERVE HYPOPLASIA	20	0.1%	4	0.1%
130.150	OPTIC DISC COLOBOMA	26	0.2%	5	0.1%
OTHER					
900.000	OTHER, UNSPECIFIED	129	0.8%	0	0.0%
900.100	OTHER, NOT INHERITED	184	1.2%	5	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	139	0.9%	181	2.8%
NORMAL					
.000	NORMAL GLOBE	12,987	83.5%	4,931	76.0%

## MINIATURE BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
	- iris to cornea	Not defined	1	NO	
B.	Cataract	Not defined	1	NO	
C.	Lens luxation	Autosomal recessive	2-4	NO	Mutation of the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Although the total number of Miniature Bull Terriers presented for OFA/CERF examination is not large, the incidence of PPM in this breed is approximately 10% in recent years. Some of these PPM's have been iris to cornea and iris to lens. Considerable discretion should be used before breeding a dog with the latter more severe forms of PPM.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

Two loci with potentially enhancing effects on the *ADAMTS17* mutation are associated with primary lens luxation (PLL) in Australian Miniature Bull Terriers. PLL associated allele of the BICF2G630420272 SNP

increases the risk of PLL in the presence of the ADAMTS17 mutation. Candidate genes in the two regions of interest included CPE on chromosome 15 and CTCF on chromosome 1. The ADAMTS17 mutation is also associated with abnormal foot and nail shapes, pedal hyperkeratosis, and persistent pupillary membranes. Association of the ADAMTS17 mutation with possible pedal skeletal abnormalities in the Miniature Bull Terriers supports primary lens luxation in this breed and Marchesani syndrome-like disease in humans as being homologous diseases.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Komaromy A. Genetics of canine primary glaucomas. *Vet Clin Small Anim.* 2015; 45: 1159-1182.
3. Gharanhkhani P, O'Leary CA, Duffy DL, Kyaw-Tanner M. Potential modifying loci associated with primary lens luxation, pedal hyperkeratosis, and ocular phenotypes in Miniature Bull Terriers. *Invest. Ophthalmol. Vis. Sci.* 2015; 56(13):8288-8296. doi:10.1167/iov.15-18074.
4. Gould D, Pettitt L, McLaughlin B, Holmes N, Forman O, Thomas A, Ahonen S, Lohi H, O'Leary C, Sargan D, Mellersh C. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011 Nov;14(6):378-84. doi: 10.1111/j.1463-5224.2011.00892.x. Epub 2011 Aug 3. PMID: 22050825.

## OCULAR DISORDERS REPORT MINIATURE BULL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,283		2018-2022 91	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	0.2%	1	1.1%
10.000 GLAUCOMA			1	0.1%	0	0.0%
<b>EYELIDS</b>						
22.000 ECTROPION, UNSPECIFIED			1	0.1%	0	0.0%
25.110 DISTICHIASIS			1	0.1%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			6	0.5%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			5	0.4%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			13	1.0%	0	0.0%
<b>UVEA</b>						
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			4	0.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			80	6.2%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			52	4.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			82	6.4%	1	1.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.6%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			8	0.6%	3	3.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			14	1.1%	3	3.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			54	4.2%	4	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			16	1.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.1%	1	1.1%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			8	0.6%	1	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			15	1.2%	1	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			5	0.4%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.1%	1	1.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			12	0.9%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			4	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			51	4.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>70</b>	<b>5.5%</b>	<b>4</b>	<b>4.4%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			4	0.3%	1	1.1%
110.320 VITREOUS DEGENERATION SYNERESIS			20	1.6%	1	1.1%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			3	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			13	1.0%	0	0.0%
120.960 RETINOPATHY			2	0.2%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			12	0.9%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			3	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA			1	0.1%	0	0.0%

# OCULAR DISORDERS REPORT MINIATURE BULL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		9	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED		33	2.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		23	1.8%	1	1.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		953	74.3%	79	86.8%

## MINIATURE PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATION DESCRIBED
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Autosomal recessive	1, 2	NO	Mutation in the <i>HS4-1</i> gene

### Description and Comments

#### A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The condition is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available.

#### D. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT MINIATURE PINSCHER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	0.4%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			3	0.4%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			1	0.1%	0	0.0%
25.110 DISTICHIASIS			5	0.6%	1	0.3%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.2%	0	0.0%
70.220 PIGMENTARY KERATITIS			4	0.5%	2	0.7%
70.700 CORNEAL DYSTROPHY			47	5.5%	12	4.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.2%	0	0.0%
<b>UVEA</b>						
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			26	3.0%	6	2.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			10	1.2%	5	1.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.2%	2	0.7%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.1%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			32	3.7%	6	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	0.8%	4	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			5	0.6%	1	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.4%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.2%	2	0.7%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.2%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			22	2.6%	6	2.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			11	1.3%	1	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	0.4%	1	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	0.3%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.2%	4	1.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	3	1.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	1	0.3%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.8%	1	0.3%
100.340 RESORBING/ HYPERMATURE CATARACT			0	0.0%	1	0.3%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>71</b>	<b>8.3%</b>	<b>27</b>	<b>9.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			5	0.6%	0	0.0%
110.135 PHPV/ PTVL			2	0.2%	0	0.0%

## OCULAR DISORDERS REPORT MINIATURE PINSCHER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 855		2018-2022 289	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	10	1.2%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	36	4.2%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.4%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	12	1.4%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.4%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	2	0.2%	1	0.3%
130.120	OPTIC NERVE HYPOPLASIA	9	1.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	12	1.4%	0	0.0%
900.100	OTHER, NOT INHERITED	26	3.0%	1	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	18	2.1%	19	6.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	635	74.3%	228	78.9%

## MINIATURE SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with congenital cataract	Autosomal recessive	1-4, 16	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Autosomal recessive	1, 5-8, 16	NO	
E.	Retinal dysplasia with Persistent hyperplastic primary vitreous (PHPV)	Autosomal recessive	11	NO	
F.	Retinal atrophy				
	- Type A	X-linked	1, 9, 10, 12	NO	
	- <i>PPT1</i>	Autosomal recessive	13	NO	Mutation in the gene <i>PPT1</i>
G.	Ceroid lipofuscinosis	Presumed autosomal recessive	14, 15	NO	

### Description and Comments

#### A. Microphthalmia with congenital cataract

Congenital nuclear and posterior cortical lens opacities that progress slowly. In some cases, these cataracts appear similar to the congenital cataracts described in "E" below. An associated abnormality in this defect is microphthalmia that is often mild and is accompanied by a 1-3 mm reduction in the axial length of the globe as determined by ultrasonography. The cataracts often do not become mature and cause blindness until the dogs reach 3-5 years of age. Congenital cataracts and microphthalmia are inherited as an autosomal recessive disorder.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

**D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Congenital cataracts in the Miniature Schnauzer are bilateral and appear prior to 6 weeks of age. At this time they may already involve the entire lens. Others will first appear as posterior subcapsular opacities and usually progress to complete cataracts. These congenital cataracts are inherited as an autosomal recessive trait. Later-onset cataracts may represent a genetically distinct entity. There are other types of cataract in the breed which are also likely hereditary.

Note: It is not certain whether A and F are genetically distinct, or different manifestations of the same entity, as eyes affected with cataracts are often smaller than normal.

**E. Retinal dysplasia with persistent hyperplastic primary vitreous (PHPV)**

In the Miniature Schnauzer PHPV is associated with retinal dysplasia in some dogs. In this association it may be unilateral or bilateral and most often manifests as small white posterior lens capsule plaques accompanied by white primary vitreous mass extending to the optic disc. Patent hyaloid arteries and posterior lens capsule vessels may also be present.

**F. Retinal atrophy****- Type A**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most forms of PRA are inherited as recessive traits.

A form of PRA in the Miniature Schnauzer was previously characterized and called photoreceptor dysplasia (now called Type A PRA, known to be X-linked in terms of inheritance). The dysplasia results from the abnormal development of visual cells followed by their degeneration. The disorder appears to affect the generation of an electrical signal within the retinal photoreceptor cells. Although fundus abnormalities usually are not present until 2-3 years of age, abnormalities of the electroretinogram can be demonstrated by 8-10 weeks of age. Clinical signs include mildly impaired night vision and variable rate of progression.

Initial studies suggested a mutation in phosducin was responsible, but this was disproven. This disease is extremely rare. The causative gene for Type A PRA has not been published although a DNA test is available. Another more common autosomal recessive form of PRA appears to be present in the Miniature Schnauzer,

but the causative gene has not yet been determined; it also affects dogs ~2-4 years of age. Lastly, cases of late-onset PRA in the breed are recognized clinically but the inheritance pattern is unknown. (G. Aguirre personal communication 2016).

#### - PPT-1

*PPT1 (HIVP3)* mutations have been identified to segregate with PRA in Miniature Schnauzers. Age of onset is variable, and more than one variant may be causative. Penetrance of the mutation may be incomplete so care should be taken in interpretation of genetic testing results.

#### G. Ceroid lipofuscinosis

An inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease). This disease is very rare.

#### References

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**Commented [1]:** needs to be removed, and references renumbered

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13. Murgiano L, Becker D, Torjman D, Niggel JK, Milano A, Cullen C, Feng R, Wang F, Jagannathan V, Pearce-Kelling S, Katz ML, Leeb T, Aguirre GD. Complex Structural *PPT1* Variant Associated with Non-syndromic Canine Retinal Degeneration. *G3 (Bethesda)*. 2019 Feb 7;9(2):425-437. doi: 10.1534/g3.118.200859. PMID: 30541930; PMCID: PMC6385984.
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## OCULAR DISORDERS REPORT MINIATURE SCHNAUZER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 31,228		2018-2022 5,786	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			23	0.1%	2	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			5	0.0%	9	0.2%
25.110 DISTICHIASIS			638	2.0%	106	1.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	3	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			6	0.0%	2	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			4	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			7	0.0%	5	0.1%
70.700 CORNEAL DYSTROPHY			158	0.5%	20	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			17	0.1%	1	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			2	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			1	0.0%	1	0.0%
93.120 IRIS CYST			1	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			10	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			518	1.7%	76	1.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			50	0.2%	3	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			81	0.3%	7	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			12	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			111	0.4%	74	1.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			13	0.0%	2	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			4	0.0%	1	0.0%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
130.110 MICROPAPILLA			0	0.0%	2	0.0%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			61	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			642	2.1%	109	1.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			155	0.5%	34	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			62	0.2%	14	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			55	0.2%	5	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			17	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			91	0.3%	28	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			21	0.1%	9	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			51	0.2%	21	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			118	0.4%	27	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			149	0.5%	25	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			70	0.2%	17	0.3%

# OCULAR DISORDERS REPORT MINIATURE SCHNAUZER

Year Examined: Total # Dogs:		1993-2017 31,228		2018-2022 5,786	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	9	0.0%	3	0.1%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	38	0.1%	3	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	29	0.1%	17	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	30	0.1%	13	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	12	0.0%	10	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	18	0.1%	11	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	3	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	2	0.0%	3	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	19	0.1%	12	0.2%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	23	0.1%	17	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	152	0.5%	5	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	2	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>1,163</b>	<b>3.7%</b>	<b>262</b>	<b>4.5%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	44	0.1%	17	0.3%
110.135	PHPV/ PTVL	24	0.1%	1	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	47	0.2%	6	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	141	0.5%	13	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	68	0.2%	2	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	49	0.2%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	32	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	151	0.5%	3	0.1%
120.400	RETINAL HEMORRHAGE	6	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	14	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	0	0.0%
120.960	RETINOPATHY	6	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	49	0.2%	10	0.2%
130.120	OPTIC NERVE HYPOPLASIA	16	0.1%	1	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	158	0.5%	0	0.0%
900.100	OTHER, NOT INHERITED	341	1.1%	1	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	208	0.7%	127	2.2%
<b>NORMAL</b>					
.000	NORMAL GLOBE	28,402	91.0%	5,161	89.2%

## MUDI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

Any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases, or nutritional deficiencies.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT MUDI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 108		2018-2022 254	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	1.9%	1	0.4%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.4%
70.700 CORNEAL DYSTROPHY			0	0.0%	2	0.8%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			10	9.3%	18	7.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	3.7%	6	2.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.9%	7	2.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	4.6%	4	1.6%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.9%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			4	3.7%	2	0.8%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>7</b>	<b>6.5%</b>	<b>15</b>	<b>5.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	1	0.4%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.4%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	3.7%	19	7.5%
<b>NORMAL</b>						
.000 NORMAL GLOBE			88	81.5%	205	80.7%

## MUNSTERLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the MUNSTERLANDER breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT MUNSTERLANDER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	1 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	1	100.0%

## NATIVE AMERICAN INDIAN DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NATIVE AMERICAN INDIAN DOG breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## NATIVE AM. INDIAN DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	1 #	%
<b>LENS</b>					
100.326 INCOMPLETE CATARACT, NUCLEUS		1	100.0%	0	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		1	100.0%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		0	0.0%	1	100.0%

## NATIVE AMERICAN VILLAGE DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NATIVE AMERICAN VILLAGE DOG breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## NATIVE AM. VILLAGE DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	1 #	%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	50.0%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		1	50.0%	1	100.0%

## NEAPOLITAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1,2	Breeder option
B.	Ectropion	Not defined	1	Breeder option

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### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Guandalini A, Di Girolamo N, Santillo D, Andreani V, Corvi R, Bandini M, Peruccio C. Epidemiology of ocular disorders presumed to be inherited in three large Italian dog breeds in Italy. *Vet Ophthalmol.* 2017 Sep;20(5):420-426. doi: 10.1111/vop.12442. Epub 2016 Nov 11. PMID: 27860098. \*\*non-USA dog population\*\*

## OCULAR DISORDERS REPORT NEAPOLITAN MASTIFF

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			80		43	
			#	%	#	%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			14	17.5%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			19	23.8%	16	37.2%
22.000 ECTROPION, UNSPECIFIED			28	35.0%	22	51.2%
25.110 DISTICHIASIS			8	10.0%	3	7.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	1.3%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	1.3%	2	4.7%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			5	6.3%	6	14.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			3	3.8%	0	0.0%
70.700 CORNEAL DYSTROPHY			1	1.3%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			0	0.0%	1	2.3%
<b>UVEA</b>						
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	1.3%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	1.3%	3	7.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	1.3%	2	4.7%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	1.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	1.3%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			3	3.8%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>6</b>	<b>7.5%</b>	<b>3</b>	<b>7.0%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	2.5%	0	0.0%
120.960 RETINOPATHY			1	1.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED			1	1.3%	1	2.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	7.5%	5	11.6%
<b>NORMAL</b>						
.000 NORMAL GLOBE			27	33.8%	9	20.9%

# NEDERLANDSE KOOIKERHONDJE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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## Description and Comments

### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. This has been reported in the Italian population of the breed.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT NEDERLANDSE KOOIKERHONDJE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			125		177	
			#	%	#	%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	2	1.1%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3	2.4%	2	1.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.8%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.6%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			9	7.2%	4	2.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.8%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.8%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	1.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	2.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			3	2.4%	3	1.7%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	0.6%
100.328 Y-SUTURE TIP OPACITIES			1	0.8%	2	1.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>10</b>	<b>8.0%</b>	<b>5</b>	<b>2.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.8%	2	1.1%
110.320 VITREOUS DEGENERATION SYNERESIS			2	1.6%	4	2.3%
<b>RETINA</b>						
120.960 RETINOPATHY			1	0.8%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	5.6%	12	6.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			105	84.0%	153	86.4%

## NEW ZEALAND HUNTAWAY

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NEW ZEALAND HUNTAWAY breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT NEW ZEALAND HUNTAWAY

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>UVEA</b> 93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		1	50.0%	0	
<b>NORMAL</b> .000 NORMAL GLOBE		2	100.0%	0	

## NEWFOUNDLAND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2	NO
B.	Entropion	Not defined	1	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Uveal cysts	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

Some Newfoundlands have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmic examination using a slitlamp biomicroscope and an indirect ophthalmoscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. The inheritance of goniodysgenesis in the Newfoundland is not known. Until the inheritance is determined, control should be directed towards removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny afflicted with glaucoma.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### D. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating

within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **F. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126. \*\*non-USA dog population\*\*

## OCULAR DISORDERS REPORT NEWFOUNDLAND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,297		2018-2022 570	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			6	0.2%	0	0.0%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			128	3.9%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			224	6.8%	42	7.4%
22.000 ECTROPION, UNSPECIFIED			235	7.1%	12	2.1%
25.110 DISTICHIASIS			21	0.6%	2	0.4%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			15	0.5%	3	0.5%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			10	0.3%	5	0.9%
<b>CORNEA</b>						
70.210 PANNUS			1	0.0%	1	0.2%
70.220 PIGMENTARY KERATITIS			2	0.1%	3	0.5%
70.700 CORNEAL DYSTROPHY			1	0.0%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			0	0.0%	2	0.4%
<b>UVEA</b>						
93.120 IRIS CYST			48	1.5%	10	1.8%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			3	0.1%	3	0.5%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			23	0.7%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.2%	2	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			4	0.1%	4	0.7%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			11	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			110	3.3%	16	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			14	0.4%	5	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			14	0.4%	3	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			8	0.2%	2	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			12	0.4%	1	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			4	0.1%	1	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			6	0.2%	5	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			25	0.8%	1	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			93	2.8%	13	2.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			22	0.7%	4	0.7%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			14	0.4%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			14	0.4%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			8	0.2%	3	0.5%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	4	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			5	0.2%	6	1.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	3	0.5%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	2	0.4%
100.328 Y-SUTURE TIP OPACITIES			3	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			38	1.2%	5	0.9%

## OCULAR DISORDERS REPORT NEWFOUNDLAND

Year Examined: Total # Dogs:		1993-2017 3,297		2018-2022 570	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>293</b>	<b>8.9%</b>	<b>60</b>	<b>10.5%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	5	0.2%	1	0.2%
110.135	PHPV/ PTVL	4	0.1%	1	0.2%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	4	0.1%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	28	0.8%	1	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	1	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	1	0.0%	0	0.0%
<b>FUNDUS</b>					
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.2%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	7	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	29	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	73	2.2%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	50	1.5%	20	3.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	2,481	75.3%	440	77.2%

## NORFOLK TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	-endothelial opacity/no strands	Not defined	1	NO	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	2, 3	NO	Mutation in the ADAMTS17 gene
E.	Optic nerve hypoplasia	Not defined	1	NO	

### Description and Comments

#### A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in

*ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

**E. Optic nerve hypoplasia**

A congenital anomaly, which results in a small optic disk diameter and vision loss.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.
3. Komaromy A. Genetics of canine primary glaucomas. *Vet Clin Small Anim.* 2015; 45: 1159-1182.

## OCULAR DISORDERS REPORT NORFOLK TERRIER

Year Examined: Total # Dogs:		1993-2017 1,450		2018-2022 400	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.160	MACROPALPEBRAL FISSURE	1	0.1%	0	0.0%
25.110	DISTICHIASIS	6	0.4%	1	0.3%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.3%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.1%	0	0.0%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	14	1.0%	6	1.5%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	2	0.5%
<b>UVEA</b>					
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	311	21.4%	81	20.3%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	1	0.3%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	4	0.3%	3	0.8%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	10	0.7%	13	3.3%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.1%	7	1.8%
<b>FUNDUS</b>					
97.120	COLOBOMA	1	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.3%
130.110	MICROPAPILLA	0	0.0%	1	0.3%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.3%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	1	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	45	3.1%	9	2.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	5	0.3%	2	0.5%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	5	0.3%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	8	0.6%	2	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.3%	2	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	7	0.5%	6	1.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	16	1.1%	5	1.3%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	6	0.4%	5	1.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	2	0.1%	1	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	5	0.3%	1	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	3	0.8%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.1%	2	0.5%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	1	0.3%
100.330	GENERALIZED/ COMPLETE CATARACT	4	0.3%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	68	4.7%	30	7.5%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	8	0.6%	1	0.3%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	8	0.6%	1	0.3%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	7	0.5%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	10	0.7%	1	0.3%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%

# OCULAR DISORDERS REPORT NORFOLK TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1,450		400	
		#	%	#	%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		11	0.8%	3	0.8%
130.120 OPTIC NERVE HYPOPLASIA		18	1.2%	8	2.0%
130.150 OPTIC DISC COLOBOMA		19	1.3%	1	0.3%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		14	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED		38	2.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		27	1.9%	13	3.3%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,034	71.3%	257	64.3%

## NORRBOTTENSPETS

DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A. Retinal atrophy				
- ( <i>prcd</i> )	Autosomal recessive	1	NO	Mutation of the <i>prcd</i> gene

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### Description and Comments

#### A. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Norrbottenspets is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

- Donner J, Anderson H, Davison S, Hughes AM, Bouirman J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Correction: Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2019 Jan 18;15(1):e1007938. doi: 10.1371/journal.pgen.1007938. Erratum for: PLoS Genet. 2018 Apr 30;14(4):e1007361. PMID: 30657768; PMCID: PMC6338350.

# OCULAR DISORDERS REPORT NORRBOTTENSPETS

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			112		17	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	1.8%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.9%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			7	6.3%	1	5.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.9%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	1.8%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	5.4%	1	5.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	1.8%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.9%	1	5.9%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.9%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			7	6.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			9	8.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.9%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			3	2.7%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	5.9%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>25</b>	<b>22.3%</b>	<b>1</b>	<b>5.9%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	1.8%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	1.8%	0	0.0%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			3	2.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.9%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			84	75.0%	15	88.2%

## NORTH AMERICAN SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NORTH AMERICAN SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT NORTH AMERICAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>VITREOUS</b> 110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		1	16.7%	0	
<b>NORMAL</b> .000 NORMAL GLOBE		5	83.3%	0	

## NORTHERN INUIT

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal dysplasia - folds/geographic/detached (with skeletal defects)	Autosomal recessive	1, 2	NO	Mutation in the COL9A3 gene

### Description and Comments

#### A. Retinal dysplasia - folds or detachment with skeletal defects

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 1 (DRD1) also occurs in the Labrador Retriever. A similar condition, DRD2, occurs in the Samoyed. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration suggesting a semi-dominant mechanism with respect to the eyes. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1 base pair insertion of COL9A3. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Stavinochova R, Hartley C, Burmeister LM, Ricketts SL, Pettitt L, Tetas Pont R, Hitti RJ, Schofield E, Oliver JAC, Mellersh CS. Clinical, histopathological and genetic characterisation of oculoskeletal dysplasia in the Northern Inuit Dog. PLoS One. 2019 Aug 15;14(8):e0220761. doi: 10.1371/journal.pone.0220761. PMID: 31415586; PMCID: PMC6695176. \*\*Reference (2) from non-USA dog population\*\*

# OCULAR DISORDERS REPORT NORTHERN INUIT

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		6 #	%	19 #	%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	2	10.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		0	0.0%	1	5.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		0	0.0%	1	5.3%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>0</b>	<b>0.0%</b>	<b>2</b>	<b>10.5%</b>
<b>NORMAL</b>					
.000 NORMAL GLOBE		6	100.0%	17	89.5%

# NORWEGIAN BUHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract			
	- generalized	Not defined	1, 3	NO
	- pulverulent	Presumed autosomal dominant	2, 3	Breeder option
B.	Y-suture top opacity	Not defined	1	Breeder option

## Description and Comments

### A. Cataract

#### - generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

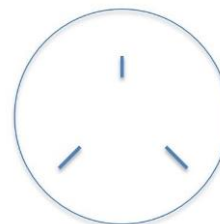
#### - pulverulent

With the pulverulent cataract in the Norwegian Buhund, initial lens changes may be visible as early as 6.5 weeks of age as small dots parallel to the suture lines behind the nucleus. By the age of 4 to 5.5 years, the opacities progress to involve the fetal nucleus which then resembles a ball of candy floss. The adult nucleus and the cortex remain clear. An autosomal dominant mode of inheritance with a high degree of penetrance has been suggested.

Rates of progression of these cataracts can vary, and have been noted to develop in older animals (over the age of 7) that were previously documented to be free from this condition.

### B. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Bjerkas E and Haaland MB. Pulverulent nuclear cataract in the Norwegian Buhund. *J Small Anim Pract.* 1995;36:471-474.
3. Kristiansen E, Revold T, Lingaas F, Narfstrom K, Pedersen PB, Kielland C, Dahl S, Ropstad EO. (2017), Cataracts in the Norwegian Buhund – current prevalence and characteristics. *Vet Ophthalmol*, 20: 460-467. doi.10.1111/vop.12449.

## OCULAR DISORDERS REPORT NORWEGIAN BUHUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 738		2018-2022 347	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.1%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	0.3%	1	0.3%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.3%
70.700 CORNEAL DYSTROPHY			7	0.9%	2	0.6%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.1%	0	0.0%
93.120 IRIS CYST			0	0.0%	1	0.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2	0.3%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.3%	1	0.3%
93.810 UVEAL MELANOMA			0	0.0%	1	0.3%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			84	11.4%	46	13.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			8	1.1%	9	2.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			11	1.5%	6	1.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.1%	1	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.3%	1	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			11	1.5%	11	3.2%
100.306 PUNCTATE CATARACT, NUCLEUS			25	3.4%	17	4.9%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	2	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	0.7%	3	0.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			20	2.7%	10	2.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.3%	1	0.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			10	1.4%	5	1.4%
100.316 INCIPIENT CATARACT, NUCLEUS			16	2.2%	9	2.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.3%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			14	1.9%	3	0.9%
100.330 GENERALIZED/ COMPLETE CATARACT			6	0.8%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>121</b>	<b>16.4%</b>	<b>76</b>	<b>21.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			0	0.0%	4	1.2%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			8	1.1%	3	0.9%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.4%	0	0.0%
120.960 RETINOPATHY			3	0.4%	5	1.4%
120.970 CMR/ CMR-LIKE RETINOPATY			0	0.0%	1	0.3%
<b>FUNDUS</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.6%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.6%
120.960 RETINOPATHY			0	0.0%	1	0.3%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			14	1.9%	0	0.0%
900.100 OTHER, NOT INHERITED			18	2.4%	5	1.4%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			21	2.8%	18	5.2%

# OCULAR DISORDERS REPORT NORWEGIAN BUHUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		544	73.7%	234	67.4%

## NORWEGIAN ELKHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Autosomal recessive	1-6	NO	Mutation of the <i>ADAMS10</i> gene
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- ( <i>prcd</i> )	Autosomal recessive	1	NO	Mutation of the <i>prcd</i> gene
	- Rod dysplasia ( <i>rd</i> )**	Autosomal recessive	7-10	NO	
	- Early retinal degeneration ( <i>erd</i> )**	Autosomal recessive	11-15	NO	Mutation of the <i>STK38L</i> gene
G.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

In the Norwegian Elkhound, glaucoma appears to be familial. In most cases the drainage angle is reported to be open. A mutation has been found in *ADAMTS10* in some Norwegian Elkhounds with glaucoma, but a genetic test is not yet available.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis

should be recorded; breeding discretion is advised.

### **C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **E. Retinal atrophy**

#### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### **- *prcd***

Studies have shown that PRA in the Norwegian Elkhound is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **- rod dysplasia (*rd*)\*\***

Inappropriate development of the visual cells resulting in vision impairment in dim light by 6 months and total blindness at 3-5 years. Ophthalmoscopic signs may be evident after 5 months of age, with signs of retinal vascular thinning after 2 years. An ERG can provide a diagnosis as early as 6 weeks of age. In the Norwegian Elkhound, this is an autosomal recessive trait.

#### **- early retinal degeneration (*erd*)\*\***

Another form of PRA reported in the Norwegian Elkhound. Animals are night blind at 6 weeks and blind by 1 year of age. Clinical signs are evident by 6 months. On histopathologic examination there is an abnormal structural development of the photoreceptors followed by rapid rod/cone degeneration. The mutation is found in the *STK38L* gene and is inherited as an autosomal recessive trait. While a DNA test is available, no Norwegian Elkhounds are thought to exist with this mutation anymore.

\*\*Although previously described, these diseases do not exist in the current population after being identified in a small number of dogs and described in the literature.\*\*

### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Ekesten B, Bjerkas E, Kongsengen Kea. Primary glaucoma in the Norwegian Elkhound. *Vet Comp Ophthalmol*. 1997;7:14-18.
3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.
4. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986;188:1028-1030.
5. Ahonen SJ, Kaukonen M, Nussdorfer FD, et al. A novel missense mutation in ADAMTS10 in Norwegian Elkhound primary glaucoma. *PLoS One*. 2014;9:e111941.
6. Martin CL, Wyman M. Primary glaucoma in the dog. *Vet Clin North Am*. 1978;8:257-286.
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8. Aguirre GD, Rubin LF. Progressive retinal atrophy (rod dysplasia) in the Norwegian Elkhound. *J Am Vet Med Assoc*. 1971;158:208-218.
9. Aguirre GD, Rubin LF. An electrophysiologic approach for early diagnosis of progressive retinal atrophy in Norwegian Elkhound. *J Am Anim Hosp Assoc*. 1971;7:136-142.
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11. Acland GM, Aguirre GD. Retinal degenerations in the dog: IV. Early retinal degeneration (erd) in Norwegian Elkhounds. *Exp Eye Res*. 1987;44:491-521.
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13. Ray K, Acland GM, Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci*. 1996;37:783-794.
14. Kukekova AV, Aguirre GD, Acland GM. Cloning and characterization of canine SHARP1 and its evaluation as a positional candidate for canine early retinal degeneration (erd). *Gene*. 2003;312:335-343.
15. Goldstein O, Kukekova AV, Aguirre GD, et al. Exonic SINE insertion in STK38L causes canine early retinal degeneration (erd). *Genomics*. 2010;96:362-368.

# OCULAR DISORDERS REPORT NORWEGIAN ELKHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,659		2018-2022 202	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.2%	0	0.0%
10.000 GLAUCOMA			2	0.1%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			16	0.6%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			5	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			14	0.5%	0	0.0%
25.110 DISTICHIASIS			45	1.7%	2	1.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.1%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			2	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			10	0.4%	2	1.0%
<b>UVEA</b>						
93.120 IRIS CYST			6	0.2%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			37	1.4%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			11	0.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.2%	1	0.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			4	0.2%	5	2.5%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			23	0.9%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			110	4.1%	19	9.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			10	0.4%	5	2.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			10	0.4%	1	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.2%	2	1.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			13	0.5%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.2%	6	3.0%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.1%	3	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			12	0.5%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			39	1.5%	1	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			24	0.9%	2	1.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			8	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			10	0.4%	2	1.0%
100.317 INCIPIENT CATARACT, CAPSULAR			9	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	1	0.5%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.5%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.5%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			4	0.2%	6	3.0%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			4	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>185</b>	<b>7.0%</b>	<b>29</b>	<b>14.4%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			7	0.3%	0	0.0%
110.135 PHPV/ PTVL			2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			8	0.3%	0	0.0%

## OCULAR DISORDERS REPORT NORWEGIAN ELKHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,659		2018-2022 202	
		#	%	#	%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		50	1.9%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		10	0.4%	0	0.0%
120.400 RETINAL HEMORRHAGE		3	0.1%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.0%	0	0.0%
FUNDUS					
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	1	0.5%
OPTIC NERVE					
130.110 MICROPAPILLA		0	0.0%	1	0.5%
130.120 OPTIC NERVE HYPOPLASIA		3	0.1%	0	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		22	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED		32	1.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		21	0.8%	21	10.4%
NORMAL					
.000 NORMAL GLOBE		2,276	85.6%	144	71.3%

## NORWEGIAN LUNDEHUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the NORWEGIAN LUNDEHUND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT NORWEGIAN LUNDEHUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		50 #	%	2 #	%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		13	26.0%	1	50.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		1	2.0%	0	0.0%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		8	16.0%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	2.0%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		2	4.0%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX		2	4.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX		1	2.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES		2	4.0%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT		3	6.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>11</b>	<b>22.0%</b>	<b>0</b>	<b>0.0%</b>
<b>VITREOUS</b>					
110.320 VITREOUS DEGENERATION SYNERESIS		2	4.0%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		1	2.0%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		31	62.0%	1	50.0%

## NORWICH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	2	NO	
D.	Lens luxation	Autosomal recessive	2, 3	NO	Mutation in the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010;51:4716-4721.
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.

## OCULAR DISORDERS REPORT NORWICH TERRIER

Year Examined: Total # Dogs:		1993-2017		2018-2022	
		3,348		567	
Diagnostic Name		#	%	#	%
EYELIDS					
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	24	0.7%	9	1.6%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.1%	0	0.0%
NICTITANS					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	4	0.1%	0	0.0%
CORNEA					
70.700	CORNEAL DYSTROPHY	19	0.6%	4	0.7%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	4	0.1%	0	0.0%
UVEA					
93.120	IRIS CYST	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	186	5.6%	14	2.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	4	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	8	0.2%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	1	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	0.1%	4	0.7%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	5	0.1%	2	0.4%
FUNDUS					
97.120	COLOBOMA	2	0.1%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
LENS					
100.200	CATARACT, UNSPECIFIED	5	0.1%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	78	2.3%	10	1.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	15	0.4%	4	0.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	12	0.4%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	0.1%	3	0.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	9	0.3%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS	4	0.1%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	5	0.1%	2	0.4%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	19	0.6%	3	0.5%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	19	0.6%	5	0.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	13	0.4%	2	0.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	6	0.2%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	14	0.4%	4	0.7%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.0%	4	0.7%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.0%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.1%	0	0.0%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	1	0.0%	3	0.5%
100.330	GENERALIZED/ COMPLETE CATARACT	13	0.4%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.0%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	146	4.4%	28	4.9%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	3	0.1%	0	0.0%
110.135	PHPV/ PTVL	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	11	0.3%	0	0.0%

## OCULAR DISORDERS REPORT NORWICH TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 3,348		2018-2022 567	
		#	%	#	%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		7	0.2%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		4	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		14	0.4%	0	0.0%
120.960 RETINOPATHY		6	0.2%	1	0.2%
OPTIC NERVE					
130.110 MICROPAPILLA		1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		8	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA		3	0.1%	0	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		28	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED		52	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		27	0.8%	10	1.8%
NORMAL					
.000 NORMAL GLOBE		2,978	88.9%	502	88.5%

## NOVA SCOTIA DUCK TOLLING RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Persistent hyaloid artery remnant	Not defined	1	Breeder option	
F.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- ( <i>prcd</i> )	Autosomal recessive	1,5	NO	Mutation of the <i>prcd</i> gene
G.	Choroidal hypoplasia (Collie eye anomaly)	Autosomal recessive	3, 4, 6	NO	Mutation of the <i>NHEJ1</i> gene
	- staphyloma/coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- optic nerve coloboma				

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

In the Nova Scotia Duck Tolling Retriever, many of the PPMs identified on routine screening examinations bridge from the iris to the lens where they are associated with focal cataract. This may result in vision impairment.

**D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**E. Persistent hyaloid artery remnant (PHA)**

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

**F. Retinal atrophy****- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

**- *prcd***

Studies have shown that the principal form of PRA in the Nova Scotia Duck Tolling Retriever is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

**G. Choroidal hypoplasia (Collie eye anomaly)**

- **staphyloma/coloboma**
- **retinal detachment**
- **retinal hemorrhage**
- **optic nerve coloboma**

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie eye anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.
3. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. *Genomics.* 2003;82:86-95.
4. Brown EA, Thomasy SM, Murphy CJ, Bannasch DL. Genetic analysis of optic nerve head coloboma in the Nova Scotia Duck Tolling Retriever identifies discordance with the NHEJ1 intronic deletion (collie eye anomaly mutation). *Vet Ophthalmol.* 2018 Mar;21(2):144-150. doi: 10.1111/vop.12488. Epub 2017 Jul 12. PMID: 28702949; PMCID: PMC5766432.
5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563. PMID: 16938425
6. Marelli SP, Rizzi R, Paganelli A, Bagardi M, Minozzi G, Brambilla PG, Polli M. Genotypic and allelic frequency of a mutation in the *NHEJ1* gene associated with collie eye anomaly in dogs in Italy. *Vet Rec Open.* 2022 Jan 29;9(1):e26. doi: 10.1002/vro2.26. PMID: 35127102; PMCID: PMC8800487. \*\*non-USA dog population\*\*

## OCULAR DISORDERS REPORT NOVA SCOTIA DUCK TOLLING RETRIEVER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 6,018		2018-2022 1,328	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	2	0.2%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
25.110 DISTICHIASIS			741	12.3%	161	12.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	2	0.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			10	0.2%	3	0.2%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			5	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			5	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			161	2.7%	31	2.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			21	0.3%	4	0.3%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			133	2.2%	44	3.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			53	0.9%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.0%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			151	2.5%	106	8.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.0%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	1	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	6	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			18	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			346	5.7%	85	6.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			50	0.8%	15	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			30	0.5%	6	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			18	0.3%	4	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.0%	5	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			19	0.3%	9	0.7%
100.306 PUNCTATE CATARACT, NUCLEUS			33	0.5%	19	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR			31	0.5%	31	2.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			21	0.3%	6	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			36	0.6%	5	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			22	0.4%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			7	0.1%	2	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			12	0.2%	3	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			11	0.2%	9	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.0%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			13	0.2%	29	2.2%

## OCULAR DISORDERS REPORT NOVA SCOTIA DUCK TOLLING RETRIEVER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 6,018		2018-2022 1,328	
		#	%	#	%
<b>LENS Continued</b>					
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.1%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	324	5.4%	115	8.7%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	21	0.3%	10	0.8%
110.135	PHPV/ PTVL	7	0.1%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	1	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	12	0.2%	2	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	50	0.8%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	13	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	97	1.6%	1	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	1	0.0%	1	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	13	0.2%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	13	0.2%	1	0.1%
130.150	OPTIC DISC COLOBOMA	3	0.0%	1	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	98	1.6%	0	0.0%
900.100	OTHER, NOT INHERITED	280	4.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	127	2.1%	81	6.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,474	74.3%	840	63.3%

## OLD ENGLISH SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular anomalies	Not defined	1, 2	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
D.	Cataract	Not defined	1, 3	NO
E.	Retinal dysplasia - folds	Not defined	1	Breeder option
F.	Micropapilla	Not defined	1	Breeder option

### Description and Comments

#### A. Microphthalmia with multiple congenital ocular defects

Microphthalmia is a developmental anomaly in which the eyeball is abnormally small. This is often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina.

Microphthalmia with cataract and retinal abnormalities including retinal detachment, has been reported in litters of Old English Sheepdogs. Lesions were non-progressive. However, blindness did result in some dogs. The mode of inheritance is unknown, but affected dogs should not be bred.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. In one study of 66 interrelated Old English Sheepdogs, an autosomal recessive mode of inheritance was suggested. Retinal detachment was an associated finding in 5/43 affected dogs in this study. The location of the opacity within the lens and the age of onset was highly variable.

**E. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**F. Micropapilla**

A congenital anomaly which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Barrie K. Posterior lenticonus, microphthalmia, cataracts and retinal folds in Old English Sheepdogs. *J Am Anim Hosp Assoc.* 1979;15:715.
3. Koch SA. Cataracts in interrelated Old English Sheepdogs. *J Am Vet Med Assoc.* 1972 Feb 1;160:299-301.

## OCULAR DISORDERS REPORT OLD ENGLISH SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 5,368		2018-2022 993	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			10	0.2%	0	0.0%
10.000 GLAUCOMA			4	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			13	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			2	0.0%	0	0.0%
25.110 DISTICHIASIS			90	1.7%	22	2.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.0%	1	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			21	0.4%	8	0.8%
<b>UVEA</b>						
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			477	8.9%	156	15.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			8	0.1%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			9	0.2%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			10	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.0%	3	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			3	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			0	0.0%	1	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			3	0.1%	1	0.1%
97.120 COLOBOMA			1	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.2%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	0.1%
130.110 MICROPAPILLA			0	0.0%	2	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			35	0.7%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			287	5.3%	67	6.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			71	1.3%	31	3.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			12	0.2%	3	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			11	0.2%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			6	0.1%	6	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			8	0.1%	6	0.6%
100.306 PUNCTATE CATARACT, NUCLEUS			19	0.4%	4	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			21	0.4%	22	2.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			46	0.9%	13	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			46	0.9%	7	0.7%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			18	0.3%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			12	0.2%	1	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			14	0.3%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			33	0.6%	5	0.5%

## OCULAR DISORDERS REPORT OLD ENGLISH SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		5,368		993	
		#	%	#	%
<b>LENS Continued</b>					
100.317	INCIPIENT CATARACT, CAPSULAR	6	0.1%	4	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.1%	1	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	4	0.1%	1	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	2	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	2	0.0%	6	0.6%
100.330	GENERALIZED/ COMPLETE CATARACT	61	1.1%	2	0.2%
100.340	RESORBING/ HYPERMATURE CATARACT	2	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	6	0.1%	1	0.1%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>430</b>	<b>8.0%</b>	<b>112</b>	<b>11.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	17	0.3%	3	0.3%
110.135	PHPV/ PTVL	3	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	26	0.5%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	92	1.7%	3	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	13	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	9	0.2%	0	0.0%
120.960	RETINOPATHY	5	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	18	0.3%	5	0.5%
130.120	OPTIC NERVE HYPOPLASIA	15	0.3%	0	0.0%
130.150	OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	35	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	78	1.5%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	63	1.2%	25	2.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,265	79.5%	691	69.6%

## OLD ENGLISH BULLDOGGE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the OLD ENGLISH BULLDOGGE breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT OLDE ENGLISH BULLDOGGE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			23		18	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			2	8.7%	0	0.0%
25.110 DISTICHIASIS			7	30.4%	3	16.7%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	4.3%	0	0.0%
93.120 IRIS CYST			0	0.0%	1	5.6%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	4.3%	0	0.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	4.3%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	4.3%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	4.3%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	4.3%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>8.7%</b>	<b>0</b>	<b>0.0%</b>
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	5.6%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	5.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	5.6%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	8.7%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			11	47.8%	12	66.7%

## OTTERHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the OTTERHOUND breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT OTTERHOUND

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	8		2	
		#	%	#	%
UVEA					
93.120 IRIS CYST		1	12.5%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	12.5%	0	0.0%
LENS					
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		0	0.0%	1	50.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		0	0.0%	1	50.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		0	0.0%	2	100.0%
NORMAL					
.000 NORMAL GLOBE		7	87.5%	1	50.0%

## PAPILLON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
F.	Retinal atrophy ( <i>CNGB1</i> )	Autosomal recessive	1, 2-5	NO	Mutation in the <i>CNGB1</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases,

persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Nuclear and posterior cortical cataracts have been reported in the Papillon.

#### **E. Vitreous degeneration**

A liquefaction of the vitreous gel, which may predispose to retinal detachment resulting in blindness.

#### **F. Retinal atrophy - *CNGB1***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In one study of 707 dogs in Sweden, an autosomal recessive mode of inheritance was suggested. Clinical onset is reported at 5-6 years of age. In approximately 70% of cases of PRA in the Papillon, a *CNGB1* mutation is present, leading to an abnormal *CNGB1* protein in the rod outer segments. The mode of transmission is autosomal recessive. A genetic test is available.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Haakanson N, Narfstrom K. Progressive retinal atrophy in Papillon dogs in Sweden: A clinical survey. *Prog Vet Comp Ophthalmol*. 1995;5:83.
3. Narfstrom K, Ekestén B. Electroretinographic evaluation of Papillons with and without hereditary retinal degeneration. *Am J Vet Res*. 1998;59:221-226.
4. Ahonen SJ, Arumilli M, Lohi H. A *CNGB1* frameshift mutation in Papillon and Phalene dogs with progressive retinal atrophy. *PLoS One*. 2013;8:e72122.
5. Winkler PA, Ekenstedt KJ, Occelli LM, et al. A large animal model for *CNGB1* autosomal recessive retinitis pigmentosa. *PLoS One*. 2013;8:e72229.

## OCULAR DISORDERS REPORT PAPILLON

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 11,198		2018-2022 1,464	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			9	0.1%	1	0.1%
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			19	0.2%	3	0.2%
25.110 DISTICHIASIS			156	1.4%	30	2.0%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			8	0.1%	2	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	1	0.1%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			5	0.0%	1	0.1%
70.220 PIGMENTARY KERATITIS			2	0.0%	2	0.1%
70.700 CORNEAL DYSTROPHY			117	1.0%	19	1.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			2	0.0%	1	0.1%
93.120 IRIS CYST			4	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			345	3.1%	42	2.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.1%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			9	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			6	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			16	0.1%	6	0.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			6	0.1%	3	0.2%
93.810 UVEAL MELANOMA			0	0.0%	4	0.3%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			0	0.0%	1	0.1%
97.120 COLOBOMA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	4	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	3	0.2%
120.960 RETINOPATHY			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			19	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			369	3.3%	64	4.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			81	0.7%	26	1.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			22	0.2%	8	0.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			12	0.1%	4	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			9	0.1%	4	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			17	0.2%	5	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			32	0.3%	14	1.0%
100.307 PUNCTATE CATARACT, CAPSULAR			22	0.2%	8	0.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			89	0.8%	14	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			54	0.5%	13	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			34	0.3%	8	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			6	0.1%	0	0.0%

# OCULAR DISORDERS REPORT PAPILLON

Year Examined: Total # Dogs:		1993-2017 11,198		2018-2022 1,464	
Diagnostic Name		#	%	#	%
LENS Continued					
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	10	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	23	0.2%	5	0.3%
100.317	INCIPIENT CATARACT, CAPSULAR	13	0.1%	2	0.1%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	3	0.0%	5	0.3%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	3	0.0%	7	0.5%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	1	0.0%	2	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	3	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	7	0.1%	1	0.1%
100.330	GENERALIZED/ COMPLETE CATARACT	45	0.4%	5	0.3%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	5	0.0%	1	0.1%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	498	4.4%	132	9.0%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	42	0.4%	4	0.3%
110.135	PHPV/ PTVL	14	0.1%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	40	0.4%	6	0.4%
110.320	VITREOUS DEGENERATION SYNERESIS	286	2.6%	21	1.4%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	67	0.6%	4	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	14	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	3	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	114	1.0%	4	0.3%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	8	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	1	0.1%
120.960	RETINOPATHY	3	0.0%	1	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	8	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	12	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	3	0.0%	0	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	77	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	204	1.8%	3	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	99	0.9%	62	4.2%
NORMAL					
.000	NORMAL GLOBE	9,630	86.0%	1,176	80.3%

## PARSON RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not define	1	Breeder option	
C.	Cataract	Not defined	1, 2	NO	
D.	Lens luxation	Autosomal recessive	3, 4	NO	Mutation in the <i>ADAMTS17</i> gene
E.	Vitreous degeneration  - syneresis	Not defined	1	Breeder option	
F.	Retinal atrophy - generalized	Not defined	1	NO	
G.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	5	NO	Mutation in the <i>NHEJ1</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

#### **D. Lens luxation**

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation may result in blinding retinal detachment and/or elevated intraocular pressure (glaucoma) causing vision impairment, pain, and blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

#### **E. Vitreous degeneration**

Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

#### **F. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### **G. Choroidal hypoplasia (Collie Eye Anomaly)**

- **staphyloma/coloboma**
- **retinal detachment**
- **retinal hemorrhage**
- **optic nerve coloboma**

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Oberbauer AM, Hollingsworth SR, Belanger JM, et al. Inheritance of cataracts and primary lens luxation in Jack Russell Terriers. *Am J Vet Res*. 2008;69:222-227.
3. Farias FH, Johnson GS, Taylor JF, et al. An *ADAMTS17* splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721.
4. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.
5. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet*. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet*. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.



## OCULAR DISORDERS REPORT PARSON RUSSELL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,784		2018-2022 245	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			69	2.5%	7	2.9%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			14	0.5%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	0.4%
93.120 IRIS CYST			2	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			178	6.4%	32	13.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.0%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			6	0.2%	5	2.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.1%	1	0.4%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			90	3.2%	14	5.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			18	0.6%	10	4.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			10	0.4%	2	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			4	0.1%	2	0.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			10	0.4%	5	2.0%
100.306 PUNCTATE CATARACT, NUCLEUS			7	0.3%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			7	0.3%	4	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			16	0.6%	1	0.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			41	1.5%	4	1.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			7	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			15	0.5%	3	1.2%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			10	0.4%	3	1.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.1%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	3	1.2%
100.330 GENERALIZED/ COMPLETE CATARACT			11	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>166</b>	<b>6.0%</b>	<b>35</b>	<b>14.3%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			5	0.2%	5	2.0%
110.135 PHPV/ PTVL			1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			9	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			36	1.3%	1	0.4%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			9	0.3%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			25	0.9%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT PARSON RUSSELL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,784		2018-2022 245	
		#	%	#	%
<b>RETINA Continued</b>					
120.920 RETINAL DETACHMENT WITH DIALYSIS		1	0.0%	0	0.0%
120.960 RETINOPATHY		1	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		2	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		2	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		39	1.4%	0	0.0%
900.100 OTHER, NOT INHERITED		97	3.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		37	1.3%	20	8.2%
<b>NORMAL</b>					
.000 NORMAL GLOBE		2,388	85.8%	166	67.8%

## PATTERDALE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the <i>ADAMTS17</i> gene

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### Description and Comments

#### A. Lens Luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Patterdale Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384. \*\*non-USA dog population\*\*

## OCULAR DISORDERS REPORT PATTERDALE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		19 #	%	1 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		1	5.3%	0	0.0%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		1	5.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		1	5.3%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		17	89.5%	1	100.0%

## PEKINGESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1-3	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Exposure keratopathy syndrome	Not defined	1	Breeder option
D.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### C. Exposure keratopathy syndrome

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos. Macroblepharon is defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med*.

1976;20:39-67.

3. Gelatt KN. Pediatric ophthalmology in small animal practice. *Vet Clin North Am.* 1973;3:321.
4. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research.* 1974;35:571-574.

# OCULAR DISORDERS REPORT PEKINGESE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 227		2018-2022 118	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.4%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	2	1.7%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.9%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			12	5.3%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			21	9.3%	22	18.6%
22.000 ECTROPION, UNSPECIFIED			2	0.9%	0	0.0%
25.110 DISTICHIASIS			24	10.6%	4	3.4%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.4%	1	0.8%
<b>CORNEA</b>						
70.210 PANNUS			7	3.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			33	14.5%	15	12.7%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			0	0.0%	1	0.8%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			0	0.0%	1	0.8%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.4%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			3	1.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	1.8%	1	0.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	1.3%	1	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.9%	1	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			0	0.0%	2	1.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.4%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	2.2%	1	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	1.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	2.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	1.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.9%	0	0.0%
100.340 RESORBING/ HYPERMATURE CATARACT			0	0.0%	1	0.8%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>28</b>	<b>12.3%</b>	<b>6</b>	<b>5.1%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.4%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.4%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	1.3%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.4%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			1	0.4%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	2.6%	0	0.0%
900.100 OTHER, NOT INHERITED			11	4.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			9	4.0%	11	9.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			124	54.6%	74	62.7%

## PEMBROKE WELSH CORGI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
C.	Cataract	Not defined	1	NO
D.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Persistent pupillary membranes are a significant problem in this breed with frequent documentation of strands bridging from the iris to the cornea noted on routine screening eye examinations. These may be associated with corneal opacity which may result in vision impairment, thus the recommendation against breeding Pembroke Welsh Corgis with PPM.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT PEMBROKE WELSH CORGI

	Year Examined: Total # Dogs:	1993-2017 20,674		2018-2022 4,225	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110 MICROPTHALMIA		19	0.1%	2	0.0%
10.000 GLAUCOMA		1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA		0	0.0%	2	0.0%
<b>EYELIDS</b>					
20.140 ECTOPIC CILIA		3	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED		1	0.0%	0	0.0%
25.110 DISTICHIASIS		352	1.7%	55	1.3%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>					
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		7	0.0%	2	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA		7	0.0%	0	0.0%
<b>NICTITANS</b>					
51.100 THIRD EYELID CARTILAGE ANOMALY		1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID		2	0.0%	0	0.0%
<b>CORNEA</b>					
70.210 PANNUS		3	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS		2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY		66	0.3%	17	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION		70	0.3%	3	0.1%
<b>UVEA</b>					
90.250 PIGMENTARY UVEITIS		0	0.0%	1	0.0%
93.110 IRIS HYPOPLASIA		4	0.0%	2	0.0%
93.120 IRIS CYST		8	0.0%	1	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM		8	0.0%	0	0.0%
93.150 IRIS COLOBOMA		5	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST		3	0.0%	3	0.1%
93.180 IIRIS SPHINCTER DYSPLASIA		1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		3,815	18.5%	749	17.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		68	0.3%	13	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		412	2.0%	46	1.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS		15	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		3	0.0%	1	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		57	0.3%	42	1.0%
95.120 CILIARY BODY CYST		0	0.0%	1	0.0%
<b>FUNDUS</b>					
97.110 CHOROIDAL HYPOPLASIA		5	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	66	1.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	3	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	2	0.0%
120.960 RETINOPATHY		0	0.0%	6	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY		0	0.0%	1	0.0%
<b>LENS</b>					
100.200 CATARACT, UNSPECIFIED		79	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		471	2.3%	102	2.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		80	0.4%	23	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		69	0.3%	14	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX		34	0.2%	11	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES		4	0.0%	1	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		31	0.1%	6	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS		78	0.4%	21	0.5%

## OCULAR DISORDERS REPORT PEMBROKE WELSH CORGI

Year Examined: Total # Dogs:		1993-2017 20,674		2018-2022 4,225	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.307	PUNCTATE CATARACT, CAPSULAR	41	0.2%	26	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	119	0.6%	9	0.2%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	188	0.9%	20	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	72	0.3%	10	0.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.0%	2	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	21	0.1%	3	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	205	1.0%	29	0.7%
100.317	INCIPIENT CATARACT, CAPSULAR	29	0.1%	7	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	8	0.0%	5	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	13	0.1%	3	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	5	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	1	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	20	0.1%	17	0.4%
100.327	INCOMPLETE CATARACT, CAPSULAR	2	0.0%	1	0.0%
100.328	Y-SUTURE TIP OPACITIES	7	0.0%	10	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	77	0.4%	4	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	9	0.0%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	1,182	5.7%	217	5.1%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	74	0.4%	25	0.6%
110.135	PHPV/ PTVL	22	0.1%	4	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	8	0.0%	3	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	91	0.4%	6	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	1,226	5.9%	99	2.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	173	0.8%	12	0.3%
120.190	RETINAL DYSPLASIA, DETACHED	3	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	36	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	7	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	6	0.0%	0	0.0%
120.960	RETINOPATHY	8	0.0%	3	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	6	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	9	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	125	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	313	1.5%	2	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	254	1.2%	109	2.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	14,680	71.0%	2,954	69.9%

## PERRO DE PRESA CANARIO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	1	NO (Breeder option with Normal DNA test for CMR)	Mutation in the <i>CNGB3</i> gene

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### Description and Comments

#### A. Multifocal retinopathy

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

The breeding advice for breeds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the *BEST1* mutation.

### References

1. Yeh CY, Goldstein O, Kukekova AV, Holley D, Knollinger AM, Huson HJ, Pearce-Kelling SE, Acland GM, Komáromy AM. Genomic deletion of CNGB3 is identical by descent in multiple canine breeds and causes achromatopsia. BMC Genet. 2013 Apr 20;14:27. doi: 10.1186/1471-2156-14-27. PMID: 23601474

# OCULAR DISORDERS REPORT

## PERRO DE PRESA CANARIO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		9	%	10	%
<b>GLOBE</b>					
10.000 GLAUCOMA		1	11.1%	0	0.0%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	22.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		1	11.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		1	11.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR		1	11.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		1	11.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>3</b>	<b>33.3%</b>	<b>0</b>	<b>0.0%</b>
<b>OTHER</b>					
900.100 OTHER, NOT INHERITED		1	11.1%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		6	66.7%	10	100.0%

## PERUVIAN INCA ORCHID

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT PERUVIAN INCA ORCHID

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			29 #	%	51 #	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			2	6.9%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	3.4%	1	2.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	3.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	1	2.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	3.4%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	6.9%	2	3.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	3.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	3.4%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	3.4%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	3.4%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	3.4%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	3.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>9</b>	<b>31.0%</b>	<b>3</b>	<b>5.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	1	2.0%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	3.9%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	3	5.9%
120.960 RETINOPATHY			0	0.0%	2	3.9%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	3.4%	0	0.0%
900.100 OTHER, NOT INHERITED			0	0.0%	1	2.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	3.4%	1	2.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			26	89.7%	41	80.4%

## PETIT BASSET GRIFFON VENDEEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma – POAG	Autosomal recessive	2-4	NO	Mutation in the <i>ADAMTS17</i> gene
B.	Corneal dystrophy				
	- endothelial	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to cornea	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	- endothelial opacity/no strands	Not defined	1	NO	
D.	Cataract	Not defined	1	NO	
E.	Lens luxation	Autosomal recessive	4	NO	Mutation in the <i>ADAMTS17</i> gene
F.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

Primary Open Angle Glaucoma (POAG) in the Petit Basset Griffon Vendéen is caused by an inversion with a breakpoint disrupting the *ADAMTS17* gene. Pectinate ligament abnormalities are not present on gonioscopy and the iridocorneal angle remains open. The initial clinical features are noted around 3-4 years and include a small rise in intraocular pressure accompanied by lens subluxation. Retinal degeneration and optic nerve cupping noted in late stages when globe enlargement and vision disruption has occurred. A DNA test is available.

#### B. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does

not occur until the animal is older.

### **C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **E. Lens Luxation**

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### **F. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## **References**

1. ACVO Genetics Committee, 1999 and/or Data from OFA All-Breeds Report, 1991-1998.
2. Forman OP, Pettitt L, Komaromy AM, et al. A Novel Genome-Wide Association Study Approach Using Genotyping by Exome Sequencing Leads to the Identification of a Primary Open Angle Glaucoma Association Inversion Disrupting *ADAMTS17*; PLoS one, 2015: 10(12):e0143546.
3. Jeanes EC, Oliver JAC, Ricketts SL, Gould DJ, Mellersh CS. Glaucoma-causing *ADAMTS17* mutations are also reproducibly associated with height in two domestic dog breeds: selection for short stature may have contributed to increased prevalence of glaucoma. Canine Genet Epidemiol. 2019 May 17;6:5. doi: 10.1186/s40575-019-0071-6. PMID: 31131111; PMCID: PMC6524303. \*\*reference derived from non-USA dog population\*\*
4. Bedford, PGC (2017), Open-angle glaucoma in the Petit Basset Griffon Vendeen. Vet Ophthalmol, 20: 98-102. doi.10.1111/vop.12369. \*\*reference derived from non-USA dog population\*\*

# **OCULAR DISORDERS REPORT** **PETIT BASSET GRIFFON VENDEEN**

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,515		2018-2022 202	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			3	0.1%	1	0.5%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			3	0.1%	0	0.0%
25.110 DISTICHIASIS			11	0.4%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			1	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			17	0.7%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			26	1.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			3	0.1%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.1%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			482	19.2%	29	14.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			36	1.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			215	8.5%	10	5.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			15	0.6%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			19	0.8%	6	3.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			66	2.6%	21	10.4%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			112	4.5%	7	3.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			41	1.6%	4	2.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			7	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.1%	1	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			4	0.2%	1	0.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			18	0.7%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			22	0.9%	2	1.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			25	1.0%	2	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			7	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			6	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.1%	1	0.5%
100.317 INCIPIENT CATARACT, CAPSULAR			13	0.5%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			4	0.2%	2	1.0%
100.330 GENERALIZED/ COMPLETE CATARACT			12	0.5%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			9	0.4%	1	0.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>172</b>	<b>6.8%</b>	<b>13</b>	<b>6.4%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			12	0.5%	1	0.5%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			4	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			9	0.4%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	4	2.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			112	4.5%	2	1.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			11	0.4%	0	0.0%

## OCULAR DISORDERS REPORT PETIT BASSET GRIFFON VENDEEN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2,515		202	
		#	%	#	%
<b>RETINA Continued</b>					
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		3	0.1%	0	0.0%
120.400 RETINAL HEMORRHAGE		2	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		3	0.1%	1	0.5%
130.150 OPTIC DISC COLOBOMA		1	0.0%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		38	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED		77	3.1%	4	2.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		47	1.9%	5	2.5%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,611	64.1%	134	66.3%

## PHARAOH HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	-lens pigment foci	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT PHARAOH HOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 432		2018-2022 133	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			7	1.6%	1	0.8%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			3	0.7%	1	0.8%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.2%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			32	7.4%	12	9.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			11	2.5%	8	6.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.2%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			27	6.3%	6	4.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	1.6%	2	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	2	1.5%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.5%	1	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.2%	1	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR			5	1.2%	2	1.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	0.5%	1	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	0.5%	1	0.8%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	0.7%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			4	0.9%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.2%	1	0.8%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.5%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>34</b>	<b>7.9%</b>	<b>11</b>	<b>8.3%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			0	0.0%	3	2.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			3	0.7%	1	0.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			2	0.5%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	0.7%	0	0.0%
120.960 RETINOPATHY			0	0.0%	3	2.3%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			4	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			7	1.6%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	0.9%	8	6.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			350	81.0%	93	69.9%

## PICARDY SPANIEL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PICARDY SPANIEL breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT PICARDY SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0 #	%	1 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		0		1	100.0%

## PLOTT

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	( <i>prcd</i> )	Autosomal recessive	1-3	NO	Mutation in the <i>prcd</i> gene

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### Description and Comments

#### A. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Plott is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Plott. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650
3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

OCULAR DISORDERS REPORT  
PLOTT

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		5 #	%	4 #	%
NORMAL .000 NORMAL GLOBE		5	100.0%	4	100.0%

## POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT POINTER

Year Examined: Total # Dogs:		1993-2017 749		2018-2022 149	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	5	0.7%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	1	0.1%	0	0.0%
25.110	DISTICHIASIS	4	0.5%	0	0.0%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	10	1.3%	2	1.3%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	1.6%	0	0.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.1%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	20	2.7%	2	1.3%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.1%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.1%	1	0.7%
100.306	PUNCTATE CATARACT, NUCLEUS	4	0.5%	2	1.3%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	3	0.4%	1	0.7%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	0.7%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	0	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.7%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.1%	1	0.7%
100.328	Y-SUTURE TIP OPACITIES	1	0.1%	1	0.7%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	16	2.1%	7	4.7%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	1	0.1%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	7	0.9%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.4%	1	0.7%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2	0.3%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	4	0.5%	1	0.7%
130.120	OPTIC NERVE HYPOPLASIA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	7	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	6	0.8%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	14	1.9%	6	4.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	670	89.5%	134	89.9%

# POLISH LOWLAND SHEEPDOG

(Polski Owczarek Nizinny)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	-epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- rod-cone dysplasia type 1 ( <i>rcd4</i> )	Autosomal recessive	4	NO	Mutation in the <i>C17H2orf71</i> gene
	- late onset (LOPRA)	Autosomal recessive	2	NO	Mutation in the <i>C2orf71</i> gene
F.	Ceroid lipofuscinosis	Not defined	3	NO	

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3

months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **E. Rod-cone dysplasia, type 4 (*rcd4*)**

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available.

A form of PRA, similar to that found in Gordon and Irish setters, has also been found in the the Polish Lowland Sheepdog. This form of PRA has been referred to as late-onset, slowly progressive PRA (LOPRA). Slight vascular attenuation, first seen between 4.5 -6 years of age precedes tapetal hyperreflectivity. All fundic changes were bilaterally symmetric and progressed slowly eventually causing clinical blindness, bilateral complete vascular attenuation, and tapetal hyperreflectivity by 12 years of age, on average. Almost all affected dogs were homozygous for the *rcd4* mutation in *C17H2orf71* gene. A DNA test is available.

#### **F. Ceroid lipofuscinosis**

A systemic metabolic disorder that affects the retina and retinal pigment epithelium with accumulation of lipopigments resulting in retinal degeneration.

#### **Historical Note:**

Central progressive retinal atrophy was previously a condition listed for this breed. However as the condition is no longer identified in the breed, the condition has been removed. Central progressive retinal atrophy was a progressive retinal degeneration in which photoreceptor death occurred secondary to disease of the underlying pigment epithelium. Progression was slow and some animals never lost vision. CPRA occurred in England, but was uncommon elsewhere.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in *C2orf71*. *Anim Genet.* 2012;44:169-177.
3. Narfstrom K, Wrigstad A, Ekesten B, et al. Neuronal ceroid lipofuscinosis: clinical and morphologic findings in nine affected Polish Owczarek Nizinny (PON) dogs. *Vet Ophthalmol.* 2007;10:111-120.
4. Karlakov-Mortensen P, Proschowsky HF, Gao F, Fredholm M. Identification of the mutation causing

progressive retinal atrophy in Old Danish Pointing Dog. Anim Genet. 2018 Jun;49(3):237-241. doi: 10.1111/age.12659. Epub 2018 Apr 6. PMID: 29624701.

## OCULAR DISORDERS REPORT POLISH LOWLAND SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,149		2018-2022 173	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			18	1.6%	6	3.5%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			32	2.8%	8	4.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			78	6.8%	21	12.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			49	4.3%	10	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	1.1%	11	6.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			9	0.8%	1	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.3%	2	1.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.1%	1	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			4	0.3%	2	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			7	0.6%	1	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			4	0.3%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.2%	2	1.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.1%	4	2.3%
100.317 INCIPIENT CATARACT, CAPSULAR			3	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.2%	2	1.2%
100.328 Y-SUTURE TIP OPACITIES			1	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>58</b>	<b>5.0%</b>	<b>27</b>	<b>15.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			10	0.9%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			19	1.7%	2	1.2%
120.960 RETINOPATHY			1	0.1%	0	0.0%
<b>FUNDUS</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.6%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.6%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			5	0.4%	0	0.0%
900.100 OTHER, NOT INHERITED			24	2.1%	1	0.6%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	0.3%	7	4.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			963	83.8%	113	65.3%

## POLISH TATRA SHEEPDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the POLISH TATRA SHEEPDOG breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT POLISH TATRA SHEEPDOG

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	2		0	
		#	%	#	%
LENS					
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	50.0%	0	
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		1	50.0%	0	
100.345 SIGNIFICANT CATARACTS (SUMMARY)		2	100.0%	0	
NORMAL					
.000 NORMAL GLOBE		1	50.0%	0	

## POMERANIAN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Entropion	Not defined	1	Breeder option	
C.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy  - rod-cone dysplasia type 3 ( <i>rcd3</i> )	Autosomal recessive	2	NO	Mutation in the <i>PDE6A</i> gene
	- <i>prcd</i>	Autosomal recessive	2, 3	NO	Mutation in the <i>prcd</i> gene

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward head conformation that minimizes or eliminates the likelihood of the defect.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## **E. Retinal atrophy**

### **- rod-cone dysplasia type 3 (*rcd3*)**

PRA is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (*rcd3*). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

### **Retinal atrophy – *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Pomeranian is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.
3. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

## OCULAR DISORDERS REPORT POMERANIAN

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,338		2018-2022 1,251	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	0.2%	3	0.2%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			9	0.7%	63	5.0%
22.000 ECTROPION, UNSPECIFIED			1	0.1%	0	0.0%
25.110 DISTICHIASIS			56	4.2%	48	3.8%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			0	0.0%	1	0.1%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			2	0.1%	2	0.2%
70.700 CORNEAL DYSTROPHY			3	0.2%	4	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	0.1%
93.150 IRIS COLOBOMA			1	0.1%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			80	6.0%	119	9.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.2%	2	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			4	0.3%	1	0.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.5%	14	1.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	2	0.2%
93.810 UVEAL MELANOMA			1	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			33	2.5%	13	1.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			7	0.5%	9	0.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.1%	2	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.1%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.4%	1	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.1%	3	0.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			13	1.0%	6	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			8	0.6%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			4	0.3%	6	0.5%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			2	0.1%	3	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	4	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT			11	0.8%	1	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT			1	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			0	0.0%	1	0.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>64</b>	<b>4.8%</b>	<b>37</b>	<b>3.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			4	0.3%	1	0.1%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%

## OCULAR DISORDERS REPORT POMERANIAN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,338		2018-2022 1,251	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.3%	5	0.4%
110.320	VITREOUS DEGENERATION SYNERESIS	15	1.1%	4	0.3%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	5	0.4%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	17	1.3%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	0	0.0%
120.960	RETINOPATHY	2	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	2	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	2	0.1%	1	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	10	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	27	2.0%	2	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	16	1.2%	42	3.4%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,097	82.0%	941	75.2%

## POODLE (Standard)

\*Up until 2022, the toy/minature/standard poodle conditions were assessed as a group, therefore statistics prior to this date may not reflect the real incidence within the breed subgroups. From 2021, the Standard Poodle is assessed separately from the Toy & Miniature varieties, and conditions may be added or removed from each page as statistics start to be generated.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 2-4	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 10-20	NO	Mutation in the <i>prcd</i> gene
	- rod-cone dysplasia type 4 ( <i>rcd4</i> )	Autosomal recessive	21	NO	Mutation in the <i>C2orf71</i> gene
H.	Day blindness/retinal degeneration	Autosomal recessive	1	NO	Mutation has not been published
I.	Micropapilla	Not defined	1	Breeder option	

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**B. Corneal Dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

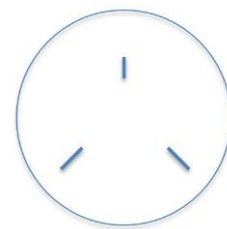
**D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

**E. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

**F. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

**G. Retinal atrophy**

- *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that PRA in the Poodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

#### **- rod-cone dysplasia, type 4 (*rcd4*)**

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

### **H. Day blindness/tetinal degeneration**

An autosomal recessive disorder of standard poodles and 'Doodles' (where the mix-bred dogs are backcrossed to standard poodles that carry the genetic defect); the disease also has been referred to as achromatopsia. The salient clinical findings is profound visual difficulty in bright light, day blindness, with subjective normal night vision. In the early stages of the disease, fundus examination is normal with some dogs showing focal hyperreflectivity of the cone-rich fovea like region of the retina; the photopic ERG is not recordable. In some older dogs, there is progression resulting in poor/absent vision under both dim and bright light conditions, markedly abnormal or non-recordable ERG, and a fundus appearance indicative of late stage retinal degeneration and indistinguishable from progressive retinal atrophy.

### **I. Micropapilla**

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

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## OCULAR DISORDERS REPORT POODLE, STANDARD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 22,284		2018-2022 26,592	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			4	0.0%	0	0.0%
10.000 GLAUCOMA			4	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			0	0.0%	4	0.0%
21.000 ENTROPION, UNSPECIFIED			80	0.4%	72	0.3%
22.000 ECTROPION, UNSPECIFIED			0	0.0%	4	0.0%
25.110 DISTICHIASIS			336	1.5%	412	1.5%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	16	0.1%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			24	0.1%	4	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			8	0.0%	4	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			4	0.0%	0	0.0%
51.100 THIRD EYELID CARTILAGE ANOMALY			44	0.2%	32	0.1%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			4	0.0%	4	0.0%
70.700 CORNEAL DYSTROPHY			116	0.5%	144	0.5%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			12	0.1%	0	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			0	0.0%	4	0.0%
93.110 IRIS HYPOPLASIA			0	0.0%	12	0.0%
93.120 IRIS CYST			8	0.0%	12	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			572	2.6%	620	2.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			8	0.0%	12	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			8	0.0%	4	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			528	2.4%	612	2.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			12	0.1%	16	0.1%
93.810 UVEAL MELANOMA			12	0.1%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1,600	7.2%	1,108	4.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			868	3.9%	564	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			180	0.8%	84	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			192	0.9%	144	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			120	0.5%	84	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			280	1.3%	112	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			132	0.6%	96	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			332	1.5%	312	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			156	0.7%	184	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			124	0.6%	88	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			140	0.6%	112	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			8	0.0%	20	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			40	0.2%	36	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			72	0.3%	56	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			56	0.3%	60	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			20	0.1%	40	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			24	0.1%	24	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			32	0.1%	12	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			16	0.1%	20	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR			8	0.0%	4	0.0%
100.328 Y-SUTURE TIP OPACITIES			168	0.8%	224	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT			20	0.1%	4	0.0%

## OCULAR DISORDERS REPORT POODLE, STANDARD

Year Examined: Total # Dogs:		1993-2017 22,284		2018-2022 26,592	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.340	RESORBING/ HYPERMATURE CATARACT	4	0.0%	4	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>2,824</b>	<b>12.7%</b>	<b>2,060</b>	<b>7.7%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	68	0.3%	32	0.1%
110.135	PHPV/ PTVL	16	0.1%	4	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	12	0.1%	4	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	44	0.2%	60	0.2%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	12	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	8	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
130.110	MICROPAPILLA	0	0.0%	36	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	92	0.4%	72	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	24	0.1%	16	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	8	0.0%	0	0.0%
120.960	RETINOPATHY	32	0.1%	12	0.0%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	4	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	96	0.4%	28	0.1%
130.120	OPTIC NERVE HYPOPLASIA	8	0.0%	0	0.0%
<b>OTHER</b>					
900.100	OTHER, NOT INHERITED	64	0.3%	4	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1,072	4.8%	996	3.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	17,376	78.0%	21,896	82.3%

## POODLE

### (Miniature and Toy varieties)

\*Up until 2022, the toy/miniature/standard poodle conditions were assessed as a group, therefore statistics prior to this date may not reflect the real incidence within the breed subgroups. From 2021, the Standard Poodle is assessed separately from the Toy & Miniature varieties, and conditions may be added or removed from each page as statistics start to be generated.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 2-4	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 5-15	NO	Mutation in the <i>prcd</i> gene
	- rod-cone dysplasia type 4 ( <i>rcd4</i> )	Autosomal recessive	16-20	NO	Mutation in the <i>C2orf71</i> gene *only in Miniatures
H.	Micropapilla	Not defined	1	Breeder option	

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

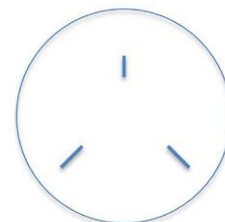
### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

### E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### F. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

### G. Retinal atrophy

- *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that PRA in the Poodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

#### **- Rod-cone dysplasia, type 4 (*rcd4*)**

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

#### **H. Micropapilla**

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
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20. Aguirre GD, Rubin LF. Progressive retinal atrophy in the Miniature Poodle: an electrophysiologic study. *J Am Vet Med Assoc*. 1972;160:191-201.

## OCULAR DISORDERS REPORT POODLE, TOY AND MINIATURE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 13,556		2018-2022 19,796	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			8	0.1%	24	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	4	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			16	0.1%	28	0.1%
21.000 ENTROPION, UNSPECIFIED			12	0.1%	20	0.1%
22.000 ECTROPION, UNSPECIFIED			0	0.0%	4	0.0%
25.110 DISTICHIASIS			1,432	10.6%	2,176	11.0%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	40	0.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			24	0.2%	16	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			4	0.0%	4	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			0	0.0%	8	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			16	0.1%	12	0.1%
70.700 CORNEAL DYSTROPHY			72	0.5%	84	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	8	0.0%
93.120 IRIS CYST			4	0.0%	4	0.0%
93.150 IRIS COLOBOMA			4	0.0%	4	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	4	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			4	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,356	10.0%	1,780	9.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			60	0.4%	64	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			16	0.1%	4	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			180	1.3%	420	2.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	16	0.1%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			8	0.1%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			624	4.6%	572	2.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			324	2.4%	260	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			120	0.9%	88	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			52	0.4%	64	0.3%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			8	0.1%	28	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			216	1.6%	100	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			28	0.2%	24	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			120	0.9%	132	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			116	0.9%	176	0.9%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			124	0.9%	76	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			52	0.4%	28	0.1%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.0%	16	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			36	0.3%	64	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			16	0.1%	24	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			32	0.2%	12	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			56	0.4%	36	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			56	0.4%	56	0.3%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			12	0.1%	12	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			4	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			4	0.0%	8	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	8	0.0%

## OCULAR DISORDERS REPORT POODLE, TOY AND MINIATURE

Year Examined: Total # Dogs:		1993-2017 13,556		2018-2022 19,796	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.327	INCOMPLETE CATARACT, CAPSULAR	8	0.1%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	104	0.8%	220	1.1%
100.330	GENERALIZED/ COMPLETE CATARACT	48	0.4%	28	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	8	0.1%	4	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	8	0.1%	4	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>1,444</b>	<b>10.7%</b>	<b>1,244</b>	<b>6.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	100	0.7%	72	0.4%
110.135	PHPV/ PTVL	12	0.1%	8	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	36	0.3%	40	0.2%
110.320	VITREOUS DEGENERATION SYNERESIS	172	1.3%	96	0.5%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	4	0.0%	8	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	8	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	28	0.2%	12	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	8	0.1%	4	0.0%
120.960	RETINOPATHY	12	0.1%	16	0.1%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	16	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	8	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	8	0.0%
120.960	RETINOPATHY	0	0.0%	12	0.1%
130.110	MICROPAPILLA	0	0.0%	60	0.3%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	60	0.3%
130.150	OPTIC DISC COLOBOMA	0	0.0%	28	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	208	1.5%	56	0.3%
130.120	OPTIC NERVE HYPOPLASIA	136	1.0%	84	0.4%
130.150	OPTIC DISC COLOBOMA	16	0.1%	8	0.0%
<b>OTHER</b>					
900.100	OTHER, NOT INHERITED	52	0.4%	4	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	552	4.1%	556	2.8%
<b>NORMAL</b>					
.000	NORMAL GLOBE	8,844	65.2%	13,840	69.9%

## POODLE

### (Unspecified variety)

\*Up until 2022, the toy/minature/standard poodle conditions were assessed as a group, therefore statistics prior to this date may not reflect the real incidence within the breed subgroups. From 2021, the Standard Poodle is assessed separately from the Toy & Miniature varieties, and conditions may be added or removed from each page as statistics start to be generated.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 2-4	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 10-20	NO	Mutation in the <i>prcd</i> gene
	- rod-cone dysplasia type 4 ( <i>rcd4</i> )	Autosomal recessive	5-9	NO	Mutation in the <i>C2orf71</i> gene *only in Standards & Miniatures
H.	Day blindness/retinal degeneration	Autosomal recessive	1	NO	Mutation has not been published *only in Standards
I.	Micropapilla	Not defined	1	Breeder option	

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is recommended; breeding discretion is

advised.

#### **B. Corneal Dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### **C. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

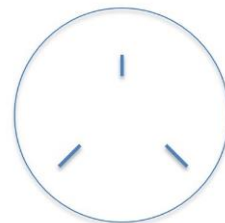
#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

#### **E. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **F. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

#### **G. Retinal atrophy**

**- *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that PRA in the Poodle is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available. It is important to note that in all breeds in which a molecular diagnostic test for the disease is available, it is possible to have dogs diagnosed clinically as affected, yet the DNA test results are normal. This suggests that other genetic causes of PRA exist or that the diagnosed affected dog has an acquired disease that mimics the inherited disorder.

**- rod-cone dysplasia, type 4 (*rcd4*)**

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

**H. Cone degeneration: Day Blindness/Retinal degeneration:**

An autosomal recessive disorder of standard poodles and 'Doodles' (where the mix-bred dogs are backcrossed to standard poodles that carry the genetic defect); the disease also has been referred to as achromatopsia. The salient clinical findings is profound visual difficulty in bright light, day blindness, with subjective normal night vision. In the early stages of the disease, fundus examination is normal with some dogs showing focal hyperreflectivity of the cone-rich fovea like region of the retina; the photopic ERG is not recordable. In some older dogs, there is progression resulting in poor/absent vision under both dim and bright light conditions, markedly abnormal or non-recordable ERG, and a fundus appearance indicative of late stage retinal degeneration and indistinguishable from progressive retinal atrophy.

**I. Micropapilla**

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

**References**

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11. Parkes JH, Aguirre G, Rockey JH, et al. Progressive rod-cone degeneration in the dog: characterization of the visual pigment. *Invest Ophthalmol Vis Sci.* 1982;23:674-678.
12. Sandberg MA, Pawlyk BS, Berson EL. Full-field electroretinograms in Miniature Poodles with progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci.* 1986;27:1179-1184.
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15. Ray K, Acland GM, Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci.* 1996;37:783-794.
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18. Wetzel MG, Fahlman C, Maude MB, et al. Fatty acid metabolism in normal Miniature Poodles and those affected with progressive rod-cone degeneration (prcd). *Prog Clin Biol Res.* 1989;314:427-439.
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20. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006;88:551-563. PMID: 16938425

## OCULAR DISORDERS REPORT POODLE, UNSPECIFIED VARIETY

	Year Examined: Total # Dogs:	1993-2017 172,796		2018-2022 6,596	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110 MICROPTHALMIA		80	0.0%	16	0.2%
10.000 GLAUCOMA		20	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA		0	0.0%	4	0.1%
<b>EYELIDS</b>					
20.110 EYELID DERMOID		4	0.0%	0	0.0%
20.140 ECTOPIC CILIA		136	0.1%	4	0.1%
20.160 MACROPALPEBRAL FISSURE		4	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED		448	0.3%	20	0.3%
22.000 ECTROPION, UNSPECIFIED		20	0.0%	0	0.0%
25.110 DISTICHIASIS		10,996	6.4%	184	2.8%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		0	0.0%	8	0.1%
<b>NASOLACRIMAL</b>					
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM		8	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA		32	0.0%	0	0.0%
<b>NICTITANS</b>					
51.100 THIRD EYELID CARTILAGE ANOMALY		124	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID		72	0.0%	0	0.0%
<b>CORNEA</b>					
70.210 PANNUS		156	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS		100	0.1%	8	0.1%
70.700 CORNEAL DYSTROPHY		976	0.6%	24	0.4%
70.730 CORNEAL ENDOTHELIAL DEGENERATION		32	0.0%	0	0.0%
<b>UVEA</b>					
90.250 PIGMENTARY UVEITIS		8	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA		4	0.0%	8	0.1%
93.120 IRIS CYST		28	0.0%	4	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM		20	0.0%	0	0.0%
93.150 IRIS COLOBOMA		20	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST		0	0.0%	4	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		5,012	2.9%	420	6.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		304	0.2%	4	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		120	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS		156	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		300	0.2%	160	2.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		12	0.0%	0	0.0%
93.810 UVEAL MELANOMA		4	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL		0	0.0%	4	0.1%
<b>FUNDUS</b>					
97.110 CHOROIDAL HYPOPLASIA		12	0.0%	0	0.0%
97.120 COLOBOMA		44	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	4	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	4	0.1%
130.110 MICROPAPILLA		0	0.0%	20	0.3%
130.120 OPTIC NERVE HYPOPLASIA		0	0.0%	12	0.2%
<b>LENS</b>					
100.200 CATARACT, UNSPECIFIED		1,536	0.9%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		8,928	5.2%	156	2.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1,656	1.0%	68	1.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		716	0.4%	8	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX		464	0.3%	12	0.2%

# OCULAR DISORDERS REPORT POODLE, UNSPECIFIED VARIETY

Year Examined: Total # Dogs:		1993-2017 172,796		2018-2022 6,596	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	196	0.1%	20	0.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	432	0.3%	56	0.8%
100.306	PUNCTATE CATARACT, NUCLEUS	140	0.1%	16	0.2%
100.307	PUNCTATE CATARACT, CAPSULAR	164	0.1%	60	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	1,800	1.0%	44	0.7%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1,508	0.9%	36	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	956	0.6%	20	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	140	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	332	0.2%	16	0.2%
100.316	INCIPIENT CATARACT, NUCLEUS	248	0.1%	12	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	136	0.1%	28	0.4%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	8	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	12	0.0%	16	0.2%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	12	0.0%	0	0.0%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	4	0.1%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	4	0.1%
100.328	Y-SUTURE TIP OPACITIES	20	0.0%	60	0.9%
100.330	GENERALIZED/ COMPLETE CATARACT	1,672	1.0%	12	0.2%
100.340	RESORBING/ HYPERMATURE CATARACT	4	0.0%	4	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	104	0.1%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>12,124</b>	<b>7.0%</b>	<b>444</b>	<b>6.7%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	232	0.1%	36	0.5%
110.135	PHPV/ PTVL	88	0.1%	8	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	128	0.1%	4	0.1%
110.320	VITREOUS DEGENERATION SYNERESIS	1,052	0.6%	28	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	472	0.3%	8	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	80	0.0%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	36	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	2,300	1.3%	12	0.2%
120.400	RETINAL HEMORRHAGE	12	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	108	0.1%	0	0.0%
120.960	RETINOPATHY	16	0.0%	8	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	456	0.3%	8	0.1%
130.120	OPTIC NERVE HYPOPLASIA	768	0.4%	16	0.2%
130.150	OPTIC DISC COLOBOMA	192	0.1%	8	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	1,732	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	3,500	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	888	0.5%	256	3.9%
<b>NORMAL</b>					
.000	NORMAL GLOBE	141,264	81.8%	5,148	78.0%

## PORCELAINE HOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PORCELAINE HOUND breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT PORCELAINE HOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		14 #	%	35 #	%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	2.9%
<b>NORMAL</b> .000 NORMAL GLOBE		14	100.0%	34	97.1%

## PORTUGUESE PODENGO

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PORTUGUESE PODENGO breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT PORTUGUESE PODENGO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		49 #	%	8 #	%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	1	2.0%	0	0.0%
25.110	DISTICHIASIS	1	2.0%	0	0.0%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	3	6.1%	0	0.0%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.1%	0	0.0%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	2.0%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	0	0.0%	1	12.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	12.5%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	1	2.0%	2	25.0%
<b>VITREOUS</b>					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	2.0%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	1	2.0%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	2	25.0%
120.960	RETINOPATHY	1	2.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	1	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	4.1%	0	0.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	43	87.8%	5	62.5%

# PORTUGUESE PODENGO PEQUENO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Retinal atrophy  - rod-cone dysplasia type 3 ( <i>rcd3</i> )	Autosomal recessive	1	NO	Mutation in the <i>PDE6A</i> gene
	- ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### C. Cataracts

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### D. Retinal atrophy

#### - rod-cone dysplasia type 3 (*rcd3*)

PRA in the Portuguese Podengo Pequeno is an autosomal recessive trait caused by a one base pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (*rcd3*). PRA begins early in life with clinical signs of night blindness and a lack of rod ERG responses is seen at 6-8 weeks of

age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. The mutation is found in the *PDE6A* gene. A DNA test is available.

#### **- *prcd***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Other forms of retinal degeneration that are not *prcd* are recognized in the Portuguese Podengo Pequeno. The currently available genetic test will not detect these other forms of PRA.

## **References**

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.
2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425
3. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet*. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet*. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT PORTUGUESE PODENGO PEQUENO

Year Examined: Total # Dogs:		1993-2017 263		2018-2022 194	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	0	0.0%	1	0.5%
25.110	DISTICHIASIS	13	4.9%	14	7.2%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	1	0.4%	4	2.1%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	12	4.6%	11	5.7%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	1	0.4%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	0	0.0%	2	1.0%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	3.0%	9	4.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	2	0.8%	2	1.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	0.4%	0	0.0%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	5	1.9%	3	1.5%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.4%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	0.4%	1	0.5%
100.306	PUNCTATE CATARACT, NUCLEUS	2	0.8%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	1	0.4%	1	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	5	1.9%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	2	0.8%	1	0.5%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	1	0.4%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.4%	1	0.5%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	5	2.6%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.4%	0	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES	1	0.4%	3	1.5%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.4%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.4%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	1.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	25	9.5%	15	7.7%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.8%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	5	1.9%	1	0.5%
110.320	VITREOUS DEGENERATION SYNERESIS	11	4.2%	1	0.5%
<b>RETINA</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.5%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	1.9%	0	0.0%
120.960	RETINOPATHY	3	1.1%	0	0.0%
<b>OTHER</b>					
900.100	OTHER, NOT INHERITED	0	0.0%	1	0.5%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	8	3.0%	6	3.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	199	75.7%	146	75.3%

## PORTUGUESE POINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PORTUGUESE POINTER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT PORTUGUESE POINTER

Diagnostic Name	Year Examined:		1993-2017		2018-2022	
	Total # Dogs:		11		0	
			#	%	#	%
<b>LENS</b>						
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	9.1%	0	
100.316 INCIPIENT CATARACT, NUCLEUS			1	9.1%	0	
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>18.2%</b>	<b>0</b>	
<b>NORMAL</b>						
.000 NORMAL GLOBE			9	81.8%	0	

## PORTUGUESE WATER DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmia with multiple ocular defects	Autosomal recessive	1-3	NO	Mutation is not yet published
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
E.	Cataract	Not defined	1	NO	
F.	Y-suture tip opacities	Not defined	1	Breeder option	
G.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- early onset	Autosomal recessive	4	NO	Mutation in the <i>CCDC66</i> gene
	- <i>prcd</i>	Autosomal recessive	5	NO	Mutation in the <i>prcd</i> gene
H.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Microphthalmia with multiple congenital ocular defects

This is a congenital abnormality present bilaterally and characterized by a small globe and associated ocular defects which can affect the cornea, anterior chamber, lens and/or retina. These associated defects may be variable in severity. Several cases have been identified, all of which appeared to have a common ancestry. All affected animals so far identified have been the progeny of dogs that were phenotypically normal, suggesting that the defect is not dominantly inherited.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### **C. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

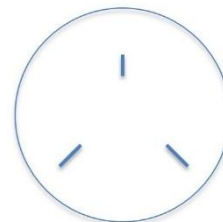
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### **F. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

### **G. Retinal atrophy**

### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

### - *prcd*

Studies have shown that the principal form of PRA in the Portuguese Water Dog is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### - early onset

A second, earlier onset form of PRA has also been identified recently in the Portuguese Water Dog. The onset of visual deficits occurs at 2-3 years of age, and, dogs show advanced retinal degeneration at the time visual deficits are recognized. The condition appears inherited as autosomal recessive. A DNA test is available.

## H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
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3. Shaw, G. C., et al. (2019). "Microphthalmia With Multiple Anterior Segment Defects in Portuguese Water Dogs." *Vet Pathol* 56(2): 269-273. PMID: 30131012
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2006;88:551-563. Epub 2006/08/30. PMID: 16938425

## OCULAR DISORDERS REPORT PORTUGUESE WATER DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 32,648		2018-2022 8,001	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			20	0.1%	13	0.2%
10.000 GLAUCOMA			6	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			3	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			61	0.2%	16	0.2%
22.000 ECTROPION, UNSPECIFIED			3	0.0%	0	0.0%
25.110 DISTICHIASIS			1,184	3.6%	251	3.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	2	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	2	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			6	0.0%	5	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			4	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			5	0.0%	3	0.0%
70.700 CORNEAL DYSTROPHY			251	0.8%	128	1.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			6	0.0%	1	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			2	0.0%	6	0.1%
93.120 IRIS CYST			10	0.0%	2	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			2	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			2	0.0%	0	0.0%
93.180 IIRIS SPHINCTER DYSPLASIA			0	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			2,039	6.2%	644	8.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			42	0.1%	18	0.2%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			34	0.1%	3	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			43	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			58	0.2%	48	0.6%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			10	0.0%	3	0.0%
93.810 UVEAL MELANOMA			6	0.0%	3	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			2	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	21	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			69	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2,150	6.6%	505	6.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			583	1.8%	315	3.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			124	0.4%	54	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			85	0.3%	33	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			57	0.2%	22	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			99	0.3%	35	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			32	0.1%	13	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			91	0.3%	68	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			140	0.4%	47	0.6%

# OCULAR DISORDERS REPORT PORTUGUESE WATER DOG

	Year Examined: Total # Dogs:	1993-2017 32,648		2018-2022 8,001	
Diagnostic Name		#	%	#	%
LENS Continued					
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		101	0.3%	23	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX		108	0.3%	33	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES		15	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES		20	0.1%	6	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS		28	0.1%	5	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR		29	0.1%	16	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX		15	0.0%	9	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX		14	0.0%	7	0.1%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		3	0.0%	8	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES		1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES		1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS		3	0.0%	1	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR		1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		66	0.2%	67	0.8%
100.330 GENERALIZED/ COMPLETE CATARACT		74	0.2%	8	0.1%
100.340 RESORBING/ HYPERMATURE CATARACT		3	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		11	0.0%	3	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		1,696	5.2%	703	8.8%
VITREOUS					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		48	0.1%	21	0.3%
110.135 PHPV/ PTVL		18	0.1%	2	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		6	0.0%	10	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS		42	0.1%	13	0.2%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		270	0.8%	46	0.6%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		19	0.1%	1	0.0%
120.190 RETINAL DYSPLASIA, DETACHED		2	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		177	0.5%	1	0.0%
120.400 RETINAL HEMORRHAGE		8	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		3	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		3	0.0%	0	0.0%
120.960 RETINOPATHY		2	0.0%	4	0.0%
OPTIC NERVE					
130.110 MICROPAPILLA		16	0.0%	4	0.0%
130.120 OPTIC NERVE HYPOPLASIA		11	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA		6	0.0%	0	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		313	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED		538	1.6%	2	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		424	1.3%	270	3.4%
NORMAL					
.000 NORMAL GLOBE		27,153	83.2%	6,081	76.0%

## PUDELPOINTER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the PUDELPOINTER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT PUDELPOINTER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	25.0%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE			3	75.0%	5	100.0%

## PUG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Pigmentary Keratitis/Pigmentary Keratopathy	Not defined	1-3	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1, 4	NO
F.	Vitreous degeneration  - syneresis	Not defined	1	Breeder option

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### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Pug, entropion usually involves the medial canthal margin of the lower eyelid(s).

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Pigmentary keratitis/keratopathy

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

The breed standard indicates the Pug should have a "large massive round head with very large, bold and prominent eyes." These characteristics give rise to the ocular exposure and irritative problems common in the breed.

Pigmentary keratopathy is a condition reported in Pugs in which the cornea becomes pigmented, often resulting in vision impairment. Development of pigmentary keratopathy is associated in some studies with low tear production (STT) and medial eyelid entropion.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **F. Vitreous degeneration - syneresis**

Liquefaction of the vitreous gel which may predispose to retinal detachment.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Labelle AL, Dresser CB, Hamor RE, et al. Characteristics of, prevalence of, and risk factors for corneal pigmentation (pigmentary keratopathy) in Pugs. *J Am Vet Med Assoc.* 2013;243:667-674.
3. Maini, S., et al. (2019). "Pigmentary keratitis in pugs in the United Kingdom: prevalence and associated features." *BMC Vet Res* 15(1): 384. PMID: 31666065
4. Gelatt KN, Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005;8:101-111.

# OCULAR DISORDERS REPORT PUG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,826		2018-2022 908	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			3	0.1%	0	0.0%
<b>EYELIDS</b>						
20.110 EYELID DERMOID			1	0.0%	0	0.0%
20.140 ECTOPIC CILIA			15	0.5%	4	0.4%
20.160 MACROPALPEBRAL FISSURE			67	2.4%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			506	17.9%	134	14.8%
22.000 ECTROPION, UNSPECIFIED			11	0.4%	0	0.0%
25.110 DISTICHIASIS			249	8.8%	52	5.7%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			8	0.3%	1	0.1%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			80	2.8%	0	0.0%
70.220 PIGMENTARY KERATITIS			918	32.5%	412	45.4%
70.700 CORNEAL DYSTROPHY			14	0.5%	1	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.1%	0	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	1	0.1%
93.120 IRIS CYST			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			3	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			301	10.7%	105	11.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			8	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			16	0.6%	2	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			9	0.3%	1	0.1%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.0%	0	0.0%
130.110 MICROPAPILLA			0	0.0%	2	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			60	2.1%	9	1.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			14	0.5%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			6	0.2%	2	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			8	0.3%	2	0.2%
100.306 PUNCTATE CATARACT, NUCLEUS			10	0.4%	3	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			5	0.2%	3	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			20	0.7%	3	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			18	0.6%	3	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			8	0.3%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			8	0.3%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			7	0.2%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.1%	1	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT PUG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 2,826		2018-2022 908	
		#	%	#	%
<b>LENS Continued</b>					
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	2	0.1%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	0	0.0%
100.328	Y-SUTURE TIP OPACITIES	0	0.0%	2	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	13	0.5%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	143	5.1%	19	2.1%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	16	0.6%	2	0.2%
110.135	PHPV/ PTVL	3	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	4	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	27	1.0%	4	0.4%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	20	0.7%	1	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	12	0.4%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	3	0.1%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	1	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	36	1.3%	0	0.0%
900.100	OTHER, NOT INHERITED	165	5.8%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	113	4.0%	41	4.5%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,130	40.0%	350	38.5%

## PULI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens foci / no strands	Not defined	1	Passes with no notation	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene
D.	Retinal dysplasia				
	- folds	Not defined	1	Breeder option	

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Puli is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*)

gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

#### **D. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. PLoS One. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650

# OCULAR DISORDERS REPORT

## PULI

Year Examined: Total # Dogs:		1993-2017 1,154		2018-2022 161	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
20.110	EYELID DERMOID	1	0.1%	0	0.0%
20.140	ECTOPIC CILIA	1	0.1%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.1%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	8	0.7%	0	0.0%
25.110	DISTICHIASIS	7	0.6%	0	0.0%
<b>CORNEA</b>					
70.220	PIGMENTARY KERATITIS	5	0.4%	0	0.0%
70.700	CORNEAL DYSTROPHY	18	1.6%	0	0.0%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.1%	0	0.0%
<b>UVEA</b>					
93.120	IRIS CYST	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	265	23.0%	21	13.0%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	14	1.2%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	8	0.7%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	7	0.6%	5	3.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	0	0.0%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	3	0.3%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	67	5.8%	5	3.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	8	0.7%	6	3.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.3%	2	1.2%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.6%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	12	1.0%	2	1.2%
100.306	PUNCTATE CATARACT, NUCLEUS	5	0.4%	0	0.0%
100.307	PUNCTATE CATARACT, CAPSULAR	4	0.3%	0	0.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	10	0.9%	3	1.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	4	0.3%	3	1.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	7	0.6%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	3	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	0	0.0%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.6%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	2	0.2%	1	0.6%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.6%
100.328	Y-SUTURE TIP OPACITIES	3	0.3%	2	1.2%
100.330	GENERALIZED/ COMPLETE CATARACT	7	0.6%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	1	0.1%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	70	6.1%	20	12.4%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	2	0.2%	1	0.6%
110.135	PHPV/ PTVL	1	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	1	0.1%	0	0.0%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	49	4.2%	2	1.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	3	0.3%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	4	0.3%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	2	0.2%	0	0.0%

## OCULAR DISORDERS REPORT PULI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		2	0.2%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		3	0.3%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		13	1.1%	0	0.0%
900.100 OTHER, NOT INHERITED		46	4.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		8	0.7%	6	3.7%
<b>NORMAL</b>					
.000 NORMAL GLOBE		772	66.9%	117	72.7%

# PUMI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT PUMI

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		112 #	%	60 #	%
<b>CORNEA</b>					
70.700 CORNEAL DYSTROPHY		1	0.9%	0	0.0%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		6	5.4%	4	6.7%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		3	2.7%	1	1.7%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		5	4.5%	1	1.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	0.9%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS		1	0.9%	2	3.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES		1	0.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>3</b>	<b>2.7%</b>	<b>2</b>	<b>3.3%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		2	1.8%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS		0	0.0%	1	1.7%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		2	1.8%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		1	0.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	1.8%	2	3.3%
<b>NORMAL</b>					
.000 NORMAL GLOBE		101	90.2%	52	86.7%

## PYRENEAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

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### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT PYRENEAN MASTIFF

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			5		16	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			1	20.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			2	40.0%	1	6.3%
25.110 DISTICHIASIS			1	20.0%	1	6.3%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	20.0%	6	37.5%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	2	12.5%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	3	18.8%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>0</b>	<b>0.0%</b>	<b>3</b>	<b>18.8%</b>
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	20.0%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			0	0.0%	8	50.0%

## PYRENEAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Choroidal hypoplasia	Not defined	1	NO
D.	Retinal dysplasia - folds	Not defined	1	Breeder option

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Choroidal hypoplasia

Inadequate development of the choroid present at birth and non-progressive. This condition is more commonly identified in the Collie breed where it is a manifestation of "Collie Eye Anomaly."

#### D. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT PYRENEAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPTHALMIA			0	0.0%	2	0.8%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	0.4%
25.110 DISTICHIASIS			1	0.2%	1	0.4%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.2%	1	0.4%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			2	0.4%	2	0.8%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.2%	2	0.8%
93.150 IRIS COLOBOMA			1	0.2%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			26	4.9%	7	2.6%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.2%	0	0.0%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			20	3.8%	6	2.3%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			13	2.4%	5	1.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			5	0.9%	1	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.4%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.6%	1	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	0.9%	3	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.2%	1	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.4%	1	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			8	1.5%	1	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			4	0.8%	2	0.8%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.4%
100.326 INCOMPLETE CATARACT, NUCLEUS			2	0.4%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			1	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>35</b>	<b>6.6%</b>	<b>13</b>	<b>4.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			5	0.9%	3	1.1%
110.135 PHPV/ PTVL			0	0.0%	5	1.9%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.2%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			10	1.9%	5	1.9%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.2%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.4%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			0	0.0%	2	0.8%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	1	0.4%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			9	1.7%	0	0.0%
900.100 OTHER, NOT INHERITED			11	2.1%	0	0.0%

# OCULAR DISORDERS REPORT PYRENEAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>OTHER Continued</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			11	2.1%	13	4.9%
<b>NORMAL</b> .000 NORMAL GLOBE			442	83.2%	216	81.2%

## RAT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1, 2	NO	Mutation in the <i>ADAMTS17</i> gene

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### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

1. Farias FH, Johnson GS, Taylor JF, et al. An *ADAMTS17* splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010;51:4716-4721.
2. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.

## OCULAR DISORDERS REPORT RAT TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			311		76	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			5	1.6%	2	2.6%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			12	3.9%	2	2.6%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.6%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	1.6%	1	1.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	1.0%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			3	1.0%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.6%	1	1.3%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.3%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	0.3%	1	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT			5	1.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			6	1.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>19</b>	<b>6.1%</b>	<b>1</b>	<b>1.3%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.6%	1	1.3%
110.320 VITREOUS DEGENERATION SYNERESIS			3	1.0%	0	0.0%
<b>RETINA</b>						
120.190 RETINAL DYSPLASIA, DETACHED			2	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	1.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	1.0%	1	1.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			274	88.1%	68	89.5%

## REDBONE COONHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the REDBONE COONHOUND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT REDBONE COONHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			38		31	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	2	6.5%
25.110 DISTICHIASIS			1	2.6%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			0	0.0%	1	3.2%
<b>UVEA</b>						
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	2.6%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	2.6%	1	3.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	2.6%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	3.2%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>1</b>	<b>2.6%</b>	<b>1</b>	<b>3.2%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	3.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	2.6%	0	0.0%
120.960 RETINOPATHY			1	2.6%	0	0.0%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	2.6%	1	3.2%
<b>NORMAL</b>						
.000 NORMAL GLOBE			34	89.5%	25	80.6%

# RHODESIAN RIDGEBACK

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

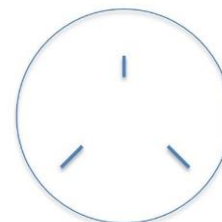
### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may

involve the lens completely (diffuse) or in a localized region.

### E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Breed club request to ACVO Genetics Committee, 2008.

## OCULAR DISORDERS REPORT RHODESIAN RIDGEBACK

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 5,042		2018-2022 1,563	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			0	0.0%	1	0.1%
21.000 ENTROPION, UNSPECIFIED			15	0.3%	4	0.3%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			141	2.8%	35	2.2%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			5	0.1%	4	0.3%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			6	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			27	0.5%	12	0.8%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.0%	0	0.0%
93.120 IRIS CYST			5	0.1%	1	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			4	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			299	5.9%	69	4.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			83	1.6%	76	4.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			5	0.1%	0	0.0%
93.810 UVEAL MELANOMA			3	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			238	4.7%	49	3.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			22	0.4%	5	0.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			58	1.2%	17	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			7	0.1%	2	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.0%	3	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			46	0.9%	12	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	2	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			29	0.6%	19	1.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			10	0.2%	3	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			93	1.8%	25	1.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			13	0.3%	7	0.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			18	0.4%	3	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			6	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			25	0.5%	9	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	4	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			4	0.1%	7	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	2	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	2	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			22	0.4%	22	1.4%
100.330 GENERALIZED/ COMPLETE CATARACT			3	0.1%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>342</b>	<b>6.8%</b>	<b>124</b>	<b>7.9%</b>

## OCULAR DISORDERS REPORT RHODESIAN RIDGEBACK

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 5,042		2018-2022 1,563	
		#	%	#	%
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		4	0.1%	9	0.6%
110.135 PHPV/ PTVL		1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		8	0.2%	2	0.1%
110.320 VITREOUS DEGENERATION SYNERESIS		8	0.2%	2	0.1%
<b>FUNDUS</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	2	0.1%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		7	0.1%	3	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		1	0.0%	1	0.1%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		5	0.1%	2	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		1	0.0%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		1	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA		5	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		51	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED		92	1.8%	1	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		67	1.3%	28	1.8%
<b>NORMAL</b>					
.000 NORMAL GLOBE		4,179	82.9%	1,236	79.1%

## ROTTWEILER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	3	NO
B.	Uveal cysts			
	-iris cyst	Not defined	1	Breeder option
	-anterior chamber cyst	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Retinal atrophy			
	- generalized	Not defined	1, 2	NO

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

A variety of cataracts have been observed in this breed ranging from the posterior polar cataract similar to that in the Golden Retriever and cataracts involving multiple areas of the nucleus and cortex. Further studies need to be performed as to the exact mode of inheritance, but it is our recommendation that the individually afflicted dog should not be bred.

#### **E. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Bjerkas E. Progressive retinal atrophy in dogs in Norway. *Norsk Veterinaertidsskrift*. 1991;103:601-610. \*\*reference derived from non-USA dog population\*\*
3. Breed club request to ACVO genetics committee, 2022

## OCULAR DISORDERS REPORT ROTTWEILER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 15,980		2018-2022 2,943	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			3	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			10	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			128	0.8%	20	0.7%
22.000 ECTROPION, UNSPECIFIED			30	0.2%	2	0.1%
25.110 DISTICHIASIS			95	0.6%	13	0.4%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			4	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			16	0.1%	1	0.0%
<b>CORNEA</b>						
70.210 PANNUS			3	0.0%	1	0.0%
70.220 PIGMENTARY KERATITIS			2	0.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			150	0.9%	22	0.7%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			7	0.0%	1	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			12	0.1%	6	0.2%
93.120 IRIS CYST			257	1.6%	85	2.9%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			55	0.3%	9	0.3%
93.170 ANTERIOR CHAMBER CYST			33	0.2%	48	1.6%
93.180 IRIS SPHINCTER DYSPLASIA			0	0.0%	1	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			126	0.8%	24	0.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			39	0.2%	8	0.3%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			55	0.3%	11	0.4%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			8	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			176	1.1%	138	4.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			14	0.1%	6	0.2%
93.810 UVEAL MELANOMA			3	0.0%	2	0.1%
95.120 CILIARY BODY CYST			19	0.1%	8	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			229	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			960	6.0%	207	7.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			216	1.4%	156	5.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			304	1.9%	44	1.5%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			13	0.1%	5	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			26	0.2%	10	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			97	0.6%	11	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			46	0.3%	24	0.8%
100.307 PUNCTATE CATARACT, CAPSULAR			94	0.6%	49	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			130	0.8%	38	1.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			558	3.5%	98	3.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			42	0.3%	10	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			13	0.1%	4	0.1%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			81	0.5%	13	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			61	0.4%	7	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			50	0.3%	20	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			7	0.0%	2	0.1%

# OCULAR DISORDERS REPORT ROTTWEILER

	Year Examined: Total # Dogs:	1993-2017 15,980		2018-2022 2,943	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX		12	0.1%	7	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		1	0.0%	1	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES		1	0.0%	2	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS		1	0.0%	4	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR		4	0.0%	2	0.1%
100.328 Y-SUTURE TIP OPACITIES		22	0.1%	14	0.5%
100.330 GENERALIZED/ COMPLETE CATARACT		49	0.3%	2	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		3	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>2,035</b>	<b>12.7%</b>	<b>509</b>	<b>17.3%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		28	0.2%	7	0.2%
110.135 PHPV/ PTVL		8	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		11	0.1%	6	0.2%
110.320 VITREOUS DEGENERATION SYNERESIS		60	0.4%	10	0.3%
<b>FUNDUS</b>					
120.170 RETINAL DYSPLASIA, FOLDS		0	0.0%	4	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		0	0.0%	4	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		0	0.0%	1	0.0%
120.960 RETINOPATHY		0	0.0%	3	0.1%
120.970 CMR/ CMR-LIKE RETINOPATHY		0	0.0%	1	0.0%
130.110 MICROPAPILLA		0	0.0%	1	0.0%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		136	0.9%	15	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		48	0.3%	6	0.2%
120.190 RETINAL DYSPLASIA, DETACHED		1	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		181	1.1%	2	0.1%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		1	0.0%	0	0.0%
120.960 RETINOPATHY		23	0.1%	7	0.2%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		17	0.1%	2	0.1%
130.120 OPTIC NERVE HYPOPLASIA		17	0.1%	1	0.0%
130.150 OPTIC DISC COLOBOMA		2	0.0%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		137	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED		336	2.1%	3	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		301	1.9%	160	5.4%
<b>NORMAL</b>					
.000 NORMAL GLOBE		12,577	78.7%	2,031	69.0%

# RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	2	NO	Mutation in the <i>ADAMTS17</i> gene

## Description and Comments

### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

## OCULAR DISORDERS REPORT RUSSELL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 432		2018-2022 247	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			14	3.2%	8	3.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.2%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.2%	1	0.4%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.2%	0	0.0%
93.150 IRIS COLOBOMA			1	0.2%	0	0.0%
93.180 IRIS SPHINCTER DYSPLASIA			1	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			18	4.2%	19	7.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			0	0.0%	1	0.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.5%	1	0.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			19	4.4%	18	7.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	3.0%	4	1.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.5%	1	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.5%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	1.2%	4	1.6%
100.306 PUNCTATE CATARACT, NUCLEUS			0	0.0%	4	1.6%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	5	2.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	3	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.2%	1	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			3	0.7%	2	0.8%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			1	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>27</b>	<b>6.3%</b>	<b>27</b>	<b>10.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.2%	2	0.8%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			0	0.0%	1	0.4%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.5%	1	0.4%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.2%	0	0.0%
<b>FUNDUS</b>						
130.110 MICROPAPILLA			0	0.0%	1	0.4%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			15	3.5%	13	5.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			365	84.5%	182	73.7%

## RUSSIAN TOY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT RUSSIAN TOY

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			70		102	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	1.4%	1	1.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	1.4%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			5	7.1%	7	6.9%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	7.1%	10	9.8%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	1.4%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	1.4%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	4.3%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	4.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	1.4%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	2.9%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	1.4%	1	1.0%
100.328 Y-SUTURE TIP OPACITIES			1	1.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>7</b>	<b>10.0%</b>	<b>1</b>	<b>1.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	1.4%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			4	5.7%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			3	4.3%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	1.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	1.0%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	1.0%
120.190 RETINAL DYSPLASIA, DETACHED			0	0.0%	1	1.0%
120.960 RETINOPATHY			1	1.4%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	2.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	4.3%	2	2.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			50	71.4%	79	77.5%

## Russian Tsvetnaya Bolonka (Bolonka Zwetna)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TEST
A.	Cataract	Not defined	1	NO	

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT RUSSIAN TSVETNAYA BOLONKA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			109		26	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	0.9%	0	0.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.9%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			2	1.8%	0	0.0%
<b>UVEA</b>						
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.9%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	4.6%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.9%	2	7.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	2.8%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.9%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.9%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	2.8%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	3.8%
100.328 Y-SUTURE TIP OPACITIES			5	4.6%	1	3.8%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>9</b>	<b>8.3%</b>	<b>3</b>	<b>11.5%</b>
<b>VITREOUS</b>						
110.135 PHPV/ PTVL			1	0.9%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			8	7.3%	2	7.7%
110.320 VITREOUS DEGENERATION SYNERESIS			8	7.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			2	1.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	1.8%	4	15.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			88	80.7%	17	65.4%

## RUSO-EUROPEAN LAIKA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma - POAG	Presumed autosomal recessive	2	NO	Mutation in the ADAMTS10 gene
B.	Retinal atrophy  - ( <i>prcd</i> )	Autosomal recessive	1, 2	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Primary open angle glaucoma is present in the breed, and extensive breeding studies have demonstrated its inheritance as autosomal recessive. By one year of age, the intraocular pressure (IOP) is elevated, but the filtration angle is open (early glaucoma). Animals with moderate glaucoma show sustained elevations of IOP, focal disinsertions of the lens zonules and focal closures of the iridocorneal angle. Later the globe enlarges, the lens luxates and the eyes become blind and show the effects of chronic glaucoma. The causative mutation in *ADAMTS10* causes an arginine for glycine substitution at position 661. A DNA test is available.

#### B. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Russo-European Laika is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary

ocular conditions of the Russo-European Laika. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Donner J, Kaukonen M, Anderson H, Möller F, Kyöstiä K, Sankari S, Hytönen M, Giger U, Lohi H. Genetic Panel Screening of Nearly 100 Mutations Reveals New Insights into the Breed Distribution of Risk Variants for Canine Hereditary Disorders. *PLoS One*. 2016 Aug 15;11(8):e0161005. doi: 10.1371/journal.pone.0161005. PMID: 27525650
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet*. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet*. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT RUSO-EUROPEAN LAIKA

**There are no statistics available for this breed**

## SAINT BERNARD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1, 2	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Persistent pupillary membrane - iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In this breed, entropion is associated with an exceptionally large palpebral fissure.

#### C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### D. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Priester WA. Congenital ocular defects in cattle, horses, cats, and dogs. *J Am Vet Med Assoc*. 1972 Jun 1;160:1504-1511.

## OCULAR DISORDERS REPORT SAINT BERNARD

Diagnostic Name		Year Examined:	1993-2017		2018-2022	
		Total # Dogs:	277		185	
			#	%	#	%
<b>EYELIDS</b>						
20.160	MACROPALPEBRAL FISSURE		21	7.6%	0	0.0%
21.000	ENTROPION, UNSPECIFIED		73	26.4%	37	20.0%
22.000	ECTROPION, UNSPECIFIED		97	35.0%	36	19.5%
25.110	DISTICHIASIS		18	6.5%	7	3.8%
<b>NICTITANS</b>						
51.100	THIRD EYELID CARTILAGE ANOMALY		1	0.4%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID		1	0.4%	0	0.0%
<b>CORNEA</b>						
70.220	PIGMENTARY KERATITIS		1	0.4%	0	0.0%
70.700	CORNEAL DYSTROPHY		2	0.7%	0	0.0%
<b>UVEA</b>						
93.120	IRIS CYST		2	0.7%	0	0.0%
93.170	ANTERIOR CHAMBER CYST		2	0.7%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		25	9.0%	14	7.6%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS		1	0.4%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA		2	0.7%	0	0.0%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS		1	0.4%	0	0.0%
<b>LENS</b>						
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		14	5.1%	10	5.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX		2	0.7%	5	2.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX		3	1.1%	3	1.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX		2	0.7%	2	1.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES		1	0.4%	0	0.0%
100.306	PUNCTATE CATARACT, NUCLEUS		2	0.7%	1	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR		1	0.4%	1	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		5	1.8%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		5	1.8%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		6	2.2%	2	1.1%
100.316	INCIPIENT CATARACT, NUCLEUS		5	1.8%	1	0.5%
100.317	INCIPIENT CATARACT, CAPSULAR		1	0.4%	1	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX		1	0.4%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS		1	0.4%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR		0	0.0%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES		1	0.4%	1	0.5%
100.330	GENERALIZED/ COMPLETE CATARACT		9	3.2%	1	0.5%
100.345	SIGNIFICANT CATARACTS (SUMMARY)		44	15.9%	18	9.7%
<b>VITREOUS</b>						
110.120	PERSISTENT HYALOID ARTERY/ REMNANT		3	1.1%	1	0.5%
110.135	PHPV/ PTVL		1	0.4%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS		0	0.0%	1	0.5%
<b>RETINA</b>						
120.170	RETINAL DYSPLASIA, FOLDS		5	1.8%	0	0.0%
<b>OPTIC NERVE</b>						
130.110	MICROPAPILLA		1	0.4%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA		1	0.4%	0	0.0%
<b>OTHER</b>						
900.000	OTHER, UNSPECIFIED		3	1.1%	0	0.0%
900.100	OTHER, NOT INHERITED		10	3.6%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		15	5.4%	6	3.2%

# OCULAR DISORDERS REPORT

## SAINT BERNARD

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		#	%	#	%
<b>NORMAL</b> .000 NORMAL GLOBE		100	36.1%	100	54.1%

## SALUKI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT SALUKI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	0.3%	6	7.5%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.3%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			7	2.4%	4	5.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	1.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.7%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.3%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			18	6.1%	6	7.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.3%	1	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			4	1.3%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.3%	1	1.3%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.3%	1	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR			3	1.0%	2	2.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.3%	1	1.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.7%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	1.3%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	4	5.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>17</b>	<b>5.7%</b>	<b>7</b>	<b>8.8%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			7	2.4%	3	3.8%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.7%	0	0.0%
<b>RETINA</b>						
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	0.7%	0	0.0%
<b>OPTIC NERVE</b>						
130.150 OPTIC DISC COLOBOMA			2	0.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED			5	1.7%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	5	6.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			252	84.8%	60	75.0%

## SAMOYED

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1-7	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1, 8	Breeder option	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy				
	- ( <i>RPGR</i> )	X-linked recessive	1, 9, 10	NO	Mutation in the <i>RPGR</i> gene
G.	Retinal dysplasia (without skeletal defects)				
	- folds	Presumed autosomal recessive	1	NO (Breeder option requires Normal genetic test for mutation in COL9A2 gene)	Mutation in the <i>COL9A2</i> gene
H.	Retinal dysplasia (with skeletal defects)				
	- folds/geographic/detached	Autosomal recessive with incomplete dominance for the eyes	1, 11-14	NO	Mutation in the <i>COL9A2</i> gene
I.	Uveodermatologic syndrome	Not defined	1, 15, 16	NO	

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### Description and Comments

#### A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

#### **B. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### **C. Corneal dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **F. Retinal atrophy - *RPGR***

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In the Samoyed, one form of PRA, known as XLPR1, is due to a mutation in the *RPGR* gene and is inherited as a recessive, sex-linked trait. A DNA test is available.

#### **G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness.

In the Samoyed, the presence of retinal folds may be seen in the heterozygous state described in "I" below. Thus the recommendation against breeding. The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog showing that it is not a carrier of the *COL9A2* mutation.

## H. Retinal dysplasia - folds with skeletal defects in homozygous affected dogs

This condition is also known as oculo-skeletal dysplasia (OSD) or dwarfism with retinal dysplasia type 2 (DRD2) in the Samoyed. A similar condition, DRD1, occurs in the Labrador Retriever. The condition is autosomal recessive and homozygous affected dogs have shortened forelimbs ("downhill" conformation) with valgus deformity. They have severe ocular defects including cataract, retinal folds/multifocal retinal dysplasia, vitreal degeneration and retinal detachment. The ocular abnormalities result in blindness in most dogs. Heterozygous dogs can have either a normal ocular exam or have multiple retinal folds, vitreal membranes, or vitreal degeneration suggesting a semi-dominant mechanism with respect to the eyes. It is important to note that generally the retinal folds present in heterozygous dogs tend to cluster around the major superior blood vessels of the central tapetal region. The condition is caused by a 1,267 bp deletion of *COL9A2*. A DNA test is available.

## I. Uveodermatologic syndrome

Uveodermatologic syndrome in the Samoyed bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechiae) and the peripheral iris and cornea (peripheral anterior synechiae) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. Some veterinary ophthalmologists feel there is a prevalence of this entity in the Samoyed. Additional studies are needed to validate this experience and explore the possibility of a genetic basis.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Ekesten B, Narfstrom K. Correlation of morphologic features of the iridocorneal angle to intraocular pressure in Samoyeds. *Am J Vet Res*. 1991;52:1875-1878.
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7. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.
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## OCULAR DISORDERS REPORT SAMOYED

Year Examined: Total # Dogs:		1993-2017 25,252		2018-2022 5,718	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110	MICROPHTHALMIA	22	0.1%	2	0.0%
10.000	GLAUCOMA	10	0.0%	1	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
<b>EYELIDS</b>					
20.140	ECTOPIC CILIA	7	0.0%	2	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	6	0.0%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	3	0.0%	1	0.0%
25.110	DISTICHIASIS	1,430	5.7%	209	3.7%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	16	0.1%	9	0.2%
40.910	KERATOCONJUNCTIVITIS SICCA	15	0.1%	2	0.0%
<b>NICTITANS</b>					
51.100	THIRD EYELID CARTILAGE ANOMALY	4	0.0%	1	0.0%
<b>CORNEA</b>					
70.210	PANNUS	4	0.0%	0	0.0%
70.220	PIGMENTARY KERATITIS	2	0.0%	0	0.0%
70.700	CORNEAL DYSTROPHY	907	3.6%	212	3.7%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	17	0.1%	0	0.0%
<b>UVEA</b>					
93.120	IRIS CYST	10	0.0%	3	0.1%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	1	0.0%	0	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.180	IRIS SPHINCTER DYSPLASIA	0	0.0%	1	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	499	2.0%	127	2.2%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	25	0.1%	13	0.2%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	39	0.2%	6	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	16	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	13	0.1%	5	0.1%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	14	0.1%	4	0.1%
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%
95.120	CILIARY BODY CYST	2	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	2	0.0%	3	0.1%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	4	0.0%	0	0.0%
97.120	COLOBOMA	7	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	28	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	17	0.3%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.960	RETINOPATHY	0	0.0%	1	0.0%
130.110	MICROPAPILLA	0	0.0%	2	0.0%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	2	0.0%
130.150	OPTIC DISC COLOBOMA	0	0.0%	2	0.0%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	100	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	834	3.3%	177	3.1%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	133	0.5%	97	1.7%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	181	0.7%	31	0.5%

## OCULAR DISORDERS REPORT SAMOYED

Year Examined: Total # Dogs:		1993-2017 25,252		2018-2022 5,718	
Diagnostic Name		#	%	#	%
LENS Continued					
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	16	0.1%	2	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	16	0.1%	6	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	72	0.3%	13	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	35	0.1%	11	0.2%
100.307	PUNCTATE CATARACT, CAPSULAR	84	0.3%	51	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	99	0.4%	32	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	272	1.1%	46	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	30	0.1%	6	0.1%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	7	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	58	0.2%	5	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	41	0.2%	14	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	38	0.2%	15	0.3%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	2	0.0%	2	0.0%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	19	0.1%	12	0.2%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	3	0.0%	0	0.0%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	4	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	5	0.0%	3	0.1%
100.328	Y-SUTURE TIP OPACITIES	14	0.1%	12	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	66	0.3%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	2	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	3	0.0%	1	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	1,279	5.1%	352	6.2%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	25	0.1%	8	0.1%
110.135	PHPV/ PTVL	13	0.1%	1	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	2	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	97	0.4%	5	0.1%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	514	2.0%	52	0.9%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	191	0.8%	25	0.4%
120.190	RETINAL DYSPLASIA, DETACHED	26	0.1%	6	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	56	0.2%	0	0.0%
120.400	RETINAL HEMORRHAGE	2	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	10	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	1	0.0%
120.960	RETINOPATHY	7	0.0%	3	0.1%
OPTIC NERVE					
130.110	MICROPAPILLA	19	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	14	0.1%	1	0.0%
130.150	OPTIC DISC COLOBOMA	73	0.3%	2	0.0%
OTHER					
900.000	OTHER, UNSPECIFIED	176	0.7%	0	0.0%
900.100	OTHER, NOT INHERITED	450	1.8%	2	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	306	1.2%	193	3.4%
NORMAL					
.000	NORMAL GLOBE	20,671	81.9%	4,614	80.7%

## SCHAPENDOES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Retinal atrophy				
	- (CCDC66)	Autosomal recessive	2, 3	NO	Mutation in the CCDC66 gene

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### B. Retinal atrophy - CCDC66

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

In the Schapendoes the age of onset is between 2-5 years of age. The causal mutation is a single base pair insertion in exon 6 of the gene coiled-coil domain containing 66 (CCDC66) that leads to a stop codon. The mutation is inherited as an autosomal recessive trait. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Dekomien G, Vollrath C, Petrasch-Parwez E, et al. Progressive retinal atrophy in Schapendoes dogs: mutation of the newly identified CCDC66 gene. *Neurogenetics*. 2010 May;11:163-174.
3. Lippmann T, Jonkisz A, Dobosz T, et al. Haplotype-defined linkage region for gPRA in Schapendoes dogs. *Mol Vis*. 2007;13:174-180.

## OCULAR DISORDERS REPORT SCHAPENDOES

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			97 #	%	48 #	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	2.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	2.1%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	1.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	1.0%	1	2.1%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	4.1%	7	14.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			4	4.1%	5	10.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	1.0%	1	2.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			0	0.0%	1	2.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	2	4.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	3	6.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	2.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	2.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	1	2.1%
100.328 Y-SUTURE TIP OPACITIES			2	2.1%	1	2.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>9</b>	<b>9.3%</b>	<b>13</b>	<b>27.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	2.1%	1	2.1%
110.320 VITREOUS DEGENERATION SYNERESIS			1	1.0%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	4.2%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	1.0%	0	0.0%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			6	6.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	3	6.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			78	80.4%	32	66.7%

## SCHIPPERKE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1	NO

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### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

# OCULAR DISORDERS REPORT SCHIPPERKE

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,552		2018-2022 325	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	0.3%
25.110 DISTICHIASIS			48	3.1%	8	2.5%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.3%
70.700 CORNEAL DYSTROPHY			3	0.2%	1	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			140	9.0%	20	6.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			6	0.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			10	0.6%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.5%	3	0.9%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			70	4.5%	11	3.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			20	1.3%	5	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.4%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.2%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			12	0.8%	2	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	2	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			24	1.5%	4	1.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			11	0.7%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			9	0.6%	2	0.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			7	0.5%	2	0.6%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	1	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	1	0.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	2	0.6%
100.330 GENERALIZED/ COMPLETE CATARACT			8	0.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>115</b>	<b>7.4%</b>	<b>19</b>	<b>5.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	0	0.0%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			20	1.3%	4	1.2%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			10	0.6%	1	0.3%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			4	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			17	1.1%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.3%
120.960 RETINOPATHY			2	0.1%	0	0.0%
<b>FUNDUS</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.3%

## OCULAR DISORDERS REPORT SCHIPPERKE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1,552		325	
		#	%	#	%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		16	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED		51	3.3%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		27	1.7%	12	3.7%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,231	79.3%	266	81.8%

## SCOTTISH DEERHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SCOTTISH DEERHOUND breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT SCOTTISH DEERHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b> .110 MICROPHthalmia			0	0.0%	1	11.1%
<b>EYELIDS</b> 25.110 DISTICHIASIS			5	22.7%	0	0.0%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS 93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS 93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			3 0 0	13.6% 0.0% 0.0%	3 2 1	33.3% 22.2% 11.1%
<b>LENS</b> 100.307 PUNCTATE CATARACT, CAPSULAR 100.312 INCIPIENT CATARACT, POSTERIOR CORTEX <b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			0 1 1	0.0% 4.5% 4.5%	1 0 1	11.1% 0.0% 11.1%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	4.5%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE			17	77.3%	5	55.6%

## SCOTTISH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- iris to lens	Not defined	1	NO	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
	- endothelial opacity/no strands	Not defined	1	NO	
B.	Cataract	Not defined	1	NO	
C.	Ligneous conjunctivitis	Not defined	2,3	NO	mutation in <i>PLG</i> gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Ligneous conjunctivitis

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease. In Scottish Terriers, it is associated with a single nucleotide polymorphism in the plasminogen (PLG) gene.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Mason SL, McElroy P, Nuttall T. Ligneous membranitis in Scottish Terriers. *Vet Rec.* 2012; 171: 160.
3. Ainsworth S, Carter SS, Fisher C, Dawson J, Makrides L, Nuttall T, Mason SL. Ligneous membranitis in Scottish Terriers is associated with a single nucleotide polymorphism in the plasminogen (PLG) gene. *Anim Genet.* 2015 46(6):707-710.

## OCULAR DISORDERS REPORT SCOTTISH TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			3	0.3%	1	0.6%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			2	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY			6	0.7%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.2%	0	0.0%
<b>UVEA</b>						
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			3	0.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			252	29.1%	58	32.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			43	5.0%	5	2.8%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			10	1.2%	2	1.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			94	10.9%	70	38.9%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			8	0.9%	3	1.7%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			81	9.4%	5	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			8	0.9%	2	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.5%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			5	0.6%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.6%	2	1.1%
100.307 PUNCTATE CATARACT, CAPSULAR			3	0.3%	3	1.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			6	0.7%	2	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			6	0.7%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			9	1.0%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.2%	4	2.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.1%	0	0.0%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.6%
100.328 Y-SUTURE TIP OPACITIES			2	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.6%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>66</b>	<b>7.6%</b>	<b>14</b>	<b>7.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.1%	1	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			4	0.5%	1	0.6%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	1.1%
130.110 MICROPAPILLA			0	0.0%	1	0.6%

## OCULAR DISORDERS REPORT SCOTTISH TERRIER

Diagnostic Name	Year Examined:	1993-2017		2018-2022	
	Total # Dogs:	866		180	
		#	%	#	%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		5	0.6%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		8	0.9%	0	0.0%
<b>OPTIC NERVE</b>					
130.150 OPTIC DISC COLOBOMA		2	0.2%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		13	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED		60	6.9%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		22	2.5%	10	5.6%
<b>NORMAL</b>					
.000 NORMAL GLOBE		446	51.5%	68	37.8%

## SEALYHAM TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	1-5	NO	Mutation in the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

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2. Formston C. Observations on subluxation and luxation of the crystalline lens in the dog. *J Comp Pathol*. 1945;55:168-186.
3. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447-456.
4. Curtis R, Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract*. 1980;21:657-668.
5. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

## OCULAR DISORDERS REPORT SEALYHAM TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			500		47	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			28	5.6%	1	2.1%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			35	7.0%	4	8.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.4%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			3	0.6%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.2%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			1	0.2%	0	0.0%
130.110 MICROPAPILLA			0	0.0%	1	2.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			20	4.0%	1	2.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			4	0.8%	1	2.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.6%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.4%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			5	1.0%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	0.6%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			8	1.6%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			2	0.4%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.4%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			7	1.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			5	1.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>41</b>	<b>8.2%</b>	<b>1</b>	<b>2.1%</b>
<b>VITREOUS</b>						
110.135 PHPV/ PTVL			2	0.4%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			5	1.0%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			9	1.8%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.2%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			11	2.2%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.2%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	2.1%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			0	0.0%	1	2.1%
130.120 OPTIC NERVE HYPOPLASIA			1	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			4	0.8%	0	0.0%
900.100 OTHER, NOT INHERITED			10	2.0%	1	2.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	0.4%	2	4.3%

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## SEPPALA SIBERIAN SLED DOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SEPPALA SIBERIAN SLED DOG breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT SEPPALA SIBERIAN SLED DOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	8 #	%
<b>UVEA</b> 93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		0	0.0%	1	12.5%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	7	87.5%

## SERBIAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- ( <i>prcd</i> )	Autosomal recessive	1, 2	NO	Mutation in the <i>prcd</i> gene

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### Description and Comments

#### A. Retinal atrophy – *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Serbian Hound is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Serbian Hound. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT SERBIAN HOUND

**There are no statistics available for this breed**

## SHETLAND SHEEPDOG

(Sheltie)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial / stromal	Not defined	1, 2	Breeder option	
C.	Sheltie corneal dystrophy	Not defined	3	NO	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1	NO	
F.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	NO	1	
	- <i>CNGA1</i>	Autosomal recessive	4	NO	Mutation in the <i>CNGA1</i> gene
	- <i>BBS2</i>	Autosomal recessive	10	NO	Mutation in the <i>BBS2</i> gene
	- Slowly progressive retinopathy	Not defined	5	NO	
G.	Choroidal hypoplasia (Collie eye anomaly)	Autosomal recessive	6-9	NO	Mutation in the <i>NHEJ1</i> gene
	- optic nerve coloboma				
	- retinal detachment				
	- retinal hemorrhage				
	- staphyloma/coloboma				

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

Distichiasis in the Shetland Sheepdog usually involves stiff lashes which require permanent epilation.

#### **B. Corneal dystrophy, epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### **C. Sheltie corneal dystrophy**

The corneal changes in the Shetland Sheepdog are characterized grossly by multifocal, central, subepithelial and superficial stromal, grey-white, circular or irregular rings. Some affected animals develop corneal erosions. The precocular tear film in the majority of dogs is unstable and requires symptomatic therapy to keep the patients comfortable. Further studies are necessary to define this disorder.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms are seen in the Shetland sheepdog and pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **F. Retinal atrophy**

##### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

##### **- *CNGA1***

One form of PRA in the Shetland Sheepdog is caused by a 4bp exonic deletion in *CNGA1*. However multiple forms of PRA exist in the breed and slowly progressive retinopathy is also not genetically linked to this mutation. A DNA test is available; however it will only detect this mutation.

##### **- *BBS2***

A novel form of PRA has been linked to a missense variant (single nucleotide variant in exon 11) in the Bardet-Biedl Syndrome 2 gene (*BBS2*). This disease is syndromic with facial abnormalities.

##### **- Slowly progressive retinopathy**

A retinal disease that is poorly defined. May be a variant of PRA.

**G. Choroidal hypoplasia (Collie eye anomaly)**

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie eye anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract.* 1983;24:63-83.
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8. Fredholm M, Larsen RC, Jönsson M, Söderlund MA, Hardon T, Proschowsky HF. Discrepancy in compliance between the clinical and genetic diagnosis of choroidal hypoplasia in Danish Rough Collies and Shetland Sheepdogs. *Anim Genet.* 2016 Apr; 47(2): 250-2.
9. Marelli SP, Rizzi R, Paganelli A, Bagardi M, Minozzi G, Braambillaa PG, Polli M. Genotypic and allelic frequency of a mutation in the *NHEJ1* gene associated with collie eye anomaly in dogs in Italy. *Vet Rec Open.* 2022 29;9(1); e26. doi: 10.1002/vro2.26. **\*\*reference from non-US population (Italy)\*\***
10. Hitti-Malin RJ, Burmeister LM, Lingaas F, Kaukonen M, Pettinen I, Lohi H, Sargan D, Mellaers CS. A missense variant in the Bardet-Biedl Syndrome 2 gene (*BBS2*) leads to aa novel syndromic retinal degeneration in the Shetland Sheepdog

## OCULAR DISORDERS REPORT SHETLAND SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 40,704		2018-2022 4,878	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			68	0.2%	11	0.2%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			9	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			8	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			10	0.0%	0	0.0%
25.110 DISTICHIASIS			2,602	6.4%	237	4.9%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			6	0.0%	1	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			7	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			7	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			4	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			9	0.0%	0	0.0%
70.220 PIGMENTARY KERATITIS			5	0.0%	2	0.0%
70.700 CORNEAL DYSTROPHY			1,114	2.7%	102	2.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			35	0.1%	2	0.0%
70.750 SHELTY CORNEAL DYSTROPHY			0	0.0%	1	0.0%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.110 IRIS HYPOPLASIA			6	0.0%	2	0.0%
93.120 IRIS CYST			20	0.0%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			5	0.0%	0	0.0%
93.150 IRIS COLOBOMA			27	0.1%	1	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	4	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1,746	4.3%	218	4.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			124	0.3%	6	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			202	0.5%	10	0.2%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			29	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			17	0.0%	7	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			22	0.1%	10	0.2%
93.810 UVEAL MELANOMA			1	0.0%	0	0.0%
95.120 CILIARY BODY CYST			4	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			7	0.0%	5	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			135	0.3%	34	0.7%
97.120 COLOBOMA			82	0.2%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	4	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS			0	0.0%	1	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.0%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	1	0.0%
130.150 OPTIC DISC COLOBOMA			0	0.0%	16	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			73	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			645	1.6%	107	2.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			102	0.3%	36	0.7%

## OCULAR DISORDERS REPORT SHETLAND SHEEPDOG

Year Examined: Total # Dogs:		1993-2017 40,704		2018-2022 4,878	
Diagnostic Name		#	%	#	%
LENS Continued					
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	78	0.2%	14	0.3%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	34	0.1%	6	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	14	0.0%	1	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	16	0.0%	4	0.1%
100.306	PUNCTATE CATARACT, NUCLEUS	63	0.2%	24	0.5%
100.307	PUNCTATE CATARACT, CAPSULAR	46	0.1%	24	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	154	0.4%	27	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	103	0.3%	20	0.4%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	59	0.1%	8	0.2%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	6	0.0%	1	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	13	0.0%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	38	0.1%	6	0.1%
100.317	INCIPIENT CATARACT, CAPSULAR	39	0.1%	10	0.2%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	4	0.0%	5	0.1%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	6	0.0%	3	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	3	0.0%	3	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	2	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	4	0.0%	2	0.0%
100.328	Y-SUTURE TIP OPACITIES	7	0.0%	5	0.1%
100.330	GENERALIZED/ COMPLETE CATARACT	47	0.1%	2	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	7	0.0%	0	0.0%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	904	2.2%	198	4.1%
VITREOUS					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	97	0.2%	2	0.0%
110.135	PHPV/ PTVL	20	0.0%	3	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	1	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	144	0.4%	16	0.3%
RETINA					
120.170	RETINAL DYSPLASIA, FOLDS	94	0.2%	10	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	17	0.0%	5	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	5	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	218	0.5%	5	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	18	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	22	0.1%	2	0.0%
OPTIC NERVE					
130.110	MICROPAPILLA	18	0.0%	2	0.0%
130.120	OPTIC NERVE HYPOPLASIA	25	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	193	0.5%	9	0.2%
OTHER					
900.000	OTHER, UNSPECIFIED	243	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	575	1.4%	5	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	350	0.9%	180	3.7%
NORMAL					
.000	NORMAL GLOBE	34,315	84.3%	3,940	80.8%

## SHIBA INU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1-3	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option

### Description and Comments

#### A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

A recent study found that a *SRBD1* polymorphism in exon 4 plays an important role in the development of glaucoma in the Shiba Inu. A genetic test is not yet available.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

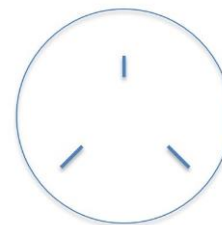
#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect

both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.
2. Kanemaki N, Tchedre KT, Imayasu M, et al. Dogs and humans share a common susceptibility gene SRBD1 for glaucoma risk. *PLoS one*. 2013;8:e74372.
3. Kato K, Sasaki N, Matsunaga S, et al. Possible association of glaucoma with pectinate ligament dysplasia and narrowing of the iridocorneal angle in Shiba Inu dogs in Japan. *Vet Ophthalmol*. 2006;9:71-75.

## OCULAR DISORDERS REPORT SHIBA INU

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 4,847		2018-2022 1,179	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			4	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			6	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			12	0.2%	0	0.0%
25.110 DISTICHIASIS			115	2.4%	24	2.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			2	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			4	0.1%	0	0.0%
70.220 PIGMENTARY KERATITIS			10	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY			35	0.7%	1	0.1%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			10	0.2%	1	0.1%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			198	4.1%	47	4.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			15	0.3%	1	0.1%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	2	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			37	0.8%	41	3.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			3	0.1%	0	0.0%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			10	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			212	4.4%	61	5.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			14	0.3%	6	0.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			20	0.4%	9	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.1%	1	0.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.1%	1	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			64	1.3%	48	4.1%
100.306 PUNCTATE CATARACT, NUCLEUS			2	0.0%	1	0.1%
100.307 PUNCTATE CATARACT, CAPSULAR			10	0.2%	5	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			36	0.7%	9	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			25	0.5%	4	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			13	0.3%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			17	0.4%	9	0.8%
100.316 INCIPIENT CATARACT, NUCLEUS			5	0.1%	2	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			6	0.1%	1	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	1	0.1%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			32	0.7%	69	5.9%
100.330 GENERALIZED/ COMPLETE CATARACT			19	0.4%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			4	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>253</b>	<b>5.2%</b>	<b>100</b>	<b>8.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			21	0.4%	8	0.7%
110.135 PHPV/ PTVL			4	0.1%	0	0.0%

## OCULAR DISORDERS REPORT SHIBA INU

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 4,847		2018-2022 1,179	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	29	0.6%	1	0.1%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.3%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	9	0.2%	2	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	2	0.0%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	29	0.6%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	7	0.1%	1	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	31	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	96	2.0%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	52	1.1%	43	3.6%
<b>NORMAL</b>					
.000	NORMAL GLOBE	4,064	83.8%	902	76.5%

## SHIH TZU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	1, 2	NO	
B.	Glaucoma	Not defined	3	NO	
C.	Entropion	Not defined	1	Breeder option	
D.	Distichiasis	Not defined	1	Breeder option	
E.	Ectopic cilia	Not defined	1	Breeder option	
F.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
G.	Pigmentary keratitis	Not defined	1	Breeder option	
H.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
I.	Cataract	Not defined	1	NO	
J.	Y-tip suture opacities	Not defined	1	Breeder option	
K.	Vitreous degeneration				
	- anterior chamber	Not defined	1, 4, 5	Breeder option	
	- syneresis	Not defined	1	Breeder option	
L.	Retinal detachment	Not defined	4, 6	NO	
M.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- <i>JPH2</i>	Autosomal recessive	8	NO**	Mutation in <i>JPH2</i> gene
N.	Optic nerve hypoplasia	Not defined	7	NO	

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
O.	Retinal degeneration	Not defined	6	NO	

## Description and Comments

### A. Keratoconjunctivitis sicca (KCS)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

### B. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

A recent study found that a *SRBD1* polymorphism in intron 1 plays an important role in the development of glaucoma in the Shih Tzu. A genetic test is not yet available.

### C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

### D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

### E. Ectopic cilia

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

### F. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### G. Exposure keratitis

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower

eyelid medial entropion, lagophthalmos and macropalpebral fissure.

#### **H. Persistent pupillary membranes (PPMs)**

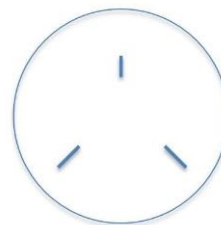
Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **I. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **J. Y-tip suture opacities**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **K. Vitreous degeneration**

A liquefaction of the vitreous gel which may predispose to retinal detachment. Forms may include presentataion into the anterior chamber, or simply contained within the posterior segment (syneresis).

#### **L. Retinal detachment**

A separation of the sensory retina from the underlying tissue. It results in blindness when complete.

#### **M. Retinal atrophy**

**- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### **- JPH2**

A homozygous nonsense mutation has been identified in the JPH2 gene of Shih Tzu dogs with PRA (from Thailand). *JPH2 has been previously found to be expressed in several excitable cells/tissues, including retinal photoreceptors, making it a candidate gene for PRA in Shih Tzus. The data in this paper were derived from a small population of dogs.*

#### **N. Optic nerve hypoplasia**

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

#### **O. Retinal degeneration**

A unilateral or bilateral retinal disease which can be progressive. When bilateral, the ophthalmoscopic lesions are sometimes asymmetrical, particularly in the early stages of the disease. Fundus examination shows initially single or multiple focal retinal lesions that appear active (local infiltrative inflammation or granulation) or inactive. The lesions can progress resulting in widespread retinal atrophy. The end-stage ophthalmoscopic lesions vary and may appear indistinguishable from PRA, or may be more characteristic of an inflammatory retinopathy. The asymmetry of the fundus abnormalities and the presence of inflammatory lesions in the retina and choroid help to differentiate this disorder from PRA. The mode of inheritance of this disease is not known; however, studies of different families suggest that it is possibly inherited. An intriguing aspect of the disease has been the preponderance of affected males compared to females. This has been confirmed in a recent unpublished survey.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract.* 2007;48:211-217.
3. Kanemaki N, Tchedre KT, Imayasu M, et al. Dogs and humans share a common susceptibility gene SRBD1 for glaucoma risk. *PloS one.* 2013;8:e74372.
4. Hendrix DV, Nasisse MP, Cowen P, et al. Clinical signs, concurrent diseases and risk factors associated with retinal detachment in dogs. *Prog Vet Comp Ophthalmol.* 1993;3:87-91.
5. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." *Vet Ophthalmol* 23(2): 219-224. PMID: 31464365
6. Itoh Y, Maehara S, Yamasaki A, et al. Investigation of fellow eye of unilateral retinal detachment in Shih-Tzu. *Vet Ophthalmol.* 2010;13:289-293.
7. da Silva EG, Dubielzig R, Zarfoss MK, et al. Distinctive histopathologic features of canine optic

nerve hypoplasia and aplasia: a retrospective review of 13 cases. *Vet Ophthalmol.* 2008;11:23-29.

8. Urkasemsin G, Pongpanich M, Sariyaa L, Kongchaaroen A, Buddhirongawatr R, Rungarunlert S, Ferreira JN, Chetuengchai W, Phokaew C, Srichomthong C, Shotelersuk V. Whole genome sequencing identifies a homozygous nonsense mutation in the JPH2 gene in Shih Tzu dogs with progressive retinal atrophy. *Anim Genet.* 2021 52;(5):714-719. PMID: 34231238 \*\*reference derived from non-USA dog population\*\*

# OCULAR DISORDERS REPORT SHIH TZU

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,893		2018-2022 966	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			6	0.2%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	2	0.2%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			41	1.4%	5	0.5%
20.160 MACROPALPEBRAL FISSURE			57	2.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			197	6.8%	110	11.4%
22.000 ECTROPION, UNSPECIFIED			4	0.1%	0	0.0%
25.110 DISTICHIASIS			512	17.7%	125	12.9%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			6	0.2%	1	0.1%
40.910 KERATOCONJUNCTIVITIS SICCA			26	0.9%	3	0.3%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			25	0.9%	0	0.0%
70.220 PIGMENTARY KERATITIS			175	6.0%	61	6.3%
70.700 CORNEAL DYSTROPHY			34	1.2%	3	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			4	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	0.1%
93.120 IRIS CYST			5	0.2%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			5	0.2%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			47	1.6%	13	1.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.1%	1	0.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			0	0.0%	1	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.0%	0	0.0%
97.120 COLOBOMA			2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	1	0.1%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			16	0.6%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			70	2.4%	10	1.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			20	0.7%	4	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			9	0.3%	3	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			5	0.2%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			5	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			21	0.7%	4	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.1%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			6	0.2%	2	0.2%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			23	0.8%	6	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			21	0.7%	2	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			15	0.5%	4	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.0%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			8	0.3%	1	0.1%
100.316 INCIPIENT CATARACT, NUCLEUS			8	0.3%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	2	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			2	0.1%	2	0.2%

## OCULAR DISORDERS REPORT SHIH TZU

Year Examined: Total # Dogs:		1993-2017 2,893		2018-2022 966	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.0%	1	0.1%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	2	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS	2	0.1%	0	0.0%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	1	0.1%
100.328	Y-SUTURE TIP OPACITIES	2	0.1%	14	1.4%
100.330	GENERALIZED/ COMPLETE CATARACT	25	0.9%	1	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>193</b>	<b>6.7%</b>	<b>39</b>	<b>4.0%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	18	0.6%	3	0.3%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	36	1.2%	10	1.0%
110.320	VITREOUS DEGENERATION SYNERESIS	145	5.0%	30	3.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	12	0.4%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	1	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	41	1.4%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	9	0.3%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	4	0.1%	0	0.0%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	11	0.4%	0	0.0%
130.150	OPTIC DISC COLOBOMA	4	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	43	1.5%	0	0.0%
900.100	OTHER, NOT INHERITED	99	3.4%	3	0.3%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	122	4.2%	97	10.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,716	59.3%	598	61.9%

# SHIKOKU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation

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## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT SHIKOKU

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		34 #	%	39 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		0	0.0%	1	2.6%
<b>UVEA</b>					
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		18	52.9%	12	30.8%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		3	8.8%	2	5.1%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		4	11.8%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR		3	8.8%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR		2	5.9%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>5</b>	<b>14.7%</b>	<b>0</b>	<b>0.0%</b>
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	2.9%	5	12.8%
<b>NORMAL</b>					
.000 NORMAL GLOBE		9	26.5%	22	56.4%

## SHILOH SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option

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### Description and Comments

#### A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT SHILOH SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	0.7%	1	1.4%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.3%	1	1.4%
<b>CORNEA</b>						
70.210 PANNUS			3	1.0%	0	0.0%
70.700 CORNEAL DYSTROPHY			33	11.5%	9	12.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.3%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.7%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3	1.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	1.4%
95.120 CILIARY BODY CYST			0	0.0%	1	1.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			12	4.2%	1	1.4%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.3%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.7%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.3%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	1.4%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.3%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>8</b>	<b>2.8%</b>	<b>1</b>	<b>1.4%</b>
<b>FUNDUS</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	1.4%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			2	0.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED			4	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	0.7%	2	2.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			242	84.6%	60	81.1%

## SHORTY BULL

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SHORTY BULL breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT SHORTY BULL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	1 #	%
<b>LENS</b>					
100.316 INCIPIENT CATARACT, NUCLEUS		0	0.0%	1	100.0%
100.345 <i>SIGNIFICANT CATARACTS (SUMMARY)</i>		0	0.0%	1	100.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		2	100.0%	0	0.0%

## SIBERIAN HUSKY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1-4	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Corneal dystrophy				
	- epithelial/stromal	Presumed autosomal recessive	1, 5-8	NO	
D.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
E.	Cataract	Not defined	1, 4	NO	
F.	Retinal atrophy				
	- ( <i>RPGR</i> )	X-linked	1, 9, 10	NO	Mutation in the <i>RPGR</i> gene
G.	Cone degeneration - (achromatopsia)	Autosomal recessive	11, 12	NO	Mutation in the <i>CNGB3</i> gene
H.	Uveodermatologic syndrome	Not defined	1, 13-15	NO	

### Description and Comments

#### A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

#### C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In the Siberian Husky, the opacities are bilaterally symmetrical, round to oval and ring shaped. They occur early in life (0.5-2 years) and may progress to cause significant vision loss. When seen, it may be beneficial to feed a low fat diet and recheck the eyes the following year to see if the opacities resolve, ruling out inherited corneal dystrophy.

#### **D. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### **E. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Siberian Husky, cataracts begin in the axial posterior cortex at approximately one year of age. Progression is variable and vision impairment may occur. In cases with rapid progression, secondary lens-induced uveitis and glaucoma may be associated with partial cataract resorption.

#### **F. Retinal atrophy – (RPGR)**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In the Siberian Husky, one form of PRA, known as XLPR1, is due to a mutation in the *RPGR* gene and is inherited as a recessive, sex-linked trait. A DNA test is available.

#### **G. Cone degeneration - hemeralopia/achromatopsia**

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A missense mutation in the same gene (*CNGB3*) that has been identified in CD-affected Alaskan Malamute-derived dogs has been detected in German Shorthaired Pointers affected with a clinically identical allelic disorder. A DNA test is available.

#### **H. Uveodermatologic syndrome**

Uveodermatologic syndrome in the Siberian Husky bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechia) and the peripheral iris and cornea (peripheral anterior synechia) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Siberian Huskies compared with other dog breeds. Affected dogs are generally young, ranging in age between 1-1/2 to 4 years.

## References

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## OCULAR DISORDERS REPORT SIBERIAN HUSKY

Year Examined: Total # Dogs:		1993-2017 40,366		2018-2022 5,943	
Diagnostic Name		#	%	#	%
GLOBE					
.110	MICROPHTHALMIA	7	0.0%	0	0.0%
10.000	GLAUCOMA	12	0.0%	4	0.1%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.0%
EYELIDS					
20.110	EYELID DERMOID	4	0.0%	0	0.0%
20.140	ECTOPIC CILIA	3	0.0%	0	0.0%
20.160	MACROPALPEBRAL FISSURE	1	0.0%	0	0.0%
21.000	ENTROPION, UNSPECIFIED	20	0.0%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	4	0.0%	0	0.0%
25.110	DISTICHIASIS	422	1.0%	48	0.8%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.0%
NASOLACRIMAL					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	2	0.0%	2	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	3	0.0%	0	0.0%
NICTITANS					
51.100	THIRD EYELID CARTILAGE ANOMALY	2	0.0%	0	0.0%
52.110	PROLAPSED GLAND OF THE THIRD EYELID	2	0.0%	0	0.0%
CORNEA					
70.210	PANNUS	22	0.1%	0	0.0%
70.220	PIGMENTARY KERATITIS	3	0.0%	1	0.0%
70.700	CORNEAL DYSTROPHY	1,041	2.6%	107	1.8%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	37	0.1%	2	0.0%
UVEA					
93.110	IRIS HYPOPLASIA	3	0.0%	2	0.0%
93.120	IRIS CYST	20	0.0%	2	0.0%
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.0%	0	0.0%
93.150	IRIS COLOBOMA	8	0.0%	1	0.0%
93.170	ANTERIOR CHAMBER CYST	1	0.0%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	959	2.4%	184	3.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	28	0.1%	3	0.1%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	55	0.1%	4	0.1%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	6	0.0%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	21	0.1%	10	0.2%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	17	0.0%	3	0.1%
93.810	UVEAL MELANOMA	1	0.0%	1	0.0%
95.120	CILIARY BODY CYST	1	0.0%	0	0.0%
97.150	CHORIORETINAL COLOBOMA, CONGENITAL	3	0.0%	1	0.0%
FUNDUS					
97.110	CHOROIDAL HYPOPLASIA	52	0.1%	13	0.2%
97.120	COLOBOMA	16	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	4	0.1%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	4	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	2	0.0%
120.960	RETINOPATHY	0	0.0%	4	0.1%
130.110	MICROPAPILLA	0	0.0%	1	0.0%
LENS					
100.200	CATARACT, UNSPECIFIED	576	1.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	746	1.8%	142	2.4%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	114	0.3%	51	0.9%

## OCULAR DISORDERS REPORT SIBERIAN HUSKY

Year Examined: Total # Dogs:		1993-2017 40,366		2018-2022 5,943	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	219	0.5%	23	0.4%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	43	0.1%	7	0.1%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	14	0.0%	3	0.1%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	112	0.3%	16	0.3%
100.306	PUNCTATE CATARACT, NUCLEUS	49	0.1%	38	0.6%
100.307	PUNCTATE CATARACT, CAPSULAR	78	0.2%	38	0.6%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	151	0.4%	33	0.6%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	1,341	3.3%	124	2.1%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	74	0.2%	18	0.3%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	18	0.0%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	262	0.6%	6	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	101	0.3%	13	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	103	0.3%	32	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	11	0.0%	9	0.2%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	96	0.2%	87	1.5%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	6	0.0%	10	0.2%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	2	0.0%	2	0.0%
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	7	0.0%	7	0.1%
100.326	INCOMPLETE CATARACT, NUCLEUS	19	0.0%	23	0.4%
100.327	INCOMPLETE CATARACT, CAPSULAR	8	0.0%	6	0.1%
100.328	Y-SUTURE TIP OPACITIES	9	0.0%	21	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	473	1.2%	8	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	2	0.0%	0	0.0%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	14	0.0%	1	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>3,879</b>	<b>9.6%</b>	<b>554</b>	<b>9.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	52	0.1%	17	0.3%
110.135	PHPV/ PTVL	7	0.0%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	1	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	39	0.1%	3	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	93	0.2%	9	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	55	0.1%	6	0.1%
120.190	RETINAL DYSPLASIA, DETACHED	14	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	168	0.4%	4	0.1%
120.400	RETINAL HEMORRHAGE	7	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	27	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.0%	3	0.1%
120.960	RETINOPATHY	28	0.1%	20	0.3%
120.970	CMR/ CMR-LIKE RETINOPATY	0	0.0%	1	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	3	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	7	0.0%	0	0.0%
130.150	OPTIC DISC COLOBOMA	3	0.0%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	354	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	760	1.9%	1	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	642	1.6%	295	5.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	34,019	84.3%	4,811	81.0%

## SILKEN WINDHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Vitreous degeneration				
	-syneresis	Not defined	1	Breeder option	
C.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	1, 2	NO	Mutation in the <i>NHEJ1</i> gene

### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### B. Vitreous degeneration -syneresis

A liquefaction of the vitreous gel which may predispose to retinal detachment.

#### C. Choroidal hypoplasia (Collie Eye Anomaly)

- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

2. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Gen Res.* 2007;17:1562-1571.

## OCULAR DISORDERS REPORT SILKEN WINDHOUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			435		548	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			0	0.0%	2	0.4%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			4	0.9%	4	0.7%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	0.2%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	0.2%	5	0.9%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			0	0.0%	1	0.2%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	0.2%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.2%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.4%
120.960 RETINOPATHY			0	0.0%	1	0.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			19	4.4%	20	3.6%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.2%	5	0.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.5%	1	0.2%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.2%	2	0.4%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.7%	3	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.2%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			6	1.4%	6	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			2	0.5%	6	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.2%	1	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	0.7%	2	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.2%	3	0.5%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			4	0.9%	7	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT			0	0.0%	1	0.2%
100.340 RESORBING/ HYPERMATURE CATARACT			0	0.0%	1	0.2%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>21</b>	<b>4.8%</b>	<b>34</b>	<b>6.2%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	1	0.2%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			4	0.9%	3	0.5%
110.320 VITREOUS DEGENERATION SYNERESIS			5	1.1%	6	1.1%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			3	0.7%	1	0.2%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.2%	0	0.0%
120.960 RETINOPATHY			3	0.7%	2	0.4%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.5%	0	0.0%
900.100 OTHER, NOT INHERITED			0	0.0%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			12	2.8%	25	4.6%
<b>NORMAL</b>						
.000 NORMAL GLOBE			395	90.8%	470	85.8%

## SILKY TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Vitreous degeneration  - syneresis	Not defined	1	Breeder option	
E.	Retinal atrophy ( <i>prcd</i> )	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Entropion

A conformational defect resulting in an "in rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

#### E. Retinal atrophy - *prcd*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also

known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

Studies have shown that the principal form of PRA in the Silky Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006;88:551-563. PMID: 16938425

# OCULAR DISORDERS REPORT SILKY TERRIER

Year Examined: Total # Dogs:		1993-2017 788		2018-2022 214	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	1	0.1%	8	3.7%
25.110	DISTICHIASIS	3	0.4%	0	0.0%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	2	0.9%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	1	0.1%	0	0.0%
<b>CORNEA</b>					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.5%
70.700	CORNEAL DYSTROPHY	8	1.0%	0	0.0%
<b>UVEA</b>					
93.140	CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM	1	0.1%	0	0.0%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	55	7.0%	11	5.1%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	1	0.1%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	3	0.4%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	0	0.0%	1	0.5%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	1	0.1%	1	0.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	2	0.3%	0	0.0%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	2	0.3%	1	0.5%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	4	0.5%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	5.2%	12	5.6%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	12	1.5%	4	1.9%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	4	0.5%	4	1.9%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	10	1.3%	0	0.0%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	1	0.5%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	2	0.3%	5	2.3%
100.306	PUNCTATE CATARACT, NUCLEUS	3	0.4%	3	1.4%
100.307	PUNCTATE CATARACT, CAPSULAR	3	0.4%	1	0.5%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	13	1.6%	6	2.8%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	19	2.4%	4	1.9%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	11	1.4%	1	0.5%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	3	0.4%	0	0.0%
100.316	INCIPIENT CATARACT, NUCLEUS	2	0.3%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	1	0.1%	1	0.5%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	1	0.1%	1	0.5%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	1	0.1%	1	0.5%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	0	0.0%	1	0.5%
100.324	INCOMPLETE CATARACT, ANTERIOR SUTURES	0	0.0%	1	0.5%
100.328	Y-SUTURE TIP OPACITIES	1	0.1%	4	1.9%
100.330	GENERALIZED/ COMPLETE CATARACT	22	2.8%	1	0.5%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	113	14.3%	35	16.4%
<b>VITREOUS</b>					
110.135	PHPV/ PTVL	0	0.0%	1	0.5%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.4%	7	3.3%
110.320	VITREOUS DEGENERATION SYNERESIS	35	4.4%	8	3.7%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	5	0.6%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	1	0.1%	1	0.5%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	9	1.1%	0	0.0%

## OCULAR DISORDERS REPORT SILKY TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 788		2018-2022 214	
		#	%	#	%
<b>RETINA Continued</b>					
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		1	0.1%	0	0.0%
120.960 RETINOPATHY		0	0.0%	1	0.5%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		2	0.3%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		12	1.5%	0	0.0%
900.100 OTHER, NOT INHERITED		24	3.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		11	1.4%	13	6.1%
<b>NORMAL</b>					
.000 NORMAL GLOBE		590	74.9%	151	70.6%

## SKYE TERRIER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SKYE TERRIER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT SKYE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		9 #	%	5 #	%
<b>EYELIDS</b> 25.110 DISTICHIASIS		1	11.1%	0	0.0%
<b>OTHER</b> 900.000 OTHER, UNSPECIFIED		1	11.1%	0	0.0%
<b>NORMAL</b> .000 NORMAL GLOBE		8	88.9%	5	100.0%

## SLOUGHI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- <i>rcd1a</i>	Autosomal recessive	2	NO	Mutation in the <i>PDE6B</i> gene

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### Description and Comments

#### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### B. Retinal atrophy

##### - generalized

A later onset degenerative disease of the retinal visual cells with visual deficits detectable at 2 to 3 years of age and which progresses to blindness. This abnormality may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. It is inherited as an autosomal recessive trait.

##### - *rcd1a*

In the Sloughi, the disease is due to an 8-bp insertion in exon 21 of the *PDE6B* gene causing the *rcd1a* form of PRA. The disease is genetically distinct from that in the Irish Setter and has a later age of onset. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Dekomien G, Runte M, Godde R, et al. Generalized progressive retinal atrophy of Sloughi dogs is due to an 8-bp insertion in exon 21 of the *PDE6B* gene. *Cytogenet Cell Genet*. 2000;90:261-267.

## OCULAR DISORDERS REPORT SLOUGH/2

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		32 #	%	68 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		0	0.0%	2	2.9%
<b>NICTITANS</b>					
51.100 THIRD EYELID CARTILAGE ANOMALY		1	3.1%	0	0.0%
<b>UVEA</b>					
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		2	6.3%	0	0.0%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	3.1%	4	5.9%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		0	0.0%	2	2.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX		0	0.0%	1	1.5%
100.306 PUNCTATE CATARACT, NUCLEUS		0	0.0%	1	1.5%
100.307 PUNCTATE CATARACT, CAPSULAR		0	0.0%	1	1.5%
100.328 Y-SUTURE TIP OPACITIES		0	0.0%	1	1.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>0</b>	<b>0.0%</b>	<b>5</b>	<b>7.4%</b>
<b>VITREOUS</b>					
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		1	3.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		1	3.1%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		31	96.9%	62	91.2%

## **SLOVAKIAN WIREHAired POINTER**

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SLOVAKIAN WIREHAired POINTER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT SLOVAKIAN WIREHAired POINTER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	1 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		0	0.0%	1	100.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1	100.0%	0	0.0%

## SMALL MUNSTERLANDER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SMALL MUNSTERLANDER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT SMALL MUNSTERLANDER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			18 #	%	9 #	%
<b>EYELIDS</b>						
22.000 ECTROPION, UNSPECIFIED			1	5.6%	0	0.0%
25.110 DISTICHIASIS			0	0.0%	1	11.1%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			2	11.1%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	5.6%	2	22.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	11.1%	1	11.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	11.1%	1	11.1%
100.307 PUNCTATE CATARACT, CAPSULAR			0	0.0%	1	11.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	5.6%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>3</b>	<b>16.7%</b>	<b>2</b>	<b>22.2%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	5.6%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			12	66.7%	5	55.6%

## SMOOTH FOX TERRIER\*

\*The Smooth Fox Terrier and the Wire Fox Terrier were originally considered two varieties of the same breed. They became separate breeds in 1985. It is likely that the same genetic diseases exist in both breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1, 2	NO	
B.	Persistent pupillary membrane - iris - iris	Not defined	1	Breeder option	
C.	Lens luxation	Autosomal recessive	1, 3-7	NO	Mutation in the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Martin CL and Wyman M. Primary glaucoma in the dog. *Vet Clin North Am.* 1978 May;8:257-286.
3. Lawson DD. Luxation of the crystalline lens in the dog. *J Small Anim Pract.* 1969;10:461.
4. Curtis R and Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract.* 1980 Dec;21:657-668.

5. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447.
6. Formston C. Observations on subluxation and luxation of the crystalline lens in the dog. *Journal of Comparative Pathology.* 1945;55:168.
7. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

## OCULAR DISORDERS REPORT SMOOTH FOX TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			299		87	
			#	%	#	%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	1.1%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			14	4.7%	6	6.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	0.3%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.3%	1	1.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.3%	1	1.1%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.3%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	1.0%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			1	0.3%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	0.7%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>5</b>	<b>1.7%</b>	<b>0</b>	<b>0.0%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			3	1.0%	1	1.1%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.7%	1	1.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			3	1.0%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	1.1%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			1	0.3%	0	0.0%
900.100 OTHER, NOT INHERITED			6	2.0%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			5	1.7%	1	1.1%
<b>NORMAL</b>						
.000 NORMAL GLOBE			263	88.0%	75	86.2%

## SOFT-COATED WHEATEN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Microphthalmos	Autosomal recessive	2, 3	NO	Mutation in the <i>RBP4</i> gene
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1, 4	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1, 4	NO	

### Description and Comments

#### A. Microphthalmos

Microphthalmia is a congenital defect characterized by a small eye often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina. A genetic test is available.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Kaukonen M, Woods S, Ahonen S. et al. Maternal inheritance of a recessive RBP for defect in canine congenital eyes disease. *Cell Reports* 2018; 23:2643–2652.
3. Kaukonen M, Woods S, Ahonen S, Lemberg S, Hellman M, Hytönen MK, Permi P, Glaser T, Lohi H. Maternal Inheritance of a Recessive RBP4 Defect in Canine Congenital Eye Disease. *Cell Rep.* 2018 May 29;23(9):2643-2652. doi: 10.1016/j.celrep.2018.04.118. PMID: 29847795; PMCID: PMC6546432.
4. Van der Woerd A. Multiple ocular anomalies in two related litters of Soft-Coated Wheaten Terriers. *Prog Vet Comp Ophthalmol.* 1995;5:78.

## OCULAR DISORDERS REPORT SOFT COATED WHEATEN TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 7,828		2018-2022 1,150	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			0	0.0%	1	0.1%
10.000 GLAUCOMA			2	0.0%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			0	0.0%	1	0.1%
20.160 MACROPALPEBRAL FISSURE			1	0.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			149	1.9%	27	2.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			10	0.1%	0	0.0%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.0%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			56	0.7%	5	0.4%
<b>UVEA</b>						
93.120 IRIS CYST			14	0.2%	1	0.1%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			3	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			267	3.4%	70	6.1%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			18	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			65	0.8%	54	4.7%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			7	0.1%	1	0.1%
95.120 CILIARY BODY CYST			4	0.1%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			0	0.0%	2	0.2%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			17	0.2%	2	0.2%
97.120 COLOBOMA			1	0.0%	0	0.0%
130.110 MICROPAPILLA			0	0.0%	2	0.2%
130.120 OPTIC NERVE HYPOPLASIA			0	0.0%	2	0.2%
130.150 OPTIC DISC COLOBOMA			0	0.0%	4	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			24	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			369	4.7%	65	5.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			58	0.7%	26	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			11	0.1%	13	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			17	0.2%	5	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			10	0.1%	7	0.6%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			7	0.1%	4	0.3%
100.306 PUNCTATE CATARACT, NUCLEUS			5	0.1%	4	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			24	0.3%	18	1.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			35	0.4%	11	1.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			32	0.4%	6	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			21	0.3%	4	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.0%	2	0.2%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			14	0.2%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			20	0.3%	2	0.2%
100.317 INCIPIENT CATARACT, CAPSULAR			18	0.2%	7	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	5	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	4	0.3%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.1%
100.328 Y-SUTURE TIP OPACITIES			3	0.0%	6	0.5%

## OCULAR DISORDERS REPORT SOFT COATED WHEATEN TERRIER

Year Examined: Total # Dogs:		1993-2017 7,828		2018-2022 1,150	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.330	GENERALIZED/ COMPLETE CATARACT	35	0.4%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.1%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	4	0.1%	1	0.1%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>334</b>	<b>4.3%</b>	<b>120</b>	<b>10.4%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	72	0.9%	8	0.7%
110.135	PHPV/ PTVL	6	0.1%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	3	0.0%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	11	0.1%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	71	0.9%	3	0.3%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	2	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	14	0.2%	1	0.1%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
120.960	RETINOPATHY	2	0.0%	0	0.0%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	14	0.2%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	5	0.1%	0	0.0%
130.150	OPTIC DISC COLOBOMA	9	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	49	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	184	2.4%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	86	1.1%	54	4.7%
<b>NORMAL</b>					
.000	NORMAL GLOBE	6,739	86.1%	866	75.3%

## SPANISH GREYHOUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SPANISH GREYHOUND breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## SPANISH GREYHOUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2 #	%	1 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		2	100.0%	1	100.0%

## SPANISH MASTIFF

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the SPANISH MASTIFF breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT

## SPANISH MASTIFF

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		1	100.0%	0	

## SPANISH WATER DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- early onset	Autosomal recessive	2	NO	Mutation in the <i>PDE6B</i> gene
	- <i>prcd</i>	Autosomal recessive	3	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Retinal atrophy

##### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### - early onset

A second, earlier onset form of PRA has also been identified recently in the Spanish Water Dog. The onset of visual deficits occurs at 2-3 years of age, and, dogs show advanced retinal degeneration at the time

visual deficits are recognized. The condition appears inherited as autosomal recessive. A DNA test is available.

**- *prcd***

Studies have shown that one form of PRA in the Spanish Water Dog is PRCD which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## References

1. ACVO Genetics Committee and Data from OFA All-Breeds Report.
2. Winkler PA, Ramsey HD, Petersen-Jones SM. A novel mutation in PDE6B in Spanish Water Dogs with early-onset progressive retinal atrophy. *Vet Ophthalmol.* 2020 Sep;23(5):792-796. doi: 10.1111/vop.12792. Epub 2020 Jul 8. PMID: 32639685.
3. Personal communication on data from Optigen with Sue Pearce-Kelling

## OCULAR DISORDERS REPORT SPANISH WATER DOG

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 316		2018-2022 224	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			3	0.9%	4	1.8%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.3%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			3	0.9%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			0	0.0%	1	0.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			13	4.1%	1	0.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			0	0.0%	1	0.4%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.3%	1	0.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			17	5.4%	10	4.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	0.3%	1	0.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			6	1.9%	9	4.0%
100.307 PUNCTATE CATARACT, CAPSULAR			2	0.6%	1	0.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.6%	1	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.3%	2	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.4%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	1	0.4%
100.330 GENERALIZED/ COMPLETE CATARACT			0	0.0%	1	0.4%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>14</b>	<b>4.4%</b>	<b>17</b>	<b>7.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.3%	2	0.9%
110.320 VITREOUS DEGENERATION SYNERESIS			2	0.6%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			8	2.5%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			4	1.3%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			8	2.5%	0	0.0%
<b>FUNDUS</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.4%
130.110 MICROPAPILLA			0	0.0%	1	0.4%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			0	0.0%	1	0.4%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			4	1.3%	0	0.0%
900.100 OTHER, NOT INHERITED			7	2.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			12	3.8%	12	5.4%
<b>NORMAL</b>						
.000 NORMAL GLOBE			258	81.6%	188	83.9%

# SPINONE ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder options
D.	Cataract	Not defined	1	NO

## Description and Comments

### A. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT SPINONE ITALIANO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,253		2018-2022 346	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			3	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			31	1.4%	2	0.6%
22.000 ECTROPION, UNSPECIFIED			15	0.7%	4	1.2%
25.110 DISTICHIASIS			30	1.3%	7	2.0%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			3	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	0.3%
<b>UVEA</b>						
90.250 PIGMENTARY UVEITIS			1	0.0%	0	0.0%
93.120 IRIS CYST			1	0.0%	0	0.0%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			103	4.6%	25	7.2%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			4	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			3	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			6	0.3%	3	0.9%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			116	5.1%	20	5.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	0.6%	6	1.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			4	0.2%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			3	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			8	0.4%	3	0.9%
100.306 PUNCTATE CATARACT, NUCLEUS			22	1.0%	5	1.4%
100.307 PUNCTATE CATARACT, CAPSULAR			7	0.3%	3	0.9%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			14	0.6%	2	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			6	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			6	0.3%	1	0.3%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			6	0.3%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			14	0.6%	3	0.9%
100.317 INCIPIENT CATARACT, CAPSULAR			5	0.2%	2	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			5	0.2%	4	1.2%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.2%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>122</b>	<b>5.4%</b>	<b>26</b>	<b>7.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.1%	1	0.3%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			7	0.3%	1	0.3%
110.320 VITREOUS DEGENERATION SYNERESIS			14	0.6%	0	0.0%

# OCULAR DISORDERS REPORT SPINONE ITALIANO

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,253		2018-2022 346	
			#	%	#	%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			10	0.4%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.0%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.0%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.0%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			22	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED			62	2.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			27	1.2%	8	2.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			1,940	86.1%	274	79.2%

## STABYHOUN

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the STABYHOUN breed. Therefore, there are no conditions listed with breeding advice.

# OCULAR DISORDERS REPORT STABYHOUN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		5 #	%	6 #	%
<b>CORNEA</b> 70.700 CORNEAL DYSTROPHY		0	0.0%	1	16.7%
<b>LENS</b> 100.312 INCIPIENT CATARACT, POSTERIOR CORTEX 100.328 Y-SUTURE TIP OPACITIES 100.345 <b>SIGNIFICANT CATARACTS (SUMMARY)</b>		1 0 1	20.0% 0.0% 20.0%	0 2 0	0.0% 33.3% 0.0%
<b>RETINA</b> 120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		1	20.0%	0	0.0%
<b>OTHER</b> 900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	16.7%
<b>NORMAL</b> .000 NORMAL GLOBE		4	80.0%	3	50.0%

## STAFFORDSHIRE BULL TERRIER\*

\*Please note that since 1972 the AKC considers the Staffordshire Bull Terrier a different breed from the American Staffordshire Terrier.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract				
	- generalized	Not defined	1	NO	
	- <i>HSF4</i>	Autosomal recessive	2-4	NO	Mutation in the <i>HSF4</i> gene
D.	Persistent hyperplastic primary vitreous (PHPV)	Not defined	1, 5, 6	NO	

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### C. Cataract

##### - generalized

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except

in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **- HSF4**

In the Staffordshire Bull Terrier, cataracts usually develop by one year of age. There is initial opacification of the suture lines progressing to nuclear and cortical cataract formation; complete cataracts and blindness develop by three years of age. The condition is inherited as an autosomal recessive mutation in the *HSF4* gene (*HSF4-1*). A DNA test is available.

#### **D. Persistent hyperplastic primary vitreous (PHPV)**

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent tunica vasculosa lentis (PTVL) which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result. The disease is an inherited disorder in the breed, but the mode of inheritance has not been defined. The results of current studies cannot rule out autosomal recessive or a dominant trait with incomplete penetrance.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978;19:109-120.
3. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305-316.
4. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol.* 2009;12:372-378.
5. Curtis R, Barnett KC, Leon A. Persistent hyperplastic primary vitreous in the Staffordshire Bull Terrier. *Vet Rec.* 1984;115:385.
6. Leon A, Curtis R, Barnett K. Hereditary persistent hyperplastic primary vitreous in the Staffordshire Bull Terrier. *J Am Anim Hosp Assoc.* 1986;22:765-774.

## OCULAR DISORDERS REPORT STAFFORDSHIRE BULL TERRIER

Year Examined: Total # Dogs:		1993-2017 1,005		2018-2022 641	
Diagnostic Name		#	%	#	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	0	0.0%	2	0.3%
25.110	DISTICHIASIS	84	8.4%	37	5.8%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	0	0.0%	1	0.2%
<b>CORNEA</b>					
70.220	PIGMENTARY KERATITIS	0	0.0%	1	0.2%
70.700	CORNEAL DYSTROPHY	4	0.4%	4	0.6%
<b>UVEA</b>					
93.120	IRIS CYST	5	0.5%	1	0.2%
93.170	ANTERIOR CHAMBER CYST	1	0.1%	1	0.2%
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	27	2.7%	16	2.5%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	2	0.2%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	12	1.2%	16	2.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	1	0.1%	1	0.2%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	38	3.8%	18	2.8%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	9	0.9%	10	1.6%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	3	0.3%	4	0.6%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	3	0.3%	2	0.3%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	3	0.3%	2	0.3%
100.307	PUNCTATE CATARACT, CAPSULAR	5	0.5%	6	0.9%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	3	0.3%	6	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	7	0.7%	5	0.8%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	5	0.5%	0	0.0%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	1	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	0.1%	2	0.3%
100.316	INCIPIENT CATARACT, NUCLEUS	0	0.0%	1	0.2%
100.317	INCIPIENT CATARACT, CAPSULAR	4	0.4%	5	0.8%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	0	0.0%	1	0.2%
100.328	Y-SUTURE TIP OPACITIES	3	0.3%	1	0.2%
100.330	GENERALIZED/ COMPLETE CATARACT	1	0.1%	0	0.0%
100.340	RESORBING/ HYPERMATURE CATARACT	0	0.0%	1	0.2%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>	<b>46</b>	<b>4.6%</b>	<b>45</b>	<b>7.0%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	4	0.4%	5	0.8%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	0	0.0%	2	0.3%
110.320	VITREOUS DEGENERATION SYNERESIS	19	1.9%	4	0.6%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	2	0.3%
120.960	RETINOPATHY	0	0.0%	1	0.2%
120.970	CMR/ CMR-LIKE RETINOPATHY	0	0.0%	1	0.2%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	5	0.5%	3	0.5%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	6	0.6%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	1	0.1%	2	0.3%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	9	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	20	2.0%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	19	1.9%	30	4.7%

# OCULAR DISORDERS REPORT STAFFORDSHIRE BULL TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1,005 #	%	641 #	%
<b>NORMAL</b> .000 NORMAL GLOBE		811	80.7%	505	78.8%

## STANDARD SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO
E.	Y-suture tip opacity	Not defined	1	Breeder option
F.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### D. Cataract

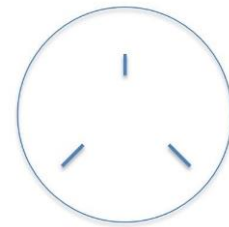
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and

affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

There are apparently several forms of cataracts in the Standard Schnauzer: 1) posterior cortex and posterior/total nucleus involvement, with slow progression; 2) dense posterior polar opacity near the sub-capsular region which progresses rapidly to very dense posterior polar plaques in young animals; 3) dense posterior polar opacity like that reported in young animals but found in older animals with variable progression.

#### **E. Y-suture tip opacity**

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### **F. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT STANDARD SCHNAUZER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,338		2018-2022 638	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHTHALMIA			1	0.0%	0	0.0%
10.000 GLAUCOMA			2	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	0	0.0%
25.110 DISTICHIASIS			68	2.0%	4	0.6%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	0	0.0%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			0	0.0%	1	0.2%
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.1%	1	0.2%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			2	0.1%	0	0.0%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.2%
70.700 CORNEAL DYSTROPHY			27	0.8%	2	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			2	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			15	0.4%	2	0.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.1%	3	0.5%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			2	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			9	0.3%	8	1.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			123	3.7%	29	4.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			25	0.7%	15	2.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			9	0.3%	6	0.9%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.2%	4	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			4	0.1%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			15	0.4%	5	0.8%
100.306 PUNCTATE CATARACT, NUCLEUS			10	0.3%	3	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			19	0.6%	2	0.3%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			15	0.4%	5	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			12	0.4%	6	0.9%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			17	0.5%	6	0.9%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.1%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			9	0.3%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			4	0.1%	4	0.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.0%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.0%	1	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			8	0.2%	8	1.3%
100.330 GENERALIZED/ COMPLETE CATARACT			13	0.4%	1	0.2%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>167</b>	<b>5.0%</b>	<b>60</b>	<b>9.4%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			3	0.1%	4	0.6%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			5	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			13	0.4%	2	0.3%

## OCULAR DISORDERS REPORT STANDARD SCHNAUZER

Year Examined: Total # Dogs:		1993-2017 3,338		2018-2022 638	
Diagnostic Name		#	%	#	%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	31	0.9%	1	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	24	0.7%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.0%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.2%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.2%
130.110	MICROPAPILLA	0	0.0%	4	0.6%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.2%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	5	0.1%	1	0.2%
130.120	OPTIC NERVE HYPOPLASIA	3	0.1%	1	0.2%
130.150	OPTIC DISC COLOBOMA	0	0.0%	1	0.2%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	31	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	71	2.1%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	41	1.2%	41	6.4%
<b>NORMAL</b>					
.000	NORMAL GLOBE	2,955	88.5%	524	82.1%

## SUSSEX SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent hyaloid artery remnant	Not defined	1	Breeder option
D.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

### Description and Comments

#### A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### C. Persistent hyaloid artery remnant (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

#### D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT SUSSEX SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			456		92	
			#	%	#	%
<b>EYELIDS</b>						
20.160 MACROPALPEBRAL FISSURE			23	5.0%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			1	0.2%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			32	7.0%	1	1.1%
25.110 DISTICHIASIS			24	5.3%	6	6.5%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			2	0.4%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			3	0.7%	0	0.0%
93.150 IRIS COLOBOMA			8	1.8%	1	1.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			3	0.7%	3	3.3%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	1.5%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.2%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			2	0.4%	2	2.2%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			17	3.7%	1	1.1%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	0.2%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.2%	1	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	0.4%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.4%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			4	0.9%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			6	1.3%	6	6.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.4%	1	1.1%
100.328 Y-SUTURE TIP OPACITIES			1	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.4%	2	2.2%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>21</b>	<b>4.6%</b>	<b>10</b>	<b>10.9%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			39	8.6%	10	10.9%
110.135 PHPV/ PTVL			4	0.9%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.2%	0	0.0%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	3.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			43	9.4%	2	2.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			2	0.4%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	0.2%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA			1	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA			3	0.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			10	2.2%	0	0.0%
900.100 OTHER, NOT INHERITED			20	4.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	1.5%	4	4.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			288	63.2%	60	65.2%

## SWEDISH LAPPHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- <i>prcd</i>	Autosomal recessive	1	NO	Mutation in the <i>prcd</i> gene

### Description and Comments

#### A. Retinal atrophy

##### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

##### - *prcd*

Studies have shown that the principal form of PRA in the Swedish Lapphund is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Swedish Lapphund. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563. PMID: 16938425

# OCULAR DISORDERS REPORT

## SWEDISH LAPPHUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		3		11	
		#	%	#	%
<b>UVEA</b>					
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS		0	0.0%	1	9.1%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	33.3%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX		1	33.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		1	33.3%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES		1	33.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES		1	33.3%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>3</b>	<b>100.0%</b>	<b>0</b>	<b>0.0%</b>
<b>RETINA</b>					
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		1	33.3%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		0	0.0%	10	90.9%

## SWEDISH VALLHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
C.	Cataract	Not defined	1	NO	
D.	Y suture tip opacities	Not defined	1	Breeder option	
E.	Vitreous degeneration				
	- syneresis	Not defined	1	Breeder option	
F.	Retinopathy	Autosomal recessive	1-4	NO	Mutation in the <i>MERTK</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

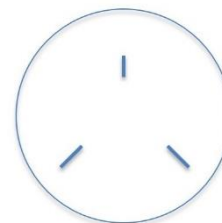
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## E. Vitreous degeneration - syneresis

Liquefaction of the vitreous gel which may predispose to retinal detachment.

## F. Retinopathy

Swedish Vallhunds have a unique form of retinal degeneration compared to most forms of PRA. The condition is multifocal rather than diffuse and the age of onset and rate of progression vary dramatically, even between littermates. The clinical signs progress in three stages. (A. Komaromy, personal communication 2016)

Stage one usually occurs between 2-3 years of age and is characterized by mottling or multifocal brown discoloration of the tapetal fundus – this should be marked as retinopathy even though visual deficits are not yet noted.

In stage two, geographic thinning of the retina can be seen and subtle night vision deficits are observed.

In stage three, the retinal thinning becomes more generalized with small islands of retinal sparing and deficits are noted in both photopic and scotopic vision. The disease has been associated with a mutation in the *MERTK* gene on canine chromosome 17. Dogs homozygous for the mutation have an 18 fold increased risk of developing the retinopathy. However, the actual causative mutation has not yet been identified.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Cooper AE, Ahonen S, Rowland JS, et al. A novel form of progressive retinal atrophy in Swedish Vallhund dogs. *PLoS one*. 2014;9:e106610.

3. Ahonen SJ, Arumilli M, Seppala E, et al. Increased expression of MERTK is associated with a unique form of canine retinopathy. *PloS one*. 2014;9:e114552.
4. Everson R, Pettitt L, Forman OP, et al. An intronic LINE-1 insertion in MERTK is strongly associated with retinopathy in Swedish Vallhund Dogs. *PLoS one*. 2017; 12(8):e0183021 PMID: 28813472

# OCULAR DISORDERS REPORT SWEDISH VALLHUND

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,587		2018-2022 280	
			#	%	#	%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.1%	0	0.0%
25.110 DISTICHIASIS			38	2.4%	2	0.7%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			22	1.4%	2	0.7%
<b>UVEA</b>						
93.120 IRIS CYST			5	0.3%	0	0.0%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			287	18.1%	60	21.4%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			10	0.6%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.2%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			7	0.4%	7	2.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
93.810 UVEAL MELANOMA			2	0.1%	0	0.0%
95.120 CILIARY BODY CYST			0	0.0%	1	0.4%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			1	0.1%	0	0.0%
120.960 RETINOPATHY			0	0.0%	8	2.9%
120.970 CMR/ CMR-LIKE RETINOPATHY			0	0.0%	1	0.4%
130.150 OPTIC DISC COLOBOMA			0	0.0%	10	3.6%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			232	14.6%	19	6.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			23	1.4%	8	2.9%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			8	0.5%	3	1.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			3	0.2%	3	1.1%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			37	2.3%	5	1.8%
100.306 PUNCTATE CATARACT, NUCLEUS			37	2.3%	10	3.6%
100.307 PUNCTATE CATARACT, CAPSULAR			8	0.5%	6	2.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			21	1.3%	6	2.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			5	0.3%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			10	0.6%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			4	0.3%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			6	0.4%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			18	1.1%	2	0.7%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	1	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			12	0.8%	12	4.3%
100.330 GENERALIZED/ COMPLETE CATARACT			7	0.4%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>190</b>	<b>12.0%</b>	<b>45</b>	<b>16.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	2	0.7%
110.135 PHPV/ PTVL			1	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			11	0.7%	1	0.4%
110.320 VITREOUS DEGENERATION SYNERESIS			41	2.6%	6	2.1%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			24	1.5%	2	0.7%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			4	0.3%	2	0.7%

## OCULAR DISORDERS REPORT SWEDISH VALLHUND

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,587		2018-2022 280	
		#	%	#	%
<b>RETINA Continued</b>					
120.190	RETINAL DYSPLASIA, DETACHED	1	0.1%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	45	2.8%	2	0.7%
120.960	RETINOPATHY	48	3.0%	7	2.5%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	3	0.2%	2	0.7%
130.150	OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	47	3.0%	0	0.0%
900.100	OTHER, NOT INHERITED	73	4.6%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	71	4.5%	17	6.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	975	61.4%	157	56.1%

# TAMASKAN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Choroidal hypoplasia (Collie Eye Anomaly) - optic nerve coloboma - retinal detachment - retinal hemorrhage - staphyloma/ coloboma	Autosomal recessive	1	NO	Mutation in the <i>NHEJ1</i> gene

## Description and Comments

- A. Choroidal hypoplasia (Collie Eye Anomaly)**  
 - staphyloma/coloboma  
 - retinal detachment  
 - retinal hemorrhage  
 - optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

## References

- Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. *PLoS Genet.* 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: *PLoS Genet.* 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT TAMASKAN

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		66 #	%	76 #	%
<b>EYELIDS</b>					
25.110 DISTICHIASIS		1	1.5%	1	1.3%
<b>CORNEA</b>					
70.700 CORNEAL DYSTROPHY		0	0.0%	3	3.9%
<b>UVEA</b>					
93.120 IRIS CYST		0	0.0%	1	1.3%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS		1	1.5%	1	1.3%
95.120 CILIARY BODY CYST		1	1.5%	0	0.0%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	1.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX		1	1.5%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		1	1.5%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		1	1.5%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS		0	0.0%	1	1.3%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX		1	1.5%	1	1.3%
100.327 INCOMPLETE CATARACT, CAPSULAR		1	1.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>5</b>	<b>7.6%</b>	<b>2</b>	<b>2.6%</b>
<b>VITREOUS</b>					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		1	1.5%	0	0.0%
<b>RETINA</b>					
120.960 RETINOPATHY		1	1.5%	0	0.0%
<b>OTHER</b>					
900.100 OTHER, NOT INHERITED		0	0.0%	1	1.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	3.0%	2	2.6%
<b>NORMAL</b>					
.000 NORMAL GLOBE		56	84.8%	66	86.8%

## TEDDY ROOSEVELT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC TESTS AVAILABLE
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the <i>ADAMTS17</i> gene

---

### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Teddy Roosevelt Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

## OCULAR DISORDERS REPORT TEDDY ROOSEVELT TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			5		8	
			#	%	#	%
<b>LENS</b>						
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX		1	20.0%	0	0.0%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX		1	20.0%	0	0.0%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX		1	20.0%	0	0.0%
100.345	<b>SIGNIFICANT CATARACTS (SUMMARY)</b>		3	60.0%	0	0.0%
<b>VITREOUS</b>						
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER		1	20.0%	0	0.0%
<b>OTHER</b>						
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	40.0%	0	0.0%
<b>NORMAL</b>						
.000	NORMAL GLOBE		1	20.0%	8	100.0%

## TENTERFIELD TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the <i>ADAMTS17</i> gene

---

### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Tenterfield Terrier. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. *ADAMTS17* mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

## OCULAR DISORDERS REPORT TENTERFIELD TERRIER

**There are no statistics available for this breed**

# TIBETAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO

## Description and Comments

### A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT TIBETAN MASTIFF

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		64 #	%	43 #	%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	3	4.7%	0	0.0%
22.000	ECTROPION, UNSPECIFIED	0	0.0%	1	2.3%
25.110	DISTICHIASIS	1	1.6%	4	9.3%
<b>CORNEA</b>					
70.700	CORNEAL DYSTROPHY	1	1.6%	0	0.0%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	8	12.5%	5	11.6%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	5	7.8%	0	0.0%
<b>LENS</b>					
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	2	3.1%	1	2.3%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	1	1.6%	0	0.0%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	1	1.6%	1	2.3%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	1	1.6%	1	2.3%
100.307	PUNCTATE CATARACT, CAPSULAR	1	1.6%	1	2.3%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	1	1.6%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	0	0.0%	2	4.7%
100.328	Y-SUTURE TIP OPACITIES	1	1.6%	2	4.7%
100.345	SIGNIFICANT CATARACTS (SUMMARY)	5	7.8%	5	11.6%
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	0	0.0%	1	2.3%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	2	3.1%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	1	1.6%	3	7.0%
<b>NORMAL</b>					
.000	NORMAL GLOBE	46	71.9%	31	72.1%

## TIBETAN SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Entropion	Not defined	1	Breeder option	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Y-suture tip opacity	Not defined	1	Breeder option	
F.	Retinal atrophy				
	- <i>FAM161A</i>	Autosomal recessive	1-3	NO	Mutation in the <i>FAM161A</i> gene

### Descriptions and Comments

#### A. Entropion

A conformational defect resulting in an "in rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

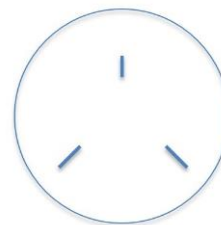
Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### E. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### F. Retinal atrophy - *FAM161A*

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In most breeds PRA is inherited as an autosomal recessive trait.

In the Tibetan Spaniel, a mutation in *FAM161A* causes a later onset (4-5 years) of PRA. This form is being called progressive retinal atrophy 3 (PRA3) and appears to be the causative mutation in about 60% of Tibetan Spaniels with PRA. This form is inherited as an autosomal recessive trait. A DNA test for PRA3 is available. This test will not detect PRA caused by other genetic mutations. At least one other form of PRA appears to be present in the Tibetan Spaniel.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Bjerkas E. Progressive retinal atrophy in dogs in Norway. *Norsk Veterinaertidsskrift*. 1991;103:601-610.
3. Downs LM, Mellersh CS. An Intronic SINE insertion in *FAM161A* that causes exon-skipping is associated with progressive retinal atrophy in Tibetan Spaniels and Tibetan Terriers. *PLoS One*. 2014;9:e93990.

## OCULAR DISORDERS REPORT TIBETAN SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,382		2018-2022 362	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			2	0.1%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			4	0.1%	0	0.0%
20.160 MACROPALPEBRAL FISSURE			5	0.1%	0	0.0%
21.000 ENTROPION, UNSPECIFIED			90	2.7%	2	0.6%
22.000 ECTROPION, UNSPECIFIED			2	0.1%	0	0.0%
25.110 DISTICHIASIS			290	8.6%	15	4.1%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.3%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			2	0.1%	1	0.3%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			2	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			6	0.2%	1	0.3%
<b>CORNEA</b>						
70.210 PANNUS			8	0.2%	0	0.0%
70.220 PIGMENTARY KERATITIS			19	0.6%	3	0.8%
70.700 CORNEAL DYSTROPHY			10	0.3%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.0%	0	0.0%
93.120 IRIS CYST			2	0.1%	1	0.3%
93.150 IRIS COLOBOMA			4	0.1%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			66	2.0%	9	2.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			4	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			5	0.1%	5	1.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	0	0.0%
93.810 UVEAL MELANOMA			2	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			9	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			82	2.4%	10	2.8%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			5	0.1%	2	0.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			4	0.1%	1	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			13	0.4%	4	1.1%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			5	0.1%	3	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			21	0.6%	1	0.3%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			12	0.4%	1	0.3%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			6	0.2%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			5	0.1%	1	0.3%
100.316 INCIPIENT CATARACT, NUCLEUS			8	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.3%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			11	0.3%	8	2.2%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%

## OCULAR DISORDERS REPORT TIBETAN SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,382		2018-2022 362	
			#	%	#	%
<b>LENS Continued</b> <i>100.345 SIGNIFICANT CATARACTS (SUMMARY)</i>			99	2.9%	14	3.9%
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			8	0.2%	2	0.6%
110.135 PHPV/ PTVL			1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			3	0.1%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			13	0.4%	1	0.3%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			9	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.0%	3	0.8%
120.190 RETINAL DYSPLASIA, DETACHED			2	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			29	0.9%	0	0.0%
120.960 RETINOPATHY			3	0.1%	2	0.6%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			2	0.1%	0	0.0%
130.150 OPTIC DISC COLOBOMA			7	0.2%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			32	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			76	2.2%	1	0.3%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			40	1.2%	15	4.1%
<b>NORMAL</b> .000 NORMAL GLOBE			2,748	81.3%	294	81.2%

## TIBETAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Lens luxation	Autosomal recessive	1, 2-7	NO	Mutation in the <i>ADAMTS17</i> gene
F.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- <i>FAM161A</i>	Autosomal recessive	1, 3, 8-11	NO	Mutation in the <i>FAM161A</i> gene
	- <i>prcd</i>	Autosomal recessive	12	NO	Mutation in the <i>prcd</i> gene
	- Rod-cone dysplasia ( <i>rcd4</i> )	Autosomal recessive	14	NO	Mutation in the <i>C2orf71</i> gene
G.	Ceroid lipofuscinosis	Not defined	13, 14	NO	

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

#### B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

### F. Retinal atrophy

#### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky and Samoyed, in most breeds studied to date, PRA is inherited as an autosomal recessive trait.

#### - *FAM161A*

There are ERG studies to indicate that there is depression of the B wave at 10-12 weeks of age in the second variety and slower depression in the first variety. Some may have no obvious signs at 5-6 years of age, only to develop clinical signs at 6-7 years of age. It is logical that any animal found with signs of bilateral atrophy should not be bred. Members of the family of the affected animal should be carefully screened. Perhaps, ERG in animals less than 4 years of age is logical, especially if the animal is intended for breed foundation.

In the Tibetan Terrier a mutation in *FAM161A* causes a later onset (4-5 years) of PRA. This form is being called progressive retinal atrophy 3 (PRA3). This form is inherited as an autosomal recessive trait. A DNA test for PRA3 is available. This test will not detect PRA caused by other genetic mutations. At least one other form of PRA appears to be present in the Tibetan Terrier.

#### - *prcd*

Studies have shown that one form of PRA in the Tibetan Terrier is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night

blindness followed by day blindness. A DNA test is available.

#### **- rod-cone dysplasia, type 4 (*rcd4*)**

A form of PRA initially identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A mutation-based gene test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and is of no value in identifying other forms of PRA.

### **G. Ceroid Lipofuscinosis**

An inherited disease of man and animal characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease. In the Tibetan Terrier, moderate visual impairment can occur in low-light conditions.

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2. Willis MB, Curtis R, Barnett KC, et al. Genetic aspects of lens luxation in the Tibetan Terrier. *Vet Rec.* 1979;104:409-412.
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## OCULAR DISORDERS REPORT TIBETAN TERRIER

Year Examined: Total # Dogs:		1993-2017 8,797		2018-2022 930	
Diagnostic Name		#	%	#	%
<b>GLOBE</b>					
.110	MICROPHTHALMIA	4	0.0%	0	0.0%
10.000	GLAUCOMA	3	0.0%	0	0.0%
40.910	KERATOCONJUNCTIVITIS SICCA	0	0.0%	1	0.1%
<b>EYELIDS</b>					
21.000	ENTROPION, UNSPECIFIED	1	0.0%	0	0.0%
25.110	DISTICHIASIS	122	1.4%	7	0.8%
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>					
32.110	IMPERFORATE LOWER NASOLACRIMAL PUNCTUM	3	0.0%	2	0.2%
<b>NICTITANS</b>					
52.110	PROLAPSED GLAND OF THE THIRD EYELID	4	0.0%	0	0.0%
<b>CORNEA</b>					
70.220	PIGMENTARY KERATITIS	3	0.0%	1	0.1%
70.700	CORNEAL DYSTROPHY	91	1.0%	8	0.9%
70.730	CORNEAL ENDOTHELIAL DEGENERATION	1	0.0%	0	0.0%
<b>UVEA</b>					
93.710	PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS	509	5.8%	69	7.4%
93.720	PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS	22	0.3%	0	0.0%
93.730	PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA	40	0.5%	0	0.0%
93.740	PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS	10	0.1%	0	0.0%
93.750	PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS	47	0.5%	33	3.5%
93.760	PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS	12	0.1%	4	0.4%
93.810	UVEAL MELANOMA	1	0.0%	0	0.0%
95.120	CILIARY BODY CYST	0	0.0%	1	0.1%
<b>FUNDUS</b>					
97.110	CHOROIDAL HYPOPLASIA	1	0.0%	0	0.0%
97.120	COLOBOMA	1	0.0%	0	0.0%
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	3	0.3%
130.120	OPTIC NERVE HYPOPLASIA	0	0.0%	1	0.1%
<b>LENS</b>					
100.200	CATARACT, UNSPECIFIED	34	0.4%	0	0.0%
100.210	CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	411	4.7%	60	6.5%
100.301	PUNCTATE CATARACT, ANTERIOR CORTEX	127	1.4%	35	3.8%
100.302	PUNCTATE CATARACT, POSTERIOR CORTEX	46	0.5%	1	0.1%
100.303	PUNCTATE CATARACT, EQUATORIAL CORTEX	18	0.2%	4	0.4%
100.304	PUNCTATE CATARACT, ANTERIOR SUTURES	19	0.2%	9	1.0%
100.305	PUNCTATE CATARACT, POSTERIOR SUTURES	10	0.1%	2	0.2%
100.306	PUNCTATE CATARACT, NUCLEUS	15	0.2%	10	1.1%
100.307	PUNCTATE CATARACT, CAPSULAR	28	0.3%	9	1.0%
100.311	INCIPIENT CATARACT, ANTERIOR CORTEX	70	0.8%	8	0.9%
100.312	INCIPIENT CATARACT, POSTERIOR CORTEX	71	0.8%	6	0.6%
100.313	INCIPIENT CATARACT, EQUATORIAL CORTEX	37	0.4%	4	0.4%
100.314	INCIPIENT CATARACT, ANTERIOR SUTURES	13	0.1%	0	0.0%
100.315	INCIPIENT CATARACT, POSTERIOR SUTURES	14	0.2%	1	0.1%
100.316	INCIPIENT CATARACT, NUCLEUS	11	0.1%	0	0.0%
100.317	INCIPIENT CATARACT, CAPSULAR	6	0.1%	6	0.6%
100.321	INCOMPLETE CATARACT, ANTERIOR CORTEX	8	0.1%	5	0.5%
100.322	INCOMPLETE CATARACT, POSTERIOR CORTEX	5	0.1%	3	0.3%
100.323	INCOMPLETE CATARACT, EQUATORIAL CORTEX	2	0.0%	3	0.3%

## OCULAR DISORDERS REPORT TIBETAN TERRIER

Year Examined: Total # Dogs:		1993-2017 8,797		2018-2022 930	
Diagnostic Name		#	%	#	%
<b>LENS Continued</b>					
100.325	INCOMPLETE CATARACT, POSTERIOR SUTURES	0	0.0%	2	0.2%
100.326	INCOMPLETE CATARACT, NUCLEUS	1	0.0%	1	0.1%
100.327	INCOMPLETE CATARACT, CAPSULAR	0	0.0%	2	0.2%
100.328	Y-SUTURE TIP OPACITIES	1	0.0%	4	0.4%
100.330	GENERALIZED/ COMPLETE CATARACT	41	0.5%	1	0.1%
100.340	RESORBING/ HYPERMATURE CATARACT	1	0.0%	2	0.2%
100.375	SUBLUXATION/ LUXATION, UNSPECIFIED	17	0.2%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>577</b>	<b>6.6%</b>	<b>114</b>	<b>12.3%</b>
<b>VITREOUS</b>					
110.120	PERSISTENT HYALOID ARTERY/ REMNANT	4	0.0%	3	0.3%
110.135	PHPV/ PTVL	2	0.0%	0	0.0%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.1%	0	0.0%
110.320	VITREOUS DEGENERATION SYNERESIS	34	0.4%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	12	0.1%	0	0.0%
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	5	0.1%	0	0.0%
120.190	RETINAL DYSPLASIA, DETACHED	4	0.0%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	124	1.4%	0	0.0%
120.400	RETINAL HEMORRHAGE	3	0.0%	0	0.0%
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	3	0.0%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.1%
120.960	RETINOPATHY	8	0.1%	2	0.2%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	2	0.0%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	4	0.0%	1	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	82	0.9%	0	0.0%
900.100	OTHER, NOT INHERITED	149	1.7%	0	0.0%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	74	0.8%	48	5.2%
<b>NORMAL</b>					
.000	NORMAL GLOBE	7,475	85.0%	716	77.0%

## TOY AUSTRALIAN SHEPHERD

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

\*Due to the breed's ancestry, most of the references cited here are for the Australian Shepherd and Miniature Australian Shepherd. The examiner may also find those breed pages as a helpful reference for other conditions that may occur but are not yet reported in the Toy Australian Shepherd.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DETECTED
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	2-6	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Iris coloboma	Not defined		NO	
D.	Iris hypoplasia	Not defined	1	Breeder option	
E.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
F.	Cataract  - <i>HSF4</i>	Autosomal co-dominant	1, 7, 8	NO	Mutation in the <i>HSF4-2</i> gene
G.	Retinal atrophy  - generalized  - ( <i>prcd</i> )	Not defined  Autosomal recessive	1  9	NO  NO	Mutation in the <i>prcd</i> gene
H.	Cone degeneration - day blindness	Autosomal recessive	10	NO	Mutation in the <i>CNGB3</i> gene
I.	Multifocal retinopathy - <i>cmr1</i>	Autosomal recessive	11, 12	NO (Breeder option with normal DNA test for <i>BEST1</i> gene)	Mutation in the <i>BEST1</i> gene
J.	Choroidal hypoplasia (Collie Eye Anomaly) - Optic nerve coloboma - Retinal detachment - Retinal hemorrhage - Staphyloma/coloboma	Autosomal recessive	13-16	NO	Mutation in the <i>NHEJ1</i> gene

## Description and Comments

### A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

### C. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

### D. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

### E. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Australian Shepherd, a mutation in *HSF4* (heat shock transcription factor 4), the HSF4-2 mutation, has been shown to increase the likelihood of cataract formation. The mutation is inherited in a co-dominant manner. Dogs with one copy of the mutation develop bilateral posterior cataracts and homozygotes develop a nuclear cataract that typically progresses to a mature cataract. A DNA test is available for this mutation. Other genetic factors can contribute to cataract formation in this breed and will not be detected by this test.

## **G. Retinal atrophy**

### **- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

### **- *prcd***

Unpublished data from genetics laboratories has shown that the principal form of PRA in the Australian Shepherd is *prcd* which is a late-onset form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## **H. Cone degeneration - day blindness or hemeralopia**

Autosomal recessively inherited early degeneration of the cone photoreceptors (achromatopsia) has been reported in miniature Australian shepherds. To date, this has not yet been reported in the toy Australian shepherd. Affected puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. Genetically, the condition results from a mutation in the *CNGB3* gene. A DNA test is available.

## **I. Multifocal retinopathy**

Canine Multifocal Retinopathy type 1 (*cmr1*) is characterized by numerous distinct (i.e. multifocal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression in the initial serous lesions after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs initially exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas, though the retina will continue to degenerate over time thus eventually causing vision impairment.

Canine Multifocal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (*BEST1*) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, Mastiff, Australian Shepherd and other breeds.

The breeding advice for Australian Shepherds diagnosed with "multifocal retinopathy" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is genetically normal, i.e. not a homozygous mutant, for the *BEST1* mutation.

**J. Choroidal hypoplasia (Collie Eye Anomaly)**

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly." The choroidal hypoplasia component is caused by a 7799 base pair deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
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5. Bertram T, Coignoul F, Chevillat N. Ocular dysgenesis in Australian Shepherd dogs. *J Am Anim Hosp Assoc.* 1984;20:177-182.
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8. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol.* 2009;12:372-378. PMID: 19883468
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13. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian Shepherd dogs. *Prog in Vet Comp Ophthalmol*. 1991;1:105-108.
14. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for ollie eye anomaly. *Genomics*. 2003;82:86-95. PMID: 12809679
15. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome research*. 2007;17:1562-1571. PMID: 17916641
16. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol*. 2007;10:19-22. PMID: 17204124.  
\*\*reference derived from non-USA dog population\*\*

## OCULAR DISORDERS REPORT TOY AUSTRALIAN SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,002		2018-2022 200	
			#	%	#	%
<b>GLOBE</b> .110 MICROPHthalmia			4	0.4%	0	0.0%
<b>EYELIDS</b> 25.110 DISTICHIASIS			48	4.8%	9	4.5%
<b>CORNEA</b> 70.700 CORNEAL DYSTROPHY			3	0.3%	1	0.5%
<b>UVEA</b> 93.110 IRIS HYPOPLASIA			17	1.7%	9	4.5%
93.150 IRIS COLOBOMA			18	1.8%	4	2.0%
93.180 IRIS SPHINCTER DYSPLASIA			3	0.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			109	10.9%	20	10.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			7	0.7%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			2	0.2%	2	1.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			0	0.0%	1	0.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.1%	0	0.0%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.1%	0	0.0%
<b>FUNDUS</b> 97.110 CHOROIDAL HYPOPLASIA			0	0.0%	1	0.5%
<b>LENS</b> 100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			13	1.3%	2	1.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	0.2%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.1%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.2%	2	1.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.1%	3	1.5%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			4	0.4%	1	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.1%	1	0.5%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.2%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.2%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>18</b>	<b>1.8%</b>	<b>7</b>	<b>3.5%</b>
<b>VITREOUS</b> 110.120 PERSISTENT HYALOID ARTERY/ REMNANT			5	0.5%	0	0.0%
110.135 PHPV/ PTVL			2	0.2%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			3	0.3%	0	0.0%
<b>RETINA</b> 120.170 RETINAL DYSPLASIA, FOLDS			3	0.3%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			1	0.1%	0	0.0%
<b>OPTIC NERVE</b> 130.110 MICROPAPILLA			10	1.0%	1	0.5%
130.120 OPTIC NERVE HYPOPLASIA			2	0.2%	0	0.0%
<b>OTHER</b> 900.000 OTHER, UNSPECIFIED			6	0.6%	0	0.0%
900.100 OTHER, NOT INHERITED			8	0.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			8	0.8%	8	4.0%
<b>NORMAL</b> .000 NORMAL GLOBE			845	84.3%	143	71.5%

## TOY FOX TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Lens luxation	Autosomal recessive	2	NO	Mutation in the ADAMTS17 gene

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in ADAMTS17 has been associated with primary lens luxation. A DNA test is available.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. Vet Ophthalmol. 2011 Nov;14:378-384.

## OCULAR DISORDERS REPORT TOY FOX TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			211		29	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			2	0.9%	0	0.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	3.4%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			1	0.5%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.5%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			0	0.0%	1	3.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			19	9.0%	2	6.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.9%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.5%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			3	1.4%	1	3.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			0	0.0%	1	3.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	2.4%	1	3.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			1	0.5%	1	3.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			0	0.0%	1	3.4%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	3.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	2	6.9%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	3.4%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>6</b>	<b>2.8%</b>	<b>8</b>	<b>27.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.5%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.5%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			3	1.4%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			7	3.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			2	0.9%	0	0.0%
<b>OPTIC NERVE</b>						
130.120 OPTIC NERVE HYPOPLASIA			2	0.9%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			2	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			3	1.4%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			6	2.8%	2	6.9%
<b>NORMAL</b>						
.000 NORMAL GLOBE			169	80.1%	22	75.9%

## TREEING WALKER

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the TREEING WALKER breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT TREEING WALKER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		7 #	%	6 #	%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		1	14.3%	1	16.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX		1	14.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES		0	0.0%	1	16.7%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>1</b>	<b>14.3%</b>	<b>1</b>	<b>16.7%</b>
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		2	28.6%	0	0.0%
<b>NORMAL</b>					
.000 NORMAL GLOBE		5	71.4%	5	83.3%

## VIZSLA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1, 2	NO
B.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
D.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine screening exam for certification.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126.

# OCULAR DISORDERS REPORT

## VIZSLA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 3,399		2018-2022 1,498	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			0	0.0%	1	0.1%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.0%	1	0.1%
21.000 ENTROPION, UNSPECIFIED			3	0.1%	1	0.1%
22.000 ECTROPION, UNSPECIFIED			3	0.1%	0	0.0%
25.110 DISTICHIASIS			29	0.9%	13	0.9%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.0%	1	0.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			4	0.1%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			7	0.2%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			49	1.4%	9	0.6%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.0%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			69	2.0%	40	2.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			13	0.4%	1	0.1%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			124	3.6%	125	8.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			1	0.0%	2	0.1%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			120	3.5%	37	2.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			23	0.7%	12	0.8%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			17	0.5%	11	0.7%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			5	0.1%	4	0.3%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	0.2%	1	0.1%
100.306 PUNCTATE CATARACT, NUCLEUS			7	0.2%	5	0.3%
100.307 PUNCTATE CATARACT, CAPSULAR			27	0.8%	17	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			19	0.6%	7	0.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			28	0.8%	16	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			22	0.6%	7	0.5%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			4	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.1%	1	0.1%
100.317 INCIPIENT CATARACT, CAPSULAR			7	0.2%	3	0.2%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.0%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			4	0.1%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			2	0.1%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>177</b>	<b>5.2%</b>	<b>84</b>	<b>5.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			4	0.1%	2	0.1%
110.135 PHPV/ PTVL			1	0.0%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			6	0.2%	9	0.6%
110.320 VITREOUS DEGENERATION SYNERESIS			13	0.4%	2	0.1%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	2	0.1%

## OCULAR DISORDERS REPORT VIZSLA

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 3,399		2018-2022 1,498	
		#	%	#	%
<b>FUNDUS Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	0	0.0%	1	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.960	RETINOPATHY	0	0.0%	1	0.1%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	3	0.1%	2	0.1%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	5	0.1%	0	0.0%
120.960	RETINOPATHY	4	0.1%	2	0.1%
<b>OPTIC NERVE</b>					
130.120	OPTIC NERVE HYPOPLASIA	1	0.0%	1	0.1%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	51	1.5%	0	0.0%
900.100	OTHER, NOT INHERITED	74	2.2%	1	0.1%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	77	2.3%	74	4.9%
<b>NORMAL</b>					
.000	NORMAL GLOBE	2,920	85.9%	1,179	78.7%

## VOLPINO ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Lens luxation	Autosomal recessive	1	NO	Mutation in the ADAMTS17 gene

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### Description and Comments

#### A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A mutation in ADAMTS17 has been associated with primary lens luxation. A DNA test is available.

### References

There are no breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the Volpino Italiano. The condition listed above is currently noted solely due to the availability of a genetic test for the disease.

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

OCULAR DISORDERS REPORT  
VOLPINO ITALIANO

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## WACHTELHUND

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WACHTELHUND breed. Therefore, there are no conditions listed with breeding advice.

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## WEIMARANER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Corneal dystrophy				
	- epithelial/stromal	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Retinal atrophy				
	- generalized	Not defined	1	NO	
	- <i>RPGR</i>	X-linked	2	NO	Mutation in the <i>RPGR</i> gene

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

In the Weimaraner, because there is significant clinical disease associated with the abnormal hairs, breeding should be discouraged.

#### B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

**D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

**E. Retinal atrophy****- generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

**- RPGR**

A recent study has shown that the principal form of PRA in the Weimaraner is a mutation in the Retinitis Pigmentosa GTPase Regulator (RPGR) gene, which was found have an X-linked inheritance pattern and appears to affect dogs at a younger age (~2.5 years in 3 affected males) in the current study. Other breeds have been shown to have a naturally occurring X-linked RP which include the Siberian husky and Samoyed breeds. The disease begins clinically with signs of night blindness.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Kropatsch R, Akkad D, Frank M, et al. A large deletion in RPGR causes XLPRA in Weimarener dogs. *Canine Genetics and Epidemiol.* 2016; 3:7.

## OCULAR DISORDERS REPORT WEIMARANER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,873		2018-2022 507	
			#	%	#	%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			3	0.2%	0	0.0%
25.110 DISTICHIASIS			550	29.4%	127	25.0%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	1	0.2%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			14	0.7%	5	1.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			33	1.8%	6	1.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			5	0.3%	1	0.2%
<b>UVEA</b>						
93.120 IRIS CYST			5	0.3%	2	0.4%
93.150 IRIS COLOBOMA			2	0.1%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.1%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			15	0.8%	5	1.0%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			3	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			3	0.2%	7	1.4%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	0	0.0%
93.810 UVEAL MELANOMA			1	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			2	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			107	5.7%	47	9.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			22	1.2%	23	4.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			7	0.4%	4	0.8%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			10	0.5%	7	1.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	0.1%	2	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			13	0.7%	2	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			8	0.4%	9	1.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			48	2.6%	13	2.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			14	0.7%	5	1.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			22	1.2%	8	1.6%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.2%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			2	0.1%	0	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			5	0.3%	7	1.4%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	11	2.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			3	0.2%	1	0.2%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.1%	1	0.2%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			2	0.1%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	2	0.4%
100.328 Y-SUTURE TIP OPACITIES			1	0.1%	1	0.2%
100.330 GENERALIZED/ COMPLETE CATARACT			5	0.3%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			2	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>172</b>	<b>9.2%</b>	<b>95</b>	<b>18.7%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			4	0.2%	2	0.4%
110.135 PHPV/ PTVL			0	0.0%	2	0.4%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.1%	3	0.6%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.1%	3	0.6%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			2	0.1%	0	0.0%

## OCULAR DISORDERS REPORT WEIMARANER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,873		2018-2022 507	
		#	%	#	%
<b>RETINA Continued</b>					
120.180	RETINAL DYSPLASIA, GEOGRAPHIC	4	0.2%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	6	0.3%	0	0.0%
120.400	RETINAL HEMORRHAGE	1	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	12	0.6%	0	0.0%
900.100	OTHER, NOT INHERITED	52	2.8%	2	0.4%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	34	1.8%	21	4.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,187	63.4%	289	57.0%

## WELSH SHEEPDOG

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WELSH SHEEPDOG breed. Therefore, there are no conditions listed with breeding advice.

OCULAR DISORDERS REPORT  
WELSH SHEEPDOG

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		1 #	%	0 #	%
NORMAL .000 NORMAL GLOBE		1	100.0%	0	

## WELSH SPRINGER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Presumed autosomal dominant	1-4	NO
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Corneal dystrophy			
	- epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
F.	Cataract	Presumed autosomal recessive	1, 5, 6	NO
G.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

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### Description and Comments

#### A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam. Due to the increased incidence of PLD in the breed and the increased progression observed with age, it may be prudent to perform repeated gonioscopy examinations over time.

Primary angle closure glaucoma has been reported in the Welsh Springer Spaniel. Females are affected more than males. Onset ranges from 10 weeks to 10 years. At the iridocorneal angle, the pectinate ligaments appear sparse and wispy in contrast to the sturdy fibers seen in other breeds. A dominant mode of inheritance is reported.

#### B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

**C. Distichiasis**

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

**D. Corneal Dystrophy - epithelial/stromal**

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

**E. Persistent pupillary membranes (PPMs)**

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

**F. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Welsh Springer Spaniel, lesions may be seen as early as 8-12 weeks of age and progress rapidly to complete cataract, impairing vision. A recessive mode of inheritance is reported.

**G. Retinal dysplasia - folds**

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

**References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Cottrell B, Barnett K. Primary glaucoma in the Welsh Springer Spaniel. *J Small Anim Pract.* 1988;29:185-199.
3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004;7:97-111. Epub 2004/02/26.
4. Oliver JA, Ekiri A, Mellersh. Prevalence and Progression of Pectinate Ligament Dysplasia in the Welsh Springer Spaniel. *J Sm Anim Pract.* 2016;57: 416-421.
5. Barnett KC. Hereditary cataract in the Welsh Springer Spaniel. *J Small Anim Pract.* 1980;21:621-625. Epub 1980/11/01.

6. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.

## OCULAR DISORDERS REPORT WELSH SPRINGER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 2,885		2018-2022 619	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.0%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			48	1.7%	11	1.8%
22.000 ECTROPION, UNSPECIFIED			3	0.1%	0	0.0%
25.110 DISTICHIASIS			348	12.1%	100	16.2%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			3	0.1%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			55	1.9%	11	1.8%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			2	0.1%	0	0.0%
<b>UVEA</b>						
93.120 IRIS CYST			1	0.0%	1	0.2%
93.150 IRIS COLOBOMA			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			1	0.0%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			662	22.9%	172	27.8%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.1%	5	0.8%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			1	0.0%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.0%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			6	0.2%	5	0.8%
95.120 CILIARY BODY CYST			1	0.0%	0	0.0%
97.150 CHORIORETINAL COLOBOMA, CONGENITAL			1	0.0%	0	0.0%
<b>FUNDUS</b>						
97.120 COLOBOMA			2	0.1%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	3	0.5%
130.110 MICROPAPILLA			0	0.0%	2	0.3%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			6	0.2%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			142	4.9%	29	4.7%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			22	0.8%	16	2.6%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			6	0.2%	4	0.6%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.0%	3	0.5%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			4	0.1%	5	0.8%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			3	0.1%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			8	0.3%	3	0.5%
100.307 PUNCTATE CATARACT, CAPSULAR			8	0.3%	5	0.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			6	0.2%	1	0.2%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			5	0.2%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			4	0.1%	1	0.2%
100.316 INCIPIENT CATARACT, NUCLEUS			2	0.1%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.1%	2	0.3%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			1	0.0%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			1	0.0%	0	0.0%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>78</b>	<b>2.7%</b>	<b>41</b>	<b>6.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			10	0.3%	1	0.2%
110.135 PHPV/ PTVL			1	0.0%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			5	0.2%	0	0.0%

# OCULAR DISORDERS REPORT WELSH SPRINGER SPANIEL

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		2,885		619	
		#	%	#	%
<b>RETINA</b>					
120.170 RETINAL DYSPLASIA, FOLDS		31	1.1%	3	0.5%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		4	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		9	0.3%	0	0.0%
<b>OPTIC NERVE</b>					
130.110 MICROPAPILLA		3	0.1%	0	0.0%
130.120 OPTIC NERVE HYPOPLASIA		7	0.2%	0	0.0%
130.150 OPTIC DISC COLOBOMA		4	0.1%	0	0.0%
<b>OTHER</b>					
900.000 OTHER, UNSPECIFIED		19	0.7%	0	0.0%
900.100 OTHER, NOT INHERITED		53	1.8%	1	0.2%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		34	1.2%	22	3.6%
<b>NORMAL</b>					
.000 NORMAL GLOBE		1,878	65.1%	326	52.7%

## WELSH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
B.	Lens luxation	Autosomal recessive	1, 2	NO	Mutation in the <i>ADAMTS17</i> gene
C.	Y suture tip opacities	Not defined	1	Breeder option	

### Description and Comment

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

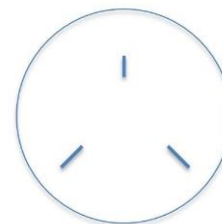
Lens pigment foci/no strands is considered an insignificant finding and therefore is not noted on the certificate.

#### B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

#### C. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip

opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14:378-384.

## OCULAR DISORDERS REPORT WELSH TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
10.000 GLAUCOMA			1	0.3%	0	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			1	0.3%	0	0.0%
25.110 DISTICHIASIS			13	3.5%	1	1.4%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			1	0.3%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			4	1.1%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.8%	1	1.4%
<b>UVEA</b>						
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	1.4%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			30	8.1%	10	13.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			2	0.5%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			3	0.8%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			4	1.1%	14	19.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			1	0.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			22	5.9%	4	5.5%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			2	0.5%	1	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			2	0.5%	0	0.0%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.3%	1	1.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	0.8%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			2	0.5%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.3%	1	1.4%
100.317 INCIPIENT CATARACT, CAPSULAR			2	0.5%	1	1.4%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	5	6.8%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			3	0.8%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>14</b>	<b>3.8%</b>	<b>4</b>	<b>5.5%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	1	1.4%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	1.6%	0	0.0%
900.100 OTHER, NOT INHERITED			13	3.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.3%	5	6.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			303	81.5%	45	61.6%

## WEST HIGHLAND WHITE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Keratoconjunctivitis sicca	Not defined	1-4	NO
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 5	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
C.	Cataract	Presumed autosomal recessive	1, 5	NO
D.	Y-suture tip opacity	Not defined	1	Breeder option
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option

### Description and Comments

#### A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

In the West Highland White Terrier, this disease has been reported more commonly in females than males.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the West Highland White Terrier, these membranes, when present, often bridge from the iris to the lens and may result in cataract with vision impairment.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

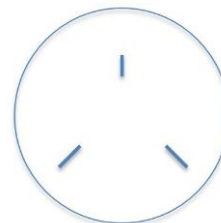
#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The cataract described in the West Highland White Terrier initially involves the posterior Y sutures and may infrequently progress, resulting in vision impairment. The age of onset is less than 6 months of age. A recessive mode of inheritance is suggested by the pedigrees which have been studied.

#### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

#### E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Sansom J, Barnett KC, Neumann W, et al. Treatment of keratoconjunctivitis sicca in dogs with cyclosporine ophthalmic ointment: a European clinical field trial. *Vet Rec.* 1995; 137: 504-507.
3. Baker GJ, Formston C. An evaluation of transplantation of the parotid duct in the treatment of keratoconjunctivitis sicca in the dog. *J Small Anim Pract.* 1968; 9: 261-268.
4. Kaswan RL, Martin CL, Chapman WL, Jr. Keratoconjunctivitis sicca: histopathologic study of nictitating membrane and lacrimal glands from 28 dogs. *Am J Vet Res.* 1984; 45: 112-118.
5. Narfstrom K. Cataract in the West Highland White Terrier. *J Small Anim Pract.* 1981; 22: 467-471.

## OCULAR DISORDERS REPORT WEST HIGHLAND WHITE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,533		2018-2022 488	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	0.3%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			3	0.2%	3	0.6%
<b>NASOLACRIMAL</b>						
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			1	0.1%	1	0.2%
40.910 KERATOCONJUNCTIVITIS SICCA			3	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			1	0.1%	0	0.0%
70.700 CORNEAL DYSTROPHY			1	0.1%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.2%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			133	8.7%	32	6.6%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			24	1.6%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.4%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			20	1.3%	9	1.8%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			4	0.3%	1	0.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			21	1.4%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			120	7.8%	40	8.2%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			23	1.5%	11	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			12	0.8%	5	1.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			4	0.3%	3	0.6%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			30	2.0%	17	3.5%
100.306 PUNCTATE CATARACT, NUCLEUS			11	0.7%	2	0.4%
100.307 PUNCTATE CATARACT, CAPSULAR			20	1.3%	17	3.5%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			37	2.4%	3	0.6%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			23	1.5%	7	1.4%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			5	0.3%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			2	0.1%	0	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			5	0.3%	5	1.0%
100.316 INCIPIENT CATARACT, NUCLEUS			14	0.9%	6	1.2%
100.317 INCIPIENT CATARACT, CAPSULAR			11	0.7%	8	1.6%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.1%	3	0.6%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.1%	2	0.4%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			4	0.3%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			0	0.0%	1	0.2%
100.327 INCOMPLETE CATARACT, CAPSULAR			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			20	1.3%	26	5.3%
100.330 GENERALIZED/ COMPLETE CATARACT			30	2.0%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>257</b>	<b>16.8%</b>	<b>91</b>	<b>18.6%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.1%	0	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			4	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			9	0.6%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			53	3.5%	4	0.8%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			3	0.2%	0	0.0%
120.190 RETINAL DYSPLASIA, DETACHED			1	0.1%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			16	1.0%	0	0.0%

## OCULAR DISORDERS REPORT WEST HIGHLAND WHITE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,533		2018-2022 488	
		#	%	#	%
<b>RETINA Continued</b>					
120.910	RETINAL DETACHMENT WITHOUT DIALYSIS	1	0.1%	0	0.0%
120.920	RETINAL DETACHMENT WITH DIALYSIS	2	0.1%	0	0.0%
120.960	RETINOPATHY	1	0.1%	0	0.0%
<b>FUNDUS</b>					
120.170	RETINAL DYSPLASIA, FOLDS	0	0.0%	8	1.6%
120.960	RETINOPATHY	0	0.0%	1	0.2%
<b>OPTIC NERVE</b>					
130.150	OPTIC DISC COLOBOMA	2	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	33	2.2%	0	0.0%
900.100	OTHER, NOT INHERITED	17	1.1%	1	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	35	2.3%	16	3.3%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,109	72.3%	342	70.1%

# WHIPPET

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
B.	Cataract	Not defined	1	NO	
C.	Vitreous degeneration  - syneresis	Not defined	1, 2	Breeder option	
D.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma	Autosomal recessive	3	NO	Mutation in the <i>NHEJ1</i> gene
E.	Retinal atrophy  - generalized	Not defined	4	NO	

## Description and Comments

### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### C. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment. This is a significant problem in the Whippet.

### D. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment

- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, sclera, and/or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly" and has been identified in the longhaired Whippet. The choroidal hypoplasia component is caused by a 7799 base pairs deletion with the gene *NHEJ1*. The mutation is a recessive trait. A DNA test is available and is diagnostic only for the choroidal hypoplasia component of CEA. For colobomas to develop, an additional mutation in a second gene has to be present; that gene is still unknown.

#### **E. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

## **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Krishnan, H., et al. (2020). "Vitreous degeneration and associated ocular abnormalities in the dog." *Vet Ophthalmol* 23(2): 219-224. PMID: 31464365
3. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome research*. 2007;17:1562-1571. Epub 2007/10/06.
4. Somma A, Moreno J, Sato M, et al. Characterization of a novel form of Progressive Retinal Atrophy in Whippet dogs: a clinical, electroretinographic, and breeding study. *Vet Ophth*. 2016: 1-10.

# OCULAR DISORDERS REPORT WHIPPET

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 12,091		2018-2022 3,067	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.0%	0	0.0%
40.910 KERATOCONJUNCTIVITIS SICCA			0	0.0%	1	0.0%
<b>EYELIDS</b>						
20.140 ECTOPIC CILIA			2	0.0%	0	0.0%
22.000 ECTROPION, UNSPECIFIED			1	0.0%	0	0.0%
25.110 DISTICHIASIS			9	0.1%	4	0.1%
<b>NICTITANS</b>						
50.210 PLASMOMA/ ATYPICAL PANNUS			1	0.0%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.0%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			5	0.0%	2	0.1%
70.700 CORNEAL DYSTROPHY			42	0.3%	8	0.3%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			6	0.0%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.0%	1	0.0%
93.120 IRIS CYST			16	0.1%	5	0.2%
93.140 CORNEAL ENDOTHELIAL PIGMENT WITHOUT PPM			1	0.0%	0	0.0%
93.170 ANTERIOR CHAMBER CYST			2	0.0%	3	0.1%
93.180 IRIS SPHINCTER DYSPLASIA			2	0.0%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			111	0.9%	57	1.9%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			10	0.1%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			11	0.1%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			16	0.1%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			9	0.1%	10	0.3%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			6	0.0%	3	0.1%
93.810 UVEAL MELANOMA			0	0.0%	1	0.0%
95.120 CILIARY BODY CYST			1	0.0%	4	0.1%
<b>FUNDUS</b>						
97.110 CHOROIDAL HYPOPLASIA			19	0.2%	0	0.0%
97.120 COLOBOMA			4	0.0%	0	0.0%
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	4	0.1%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	2	0.1%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			0	0.0%	2	0.1%
120.960 RETINOPATHY			0	0.0%	1	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			11	0.1%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			453	3.7%	125	4.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			87	0.7%	42	1.4%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			27	0.2%	9	0.3%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			50	0.4%	13	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			12	0.1%	4	0.1%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			21	0.2%	14	0.5%
100.306 PUNCTATE CATARACT, NUCLEUS			29	0.2%	18	0.6%
100.307 PUNCTATE CATARACT, CAPSULAR			22	0.2%	21	0.7%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			69	0.6%	22	0.7%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			41	0.3%	4	0.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			63	0.5%	12	0.4%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.0%	1	0.0%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			12	0.1%	1	0.0%
100.316 INCIPIENT CATARACT, NUCLEUS			17	0.1%	3	0.1%

## OCULAR DISORDERS REPORT WHIPPET

	Year Examined: Total # Dogs:	1993-2017 12,091		2018-2022 3,067	
Diagnostic Name		#	%	#	%
LENS Continued					
100.317 INCIPIENT CATARACT, CAPSULAR		21	0.2%	5	0.2%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX		6	0.0%	2	0.1%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX		5	0.0%	1	0.0%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX		3	0.0%	1	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS		0	0.0%	2	0.1%
100.328 Y-SUTURE TIP OPACITIES		17	0.1%	23	0.7%
100.330 GENERALIZED/ COMPLETE CATARACT		16	0.1%	2	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED		34	0.3%	1	0.0%
100.345 SIGNIFICANT CATARACTS (SUMMARY)		515	4.3%	177	5.8%
VITREOUS					
110.120 PERSISTENT HYALOID ARTERY/ REMNANT		20	0.2%	25	0.8%
110.135 PHPV/ PTVL		12	0.1%	1	0.0%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER		120	1.0%	48	1.6%
110.320 VITREOUS DEGENERATION SYNERESIS		544	4.5%	70	2.3%
RETINA					
120.170 RETINAL DYSPLASIA, FOLDS		33	0.3%	7	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC		5	0.0%	4	0.1%
120.190 RETINAL DYSPLASIA, DETACHED		4	0.0%	1	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)		42	0.3%	8	0.3%
120.400 RETINAL HEMORRHAGE		1	0.0%	0	0.0%
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS		4	0.0%	0	0.0%
120.920 RETINAL DETACHMENT WITH DIALYSIS		1	0.0%	0	0.0%
120.960 RETINOPATHY		9	0.1%	2	0.1%
OPTIC NERVE					
130.110 MICROPAPILLA		3	0.0%	1	0.0%
130.120 OPTIC NERVE HYPOPLASIA		3	0.0%	0	0.0%
130.150 OPTIC DISC COLOBOMA		14	0.1%	0	0.0%
OTHER					
900.000 OTHER, UNSPECIFIED		114	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED		233	1.9%	2	0.1%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		161	1.3%	158	5.2%
NORMAL					
.000 NORMAL GLOBE		10,638	88.0%	2,571	83.8%

## WHITE SHEPHERD

There are insufficient breed eye screen examination statistics providing detailed descriptions of hereditary ocular conditions of the WHITE SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT WHITE SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			43		27	
			#	%	#	%
<b>CORNEA</b>						
70.210 PANNUS			0	0.0%	2	7.4%
70.700 CORNEAL DYSTROPHY			4	9.3%	2	7.4%
<b>UVEA</b>						
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	3.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			1	2.3%	0	0.0%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	4.7%	2	7.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	3.7%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			1	2.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			2	4.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			1	2.3%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	2.3%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>4</b>	<b>9.3%</b>	<b>1</b>	<b>3.7%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	2.3%	0	0.0%
<b>OPTIC NERVE</b>						
130.110 MICROPAPILLA			1	2.3%	1	3.7%
130.120 OPTIC NERVE HYPOPLASIA			1	2.3%	0	0.0%
<b>FUNDUS</b>						
130.110 MICROPAPILLA			0	0.0%	1	3.7%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			0	0.0%	1	3.7%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			4	9.3%	1	3.7%
<b>NORMAL</b>						
.000 NORMAL GLOBE			29	67.4%	18	66.7%

## WHITE SWISS SHEPHERD

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WHITE SWISS SHEPHERD breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT WHITE SWISS SHEPHERD

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	4	9.3%
<b>UVEA</b>						
93.170 ANTERIOR CHAMBER CYST			0	0.0%	1	2.3%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	8.3%	4	9.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			1	8.3%	2	4.7%
100.307 PUNCTATE CATARACT, CAPSULAR			1	8.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			0	0.0%	1	2.3%
100.316 INCIPIENT CATARACT, NUCLEUS			0	0.0%	1	2.3%
100.328 Y-SUTURE TIP OPACITIES			0	0.0%	5	11.6%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>2</b>	<b>16.7%</b>	<b>4</b>	<b>9.3%</b>
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	2.3%
<b>NORMAL</b>						
.000 NORMAL GLOBE			11	91.7%	28	65.1%

## WINDSPRITE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WINDSPRITE breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT WINDSPRITE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		8 #	%	90 #	%
<b>CORNEA</b>					
70.700 CORNEAL DYSTROPHY		0	0.0%	1	1.1%
<b>UVEA</b>					
97.150 CHORIORETINAL COLOBOMA, CONGENITAL		0	0.0%	1	1.1%
<b>LENS</b>					
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	1	1.1%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX		0	0.0%	1	1.1%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX		0	0.0%	1	1.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX		0	0.0%	1	1.1%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>		<b>0</b>	<b>0.0%</b>	<b>3</b>	<b>3.3%</b>
<b>VITREOUS</b>					
110.320 VITREOUS DEGENERATION SYNERESIS		0	0.0%	1	1.1%
<b>OTHER</b>					
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN		0	0.0%	2	2.2%
<b>NORMAL</b>					
.000 NORMAL GLOBE		8	100.0%	84	93.3%

## WIRE FOX TERRIER\*

\*The Wire Fox Terrier and the Smooth Fox Terrier were originally considered two varieties of the same breed. They became separate breeds in 1985. It is likely that the same genetic diseases exist in both breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Glaucoma	Not defined	1, 2	NO	
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option	
C.	Cataract	Not defined	1	NO	
D.	Lens luxation	Autosomal recessive	3	NO	Mutation in the <i>ADAMTS17</i> gene

### Description and Comments

#### A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The cataracts observed in Wire Fox Terrier begin in the posterior subcapsular region and are progressive.

#### D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Martin CL, Wyman M. Primary glaucoma in the dog. *Vet Clin North Am.* 1978;8:257-286.
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.

# OCULAR DISORDERS REPORT WIRE FOX TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			320		24	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.3%	0	0.0%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			8	2.5%	1	4.2%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			3	0.9%	0	0.0%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.3%	0	0.0%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			108	33.8%	10	41.7%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			5	1.6%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			5	1.6%	0	0.0%
93.740 PERSISTENT PUPILLARY MEMBRANES, IRIS SHEETS			1	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			0	0.0%	1	4.2%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			4	1.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			2	0.6%	0	0.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			3	0.9%	0	0.0%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.3%	0	0.0%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			5	1.6%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			5	1.6%	0	0.0%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			2	0.6%	0	0.0%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			1	0.3%	0	0.0%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			1	0.3%	0	0.0%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			1	0.3%	0	0.0%
100.326 INCOMPLETE CATARACT, NUCLEUS			1	0.3%	0	0.0%
100.330 GENERALIZED/ COMPLETE CATARACT			8	2.5%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>32</b>	<b>10.0%</b>	<b>0</b>	<b>0.0%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			1	0.3%	0	0.0%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.3%	0	0.0%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	0.3%	0	0.0%
120.310 GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)			4	1.3%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			3	0.9%	0	0.0%
900.100 OTHER, NOT INHERITED			12	3.8%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	0.3%	0	0.0%
<b>NORMAL</b>						
.000 NORMAL GLOBE			186	58.1%	13	54.2%

## WIREHAired POINTING GRIFFON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Distichiasis	Not defined	1	Breeder option	
B.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
C.	Cataract				
	- generalized	Not defined	1	NO	
	- <i>fyco1</i>	Not defined	2	NO	Mutation of the <i>FYCO1</i> gene
D.	Y-suture tip opacity	Not defined	1	Breeder option	

### Description and Comments

#### A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

#### B. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

#### C. Cataract

##### - generalized

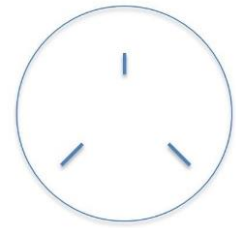
A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

##### - *FYCO1*

A mutation in the *FYCO1* gene has been associated with cataract in this breed.

#### D. Y-suture tip opacity

These are prominent (or “highlighted” or “more dense”) distal portions of the posterior sutures that may occur in the posterior cortex to occasionally on the posterior lens capsule. This is not a true cataract, so there is no lens fiber disruption (no feathering or bulbous tips). It may be in the shape of a “peace sign” as diagrammed here, but occasionally a patient may have 4-5 suture lines and therefore more suture tip opacities. They may be present only at one suture tip of one eye or up to all three (or more, as stated above) suture tips in both eyes in a given dog. They are more commonly found in multiples or at least bilaterally symmetrical. They may be visible only with biomicroscopy or sometimes with retroillumination. They do not appear to progress (unless mis-diagnosed) and are considered essentially a variation of normal or possibly familial, as they are seen more commonly in certain breeds.



These should be marked under the “Lens” section of the CAER form. The newest version of the form (3/16/21) has boxes that say, “posterior Y-suture tip opacities” which should be marked. If working with an older version of the form, there are 2 places to mark within the lens section as cataract bubbles: “punctate posterior sutures” AND ALSO MARK “suspect not inherited/significance unknown” (without which they technically fail or at least require further information before coding). This diagnosis should ALSO be accompanied by drawings (like below) and/or have comments such as: “E2” or “posterior suture tip opacities.” This helps differentiate them from 1) prominent but otherwise normal full suture lines – which should just be commented on and are treated as normal, and 2) true sutural cataracts - which would either be breeder option or failing.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Garces GR, Cristen M, Loechel, et al. FYCO1 frameshift deletion in Wirehaired Pointing Griffon dogs with juvenile cataract. *Genes (Basel)*; 2022 Feb; 13(2):334. PMID: 35205377

## OCULAR DISORDERS REPORT WIREHAired POINTING GRIFFON

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			1	0.2%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			3	0.5%	2	0.4%
25.110 DISTICHIASIS			6	1.0%	5	1.1%
<b>NICTITANS</b>						
51.100 THIRD EYELID CARTILAGE ANOMALY			1	0.2%	0	0.0%
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.2%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			0	0.0%	1	0.2%
70.700 CORNEAL DYSTROPHY			1	0.2%	1	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			3	0.5%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.2%	1	0.2%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			10	1.6%	10	2.1%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	0.2%	6	1.3%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			47	7.7%	30	6.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			13	2.1%	13	2.7%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			3	0.5%	2	0.4%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			0	0.0%	2	0.4%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			1	0.2%	1	0.2%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			4	0.7%	2	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			10	1.6%	6	1.3%
100.307 PUNCTATE CATARACT, CAPSULAR			4	0.7%	2	0.4%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	0.5%	4	0.8%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			5	0.8%	1	0.2%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			1	0.2%	2	0.4%
100.316 INCIPIENT CATARACT, NUCLEUS			6	1.0%	2	0.4%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	2	0.4%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			0	0.0%	2	0.4%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.2%
100.328 Y-SUTURE TIP OPACITIES			5	0.8%	7	1.5%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>50</b>	<b>8.2%</b>	<b>42</b>	<b>8.8%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			0	0.0%	9	1.9%
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			2	0.3%	4	0.8%
110.320 VITREOUS DEGENERATION SYNERESIS			5	0.8%	4	0.8%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.2%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			0	0.0%	1	0.2%
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			5	0.8%	0	0.0%
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	0.2%	0	0.0%
120.400 RETINAL HEMORRHAGE			1	0.2%	0	0.0%
120.960 RETINOPATHY			0	0.0%	1	0.2%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			6	1.0%	0	0.0%
900.100 OTHER, NOT INHERITED			3	0.5%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			16	2.6%	18	3.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			521	85.1%	387	81.3%

## WIREHAired VIZSLA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- lens pigment foci/no strands	Not defined	1	Passes with no notation
B.	Cataract	Not defined	1	NO

### Description and Comments

#### A. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.

## OCULAR DISORDERS REPORT WIREHAired VIZSLA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			152		132	
			#	%	#	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			0	0.0%	1	0.8%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			3	2.0%	0	0.0%
<b>CORNEA</b>						
70.700 CORNEAL DYSTROPHY			0	0.0%	1	0.8%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			11	7.2%	6	4.5%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			13	8.6%	9	6.8%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			21	13.8%	7	5.3%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			6	3.9%	0	0.0%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	0.7%	0	0.0%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			1	0.7%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			2	1.3%	0	0.0%
100.306 PUNCTATE CATARACT, NUCLEUS			1	0.7%	3	2.3%
100.307 PUNCTATE CATARACT, CAPSULAR			7	4.6%	2	1.5%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			0	0.0%	2	1.5%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.8%
100.316 INCIPIENT CATARACT, NUCLEUS			1	0.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			0	0.0%	2	1.5%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	0.8%
100.328 Y-SUTURE TIP OPACITIES			1	0.7%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>19</b>	<b>12.5%</b>	<b>11</b>	<b>8.3%</b>
<b>VITREOUS</b>						
110.200 VITREOUS DEGENERATION-ANTERIOR CHAMBER			1	0.7%	1	0.8%
110.320 VITREOUS DEGENERATION SYNERESIS			1	0.7%	0	0.0%
<b>RETINA</b>						
120.910 RETINAL DETACHMENT WITHOUT DIALYSIS			1	0.7%	0	0.0%
<b>OTHER</b>						
900.000 OTHER, UNSPECIFIED			4	2.6%	0	0.0%
900.100 OTHER, NOT INHERITED			0	0.0%	1	0.8%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			7	4.6%	6	4.5%
<b>NORMAL</b>						
.000 NORMAL GLOBE			115	75.7%	101	76.5%

## WORKING KELPIE

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the WORKING KELPIE breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT WORKING KELPIE

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017		2018-2022	
		0 #	%	2 #	%
NORMAL .000 NORMAL GLOBE		0		2	100.0%

# XOLOITZCUINTLI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Cataract	Not defined	1	NO	
B.	Retinal atrophy				
	- generalized	Presumed autosomal recessive	1	NO	
	- <i>prcd</i>	Autosomal recessive	2	NO	Mutation in the <i>prcd</i> gene

## Description and Comments

### A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

### B. Retinal atrophy

#### - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. With limited exceptions, most PRAs are recessively inherited.

#### - *prcd*

Studies have shown that the principal form of PRA in the Xoloitzcuintli is *prcd* which is a form of PRA inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels, and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene and at least 30+ breeds are affected. In most affected dogs to date, the disease is recognized clinically in dogs 3-6 years of age or older. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

## References

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Donner J, Anderson H, Davison S, Hughes AM, Bouirmane J, Lindqvist J, Lytle KM, Ganesan B, Ottka C, Ruotanen P, Kaukonen M, Forman OP, Fretwell N, Cole CA, Lohi H. Frequency and distribution of 152 genetic disease variants in over 100,000 mixed breed and purebred dogs. PLoS Genet. 2018 Apr 30;14(4):e1007361. doi: 10.1371/journal.pgen.1007361. Erratum in: PLoS Genet. 2019 Jan 18;15(1):e1007938. PMID: 29708978; PMCID: PMC5945203.

## OCULAR DISORDERS REPORT XOLOITZCUINTLI

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			82 #	%	177 #	%
<b>EYELIDS</b>						
25.110 DISTICHIASIS			1	1.2%	1	0.6%
<b>CORNEA</b>						
70.220 PIGMENTARY KERATITIS			0	0.0%	1	0.6%
<b>UVEA</b>						
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			4	4.9%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			1	1.2%	6	3.4%
<b>LENS</b>						
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			1	1.2%	7	4.0%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			0	0.0%	4	2.3%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			1	1.2%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			0	0.0%	5	2.8%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			3	3.7%	0	0.0%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			7	8.5%	1	0.6%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			3	3.7%	0	0.0%
100.317 INCIPIENT CATARACT, CAPSULAR			3	3.7%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			1	1.2%	1	0.6%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>17</b>	<b>20.7%</b>	<b>10</b>	<b>5.6%</b>
<b>VITREOUS</b>						
110.320 VITREOUS DEGENERATION SYNERESIS			0	0.0%	2	1.1%
<b>FUNDUS</b>						
120.170 RETINAL DYSPLASIA, FOLDS			0	0.0%	1	0.6%
<b>RETINA</b>						
120.180 RETINAL DYSPLASIA, GEOGRAPHIC			1	1.2%	0	0.0%
<b>OTHER</b>						
900.100 OTHER, NOT INHERITED			1	1.2%	0	0.0%
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	5	2.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			67	81.7%	152	85.9%

## YAKUTIAN LAIKA

There are insufficient breed eye screening examination statistics providing detailed descriptions of hereditary ocular conditions of the YAKUTIAN LAIKA breed. Therefore, there are no conditions listed with breeding advice.

## OCULAR DISORDERS REPORT YAKUTIAN LAIKA

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017		2018-2022	
			#	%	#	%
<b>UVEA</b>						
93.120 IRIS CYST			1	14.3%	0	0.0%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			1	14.3%	0	0.0%
<b>LENS</b>						
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			0	0.0%	1	3.8%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	3.8%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>0</b>	<b>0.0%</b>	<b>2</b>	<b>7.7%</b>
<b>RETINA</b>						
120.170 RETINAL DYSPLASIA, FOLDS			1	14.3%	0	0.0%
<b>OTHER</b>						
900.110 OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			0	0.0%	1	3.8%
<b>NORMAL</b>						
.000 NORMAL GLOBE			6	85.7%	24	92.3%

## YORKSHIRE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE	GENETIC MUTATIONS DESCRIBED
A.	Keratoconjunctivitis sicca	Not defined	1, 2	NO	
B.	Distichiasis	Not defined	1	Breeder option	
C.	Persistent pupillary membranes				
	- iris to iris	Not defined	1	Breeder option	
	- lens pigment foci/no strands	Not defined	1	Passes with no notation	
D.	Cataract	Not defined	1	NO	
E.	Lens luxation	Autosomal recessive	3-5	NO	Mutation in the <i>ADAMTS17</i> gene
F.	Vitreous degeneration	Not defined	1	Breeder option	
	-syneresis				
G.	Retinal atrophy				
	- generalized	Not defined	1	NO	

### Description and Comment

#### A. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment. There is evidence that Yorkshire Terriers sometimes present with severe, congenital, unilateral keratoconjunctivitis sicca (KCS) and it is suspected this is due to hypoplasia or aplasia of the gland.

#### B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

#### C. Persistent pupillary membranes (PPMs)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision

impairment or blindness may occur.

Lens pigment foci/no strands is considered an insignificant finding and therefore not noted on the certificate.

#### **D. Cataract**

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid, or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

#### **E. Lens luxation**

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A mutation in *ADAMTS17* has been associated with primary lens luxation. A DNA test is available.

#### **F. Vitreous degeneration - syneresis**

A liquefaction of the vitreous gel which may predispose to retinal detachment.

#### **G. Retinal atrophy - generalized**

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

### **References**

1. ACVO Genetics Committee and/or Data from OFA All-Breeds Report.
2. Herrera HD, Weichsler N, Gomez JR, et al. Severe, unilateral, unresponsive keratoconjunctivitis sicca in 16 juvenile Yorkshire Terriers. *Vet Ophthalmol.* 2007;10:285-288.
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.
4. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010;51:4716-4721.
5. Walde I. Retinal and corneal dysplasias in the Yorkshire Terrier and other breeds in Austria. *Tiereztliche Praxis.* 1997;25:62.

## OCULAR DISORDERS REPORT YORKSHIRE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:		1993-2017 1,828		2018-2022 803	
			#	%	#	%
<b>GLOBE</b>						
.110 MICROPHthalmia			5	0.3%	1	0.1%
10.000 GLAUCOMA			1	0.1%	0	0.0%
<b>EYELIDS</b>						
21.000 ENTROPION, UNSPECIFIED			0	0.0%	1	0.1%
25.110 DISTICHIASIS			37	2.0%	6	0.7%
32.110 IMPERFORATE LOWER NASOLACRIMAL PUNCTUM			0	0.0%	1	0.1%
<b>NASOLACRIMAL</b>						
40.910 KERATOCONJUNCTIVITIS SICCA			6	0.3%	1	0.1%
<b>NICTITANS</b>						
52.110 PROLAPSED GLAND OF THE THIRD EYELID			1	0.1%	0	0.0%
<b>CORNEA</b>						
70.210 PANNUS			4	0.2%	0	0.0%
70.220 PIGMENTARY KERATITIS			4	0.2%	0	0.0%
70.700 CORNEAL DYSTROPHY			15	0.8%	2	0.2%
70.730 CORNEAL ENDOTHELIAL DEGENERATION			1	0.1%	0	0.0%
<b>UVEA</b>						
93.110 IRIS HYPOPLASIA			1	0.1%	1	0.1%
93.710 PERSISTENT PUPILLARY MEMBRANES, IRIS TO IRIS			180	9.8%	52	6.5%
93.720 PERSISTENT PUPILLARY MEMBRANES, IRIS TO LENS			4	0.2%	0	0.0%
93.730 PERSISTENT PUPILLARY MEMBRANES, IRIS TO CORNEA			6	0.3%	0	0.0%
93.750 PERSISTENT PUPILLARY MEMBRANES, LENS PIGMENT FOCI/ NO STRANDS			20	1.1%	12	1.5%
93.760 PERSISTENT PUPILLARY MEMBRANES, ENDOTHELIAL OPACITY/ NO STRANDS			2	0.1%	0	0.0%
<b>LENS</b>						
100.200 CATARACT, UNSPECIFIED			23	1.3%	0	0.0%
100.210 CATARACT. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN			56	3.1%	9	1.1%
100.301 PUNCTATE CATARACT, ANTERIOR CORTEX			38	2.1%	12	1.5%
100.302 PUNCTATE CATARACT, POSTERIOR CORTEX			13	0.7%	1	0.1%
100.303 PUNCTATE CATARACT, EQUATORIAL CORTEX			6	0.3%	2	0.2%
100.304 PUNCTATE CATARACT, ANTERIOR SUTURES			5	0.3%	0	0.0%
100.305 PUNCTATE CATARACT, POSTERIOR SUTURES			6	0.3%	3	0.4%
100.306 PUNCTATE CATARACT, NUCLEUS			3	0.2%	2	0.2%
100.307 PUNCTATE CATARACT, CAPSULAR			1	0.1%	5	0.6%
100.311 INCIPIENT CATARACT, ANTERIOR CORTEX			29	1.6%	19	2.4%
100.312 INCIPIENT CATARACT, POSTERIOR CORTEX			18	1.0%	17	2.1%
100.313 INCIPIENT CATARACT, EQUATORIAL CORTEX			18	1.0%	2	0.2%
100.314 INCIPIENT CATARACT, ANTERIOR SUTURES			3	0.2%	19	2.4%
100.315 INCIPIENT CATARACT, POSTERIOR SUTURES			3	0.2%	21	2.6%
100.316 INCIPIENT CATARACT, NUCLEUS			3	0.2%	12	1.5%
100.317 INCIPIENT CATARACT, CAPSULAR			1	0.1%	1	0.1%
100.321 INCOMPLETE CATARACT, ANTERIOR CORTEX			5	0.3%	6	0.7%
100.322 INCOMPLETE CATARACT, POSTERIOR CORTEX			2	0.1%	3	0.4%
100.323 INCOMPLETE CATARACT, EQUATORIAL CORTEX			0	0.0%	1	0.1%
100.324 INCOMPLETE CATARACT, ANTERIOR SUTURES			0	0.0%	1	0.1%
100.325 INCOMPLETE CATARACT, POSTERIOR SUTURES			0	0.0%	1	0.1%
100.326 INCOMPLETE CATARACT, NUCLEUS			2	0.1%	0	0.0%
100.328 Y-SUTURE TIP OPACITIES			2	0.1%	1	0.1%
100.330 GENERALIZED/ COMPLETE CATARACT			29	1.6%	1	0.1%
100.375 SUBLUXATION/ LUXATION, UNSPECIFIED			1	0.1%	0	0.0%
<b>100.345 SIGNIFICANT CATARACTS (SUMMARY)</b>			<b>208</b>	<b>11.4%</b>	<b>129</b>	<b>16.1%</b>
<b>VITREOUS</b>						
110.120 PERSISTENT HYALOID ARTERY/ REMNANT			2	0.1%	3	0.4%

## OCULAR DISORDERS REPORT YORKSHIRE TERRIER

Diagnostic Name	Year Examined: Total # Dogs:	1993-2017 1,828		2018-2022 803	
		#	%	#	%
<b>VITREOUS Continued</b>					
110.135	PHPV/ PTVL	4	0.2%	1	0.1%
110.200	VITREOUS DEGENERATION-ANTERIOR CHAMBER	7	0.4%	7	0.9%
110.320	VITREOUS DEGENERATION SYNERESIS	17	0.9%	7	0.9%
<b>RETINA</b>					
120.170	RETINAL DYSPLASIA, FOLDS	8	0.4%	0	0.0%
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	55	3.0%	2	0.2%
120.920	RETINAL DETACHMENT WITH DIALYSIS	1	0.1%	1	0.1%
120.960	RETINOPATHY	5	0.3%	0	0.0%
<b>FUNDUS</b>					
120.310	GENERALIZED PROGRESSIVE RETINAL ATROPHY (PRA)	0	0.0%	1	0.1%
120.920	RETINAL DETACHMENT WITH DIALYSIS	0	0.0%	1	0.1%
<b>OPTIC NERVE</b>					
130.110	MICROPAPILLA	1	0.1%	0	0.0%
130.120	OPTIC NERVE HYPOPLASIA	3	0.2%	0	0.0%
130.150	OPTIC DISC COLOBOMA	1	0.1%	0	0.0%
<b>OTHER</b>					
900.000	OTHER, UNSPECIFIED	19	1.0%	0	0.0%
900.100	OTHER, NOT INHERITED	26	1.4%	2	0.2%
900.110	OTHER. SUSPECT NOT INHERITED/ SIGNIFICANCE UNKNOWN	32	1.8%	25	3.1%
<b>NORMAL</b>					
.000	NORMAL GLOBE	1,373	75.1%	624	77.7%