

# Eyelid disease: All dogs are not equal



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In the U.S. Banfield hospital population, ophthalmic diseases rank seventh in prevalence behind diseases of the oral cavity, skin, digestive system, ear, musculoskeletal system and reproductive system. For the canine eyelid diseases presented in this article, predisposition or risk is strongly associated with breed type.<sup>1</sup> Veterinarians can use their knowledge of breed-specific risk to fully educate clients about the diseases that their Pets may be more likely to experience and to provide guidance on wellness care for particular breeds.

Client communication is an important aspect of the veterinarian's responsibility; this includes educating clients about puppy breeds at risk for ophthalmic diseases. This type of communication helps establish trust and respect between the client and veteri-

narian and helps the client make important medical decisions that affect the quality of life for both the Pet and Pet's family.

## Methods of analysis

For our population analyses, we selected a series of canine in-patients (cases) of any age, breed or gender seen in 2006 and reported to have ectropion, entropion or prolapse of the third eyelid gland. We compared the patient population diagnosed as having each specific eye disease with a sample of 5,000 canine in-patients (controls) of any age, breed or gender seen in 2006 and not diagnosed with ectropion, entropion or prolapse of the third eyelid gland.

To assess relative risk for disease, we analyzed the differences between the case and control groups for age, gender and breed. In



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- Explore the health and well-being of Pet populations
- Evaluate new clinical treatments
- Monitor Pets as sentinels of zoonotic disease in family environments
- Transform Pet medical data into knowledge, *i.e.*, open new windows into Pet health care using the Banfield medical caseload and database.

## Evidence-Based Medicine Toolkit

**Odds ratio:** A measure of the degree of association (also known as a cross-product ratio or relative odds); for example, the odds of exposure among the cases compared with the odds of exposure among the controls. Both the odds ratio and the relative risk compare the relative likelihood of an event occurring between two distinct groups. Some study designs, however, prevent the calculation of the relative risk, and the odds ratio is used instead to estimate risk.

**Confidence interval:** A confidence interval helps describe the reliability of an estimate of association. The smaller the width of the interval, the more likely a similar result would be generated in repeated sampling. A wide confidence interval represents the fact that the true measure of association could be contained somewhere within the range estimated. The larger the sample size, the more reliable the results, because the estimate is representative of a larger portion of the population studied.

addition, overall prevalence rates for the selected ophthalmic diseases were generated from the U.S. Banfield in-patient population seen in 2006.

Chi-square analyses with Mantel-Haenszel statistics<sup>2</sup> were used to determine the association and disease risk by breed, gender and neuter status. A Student's t-test was used to compare mean ages among case and control groups. Breed risk was estimated for all breeds in the Banfield hospital population that had at least 450 individual Pets seen in 2006 and 10 or more reported cases of ectropion, entropion or prolapse of the third eyelid gland.

To quantify risk, we estimated the relative risk using the odds ratio<sup>3</sup> for the association between breed, gender and neuter status and the disease of interest. A relative risk of greater than 1 suggests a positive association between an outcome and a study factor, whereas a relative risk of less than 1 suggests an inverse relationship between a study factor and a disease outcome. A relative risk equal to 1 reflects no association.

For our analysis, we required a p-value of less than or equal to 0.05 to establish statistical significance. The p-value represents the probability that the association between the outcome (*e.g.*, ectropion) and a risk factor under consideration (*e.g.*, breed) is at least as extreme as that found during analysis of the data, assuming the result happened by chance alone. Confidence intervals (95 percent) were estimated for each odds ratio (relative risk). The confidence interval represents the expected range of values that might be found if the population was sampled numerous times. If the 95 percent confidence interval for an odds ratio or relative risk includes 1 (no association) within its range of values, this reflects a lack of statistical significance.

**Table 1: Overall Prevalence of Selected Ophthalmic Diagnoses for Canine Patients\***

Diagnosis	Prevalence per 10,000 dogs
Conjunctivitis	246.2
Nuclear sclerosis	62.4
Epiphora	58.2
Cataract	56.0
<b>Prolapsed third eyelid</b>	<b>54.7</b>
Corneal ulcer, medical	50.2
<b>Entropion</b>	<b>39.3</b>
Keratoconjunctivitis sicca	23.2
<b>Ectropion</b>	<b>10.1</b>
Meibomian cyst	9.7
Eyelid neoplasia	8.3
Corneal abrasion	7.9
Corneal edema	6.3
Glaucoma	5.9

\* Patients seen in Banfield hospitals during the year 2006

## Results

There were 1,189,844 canine in-patients identified from the patient records of U.S. Banfield hospitals during 2006. Ophthalmic disease was diagnosed (one or more diagnoses from this category) in 78,387 dogs from this population, a prevalence of 6.6 percent. Of the selected diseases for this analysis, ectropion was diagnosed in 1,197 dogs (0.1 percent), entropion in 4,673 dogs (0.4 percent) and prolapsed third eyelid gland in 6,513 dogs (0.6 percent). The mean ages for patients diagnosed with ectropion, entropion and prolapsed third eyelid gland were 3.6, 3.4 and 4.9 years, respectively; the mean age of the control population was 3.5 years. The difference in mean age at diagnosis was statistically significant only for patients with a prolapsed third eyelid gland.

*Table 1* details the overall prevalence for selected ophthalmic diseases. In *Table 2* (page 18), breed-specific risks for the three

**Table 2: Breed as a Predictor for Diagnosis of Selected Ophthalmic Diseases in Canine Patients\***

Breed	2006 total population	Relative risk** (95% confidence interval)		
		Ectropion	Entropion	Third eyelid gland prolapse
Akita	4,232		1.4 (0.8, 2.4)	
American Bulldog	5,105	1.9 (0.8, 4.3)	3.2 <sup>†</sup> (1.9, 5.4)	
American Cocker Spaniel	32,424	12.7 <sup>†</sup> (10.3, 15.8)		7.9 <sup>†</sup> (6.6, 9.5)
Basset Hound	10,886	15.9 <sup>†</sup> (11.4, 22.3)	1.4 (1.0, 2.1)	
Beagle	33,100			1.5 <sup>†</sup> (1.3, 1.9)
Bloodhound	562	27.4 <sup>†</sup> (6.2, 121.8)	12.9 <sup>†</sup> (3.1, 54.6)	1.9 (0.4, 9.9)
Boston Terrier	11,451			4.1 <sup>†</sup> (2.9, 5.9)
Boxer	31,985	4.5 <sup>†</sup> (3.5, 5.8)	1.2 (0.9, 1.5)	
Brittany Spaniel	2,415			1.2 (0.6, 2.5)
Bullmastiff	903	2.5 (0.6, 10.5)	4.3 <sup>†</sup> (1.6, 11.5)	
Cane Corso	480	11.2 <sup>†</sup> (3.0, 42.3)	4.3 <sup>†</sup> (1.2, 15.2)	3.1 (0.9, 10.9)
Chihuahua	80,739			1.7 <sup>†</sup> (1.5, 1.9)
Chow Chow	15,076		7.9 <sup>†</sup> (5.8, 10.7)	
Cockapoo	6,609			1.6 <sup>†</sup> (1.1, 2.4)
Dalmatian	4,711			1.3 (0.7, 2.6)
English Bulldog	9,734	13.0 <sup>†</sup> (9.0, 18.8)	23.3 <sup>†</sup> (16.8, 33.2)	9.9 <sup>†</sup> (7.1, 13.7)
English Cocker Spaniel	800	21.1 <sup>†</sup> (4.6, 96.2)	2.1 (0.4, 11.7)	5.8 <sup>†</sup> (1.3, 25.2)
English Springer Spaniel	5,043	2.3 <sup>†</sup> (1.2, 4.2)		
Fox Terrier	24,247			1.3 <sup>†</sup> (1.1, 1.7)
French Bulldog	1,309		2.4 (0.8, 6.8)	3.5 <sup>†</sup> (1.4, 9.3)
Great Dane	5,030	3.1 <sup>†</sup> (1.7, 5.6)	1.3 (0.8, 2.2)	1.7 <sup>†</sup> (1.1, 2.7)
Havanese	1,139			3.9 <sup>†</sup> (1.1, 13.3)
Lhasa Apso	13,527			5.9 <sup>†</sup> (4.3, 8.0)
Lhasa Poo	1,110			2.3 (0.9, 5.8)
Maltese	26,182			1.2 (0.9, 1.5)
Mastiff	4,385	8.3 <sup>†</sup> (5.0, 13.7)	3.5 <sup>†</sup> (2.2, 5.6)	
Neapolitan Mastiff	351	131.1 <sup>†</sup> (7.8, 2,192.4)	20.4 <sup>†</sup> (1.2, 350.1)	14.6 <sup>†</sup> (1.1, 251.0)
Newfoundland	1,216	23.2 <sup>†</sup> (5.1, 104.7)	11.3 <sup>†</sup> (2.6, 48.1)	2.7 (0.6, 13.0)
Peekapoo	2,747			3.7 <sup>†</sup> (1.9, 7.3)
Pekingese	8,897		1.1 (0.7, 1.8)	2.4 <sup>†</sup> (1.6, 3.5)
Pit Bull	51,773			
Pug	23,348		2.4 <sup>†</sup> (1.9, 3.0)	
Rottweiler	23,552		4.7 <sup>†</sup> (3.7, 6.0)	
Saint Bernard	2,291	31.1 <sup>†</sup> (14.1, 68.7)	11.0 <sup>†</sup> (5.1, 24.0)	1.4 (0.6, 3.6)
Shar-Pei	5,390	9.5 <sup>†</sup> (4.1, 22.0)	131.0 <sup>†</sup> (65.2, 262.3)	5.5 <sup>†</sup> (2.6, 11.6)
Shih Tzu	54,783		1.1 (0.9, 1.3)	1.5 <sup>†</sup> (1.3, 1.7)

\* Patients seen in Banfield hospitals during the year 2006

\*\* Estimated from odds ratio

† Statistically significant (P<0.05)

**Table 3: Sex and Spay or Neuter Status as Predictors for Selected Ophthalmic Diseases in Canine Patients\***

	Relative risk** (95% confidence interval)		
	Ectropion	Entropion	Third eyelid gland prolapse
Intact	1.8 <sup>†</sup> (1.6, 2.0)	2.0 <sup>†</sup> (1.9, 2.1)	1.6 <sup>†</sup> (1.5, 1.7)
Male	1.6 <sup>†</sup> (1.4, 1.8)	1.2 <sup>†</sup> (1.1, 1.2)	1.0 (1.0, 1.1)

\* Patients seen in Banfield hospitals during the year 2006

\*\* Estimated from odds ratio

<sup>†</sup> Statistically significant ( $P \leq 0.05$ )

eyelid diseases of interest are listed, along with the numerical calculation of risk in cases in which a positive association was estimated. *Table 3* shows the risk of ectropion, entropion or prolapse of the third eyelid gland by gender and spay or neuter status.

## Discussion

Overall prevalence of ophthalmic disease in dogs seen at U.S. Banfield hospitals was nearly 7 percent; thus, about one in 15 dogs seen in a typical Banfield hospital had one or more diagnoses from this category. Prevalence for the eyelid diseases of interest ranged from 0.6 percent for third eyelid gland prolapse to 0.1 percent for entropion. Intact dogs were more likely to be diagnosed with all of these diseases than were spayed or neutered dogs; males were more likely than females to be diagnosed with ectropion and entropion, but no association was seen between sex and diagnosis of third eyelid gland prolapse. Dogs diagnosed with prolapse of the third eyelid gland were slightly older than the average dog in the Banfield population, at 4.9 years of age as compared with 3.5 years of age in the control group.

The odds of being diagnosed with ectropion, entropion or prolapse of the third eyelid gland were much higher for certain breeds than for the general population. The

breeds at increased risk for more than one of these diseases of the canine eyelid include the Bloodhound, English Bulldog, Cane Corso, Great Dane, English Cocker Spaniel, Neapolitan Mastiff, Newfoundland, Saint Bernard and Shar-Pei. Numerous other breeds were at increased risk for just one of these three diseases.

These findings should prove useful in client education, especially for families of puppy breeds at risk for these diseases. In addition to providing information about the risk of developing diseases of the eyelid, veterinarians should also inform clients about the clinical signs of these diseases (*e.g.*, epiphora and trichiasis with entropion). Knowing the odds that their Pet is at higher risk for eyelid disease can sensitize clients to secondary signs and prevent the increased severity of problems that can arise from delaying surgical correction. Understanding susceptibility to ophthalmic diseases and communicating this health-risk information to clients help build strong client-doctor relationships and allow clients to make medical decisions that enhance the quality of life for the Pet and Pet family. 🐾

## References

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