

Prevalence of primary breed-related cataracts in the dog in North America

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Abstract

The objective of the study was to determine the prevalence of cataracts in dogs presented to veterinary medical teaching hospitals in North America between 1964 and 2003. A retrospective study of all dogs presented with cataracts to veterinary medical teaching hospitals in North America between 1964 and 2003 was conducted to determine cataract prevalence. The different decades, breeds, gender, and age at time of presentation with cataract were compared. The prevalence of dogs presented with cataract varied by decade and ranged from 0.95% (1964–73), 1.88% (1974–83), 2.42% (1994–2003), to 3.5% (1984–93). The total number of dogs presented with cataracts over the 40-year period was 39 229. From 1964 to 2003 the prevalence of cataract formation in this patient population increased by about 255%. Fifty-nine breeds of dogs were affected with cataracts above the baseline prevalence of 1.61% seen in mixed-breed/hybrid dogs. The breeds with the highest cataract prevalence included: Smooth Fox Terrier (11.70%), Havanese (11.57%), Bichon Frise (11.45%), Boston Terrier (11.11%), Miniature Poodle (10.79%), Silky Terrier (10.29%) and Toy Poodle (10.21%). The breeds with the largest number of cataractous dogs during the entire four decades were the Boston Terrier (11.11%), Miniature Poodle (10.79%), American Cocker Spaniel (8.77%), Standard Poodle (7.00%), and Miniature Schnauzer (4.98%). Gender ratios of cataractous dogs seemed to affect limited breeds. Age of presentation with cataract diagnosis varied among several breeds. In the mixed-breed/hybrid baseline population, cataract formation appeared to be age related with a higher frequency of cataract formation in dogs after 4–7 years. Cataract formation is one of the most prevalent eye diseases in the dog population, and in about 60 breeds of dogs the prevalence of cataract exceeds that of the baseline mixed-breed/hybrid group. The prevalence of cataract is also influenced by age in most purebred dogs and affects 16.80% of the 7–15+-year-old mixed-breed/hybrid dog population. Total and age-related cataract prevalence in dogs seems very similar to that in man.

Key Words: cataracts, dog, inherited, prevalence

INTRODUCTION

Most recent veterinary ophthalmology texts report that cataracts are one of the most frequent intraocular disease and a leading cause of blindness in the dog.^{1–4} Previous reports of cataract formation in the dog have focused on specific breeds, identifying gender, age-of-onset, clinical characteristics of the cataract, and possible modes of inheritance.^{6–25} In many investigations the number of dogs examined was limited, and the mode of inheritance was suggested but not confirmed statistically. In general, breed-related cataracts are thought to be inherited in most purebreds, and may initially

affect specific areas of the lens at certain ages.^{1,2} Primary cataracts may be divided based on age-of-onset (congenital, adult, and senile), maturity (incipient, immature, mature, hypermature, and resorption), and mode of inheritance.^{6–25} The biochemical basis for cataractogenesis of primary cataracts in dogs is unknown, and only partly investigated in the congenital cataract in the Miniature Schnauzer.^{26,27}

Canine Eye Registry Foundation (CERF) data²⁸ and the texts, *Inherited Eye Diseases in Purebred Dogs*² and the third edition of *Veterinary Ophthalmology*,¹ suggest that as many as 97 breeds of dogs are affected with primary cataract formation. Inherited cataracts in purebred dogs may be grouped

as: primary (without other ophthalmic and systemic abnormalities), inherited cataracts with other ophthalmic diseases, and inherited cataracts associated with ophthalmic and systemic disorders. Specific reports of primary cataract formation include the following individual breeds: Afghan Hound,¹⁵ American Cocker Spaniel,^{10,11} Bichon Frise,²⁵ Boston Terrier,⁷ Chesapeake Bay Retriever,¹⁸ Entelbacher Mountain Dog, German Shepherd,²¹ Golden Retriever,¹²⁻¹⁴ Labrador Retriever,¹² Miniature Schnauzer,^{5,6,26,27} Norwegian Buhund,²² Old English Sheepdog,⁹ Rottweiler,²⁴ Staffordshire Bull Terrier, Standard Poodle,^{16,17} Welsh Springer Spaniel,⁸ and West Highland White Terrier.¹⁹

Studies to determine the prevalence of cataracts in humans include the Beaver Dam study (Wisconsin USA),³⁰ the lens opacities case-control study in Massachusetts,³¹ the Blue Mountain study (Australia),³² the Barbados eye study,³³ the Framingham study (Massachusetts USA),³⁴ the Waterman study (Maryland, USA),³⁵ and the most recent study in America (2004) by the Eye Diseases Prevalence Research Group.³⁶ Most studies focused on a selected geographic location and the results were based on individual eye examinations that included several specific diagnostic procedures. In man, cataract formation is heavily influenced by age; inherited cataract formation appears less common. The April 2004 report indicates that 20.5 million (17.2%) Americans older than 40 years have cataract in at least one eye, and an additional 6.1 million (5.1%) have either pseudophakia or aphakia. It is estimated that by the year 2020, the number of Americans affected by cataract development will increase to 30.1 million.³⁴

Available sources of information on the prevalence of ophthalmic diseases in dogs include the Veterinary Medical Data Base (VMDB), CERF, and individual breed or area surveys. Rubin, in his text *Inherited Eye Diseases in Purebred Dogs*,² presented breed-specific information for cataract formation using the CERF data. CERF data are based, in part, on purebred dogs presented for lens evaluations in private and institutional veterinary hospitals as well as special eye clinics.² The CERF data may be most useful in estimating the first time of cataract formation in purebred dogs, but the data do not include all breeds or the mixed-breeds. The VMDB data permit breed comparisons, have nearly 40 years of patient data, and include mixed-breeds, which can be used for baseline prevalence. All comparative methods, if employed over several decades, are influenced by the introduction of new breeds, the greater emphasis of annual eye examinations, and the development of veterinary ophthalmology since 1970.

This report estimates the prevalence of cataract formation in the dog using decade, breed, gender, and age of diagnosis of cataract formation from 1964 to 2003 patients from all veterinary medical teaching hospitals in North America.

MATERIALS AND METHODS

VMDB information was evaluated from March 1964 to March 2003, and included information from the North

American veterinary medical teaching hospitals. The total numbers of dogs presented to North American veterinary teaching medical hospitals were: 230 193 (1964-73), 518 129 (1974-83), 572 956 (1984-93), and 304 167 (1994-2003); a total of 1 625 445 dogs. The codes utilized for primary or breed-related cataracts were: X20007700 (congenital cataract), X20079800 (senile cataract), X20090006 (cataract due to unknown), X20091100 (immature cataract, incipient cataract), X20094700 (juvenile cataract), X20095500 (mature cataract), X20095550 (hyperimmune cataract), and X20095600 (resorption cataract). The total number of dogs with these cataract codes included 39 229 dogs (3.1%).

Each patient was counted only once on initial presentation with a diagnosis of at least one type of cataract. Information for all of the primary or breed-related cataracts involved dogs (number of dogs with cataract; prevalence of cataract) and total hospital population of dogs (number of participants; % eligible dogs).

Specific breeds of dogs with cataract prevalence greater than mixed-breed/hybrid dogs were analyzed for cataract formation. The most frequently affected breeds were grouped into the highest breeds in which primary cataracts were diagnosed in seven or more dogs, when percent cataract prevalence was equal to or higher than the mixed-breeds/hybrid, and divided into decades (1964-73, 1974-83, 1984-93, 1994-2003). Of the 164 breeds with primary cataracts, 29 met these criteria at a prevalence of 4% or above, and an additional 26 breeds at or a prevalence of > 1.34-3.90%. Any changes in the percent prevalence within a breed over these 40 years were noted. The age and gender of the dog at first diagnosis of primary cataract were also analyzed to determine the relative time in life when the lens opacity was detected, and if gender or male-to-female ratios were consistently different over the four different periods.

RESULTS

The prevalence of dogs presented with cataracts varied by time interval. Data are recorded as a percentage (number of dogs with cataracts/total number of dogs; %). From 1964 to 1973 there were 2188/230 193 dogs (0.95%); from 1974 to 1983 there were 9750/518 129 dogs (1.88%); from 1984 to 1993 there were 19 936/572 956 dogs (3.48%); and from 1994 to 2003 there were 7355/304 167 dogs (2.42%). Between 1964-1973 and 1994-2003 the prevalence of cataracts in the total dog patient population increased by ~255%. Table 1 summarizes all four decades of breeds with cataract formation above and including the mixed-breed/hybrid dog population.

For convenience, the cataractous breeds and gender by decade were divided into 31 breeds with cataract prevalence > 4.02% (Table 2), and the remaining 28 breeds with prevalence from > 1.61% (mixed-breeds) to 3.90% are summarized in Table 3. The total number of dogs of each breed, as well as the total of cataract dogs by breed, is presented.

Table 1. Prevalence (1.34–11.70%) of primary cataracts in 58 breeds above baseline (mixed-breeds/hybrids: 1.61%) in veterinary medical teaching hospitals of North America (1964–2003)

Breed	Total	Affected	Percentage
Fox Terrier, Smooth	171	20	11.70
Havanese	216	25	11.57
Bichon Frise	5091	583	11.45
Boston Terrier	15 241	1693	11.11
Poodle, Miniature	62 150	6706	10.79
Silky Terrier	1224	126	10.29
Poodle, Toy	28 411	2901	10.21
American Cocker Spaniel	71 128	6241	8.77
Bedlington Terrier	813	69	8.49
English Cocker Spaniel	3379	278	8.23
Lakeland Terrier	201	15	7.46
Poodle, Standard	18 259	1279	7.00
Tibetan Terrier	743	44	5.92
Chinese Crested	212	12	5.66
Brussels Griffon	333	18	5.41
Clumber Spaniel	263	14	5.32
Welsh Terrier	1537	79	5.14
Schnauzer, Miniature	34 385	1714	4.98
Japanese Chin (Japanese Spaniel)	327	16	4.89
Fox Terrier, Wire	9616	469	4.88
Schnauzer, Standard	5175	245	4.73
Siberian Husky	19 169	897	4.68
Lhasa Apso	15 105	697	4.61
Miniature Pinscher	2469	113	4.58
Old Format Min/Toy Poodle	17 128	774	4.52
Yorkshire Terrier	20 283	878	4.33
Shih Tzu	16 464	682	4.14
Australian Terrier	1050	43	4.10
Norwich Terrier	323	13	4.02
Cavalier King Charles Spaniel	1487	58	3.90
Cairn Terrier	6631	258	3.89
Manchester Terrier, Toy	603	23	3.81
Manchester Terrier	1419	54	3.81
Fox Terrier, Toy	1534	58	3.78
Old Format Manchester Terrier	602	22	3.65
Puli	764	26	3.40
Maltese	7884	253	3.21
Welsh Corgi, Pembroke	3047	93	3.05
Chesapeake Bay Retriever	5622	157	2.79
West Highland White Terrier	10 179	276	2.71
Old English Sheepdog	11 396	298	2.61
Kerry Blue Terrier	1320	34	2.58
Welsh Corgi, Cardigan	2532	64	2.53
Finnish Spitz	2837	70	2.47
Samoyed	13 857	336	2.42
Italian Greyhound	949	23	2.42
Afghan Hound	7759	183	2.36
Australian Cattle Dog (Blue Heeler)	5983	139	2.32
Pug	8914	203	2.28
Jack Russell Terrier	3581	81	2.26
English Springer Spaniel	22 971	511	2.22
Golden Retriever	75 000	1647	2.20
Pekingese	15 728	336	2.14
Dachshund, Longhaired	1568	33	2.10
Whippet	1889	38	2.01
Welsh Springer Spaniel	653	13	1.99
Bearded Collie	824	16	1.94
American Eskimo	3213	59	1.84
Chihuahua	19 442	357	1.84
Australian Shepherd	15 612	267	1.71
Mixed-breed (Inc. Wolf Hybrids)	509 876	8202	1.61
Border Collie	8356	112	1.34

Breeds affected

Those breeds with the highest prevalence of cataracts between March 1964 and March 2003 included the Smooth Fox Terrier (11.70%), Havanese (11.57%), Bichon Frise (11.45%), Boston Terrier (11.11%), Miniature Poodle (10.79%), and Silky Terrier (10.21%). The Miniature Poodle had the largest number of cataractous dogs (6706). In those breeds with a cataract prevalence of 5.14–8.77% the American Cocker Spaniel had 6241 cataractous dogs and Standard Poodle was second with 1279 affected dogs. In those breeds with a cataract prevalence of 3.05–4.98% the Miniature Schnauzer had 1714 cataractous dogs, whereas the Japanese Spaniel and Norwich Terrier had only 16 and 13 affected dogs, respectively.

In those breeds with cataract prevalence of 1.71–2.79% the numbers of cataractous dogs were often limited. Those breeds with more than 200 cataractous dogs included the West Highland White Terrier, Old English Sheepdog, Samoyed, Pug, English Springer Spaniel, Golden Retriever, Pekingese, Chihuahua, and Australian Shepherd. Although the prevalence for cataracts in the Golden Retriever was low (2.20%), the number of cataractous dogs was high (1647 dogs). The mixed-breed/hybrid dogs had a cataract prevalence of 1.61% with 8202 cataractous dogs.

Effect of gender

Evaluation of the all breeds with cataracts indicated that the ratio of cataractous females to males was usually $\approx 1 : 1$ over the four decades (Tables 2 and 3). For most breeds, occasional greater numbers of cataractous females or males were reported in one decade, but these differences were not evident for the entire 1964–2003 period. The American Cocker Spaniel demonstrated a trend toward higher female-to-male ratios, whereas higher numbers of males presented with cataracts in the Australian Terrier, Brussels Griffon, Japanese Chin, and Bearded Collie.

Change by decade

Any change in the prevalence of cataract by breed is summarized in Tables 2 and 3. Those breeds with overall cataract prevalence of 10.21–11.70% between March 1964 and March 2003 that increased during this period included the Havanese, Bichon Frise, Boston Terrier, Miniature Poodle, Silky Terrier, and Toy Poodle. The breed in which cataract prevalence remained relatively unchanged was the Smooth Fox Terrier.

Those breeds with 5.14–8.77% prevalence of cataracts in which the prevalence of cataracts increased included the Bedlington Terrier, Tibetan Terrier, Chinese Crested, Clumber Spaniel, and Welsh Terrier. Those breeds in which prevalence of cataract decreased included the American Cocker Spaniel, English Cocker Spaniel, Lakeland Terrier, Standard Poodle, and Brussels Griffon.

Those breeds with cataract prevalence of 3.05–4.98% that increased during this time included the Miniature Schnauzer, Wire Fox Terrier, Standard Schnauzer, Siberian Husky, Lhasa Apso, Yorkshire Terrier, Shih Tzu, Cairn Terrier,

Table 2. Prevalence of primary cataracts in the highest 34 breeds of cataractous dogs in veterinary medical teaching hospitals of North America by decade and gender (1964–2003)

Breed	Decade	Total			Affected			Percentage Affected			F:M Ratio
		Female	Male	Total	Female	Male	Total	Female	Male	Total	
American Cocker Spaniel	1964–73	4283	3504	7787	271	148	419	6.33	4.22	5.38	1.5 : 1
	1974–83	10 887	8780	19 667	911	564	1475	8.37	6.42	7.50	1.3 : 1
	1984–93	17 033	13 432	30 465	1924	1145	3069	11.30	8.52	10.07	1.3 : 1
	1994–2003	7539	5670	13 209	785	493	1278	10.41	8.69	9.68	1.2 : 1
Australian Terrier	1964–73	36	33	69			0				
	1974–83	187	191	378	4	7	11	2.14	3.66	2.91	1 : 1.7
	1984–93	200	184	384	5	16	21	2.50	8.70	5.47	1 : 3.5
	1994–2003	108	111	219	7	4	11	6.48	3.60	5.02	1.8 : 1
Bedlington Terrier	1964–73	28	31	59	2	1	3	7.14	3.23	5.08	2.2 : 1
	1974–83	205	155	360	22	16	38	10.73	10.32	10.56	1 : 1
	1984–93	170	115	285	8	5	13	4.71	4.35	4.56	1.1 : 1
	1994–2003	68	41	109	10	5	15	14.71	12.20	13.76	1.2 : 1
Bichon Frise	1964–73	7	7	14	0	0	0				
	1974–83	227	189	416	8	8	16	3.52	4.23	3.85	1 : 1.2
	1984–93	1167	1064	2231	134	116	250	11.48	10.90	11.21	1.1 : 1
	1994–2003	1283	1147	2430	155	162	317	12.08	14.12	13.05	1 : 1.2
Boston Terrier	1964–73	1669	1508	3177	91	109	200	5.45	7.23	6.30	1 : 1.3
	1974–83	2302	2116	4418	237	227	464	10.30	10.73	10.50	1 : 1
	1984–93	2420	2406	4826	322	368	690	13.31	15.30	14.30	1 : 1.1
	1994–2003	1497	1323	2820	191	148	339	12.76	11.19	12.02	1.1 : 1
Brussels Griffon	1964–73	13	11	24	0	1	1		9.09	4.17	
	1974–83	57	43	100	1	2	3	1.75	4.65	3.00	1 : 2.7
	1984–93	59	59	118	3	7	10	5.08	11.86	8.47	1 : 2.3
	1994–2003	48	43	91	2	2	4	4.17	4.65	4.40	1 : 1.1
Cairn Terrier	1964–73	491	384	875	9	2	11	1.83	0.52	1.26	3.5 : 1
	1974–83	1102	988	2090	25	18	43	2.27	1.82	2.06	1.2 : 1
	1984–93	1388	1173	2561	74	64	138	5.33	5.46	5.39	1 : 1
	1994–2003	593	512	1105	33	33	66	5.56	6.45	5.97	1 : 1.2
Cavalier King Charles Spaniel	1964–73	0	0	0	0	0	0				
	1974–83	11	21	32	1	2	3	9.09	9.52	9.38	1 : 1
	1984–93	236	226	462	16	8	24	6.78	3.54	5.19	1.9 : 1
	1994–2003	571	422	993	19	12	31	3.33	2.84	3.12	1.2 : 1
Chinese Crested	1964–73	2	0	2	0	0	0				
	1974–83	10	7	17	0	1	1		14.29	5.88	
	1984–93	36	29	65	1	2	3	2.78	6.90	4.62	1 : 2.5
	1994–2003	64	64	128	3	5	8	4.69	7.81	6.25	1 : 1.7
Clumber Spaniel	1964–73	0	1	1	0	0	0				
	1974–83	17	35	52	0	1	1		2.86	1.92	
	1984–93	49	53	102	2	3	5	4.08	5.66	4.90	1 : 1.4
	1994–2003	53	55	108	7	1	8	13.21	1.82	7.41	7.3 : 1
English Cocker Spaniel	1964–73	63	81	144	4	6	10	6.35	7.41	6.94	1 : 1.2
	1974–83	579	487	1066	43	35	78	7.43	7.19	7.32	1 : 1
	1984–93	780	638	1418	83	54	137	10.64	8.46	9.66	1.3 : 1
	1994–2003	384	367	751	29	24	53	7.55	6.54	7.06	1.2 : 1
Fox Terrier, Smooth	1964–73			0			0				
	1974–83			0			0				
	1984–93	60	41	101	13	0	13	21.67	12.87		
	1994–2003	36	34	70	7	0	7	19.44		10.00	
Fox Terrier, Toy	1964–73	65	29	94	5	0	5	7.69		5.32	
	1974–83	317	214	531	13	11	24	4.10	5.14	4.52	1 : 1.3
	1984–93	357	256	613	10	8	18	2.80	3.13	2.94	1 : 1.1
	1994–2003	172	124	296	5	6	11	2.91	4.84	3.72	1 : 1.7
Fox Terrier, Wire	1964–73	1763	1373	3136	58	52	110	3.29	3.79	3.51	1 : 1.2
	1974–83	1707	1382	3089	79	71	150	4.63	5.14	4.86	1 : 1.1
	1984–93	1250	1035	2285	83	58	141	6.64	5.60	6.17	1.2 : 1
	1994–2003	608	498	1106	41	27	68	6.74	5.42	6.15	1.2 : 1
Havanese	1964–73										
	1974–83										
	1984–93	57	51	108	3	8	11	5.26	15.69	10.19	1 : 3
	1994–2003	51	57	108	5	9	14	9.80	15.79	12.96	1 : 1.6

Table 2. Continued

Breed	Decade	Total			Affected			Percentage Affected			F:M Ratio
		Female	Male	Total	Female	Male	Total	Female	Male	Total	
Italian Greyhound	1964-73	7	11	18	1	0	1	14.29		5.56	
	1974-83	82	68	150	1	3	4	1.22	4.41	2.67	1 : 3.6
	1984-93	190	138	328	8	4	12	4.21	2.90	3.66	1.5 : 1
	1994-2003	231	222	453	5	1	6	2.16	0.45	1.32	4.8 : 1
Japanese Chin (Japanese Spaniel)	1964-73	0	1	1	0	0	0				
	1974-83	32	34	66	3	1	4	9.38	2.94	6.06	3.2 : 1
	1984-93	71	61	132	2	6	8	2.82	9.84	6.06	1 : 3.5
Lakeland Terrier	1964-73	55	73	128	1	3	4	1.82	4.11	3.13	1 : 2.3
	1974-83	7	10	17	0	0	0				
	1984-93	30	18	48	1	1	2	3.33	5.56	4.17	1 : 1.7
Lhasa Apso	1964-73	57	47	104	5	6	11	8.77	12.77	10.58	1 : 1.5
	1974-83	18	14	32	0	2	2		14.29	6.25	
	1984-93	166	130	296	1	2	3	0.60	1.54	1.01	1 : 2.6
	1994-2003	2210	2150	4360	21	58	79	0.95	2.70	1.81	1 : 2.8
Manchester Terrier	1964-73	3831	3769	7600	174	234	408	4.54	6.21	5.37	1 : 1.4
	1974-83	1459	1390	2849	102	105	207	6.99	7.55	7.27	1 : 1.1
	1984-93	112	61	173	4	1	5	3.57	1.64	2.89	2.2 : 1
	1994-2003	379	247	626	14	10	24	3.69	4.05	3.83	1 : 1.1
Miniature Pinscher	1964-73	313	211	524	12	6	18	3.83	2.84	3.44	1.3 : 1
	1974-83	56	40	96	5	2	7	8.93	5.00	7.29	1.8 : 1
	1984-93	62	70	132	5	4	9	8.06	5.71	6.82	1.4 : 1
	1994-2003	166	149	315	10	4	14	6.02	2.68	4.44	2.2 : 1
Norwich Terrier	1964-73	445	387	832	11	18	29	2.47	4.65	3.49	1 : 1.9
	1974-83	629	561	1190	41	20	61	6.52	3.57	5.13	1.8 : 1
	1984-93	10	5	15	0	0	0				
	1994-2003	34	29	63	2	1	3	5.88	3.45	4.76	1.7 : 1
Old Format Min/Toy Poodle	1964-73	72	79	151	5	4	9	6.94	5.06	5.96	1.4 : 1
	1974-83	46	48	94	0	1	1		2.08	1.06	
	1984-93	8990	8047	17 037	387	381	768	4.30	4.73	4.51	1 : 1.1
	1994-2003	29	59	88	0	5	5		8.47	5.68	
Poodle, Miniature	1964-73	0	3	3	0	1	1		33.33	33.33	
	1974-83	3607	2972	6579	149	124	273	4.13	4.17	4.15	1 : 1
	1984-93	18 294	15 588	33 882	1564	1339	2903	8.55	8.59	8.57	1 : 1
	1994-2003	9385	7746	17 131	1544	1148	2692	16.45	14.82	15.71	1.1 : 1
Poodle, Standard	1964-73	2409	2149	4558	443	395	838	18.39	18.38	18.39	1 : 1
	1974-83	1885	1860	3745	52	45	97	2.76	2.42	2.59	1.1 : 1
	1984-93	2156	2130	4286	136	102	238	6.31	4.79	5.55	1.3 : 1
	1994-2003	3874	3485	7359	457	347	804	11.80	9.96	10.93	1.2 : 1
Poodle, Toy	1964-73	1506	1363	2869	74	66	140	4.91	4.84	4.88	1 : 1
	1974-83	1189	833	2022	51	22	73	4.29	2.64	3.61	1.6 : 1
	1984-93	6976	4906	11 882	560	327	887	8.03	6.67	7.47	1.2 : 1
	1994-2003	6359	4295	10 654	840	563	1403	13.21	13.11	13.17	1 : 1
Puli	1964-73	2334	1519	3853	321	217	538	13.75	14.29	13.96	1 : 1
	1974-83	39	48	87	1	0	1	2.56		1.15	
	1984-93	181	190	371	5	4	9	2.76	2.11	2.43	1.3 : 1
	1994-2003	112	123	235	7	4	11	6.25	3.25	4.68	1.9 : 1
Schnauzer, Standard	1964-73	39	32	71	5	0	5	12.82		7.04	
	1974-83	79	86	165	2	0	2	2.53		1.21	
	1984-93	780	724	1504	21	18	39	2.69	2.49	2.59	1.1 : 1
	1994-2003	1391	1145	2536	85	50	135	6.11	4.37	5.32	1.4 : 1
Schnauzer, Miniature	1964-73	532	438	970	37	32	69	6.95	7.31	7.11	1 : 1.1
	1974-83	2485	2116	4601	57	70	127	2.29	3.31	2.76	1 : 1.4
	1984-93	6563	5282	11 845	256	189	445	3.90	3.58	3.76	1.1 : 1
	1994-2003	6673	5190	11 863	374	326	700	5.60	6.28	5.90	1 : 1.1
Shih Tzu	1964-73	3402	2674	6076	228	214	442	6.70	8.00	7.27	1 : 1.2
	1974-83	48	44	92	0	0	0				
	1984-93	1211	1335	2546	19	28	47	1.57	2.10	1.85	1 : 1.3
	1994-2003	4059	3994	8053	181	161	342	4.46	4.03	4.25	1.1 : 1
		2963	2810	5773	163	130	293	5.50	4.63	5.08	1.2 : 1

Table 2. Continued

Breed	Decade	Total			Affected			Percentage Affected			F:M Ratio
		Female	Male	Total	Female	Male	Total	Female	Male	Total	
Siberian Husky	1964-73	786	783	1569	4	6	10	0.51	0.77	0.64	1 : 1.5
	1974-83	3270	2985	6255	79	89	168	2.42	2.98	2.69	1 : 1.2
	1984-93	3911	3595	7506	210	271	481	5.37	7.54	6.41	1 : 1.4
	1994-2003	2023	1816	3839	115	123	238	5.68	6.77	6.20	1 : 1.2
Silky Terrier	1964-73	20	13	33	0	0	0				
	1974-83	228	197	425	14	11	25	6.14	5.58	5.88	1.1 : 1
	1984-93	273	242	515	27	39	66	9.89	16.12	12.82	1 : 1.6
	1994-2003	129	122	251	16	19	35	12.40	15.57	13.94	1 : 1.3
Tibetan Terrier	1964-73	9	12	21	0	1	1		8.33	4.76	
	1974-83	99	92	191	3	4	7	3.03	4.35	3.66	1 : 1.4
	1984-93	177	182	359	11	7	18	6.21	3.85	5.01	1.6 : 1
	1994-2003	75	97	172	11	7	18	14.67	7.22	10.47	2 : 1
Welsh Terrier	1964-73	127	128	255	3	4	7	2.36	3.13	2.75	1 : 1.3
	1974-83	251	242	493	16	11	27	6.37	4.55	5.48	1.4 : 1
	1984-93	280	247	527	14	10	24	5.00	4.05	4.55	1.2 : 1
	1994-2003	136	126	262	11	10	21	8.09	7.94	8.02	1 : 1
Yorkshire Terrier	1964-73	789	656	1445	5	4	9	0.63	0.61	0.62	1 : 1
	1974-83	2528	2171	4699	55	59	114	2.18	2.72	2.43	1 : 1.2
	1984-93	4688	3967	8655	229	204	433	4.88	5.14	5.00	1 : 1.1
	1994-2003	2911	2573	5484	146	176	322	5.02	6.84	5.87	1 : 1.4

Table 3. Prevalence of primary cataracts in the next 25 breeds of cataractous dogs in veterinary medical teaching hospitals of North America by decade and gender (1964-2003)

Breed	Decade	Total			Affected			Percentage Affected			F:M Ratio
		Female	Male	Total	Female	Male	Total	Female	Male	Total	
Afghan Hound	1964-73	755	761	1516	20	29	49	2.65	3.81	3.23	1 : 1.4
	1974-83	2051	2117	4168	48	61	109	2.34	2.88	2.62	1 : 1.2
	1984-93	897	866	1763	9	14	23	1.00	1.62	1.30	1 : 1.6
	1994-2003	166	146	312	1	2	3	0.60	0.68	0.64	1 : 1.1
American Eskimo	1964-73	30	34	64	0	0	0				
	1974-83	388	345	733	1	8	9	0.26	2.32	1.23	1 : 9
	1984-93	770	756	1526	12	12	24	1.56	1.59	1.57	1 : 1
	1994-2003	472	418	890	11	15	26	2.33	3.59	2.92	1 : 1.5
Australian Cattle Dog (Blue Heeler)	1964-73	25	31	56	0	0	0				
	1974-83	825	675	1500	8	5	13	0.97	0.74	0.87	1.3 : 1
	1984-93	1402	1115	2517	36	31	67	2.57	2.78	2.66	1 : 1.1
	1994-2003	1052	858	1910	40	19	59	3.80	2.21	3.09	1.7 : 1
Australian Shepherd	1964-73	244	165	409	0	1	1		0.61	0.24	
	1974-83	2672	2222	4894	39	25	64	1.46	1.13	1.31	1.3 : 1
	1984-93	3577	2802	6379	61	45	106	1.71	1.61	1.66	1.1 : 1
	1994-2003	2089	1841	3930	56	40	96	2.68	2.17	2.44	1.2 : 1
Bearded Collie	1964-73	0	0	0	0	0	0				
	1974-83	73	56	129	1	1	2	1.37	1.79	1.55	1 : 1.3
	1984-93	212	231	443	6	4	10	2.83	1.73	2.26	1.6 : 1
	1994-2003	123	129	252	1	3	4	0.81	2.33	1.59	1 : 2.9
Border Collie	1964-73	142	89	231	0	2	2		2.25	0.87	
	1974-83	1239	932	2171	11	10	21	0.89	1.07	0.97	1 : 1.2
	1984-93	1772	1387	3159	24	20	44	1.35	1.44	1.39	1 : 1.1
	1994-2003	1458	1337	2795	29	16	45	1.99	1.20	1.61	1.7 : 1
Chesapeake Bay Retriever	1964-73	226	264	490	2	7	9	0.88	2.65	1.84	1 : 3
	1974-83	745	841	1586	20	25	45	2.68	2.97	2.84	1 : 1.1
	1984-93	1174	1136	2310	37	34	71	3.15	2.99	3.07	1.1 : 1
	1994-2003	624	612	1236	16	16	32	2.56	2.61	2.59	1 : 1
Chihuahua	1964-73	3118	2208	5326	19	23	42	0.61	1.04	0.79	1 : 1.7
	1974-83	3844	2550	6394	85	39	124	2.21	1.53	1.94	1.4 : 1
	1984-93	2824	2032	4856	79	51	130	2.80	2.51	2.68	1.1 : 1
	1994-2003	1600	1266	2866	35	26	61	2.19	2.05	2.13	1.1 : 1
Dachshund,	1964-73	0	0	0	0	0	0				
	1974-83	119	120	239	1	3	4	0.84	2.50	1.67	1 : 3
	1984-93	435	368	803	10	9	19	2.30	2.45	2.37	1 : 1.1
	1994-2003	254	272	526	6	4	10	2.36	1.47	1.90	1.6 : 1
English Springer Spaniel	1964-73	954	1028	1982	5	9	14	0.52	0.88	0.71	1 : 1.7
	1974-83	3879	3590	7469	67	87	154	1.73	2.42	2.06	1 : 1.4
	1984-93	5052	4255	9307	135	89	224	2.67	2.09	2.41	1.3 : 1
	1994-2003	2196	2017	4213	65	54	119	2.96	2.68	2.82	1.1 : 1

Table 3. Continued

Breed	Decade	Total			Affected			Percentage Affected			F:M Ratio
		Female	Male	Total	Female	Male	Total	Female	Male	Total	
Finnish Spitz	1964-73	106	68	174	0	0	0				
	1974-83	767	587	1354	10	3	13	1.30	0.51	0.96	2.6 : 1
	1984-93	567	488	1055	26	20	46	4.59	4.10	4.36	1.1 : 1
Golden Retriever	1994-2003	149	105	254	7	4	11	4.70	3.81	4.33	1.2 : 1
	1964-73	1645	1796	3441	26	21	47	1.58	1.17	1.37	1.4 : 1
	1974-83	8701	8815	17 516	255	188	443	2.93	2.13	2.53	1.4 : 1
Jack Russell Terrier	1984-93	16 711	16 305	33 016	378	335	713	2.26	2.05	2.16	1.1 : 1
	1994-2003	10 693	10 334	21 027	218	226	444	2.04	2.19	2.11	1 : 1.1
	1964-73	0	0	0	0	0	0				
Kerry Blue Terrier	1974-83	35	13	48	0	0	0				
	1984-93	499	519	1018	14	5	19	2.81	0.96	1.87	2.9 : 1
	1994-2003	1236	1279	2515	27	35	62	2.18	2.74	2.47	1 : 1.3
Maltese	1964-73	153	136	289	2	5	7	1.31	3.68	2.42	1 : 2.8
	1974-83	285	238	523	9	6	15	3.16	2.52	2.87	1.3 : 1
	1984-93	169	172	341	8	1	9	4.73	0.58	2.64	8.1 : 1
Manchester Terrier, Toy	1994-2003	83	84	167	2	1	3	2.41	1.19	1.80	2 : 1
	1964-73	370	300	670	5	8	13	1.35	2.67	1.94	1 : 2
	1974-83	939	965	1904	21	20	41	2.24	2.07	2.15	1.1 : 1
Mixed-breed (Inc. Wolf Hybrids)	1984-93	1580	1526	3106	58	59	117	3.67	3.87	3.77	1 : 1.1
	1994-2003	1180	1024	2204	47	35	82	3.98	3.42	3.72	1.2 : 1
	1964-73	53	26	79	0	0	0				
Old English Sheepdog	1974-83	187	107	294	8	6	14	4.28	5.61	4.76	1 : 1.3
	1984-93	106	66	172	4	3	7	3.77	4.55	4.07	1 : 1.2
	1994-2003	33	25	58	2	0	2	6.06		3.45	
Pekingese	1964-73	42 998	37 491	80 489	207	182	389	0.48	0.49	0.48	1 : 1
	1974-83	97 130	85 927	183 057	974	764	1738	1.00	0.89	0.95	1.1 : 1
	1984-93	92 792	78 714	171 506	2419	1938	4357	2.61	2.46	2.54	1.1 : 1
Pug	1994-2003	40 437	34 387	74 824	942	776	1718	2.33	2.26	2.30	1 : 1
	1964-73	358	365	723	3	7	10	0.84	1.92	1.38	1 : 2.3
	1974-83	2991	3028	6019	57	69	126	1.91	2.28	2.09	1 : 1.2
Samoyed	1984-93	1939	1790	3729	75	63	138	3.87	3.52	3.70	1.1 : 1
	1994-2003	491	434	925	15	9	24	3.05	2.07	2.59	1.5 : 1
	1964-73	363	233	596	11	11	22	3.03	4.72	3.69	1 : 1.6
Welsh Corgi, Cardigan	1974-83	0	1	1	0	0	0				
	1984-93	1	1	2	0	0	0				
	1994-2003	0	3	3	0	0	0				
Welsh Corgi, Pembroke	1964-73	1774	1735	3509	9	17	26	0.51	0.98	0.74	1 : 1.9
	1974-83	2799	2776	5575	44	57	101	1.57	2.05	1.81	1 : 1.3
	1984-93	2373	2368	4741	69	76	145	2.91	3.21	3.06	1 : 1.1
Whippet	1994-2003	974	929	1903	31	33	64	3.18	3.55	3.36	1 : 1.1
	1964-73	808	712	1520	5	11	16	0.62	1.54	1.05	1 : 2.5
	1974-83	1159	1168	2327	26	20	46	2.24	1.71	1.98	1.3 : 1
West Highland White Terrier	1984-93	1301	1432	2733	41	38	79	3.15	2.65	2.89	1.2 : 1
	1994-2003	1192	1142	2334	28	34	62	2.35	2.98	2.66	1 : 1.3
	1964-73	896	896	1792	4	3	7	0.45	0.33	0.39	1.3 : 1
Welsh Springer Spaniel	1974-83	2632	2474	5106	38	42	80	1.44	1.70	1.57	1 : 1.2
	1984-93	2668	2465	5133	73	106	179	2.74	4.30	3.49	1 : 1.6
	1994-2003	951	875	1826	36	34	70	3.79	3.89	3.83	1 : 1
Whippet	1964-73	65	57	122	0	0	0				
	1974-83	373	417	790	4	13	17	1.07	3.12	2.15	1 : 2.9
	1984-93	464	492	956	14	14	28	3.02	2.85	2.93	1.1 : 1
Whippet	1994-2003	320	344	664	10	9	19	3.13	2.62	2.86	1.2 : 1
	1964-73	27	28	55	0	0	0				
	1974-83	401	305	706	12	14	26	2.99	4.59	3.68	1 : 1.5
Whippet	1984-93	694	604	1298	31	23	54	4.47	3.81	4.16	1.2 : 1
	1994-2003	533	455	988	4	9	13	0.75	1.98	1.32	1 : 2.6
	1964-73	17	10	27	1	0	1	5.88		3.70	
Whippet	1974-83	93	86	179	1	1	2	1.08	1.16	1.12	1 : 1.1
	1984-93	167	130	297	4	4	8	2.40	3.08	2.69	1 : 1.3
	1994-2003	87	63	150	1	1	2	1.15	1.59	1.33	1 : 1.4
Whippet	1964-73	513	450	963	14	10	24	2.73	2.22	2.49	1.2 : 1
	1974-83	1438	1193	2631	26	41	67	1.81	3.44	2.55	1 : 1.9
	1984-93	2282	1993	4275	61	67	128	2.67	3.36	2.99	1 : 1.3
Whippet	1994-2003	1210	1100	2310	27	30	57	2.23	2.73	2.47	1 : 1.2
	1964-73	29	38	67	0	0	0				
	1974-83	287	262	549	12	6	18	4.18	2.29	3.28	1.8 : 1
Whippet	1984-93	426	375	801	11	1	12	2.58	0.27	1.50	9.7 : 1
	1994-2003	240	232	472	4	4	8	1.67	1.72	1.69	1 : 1

Manchester Terrier, Puli, and Maltese. Those breeds in which the cataract prevalence decreased, usually in the most recent decade, included the Japanese Chin, Australian Terrier, Norwich Terrier, Cavalier King Charles Spaniel, Toy Fox Terrier, and Pembroke Welsh Corgi. Those breeds in which cataract prevalence remained unchanged included the Miniature Pinscher.

Those breeds with cataract prevalence of 1.61–2.79% that increased during this time included Australian Shepherd, Border Collie, Longhaired Dachshund, Finnish Spitz, Samoyed, Australian Cattle Dog, Pug, English Springer Spaniel, and American Eskimo. Those breeds in which the cataract prevalence declined, usually in the last decade, included the Bearded Collie, Chesapeake Bay Retriever, Golden Retriever, Jack Russell Terrier, Old English Sheepdog, Kerry Blue Terrier, Cardigan Welsh Corgi, Italian Greyhound, Afghan Hound, and Chihuahua. Those breeds in which cataract prevalence remained unchanged included the West Highland White Terrier.

Age of presentation

The ages at first diagnosis of cataract varied by breed, and best presented by the percentage of cataractous dogs presented at 0–2 weeks, 2 weeks to 2 months, 2–6 months, 1–2 years, 2–4 years, 4–7 years, 7–10 years, 10–15 years, and 15+ years. In many breeds there were limited numbers of dogs in each age group in one decade; as a result all the cataractous dogs for four decades were evaluated collectively (Table 4). The age of presentation may provide some useful clinical information for many breeds of dogs not investigated to date for inherited cataracts.

For the majority of breeds, the ages of risk for cataract formation were 4–7, 7–10, and 10–15 years old. Cataract before age 1–2 years appeared infrequent. The several breeds the highest age group of cataract diagnosis varied, but some generalizations are possible. In most breeds the onset of cataract diagnosis was progressive; as dog age increased so did the prevalence of cataract formation. The gradual increase in the prevalence of cataracts usually started at 2–4 years in the American Cocker Spaniel, Bichon Frise, Havanese, Tibetan

Terrier and Welsh Terrier, and for other breeds at 4–7 years, including Australian Terrier, Bedlington Terrier, Brussels Griffon, Cairn Terrier, English Cocker Spaniel, Miniature Pinscher, Toy, Miniature and Standard Poodles, and Silky Terrier.

The highest prevalence of cataracts in dogs 1–2 years old occurred in only the Siberian Husky. Peak prevalence of cataract formation in dogs of 2–4 years of age occurred in no individual breeds, but for 4–7-year-old dogs, peak prevalence occurred in American Cocker Spaniel, Bichon Frise and Chinese Crested. The breeds with the highest prevalence of cataracts in the 7–10-year-old group included Brussels Griffon, Chesapeake Bay Retriever, English Cocker Spaniel, Havanese, Manchester Toy Terrier, Norwich Terrier, Standard Schnauzer and Tibetan Terrier. Those breeds with highest prevalence of cataracts in the 10–15-year-old age group included American Eskimo, Australian Cattle Dog, Australian Shepherd, Australian Terrier, Bedlington Terrier, Border Collie, Boston Terrier, Brussels Griffon, Cavalier King Charles Spaniel, Chihuahua, English Springer Spaniel, Finnish Spitz, Wire Fox Terrier, Italian Greyhound, Jack Russell Terrier, Kerry Blue Terrier, Japanese Chin, Lhasa Apso, Miniature Poodle, Miniature Schnauzer, and Welsh Springer Spaniel.

In some breeds the onset of cataracts seemed independent of age; these breeds included Australian Shepherd, Bedlington Terrier, Golden Retriever, English Cocker Spaniel, and Pembroke Welsh Corgi.

As a baseline, the mixed-breeds and hybrids presented with cataracts throughout life, but the prevalence of cataracts gradually increased as the dogs aged. A highest prevalence of cataracts occurred in the 10–15-year-old dogs. Although cataracts were frequently diagnosed in the age groups less than 2 years, the marked increase in cataract diagnoses started in the 4–7-year-old dogs.

DISCUSSION

Cataracts have been reported to be one of the most common eye diseases in purebred dogs, a leading cause of blindness in the adult dog, and a disease largely treatable by surgery. This

Table 4. Prevalence of primary cataracts in the 59 breeds in veterinary medical teaching hospitals of North America from 1960 to 2003 by age of presentation

Breed	% Affected										Unknown
	0–2 weeks	2 weeks to 2 months	2–6 months	6–12 months	1–2 years	2–4 years	4–7 years	7–10 years	10–15 years	15 years	
Afghan Hound		1.74	0.91	0.61	3.95	3.89	3.11	0.67	0.88		2.27
American Cocker Spaniel	1.60	1.91	2.02	3.18	6.36	9.72	12.67	11.70	9.43	8.26	9.24
American Eskimo		1.32	0.23		1.44	0.40	1.59	2.87	6.08	4.08	
Australian Cattle Dog (Blue Heeler)			0.20	0.33	0.45	0.31	3.22	8.09	12.19	2.38	
Australian Shepherd		0.84	0.81	0.64	1.48	1.80	2.33	2.81	3.38	0.79	1.75
Australian Terrier					0.86	3.65	2.49	8.64	9.09	15.38	
Bearded Collie			7.58		1.02	0.56	1.23	1.55	3.70		14.29
Bedlington Terrier			7.69	4.84	2.48	1.33	5.44	11.63	26.83		
Bichon Frise			0.68	0.85	6.97	12.05	18.35	15.67	13.79	21.15	10.26
Border Collie			0.21	0.40	0.16	0.93	1.36	2.47	4.39	3.54	2.70
Boston Terrier	2.78		1.18	1.31	3.64	6.67	8.32	16.42	26.54	8.33	8.08

Table 4. Continued

Breed	% Affected										Unknown
	0-2 weeks	2 weeks to 2 months	2-6 months	6-12 months	1-2 years	2-4 years	4-7 years	7-10 years	10-15 years	15 years	
Brussels Griffon						6.25	4.55	15.56	10.53		
Cairn Terrier	7.14		0.33	0.33	1.18	1.99	4.14	6.23	8.30	12.40	6.06
Cavalier King Charles Spaniel			3.73	2.27	3.90	3.30	4.10	4.73	6.56		11.11
Chesapeake Bay Retriever			1.52	0.89	1.49	1.85	4.14	6.92	4.42		
Chihuahua	2.00		0.31	0.22	0.46	0.23	0.86	2.64	5.99	9.79	1.49
Chinese Crested					2.86		18.75	11.11	12.50	100.00	
Clumber Spaniel			15.15	2.94		5.08	5.36	3.57	8.33		
Dachshund, Longhaired					0.86		0.76	1.94	7.46	7.69	
English Cocker Spaniel	11.11	5.45	2.59	2.65	6.64	4.24	8.97	18.68	14.11		11.11
English Springer Spaniel		0.38	1.80	1.40	1.26	1.64	2.83	2.82	4.50	3.29	
Finnish Spitz				1.06	0.59	0.71	1.32	3.33	7.88	7.35	7.50
Fox Terrier, Smooth				25.00	40.91	11.43	15.38				
Fox Terrier, Toy				0.63	1.23	0.42	5.24	6.42	8.73	15.79	
Fox Terrier, Wire		0.68	0.12	0.23	0.82	3.61	6.12	8.00	8.71	8.72	11.67
Golden Retriever	0.51	1.20	0.82	1.35	2.77	2.88	2.37	2.17	2.39	2.88	1.09
Havanese				5.88	9.38	8.47	16.67	20.69	19.05		
Italian Greyhound					0.51	2.14	7.00	10.84	42.86		
Jack Russell Terrier			0.54	0.40	1.22	2.16	4.40	5.71	6.45	4.17	
Japanese Chin (Japanese Spaniel)		16.67			3.77	2.00	5.17	4.08	9.30	50.00	33.33
Kerry Blue Terrier			4.67		1.44	1.52	3.47	2.73	3.59		
Lakeland Terrier				17.65		10.53	4.76	3.85	13.79	25.00	
Lhasa Apso	1.96		0.59	0.85	1.68	2.66	4.84	7.47	9.52	10.04	3.36
Maltese	5.00		0.26	0.71	0.55	2.68	4.63	4.46	6.44	7.95	1.85
Manchester Terrier				1.42	1.28	1.41	4.87	7.52	6.07	8.16	
Manchester Terrier, Toy							2.11	9.71	8.13		50.00
Miniature Pinscher		2.78	0.29	0.82	0.81	2.56	4.65	9.92	20.77	37.50	4.55
Mixed-breed (Inc. Wolf Hybrids)	0.75	0.16	0.16	0.16	0.40	0.91	2.01	3.23	4.71	6.24	1.22
Norwich Terrier					2.70	1.61	1.67	11.36	4.44	25.00	33.33
Old English Sheepdog		3.06	2.94	1.85	2.16	2.53	3.23	1.60	4.65	5.41	
Old Format Manchester Terrier						1.06	1.77	8.25	11.34		
Old Format Min/Toy Poodle		0.34	0.31	0.41	1.48	3.99	7.08	12.75	12.50	14.29	
Pekingese		0.38	0.84		1.16	1.56	2.04	3.53	4.55	5.35	1.20
Poodle, Miniature	1.79	0.84	0.58	0.58	3.11	5.71	10.90	15.13	16.91	16.43	10.03
Poodle, Standard	3.23	2.72	1.06	1.64	2.07	3.37	6.52	10.82	13.00	14.06	14.95
Poodle, Toy	1.11	0.44	0.62	0.89	1.96	6.19	11.30	15.45	20.19	25.40	16.56
Pug			0.30	0.39	0.83	0.68	2.43	4.55	8.02	13.56	
Puli					1.16		3.88	7.41	6.54		
Samoyed	2.17	0.43	0.80	1.61	3.22	2.02	2.44	3.84	3.07	2.90	3.66
Schnauzer, Standard			0.34	2.17	3.55	3.06	6.45	6.87	5.23	1.59	4.26
Schnauzer, Miniature	0.91	1.98	1.95	1.82	3.41	5.04	5.88	6.68	6.72	5.71	4.73
Shih Tzu			0.96	1.20	1.77	1.22	4.35	7.43	10.48	10.75	2.78
Siberian Husky	2.13	1.07	0.60	6.41	10.19	4.64	3.87	2.85	2.27	1.85	2.50
Silky Terrier			1.23	1.14	2.61	2.94	10.12	17.41	18.10	19.05	33.33
Tibetan Terrier			1.35	3.75	4.26	3.16	8.50	10.53	9.46	16.67	
Welsh Corgi, Cardigan			4.85	3.83	1.22	1.63	1.16	2.58	4.42	4.00	8.33
Welsh Corgi, Pembroke		2.94	6.18	2.30	3.50	1.96	3.25	1.72	3.59	8.33	3.70
Welsh Springer Spaniel	25.00		3.70		2.47	0.74		3.53	5.26		
Welsh Terrier					1.89	4.56	5.94	6.82	8.81	22.73	
West Highland White Terrier		1.56	1.08	0.23	0.93	1.36	3.25	4.32	4.18	11.61	4.17
Whippet			1.81	1.67	1.59	1.98	2.00	2.08	2.13	13.64	
Yorkshire Terrier	0.81		0.34	0.42	0.22	1.21	3.73	7.98	13.93	17.21	4.11

retrospective study supports these statements, and the prevalence of breed-related cataracts may, in fact, be the leading cause of visual impairment and/or blindness in the dog in North America reported to date.

This study has many of the limitations of a retrospective study, but offers an opportunity to estimate the prevalence of cataracts in a large population of dogs in North America over four decades. It also permits comparisons by decade, breed, gender, age, and includes mixed-breed/hybrid dogs as a general population base. About 20 breeds of dogs have been investigated to some extent for lens opacities, and have been reported to show inherited cataracts of different types, age-of-onset, and mode of inheritance. This report identified an additional 40 breeds of dogs that present with cataracts at frequencies higher than the baseline seen in mixed-breed/hybrid dogs that also should be studied. Of the seven breeds with a cataract prevalence of 10% or above over the past four decades, only the Bichon Frise and Boston Terrier have been investigated. In the breeds with primary cataracts with a prevalence of 5.00–8.77%, only the American Cocker Spaniel and Standard Poodle have been investigated. As the canine genome and the relationships of the dog sharing our environment are defined, the impact of genetics, nutrition, aging and other factors may be evaluated.

The decades in this report parallel the development of veterinary ophthalmology and its practice in private and academic referral clinics. With the evolution of cataract surgery in the dog from intracapsular, extracapsular and now phacoemulsification techniques, referral of patients for cataract surgery has become commonplace. Nevertheless, the material in this report will hopefully serve as a base for future prospective studies that provide additional information, at least on selected breeds. The increase in the prevalence of primary cataracts in dogs from 1964 to 2003 probably represents both increased frequency of diagnosis as well as real increases in possible inherited cataracts in many breeds. Although it is reasonable to assume that most cataract diagnoses in this study were made by the institutions' veterinary ophthalmologists, some patients were also undoubtedly examined by the other clinicians. Perhaps another significant finding in this report is the 47% reduction in total dogs presented to veterinary medical teaching hospitals (572 956 dogs in 1984–93 compared with 304 167 dogs in 1994–2003) during the last decade which may be attributed to, in part, the development of the private specialty practices.

As a result, prospective studies are indicated to establish prevalence based on complete lens evaluation with mydriasis in selected breeds. We predict prevalence levels will be higher than determined in this report. Comparison of the information in this report to the data in the CERF might be interesting as many dogs are examined for CERF certification occur only in special clinics and often owners are not aware that cataract formation is developing. This may permit determination of earlier times for cataract onset. In addition, the CERF information is based only on eye examinations by Diplomates of the American College of

Veterinary Ophthalmologists. Unfortunately, only purebred dogs are included in the CERF registry, and the baseline of mixed-breed/hybrids is not available.

Based on the results in this study, breed and age are more important than gender in the determination of cataract prevalence in the dog. Primary cataracts tend to occur most frequently in the smaller breeds but the Retriever breeds, Standard Schnauzer and Standard Poodle are important exceptions. Although reported in the UK with posterior polar cataracts, the Labrador Retriever was below the baseline of mixed-breed/hybrids in North America. The same type of cataract in the Golden Retriever consists of nearly 1700 dogs in North America but has a low prevalence (2.04%) for 1994–2003. Because the posterior polar cataract in the Golden and Labrador Retrievers does not usually affect vision and is not treated by cataract surgery, the prevalence of cataracts in these breeds may be under represented.

Age seems important for many breeds with primary cataracts, suggesting that genetics may be only partly important. In the mixed-breed/hybrid dogs, which were selected as the baseline population, there were a large number of dogs (509 876) and a progressive increase in the prevalence of cataract formation (8202 dogs). In those breeds with cataract formation peaking in the age groups 4–7 years and older, cataract studies, especially those focusing on possible mode(s) of inheritance, will require considerable time (and patience) if they are to obtain meaningful information. Long-term funding, for a decade or more, for cataract studies in the dog seems doubtful!

In summary, primary or breed-related cataracts in dogs in North America have the highest prevalence of any ophthalmic disease studied to date, and are directly related to specific breeds and age, but not to gender. Of the 164 breeds of dogs with primary cataracts and a cataract prevalence of 1% or more, 59 breeds have a prevalence greater than that seen in the baseline mixed-breed/hybrid group. Of the 30 breeds with the highest cataract prevalence for 1964–2003, cataract formation has been investigated in only five breeds, Bichon Frise,²⁵ Boston Terrier,⁷ American Cocker Spaniel,^{10,11} Standard Poodle,^{16,17} and Miniature Schnauzer.^{5,6,26,27}

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