THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan

Cairn Terrier

Evidence Base

CONTENTS

INTRODUCTION

The Kennel Club launched a new resource for breed clubs and individual breeders – the Breed Health and Conservation Plans (BHCP) project – in September 2016. The purpose of the project is to ensure that all health concerns for a breed are identified through evidence-based criteria, and that breeders are provided with useful information and resources to raise awareness of current health and welfare concerns in their breed, and support them in making balanced breeding decisions.

The Breed Health and Conservation Plans take a complete view of breed health with consideration to the following issues: known inherited conditions, complex conditions (i.e. those involving many genes and environmental effects such as nutrition or exercise levels, for example hip dysplasia), conformational concerns and population genetics.

Sources of evidence and data have been collated into an evidence base which gives clear indications of the most significant health conditions in each breed, in terms of prevalence and impact. Once the evidence base document has been produced it is discussed with the relevant Breed Health Co-ordinator and breed health representatives where applicable. Priorities are agreed based on this data and incorporated into a list of actions between the Kennel Club and the breed to tackle these health concerns. These actions are then monitored and reviewed on a regular basis.

DEMOGRAPHICS

The number of Cairn Terriers registered by year of birth between 1990 and 2020 are shown in Figure 1. The trend of registrations over year of birth (1990-2020) was -92.5 per year (with a 95% confidence interval of -103.3 to -81.7), reflecting the significant decrease in the breed's numbers over the period analysed. The breed is on the Kennel Club's vulnerable native breed "at watch" list, due to concern over the dwindling number of dogs registered per year.

[Put simply, 95% confidence intervals (C.I.s) indicate that we are 95% confident that the true estimate of a parameter lies between the lower and upper number stated.]

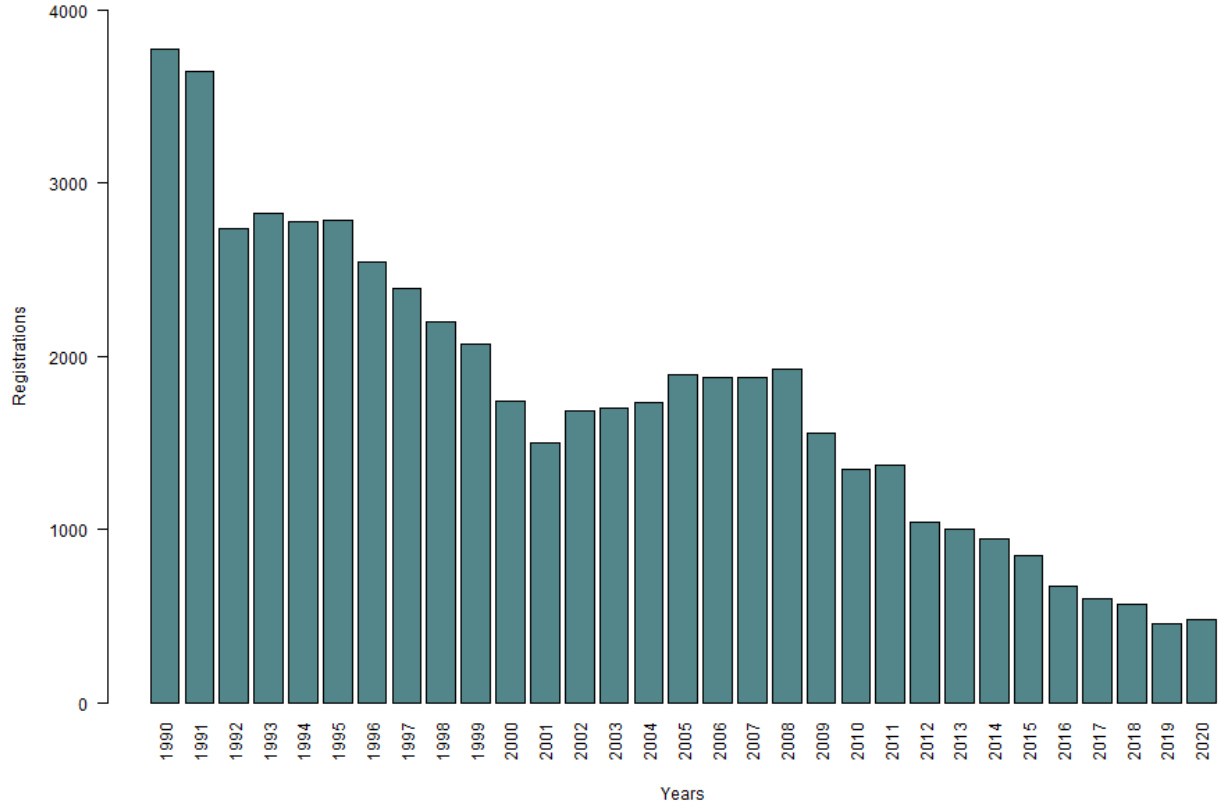

Figure 1: Number of registrations of Cairn Terriers per year of birth, 1990 – 2020.

BREED HEALTH CO-ORDINATOR ANNUAL HEALTH REPORT

Breed Health Co-ordinators (BHCs) are volunteers nominated by their breed to act as a vital conduit between the Kennel Club and the breed clubs with all matters relating to health.

The most recent Annual Health Report (AHR) (2022) yielded the following response to 'please list and rank the three health and welfare conditions that the breed considers to be currently the most important to deal with in your breed':

1. Liver shunt
2. Ocular melanosis
3. Diabetes
4. Luxating patella
5. Cancers
6. Sudden acquired retinal degeneration (SARDS)

In terms of what the breed has done to help tackle these health and welfare concerns the Cairn Health Group publish a health flyer in the year books and Cairn Terrier relief fund newsletter. The breed have also been working on a survey which will be included in the next relief fund newsletter.

BREED CLUB HEALTH ACTIVITES

The Cairn Terrier has an active Breed Health Coordinator (BHC), and information regarding the breed's health on the club websites:

- Health (thecairnterrierclub.co.uk)
- Southern Cairn Terrier Club (sctc.org.uk)

The breed also has a Cairn Terrier Health Group who monitor health concerns in the breed, produces annual reports, and encourages owners and breeders to routinely report any health concerns to the group.

BREED SPECIFIC HEALTH SURVEYS

Kennel Club Purebred and Pedigree Dog Health Surveys Results

The Kennel Club Purebred and Pedigree Dog Health Surveys were launched in 2004 and 2014 respectively for all of the recognised breeds at the time, to establish common breed-specific and breed-wide conditions.

2004 Morbidity results: Health information was collected for 284 live Cairn Terriers, of which 196 (69%) were healthy and 88 (31%) had at least one reported health condition. The top categories of diagnosis were reproductive (14.4%, 18 reports), respiratory (12.8%, 16 reports), dermatologic (10.4%, 13 reports), cardiac (9.6%, 12 reports), ocular (8.8%, 11 reports). The top specific conditions reported were kennel cough (11 reports), heart murmur – unspecified (7 reports), skin irritation/ itchy skin (6 reports), and 5 each for the following: lipoma, noisy breathing, and infertility/ poor fertility.

2004 Mortality results: A total of 124 deaths were reported for the Cairn Terrier. The median age at death was 14 years (min = 3 months, max = 18 years and 4 months). The top reported causes of death were old age (28.2%, 35 deaths), cancer (19.4%, 24 deaths), cardiac (8.9%, 11 deaths), urologic (8.1%, 10 deaths), and hepatic/ liver (5.6%, 7 deaths). The top specific causes of death were old age (28 deaths), kidney failure/ chronic kidney failure (10 deaths), heart failure (7 deaths), liver failure (7 deaths), and liver cancer (5 deaths).

2014 Morbidity results: Health information was collected for 299 live Cairn Terriers, of which 198 (66.2%) had no reported conditions and 101 (33.8%) were reported to be affected by at least one condition. The most frequently reported conditions were lipoma (15 cases, 9.2%), chronic itching (8 cases, 4.9%), skin cyst (8 cases, 4.9%), cruciate disease (7 cases, 4.3%), hypersensitivity (allergic) skin disorder (6 cases, 3.7%), and patellar luxation (6 cases, 3.7%).

2014 Mortality results: A total of 38 deaths were reported for the breed and with a median age at death of 12 years and 6 months. The top specific causes of death were liver tumour (4 deaths, 10.5%), old age (4 deaths, 10.5%), and kidney failure (3 deaths, 7.9%).

LITERATURE REVIEW

The literature review lays out the current scientific knowledge relating to the health of the breed. We have attempted to refer primarily to research which has been published in peer-reviewed scientific journals. We have also incorporated literature that was released relatively recently to try to reflect current publications and research relating to the breed.

Cancer conditions

Gastric adenocarcinoma and Ménétrier disease: Ménétrier disease is a rare condition characterised by the abnormal growth and thickening of mucous cells within the stomach, leading to clinical signs such as vomiting, lethargy, abdominal pain and anorexia (Munday et al, 2012). The nature of the disease also predisposes an affected individual to gastric adenocarcinoma (an aggressive form of cancer). In this case report, three littermates of the breed were presented, all of which were eventually euthanised due to unmanageable disease. The authors noted that given all dogs were closely related, a hereditary component was probable, but it should be noted that this has not been reported in the breed elsewhere.

T-cell lymphoma: This form of lymphoma has been suggested to be more difficult to detect due to fewer clear immune biomarkers associated with disease, and until relatively recently little research has been available on the epidemiology of disease in different breeds (Matsumoto et al, 2017). This Japanese study retrospectively reviewed cases of disease and mentioned the Cairn Terrier as being at possibly increased odds of disease, with an odds ratio of 3.8 (95% CI 1.3 – 11.2), based on the number of cases of disease in the breed compared to the overall breed population in the study sample. However, no further papers noting this in the breed could be found.

Cardiovascular conditions

Innocent murmurs: The breed has been included in a number of studies, commenting on the presence of innocent cardiac murmurs which have no clinical signs and disappear by adulthood (Marinus et al, 2017; van Staveren et al, 2019). The latter study recruited 227 Norwegian puppies, of which 82 were identified with a presumably innocent murmur. Follow-up information was available for 17 of these puppies, of which all had a resolved murmur by the age of nine and a half months, with a median of three months of age. A more recent paper found similar findings in a group of 32 puppies of the breed that underwent auscultation on a weekly basis, of which 14 were found to have a murmur (Rigterink et al, 2021). The authors noted that the intensity and presence of innocent murmur was sporadic, and there was clear week-to-week variation.

The breed has also been noted to be at low risk of developing a particular heart disease, myxomatous mitral valve disease (MMVD) (Rasmussen et al, 2011).

Endocrine conditions

Diabetes mellitus: The Cairn Terrier has been reported to be predisposed to this condition with an odds ratio of 7.46 (95% CI 4.01 – 13.88) in an insurance database (Catchpole et al, 2005) and 9.76 (95% CI 7.27 – 13.09) based on data submitted to the UK Canine Diabetes Register (Catchpole et al, 2013). The latter paper also found the breed made up 3.2% of the total cohort.

In some dog breeds, certain major histocompatibility complexes (MHCs or DLAs (dog leukocyte antigens) – a cluster of genes involved in the maintenance of the immune system) have been found to be associated with disease, but no sole haplotype has been associated consistently with disease in the breed (Catchpole et al, 2008; Holder et al, 2015; Denyer et al, 2020). The most recent study commented that whilst the disease appears to have an immunological basis in some breeds, it is not apparent that these have an obvious or strong risk towards development in breeds such as the Cairn. With this being said, another study did find portions of DNA (SNPs) associated with immune response were significantly associated with disease in the breed (Short et al, 2009). These studies signify that the disease has a complex cause, and is likely due to a number of different interplaying genes, as well as environmental factors.

Hypoadrenocorticism/ Addison's disease: Common clinical signs of this disease include lethargy, lack of appetite, vomiting, weakness, excessive thirst/ urination (polydipsia/ polyuria) and dehydration. The condition develops due to adrenal insufficiency, in that the adrenal gland does not produce the correct amount of hormones, thought to be due to an immune-mediated destruction of the adrenal glands. The condition has a progressive nature, and may not be diagnosed until the presentation of a life-threatening Addisonian crisis, resulting in a sudden drop in blood pressure and electrolyte levels. A Swedish insurance paper found a higher relative risk of disease in the Cairn Terrier, based on 25 dogs of the breed, with this being 3.39 (95% CI 2.17 – 5.06) and incidence rate of 7.40 (95% CI 5.03 – 10.9) (Hanson et al,). The prevalence in the breed was estimated to be 0.32% (95% CI 0.088% – 0.83%), with the breed also estimated to have a higher relative risk of death at 4.32 (95% CI 2.14 – 7.79). Females were also noted to have a higher predisposition, which was consistent across all breeds.

Haematological (blood) conditions

Globoid cell leukodystrophy/ Krabbe disease: This hereditary condition is due to a deficiency in a particular enzyme (galactocerebrosidase, GALC) which is involved in the breakdown of certain fatty molecules within the brain and kidneys. Clinical signs include irritability, hypersensitivity to external stimuli, and progressive mental/ motor deterioration (Victoria et al, 1996; Wenger et al, 1999). Clinical signs occur between the first and third month of age with dogs usually euthanised by nine months of age. A mutation has been determined in the *GALC* gene associated with disease in the breed, which is inherited in a simple autosomal recessive manner. A DNA test is available for the condition but not yet recognised by the Kennel Club.

Macrothrombocytopaenia: This asymptomatic condition has been described in the Cairn Terrier, and is characterised by abnormally large platelets. It is thought that in

dogs with asymptomatic disease the presence of normal platelets prevents dogs from succumbing to disease (Gelain et al, 2014). A mutation in the gene *TUBB1* has been found to be responsible, and inherited in an autosomal recessive mutation.

Hepatic (liver) conditions

Chronic hepatitis: This common liver disorder is due to long-term inflammation of the liver, which is seen in 12% of post-mortem reviews across all breeds (Bexfield et al, 2011). Out of a total of 551 cases in a UK study the Cairn Terrier was found to be at increased risk, with an odds ratio of 3.6 (95% CI 1.9 – 6.9) and median age at diagnosis of 10 years two months (range seven years to 13 years five months).

Congenital portosystemic shunt (cPSS): This disorder is due to the lack of closure of a foetal shunt in the liver at birth, which leads to an incorrect blood flow and bypassing of blood to the organ, resulting in impaired liver growth and functionality. Small breeds tend to be affected by extrahepatic shunts, which have also been described in Cairn Terriers, with 0.9% of 6,367 Dutch Cairns tested during a 11-year period affected (Van Straten et al, 2005). Of note, three families were found to have a higher prevalence than the overall population (ranging from 1.9% to 5.9%), suggesting a notable hereditary component to disease. Subsequent pedigree analysis indicates a probably polygenic mode of inheritance (whereby several genes are interplaying to cause disease) (Van Steenbeek et al, 2012).

Liver portosystemic vascular anomalies (PSVA) and microvascular dysplasia (MVD): Similar to the above, this is a congenital condition characterised by absent blood vessels which usually provide the liver with blood flow. In a study of 165 Cairns, the authors noted that despite abnormal clinical findings the affected dogs were asymptomatic (Schermerhorn et al, 1996). Elevated bile acid concentrations were indicative of abnormal liver function. The authors suggested that whilst the disease may be benign in presentation, it is advisable to test young adults. The breed clubs recommend bile testing on puppies of the breed to determine presence of disease at a young age.

Neurological conditions

Multisystemic chromatolytic neuronal degeneration: This condition has been reported in older case reports affecting single puppies of the breed, showing clinical signs including head tremors, ataxia (imbalance), collapse and periods of limpness. The disease is due to a breakdown in axons (a type of nerve cell) and has been reported in the UK, America and Australia, suggesting this disease has spread outside of one family (Cummings et al, 1988; Palmer and Blakemore, 1988; Cummings et al, 1991). However, all papers referring to the condition are relatively old and the basis for inheritance is not known.

Ocular conditions

Glaucoma: This condition, which develops due to the inability of the eye to appropriately allow drainage of fluid from the eye, resulting in increased pressure, blindness and pain, has been mentioned in the Cairn since the early 1990s (Petersen-Jones and Mould, 1991). The breed has been noted to have a particularly

high prevalence of disease, with 1.82% of 823 dogs tested in an American study between 1994-2002 affected (Gelatt et al, 2004). This paper also noted a female predilection, with a ratio of 1: 2.42, and that the prevalence increased with age. As well as this, the data suggested that the prevalence appeared to be increasing with time.

Another epidemiological study undertaken by a Swiss group noted the breed was predisposed to specifically secondary glaucoma, which develops due to the presence of another condition (Strom et al, 2011). Between 1995 and 2009 7.8% of dogs of the breed presented with secondary glaucoma, with a mean age of 10.7 ± 3.1 years. The most frequent risk factors determined were ocular melanosis (see below), which affected 15 of 17 glaucomatous Cairns, lens dislocation (n=1), and phacoclastic glaucoma (n=1). For dogs with ocular melanosis the authors found a mean age of 10.9 ± 2.9 years.

Ocular melanosis: This condition was first mentioned in the breed in 1984 by Covitz et al, with the disease characterised by a progressive spread of ocular pigmentation, or plaques, which can lead to the development of secondary glaucoma through accumulation of pigment in the fluid, which eventually reduces the ability of the eye to properly drain and causes a build-up in pressure (Petersen-Jones et al, 2007). This paper followed 114 affected dogs of the breed, and noted that the condition was mostly bilateral, in that it affected both eyes. Interestingly, it was observed that dogs also had pigmented skin plaques too, commonly seen in the gums, but this was a feature that was seen in affected and normal dogs. A range in age of presentation was seen, with some as young as one year of age and others 16. A later paper by the group looking at the cellular changes in affected dogs commented that the movement of cells has a similar appearance to cancers, but with a diffuse infiltration instead of developing into a mass (Petersen-Jones et al, 2008). The authors proposed a dominant autosomal mode of inheritance based on pedigree analysis.

More recently an American study has attempted to determine the genetic basis for disease, but of 11 potential candidate genes no apparent significance was found between these and disease manifestation, and these genes were excluded as possibilities (Winkler et al, 2013).

Renal conditions

Polycystic disease of the kidney and liver: An older paper described congenital cysts apparent in several puppies with the same sire, that formed within the liver and kidneys, with no clinical signs other than abdominal distention (McKenna and Carpenter, 1980). The authors remarked a probable hereditary basis given that this arose from the same sire, but no more recent papers could be found that describe the condition or inheritance in the breed.

Renal dysplasia: This condition results from abnormal differentiation of kidney tissues, which can vary in severity and impact. An American study described the disease in five related dogs with the breed, that were diagnosed before the onset of kidney failure or clinical signs (Seiler et al, 2010). The authors noted that it is encouraging that the disease can be determined before welfare is impacted, and that ultrasound is a useful tool to use as part of a screening programme prior to breeding.

INSURANCE DATA

There are some important limitations to consider for insurance data:

- Accuracy of diagnosis varies between disorders depending on the ease of clinical diagnosis, clinical acumen of the veterinarian and facilities available at the veterinary practice
- Younger animals tend to be overrepresented in the insured population
- Only clinical events that are not excluded and where the cost exceeds the deductible excess are included

However, insurance databases are too useful a resource to ignore as they fill certain gaps left by other types of research; in particular they can highlight common, expensive and severe conditions, especially in breeds of small population sizes, that may not be evident from teaching hospital caseloads.

Swedish Agria Data

Swedish morbidity insurance data were available from Agria for the Cairn Terrier. Reported rates are based on dog-years-at-risk (DYAR) which take into account the actual time each dog was insured during the period (2011-2016) e.g. one DYAR is equivalent to one whole year of insurance. The number of DYAR for Cairn Terrier in Sweden during this period was between 10,000 and 15,000.

<u>Specific causes for veterinary care episodes</u>

The most common specific causes of veterinary care episodes (VCEs) for Agria-insured Cairn Terrier in Sweden between 2011 and 2016 are shown in Figure 2. The top five specific causes of VCEs were: vomiting/ diarrhoea/ gastroenteritis, skin tumour, pain during locomotion, polyuria/ polydipsia (excessive urination/ drinking), and mammary tumour.

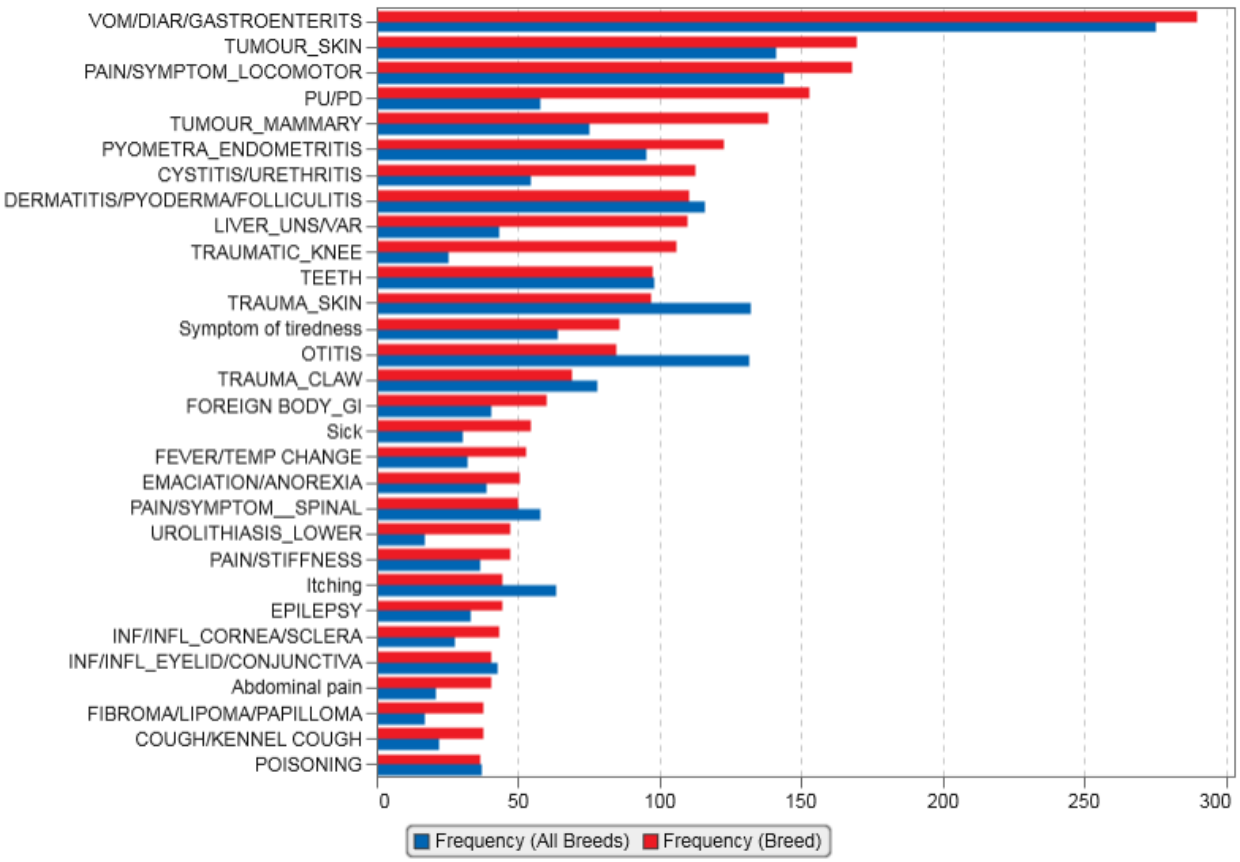

Figure 2: The most common specific causes of VCEs for the Cairn Terrier compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data.

Relative risk for veterinary care episodes

The specific causes of VCEs ordered by relative risk are shown in Figure 3 for the Cairn Terrier. In this analysis, the top five specific causes of VCEs ordered by relative risk were: Addison's disease, glaucoma, various/ normal, knee trauma, and degermation/ dystrophy/ dysplasia of the knee.

Rare conditions that occur sporadically may appear as a high relative risk; this caveat may well apply to these conditions.

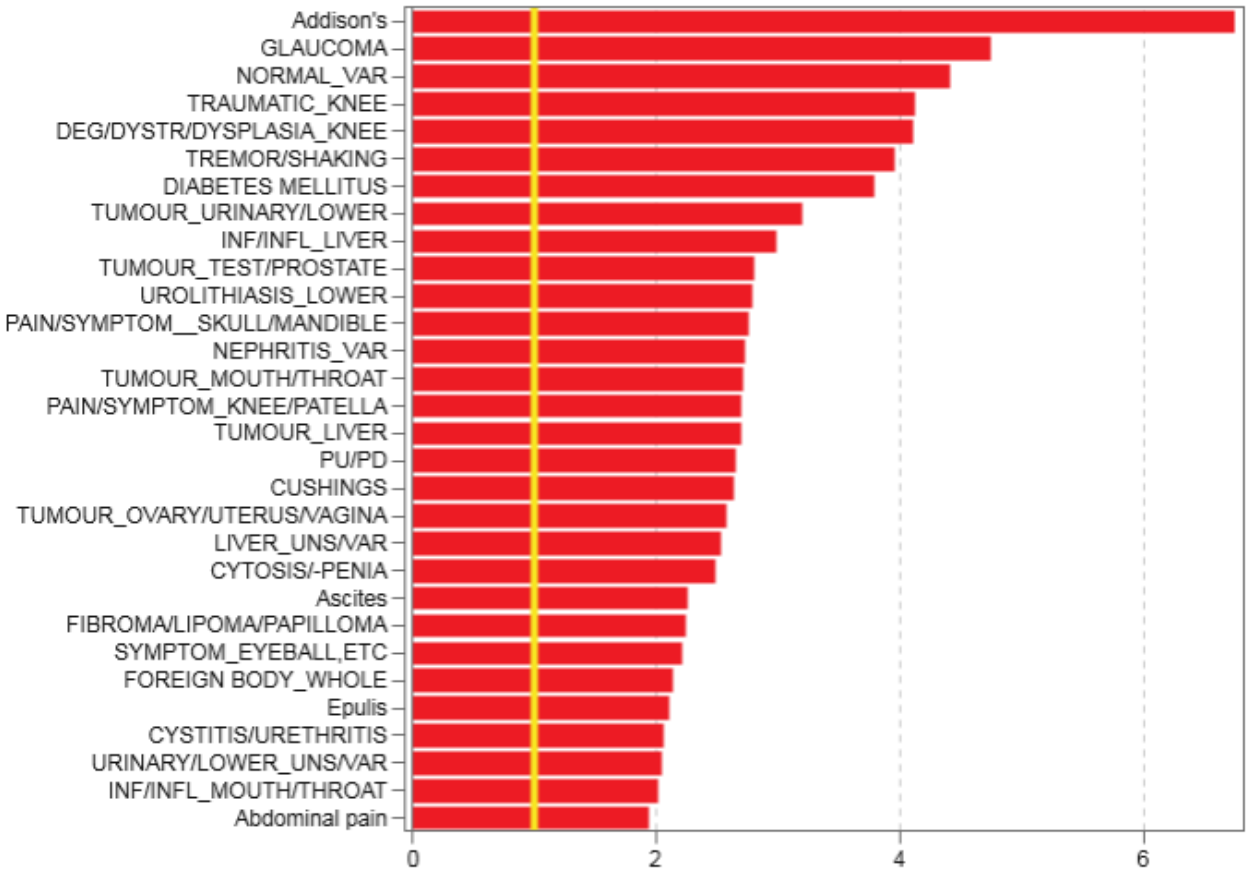

Figure 3: The specific causes of VCEs for the Cairn Terrier ordered by relative risk compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

BREED WATCH

The Cairn Terrier is a category one breed, meaning judges are not required to complete mandatory monitoring forms following an appointment as championship certificate level. To date no optional reports have been received for the breed.

PERMISSION TO SHOW

As of the 1st January 2020 exhibits for which permission to show (PTS) following surgical intervention has been requested will no longer be published in the Breed Record Supplement and instead will be detailed in BHCPs, and a yearly report will be collated for the BHC. In the past five years, three reports have been received for the Cairn Terrier (excluding neutering or caesarean sections), of which one was for the removal of a lump, another for the removal of teeth and the last other – unspecified.

ASSURED BREEDERS SCHEME

There are currently no requirements for this breed within the Kennel Club (KC)'s Assured Breeders Scheme (ABS). However, the following recommendations apply:

- Eye screening under the BVA/KC/ISDS Eye Scheme
- Bile acid testing of puppies

BREED CLUB BREEDING RECOMMENDATIONS

There are not currently any Breed Club breeding recommendations listed on the Kennel Club's website for the breed.

DNA TEST RESULTS

There are currently no recognised DNA tests for this breed.

Whilst DNA tests may be available for the breed, results from these will not be accepted by the Kennel Club until the test has been formally recognised, the process of which involves collaboration between the breed clubs and the Kennel Club in order to validate the test's accuracy.

CANINE HEALTH SCHEMES

All of the British Veterinary Association (BVA)/Kennel Club (KC) Canine Health Schemes are open to dogs of any breed with a summary given of dogs tested to date below.

HIPS

To date (Jan 2022), one Cairn Terriers have been hip scored under the BVA/KC Hip Dysplasia Scheme, with a score of 12.

EYES

The Cairn Terrier is not currently on the BVA/KC/ISDS Known Inherited Ocular Disease (KIOD) list (formally Schedule A) for any eye conditions.

KIOD lists the known inherited eye conditions in the breeds where there is enough scientific information to show that the condition is inherited in the breed, often including the actual mode of inheritance and in some cases even a DNA test. Some 291 dogs have been tested under the scheme in the last 20 years, with the count of dogs per year of birth, and their results, shown in Figure 4 below. As the breed is not on the KIOD schedule any abnormalities are noted as "test results with owner", or more recently "observation made – refer to owner".

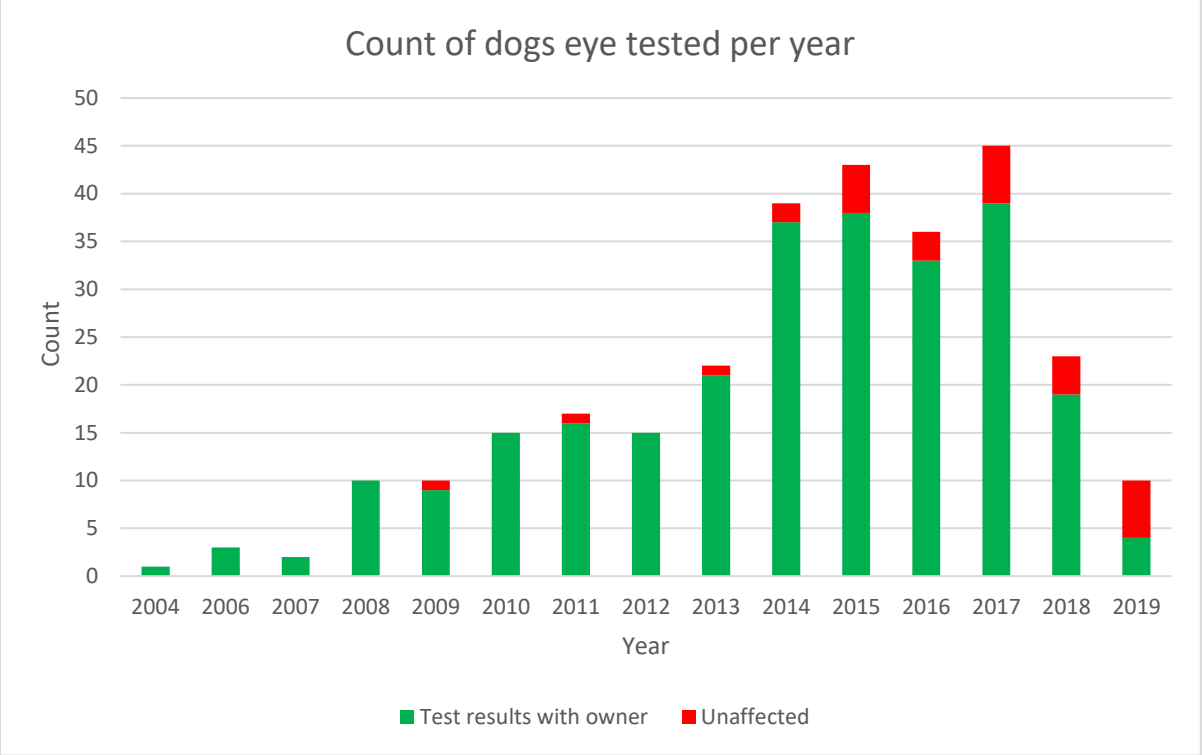

Figure 4: Count of Cairn Terriers tested per year of birth in the last 20 years.

As well as the KIOD list, the BVA record any other conditions affecting a dog at the time of examination, which is incorporated into an annual sightings report. Results of Cairn Terriers tested between 2012 and 2018 are shown in Table 1 below. The reports for 2019 onwards are still pending.

Table 1: Reports on Cairn Terriers that have participated in the BVA/KC/ISDS Eye Scheme between 2012-2018.

Year	Number Examined	Conditions Noted
2012	28 adults	2 – persistent hyperplastic primary vitreous (PHPV) 1 – nuclear cataract 2 – other cataract
2013	40 adults	1 – persistent pupillary membranes (PPM) 1 – PHPV 11 – other cataract
2014	8 adults	1 – PPM
2015	16 adults	2 – PPM 2 – retinopathy
2016	65 adults	2 – corneal lipid deposition 2 – other cataract
2017	52 adults	2 – MRD-like appearance
2018	49 adults 1 litter	1 – post capsular cataract

AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS (ACVO)

Results of examinations through ACVO are shown in Table 2 below for conditions affecting over 1% of the examined population. Between 2015 and 2019, 893 Cairn Terriers were examined, of which 58.9% (526 of 893 dogs) were found to be unaffected by any eye condition.

Whilst it is important to note that these data represent dogs in America, the organisation tend to examine a higher number of dogs than that in the UK, and therefore are a valuable source of information.

Table 2: ACVO examination results for Cairn Terriers, 1991 – 2019

Disease Category/Name	Percentage of Dogs Affected	
	1991-2014 (n=3,661)	**2015-2019** (n=893)
UVEA		
Persistent pupillary membranes (iris to iris)	8.1%	15.2%
Persistent pupillary membranes (lens pigment foci/ no strands)	0.5%	3.6%
Persistent pupillary membranes (endothelial opacity/ no strands)	0.1%	1.1%
Significant cataract (summary)	7.2%	9.0%
VITREOUS		
Persistent hyaloid artery/ remnant	0.8%	2.9%
Vitreal degeneration	1.1%	2.1%

Adapted from: https://www.ofa.org/diseases/eye-certification/blue-book

REPORTED CAESAREAN SECTIONS

When breeders register a litter of puppies, they are asked to indicate whether the litter was delivered (in whole or in part) by caesarean section. In addition, veterinary surgeons are asked to report caesarean sections they perform on Kennel Club registered bitches. The consent of the Kennel Club registered dog owner releases the veterinary surgeon from the professional obligation to maintain confidentiality (vide the Kennel Club General Code of Ethics (2)).

There are some caveats to the associated data;

- It is doubtful that all caesarean sections are reported, so the number reported each year may not represent the true proportion of caesarean sections undertaken in each breed.
- These data do not indicate whether the caesarean sections were emergency or elective.

- In all breeds, there was an increase in the number of caesarean sections reported from 2012 onwards, as the Kennel Club publicised the procedure to vets.

The number of litters registered per year for the breed and the number and percentage of reported caesarean sections in the breed for the past 10 years are shown in Table 3.

Table 3: Number of Cairn Terrier litters registered per year, and number and percentage of caesarean sections reported per year, 2010 to 2020.

Year	Number of Litters Registered	Number of C-sections	Percentage of C-sections	*Percentage of C-sections out of all KC registered litters (all breeds)*
2010	323	0	0.00%	0.35%
2011	312	2	0.64%	1.64%
2012	227	9	3.96%	8.69%
2013	223	8	3.59%	9.96%
2014	196	13	6.63%	10.63%
2015	185	12	6.49%	11.68%
2016	147	8	5.44%	13.89%
2017	137	8	5.84%	15.00%
2018	136	10	7.35%	17.21%
2019	111	7	6.31%	15.70%
2020	109	7	6.42%	14.41%

GENETIC DIVERSITY MEASURES

The effective population size is the number of breeding animals in an idealised, hypothetical population that would be expected to show the same rate of loss of genetic diversity (rate of inbreeding) as the population in question; it can be thought of as the size of the 'gene pool' of the breed. In the population analysis undertaken by the Kennel Club in 2015, an estimated effective population size of **70.3** was reported (estimated using the rate of inbreeding over the period 1980-2014).

An effective population size of less than 100 (inbreeding rate of 0.50% per generation) leads to a dramatic increase in the rate of loss of genetic diversity in a breed/population (Food & Agriculture Organisation of the United Nations, "Monitoring animal genetic resources and criteria for prioritization of breeds", 1992). An effective population size of below 50 (inbreeding rate of 1.0% per generation) indicates the future of the breed many be considered to be at risk (Food & Agriculture Organisation of the United Nations, "Breeding strategies for sustainable management of animal genetic resources", 2010).

Annual mean observed inbreeding coefficient (showing loss of genetic diversity) and mean expected inbreeding coefficient (from simulated 'random mating') over the

period 1980-2014 are shown in Figure 5. The observed inbreeding coefficient increased until a peak in approximately 2002. Since this time, the observed inbreeding coefficient has begun to decrease.

It should be noted that, while animals imported from overseas may appear completely unrelated, this is not always the case. Often the pedigree available to the Kennel Club is limited in the number of generations, hampering the ability to detect true, albeit distant, relationships.

For full interpretation see Lewis et al, 2015 https://cgejournal.biomedcentral.com/articles/10.1186/s40575-015-0027-4.

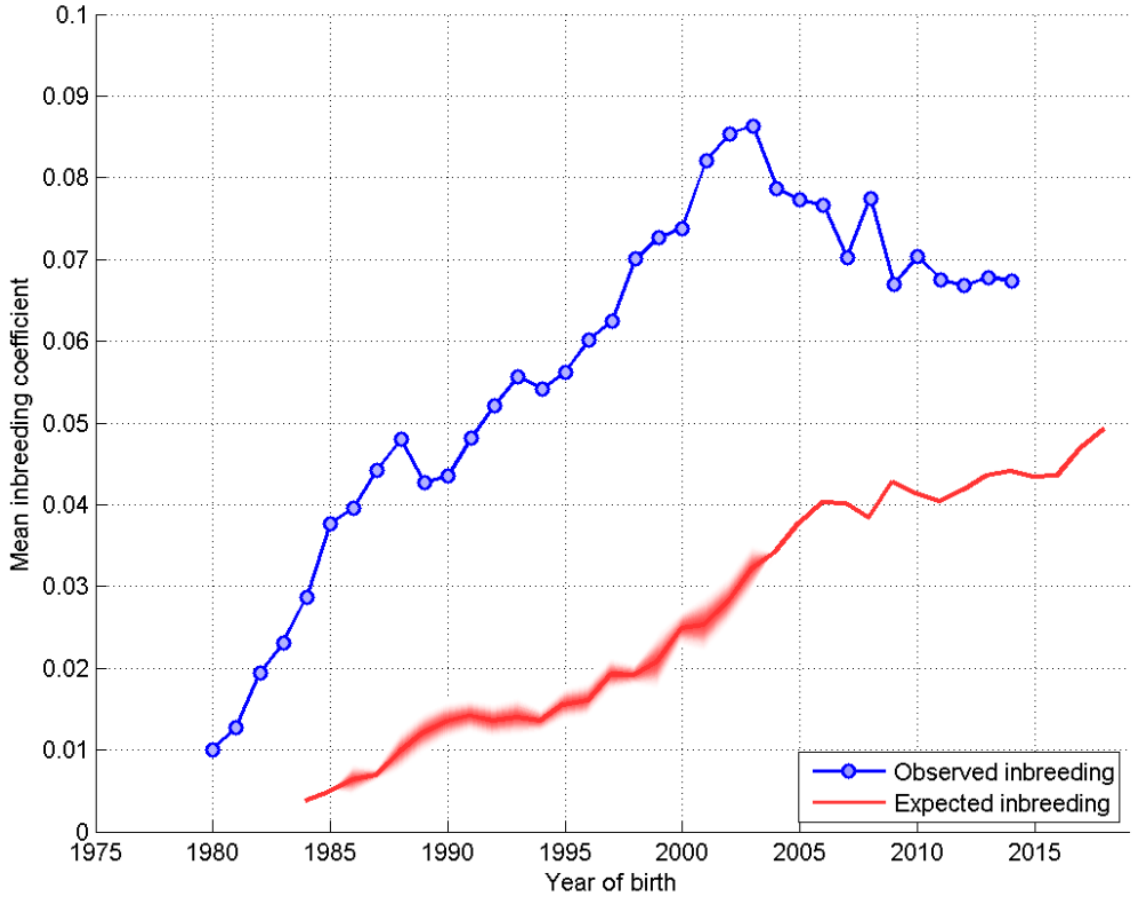

Figure 5: Annual mean observed and expected inbreeding coefficients. [The blurring of the red line denotes too little data are available to give an accurate figure, but the true value lies within the blurred area.]

The current annual breed average inbreeding coefficient is **8.2%.**

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven 5-year blocks (Figure 6). A longer 'tail' on the distribution of progeny per sire is indicative of 'popular sires' (few sires with a very large number of offspring, known to be a major contributor to a high rate of inbreeding). Throughout the period analysed, there is evidence of several popular sires being used in the breed, with one to three popular sires for the period of 2014-19.

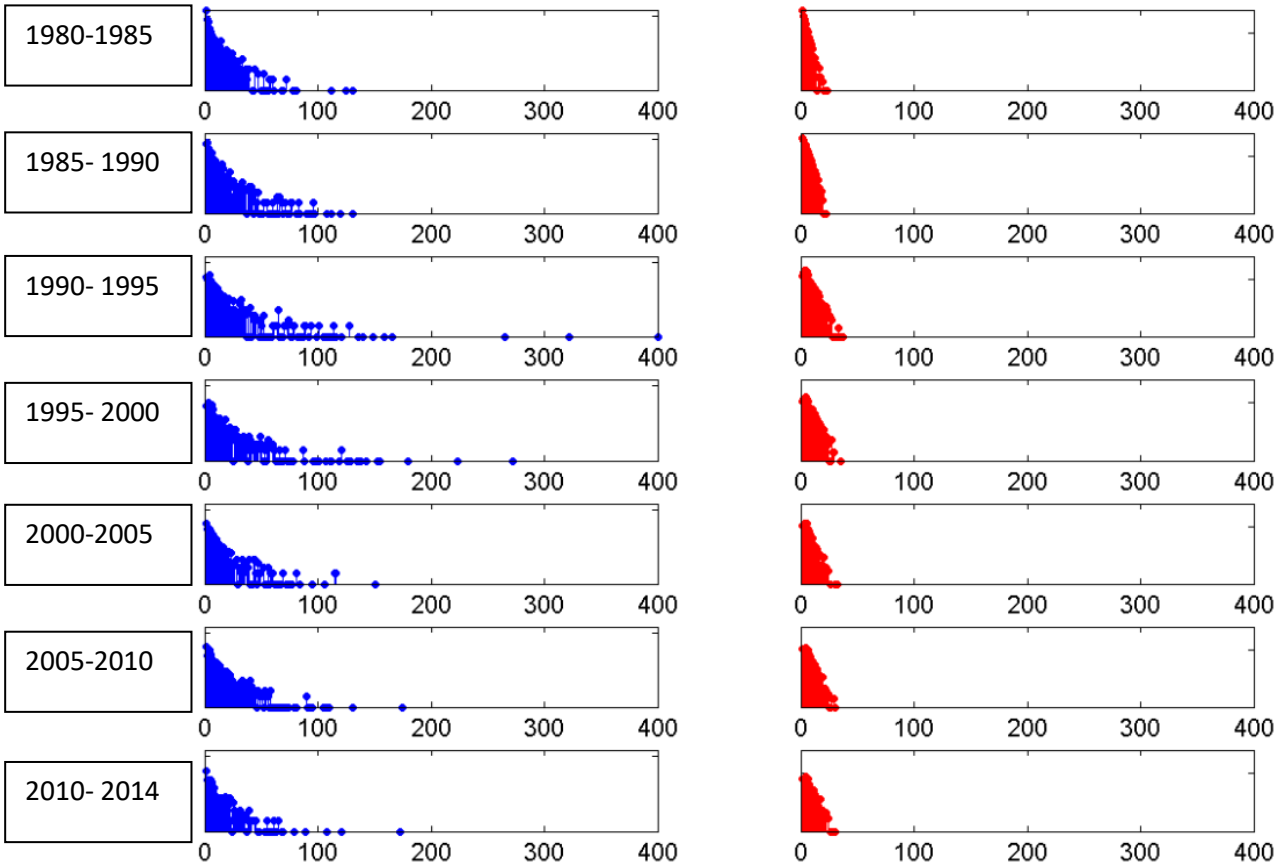

Figure 6: Distribution of the proportion of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-4 bottom). Vertical axis is a logarithmic scale

CURRENT RESEARCH

A research group at Davies Veterinary Specialists are keen to further explore ocular melanosis in the breed, in conjunction with the University of Cambridge's CRIEDD (Consortium to Research Inherited Eye Disease in Dogs) to attempt to determine the genetic basis for disease.

PRIORITIES

Correspondence between the breed representatives and the Kennel Club was undertaken in January 2022 to discuss the evidence base of the BHCP and agree the priority issues for the health of the breed. The group agreed from the evidence base that the priorities for the Cairn Terrier were:

- Ocular melanosis and secondary glaucoma
- Diabetes mellitus
- Genetic diversity

ACTION PLAN

Following the correspondence between the Kennel Club and the breed regarding the evidence base of the Breed Health & Conservation Plans, the following actions were agreed to improve the health of the Cairn Terrier. Both partners are expected to begin to action these points prior to the next review.

Breed Club actions include:

- The Breed Clubs to continue to encourage eye testing prior to breeding
- The Breed Clubs to undertake a breed health survey, with the Kennel Club to assist
- The Breed Clubs to consider proposing the recognition of relevant DNA tests to allow for recording by the Kennel Club
- The Breed Clubs to consider collaborating with the ocular melanosis project, with the Kennel Club to assist in recruitment

Kennel Club actions include:

- The Kennel Club to update the population analysis
- The Kennel Club to explore the feasibility of developing a patellar luxation scheme

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