Cairn Terrier Club of Canada
Detailed Health Recommendations
2022

It is recommended that readers review the Preamble to the Health Recommendations prior to reviewing this document. The preamble provides context and information on the process by which recommendations were reached.

Acronym Key For Section A (inheritance mode is indicated in the first column of the tables, under notes on Gene frequency)

AR	**Autosomal Recessive**
AD-IP	**Autosomal Dominant with Incomplete penetrance**
XR	**X linked recessive**
AD	**Autosomal Dominant**
A-IP	**Autosomal – Incomplete Penetrance**
PG	**Polygenic**
MF	**Multifactorial (genetic / environment / toxic / etc)**
carrier	**A dog that carries one normal and one abnormal gene.**
clear	**A dog that carries two copies of the normal gene.**
affected	**A dog that has clinical evidence of disease.**

CMO	**Craniomandibular osteopathy**
CM	**Congenital macrothrombocytopenia**
GLD	**Globoid Cell Leukodystrophy**
GBM	**Gall Bladder Mucocele**
Hemo A	**Hemophilia A**
Hemo B	**Hemophilia B**
HUU	**Hyperuricosuria / urolithiasis**
PKD	**Pyruvate Kinase Deficiency**
vWD	**Von Willebrand's Disease**
CDDY / CDPA	**Chondrodystrophy / (CDPA) Chondrodysplasia**
IVDD	**Intervertebral Disc Disease**
DM	**Degenerative myelopathy**
CaOx	**Calcium Oxalate stone (urolithiasis)**

How we judged evidence: Factors considered in assessing the strength of recommendations included: disease severity, test reliability, frequency of the condition and the quality of evidence. Recommendations are listed as strong, moderate or weak reflecting the relative importance based on the above factors. Strong recommendations are further divided into ones where the level of confidence in the evidence is high vs moderate (marked by symbols below).

Symbol	Strength of Recommendation (for or against)
*	Strong (high confidence in evidence)
^	Strong (moderate confidence in evidence)
	Moderate
	Weak
	Insufficient evidence to make a recommendation

Recommendations: ***Detailed briefing documents are available for each condition.***

Section A: Genetic Testing (see acronym table page 1)			
Tier 1 Recommendations (disorders of high significance to Cairn Terriers)			
Condition	**Testing Recommendations**	**Breeding Recommendations**	**Rationale**
CMO Gene frequency: *1-27%* **AD-IP**	**Strong^** recommendation in favour of testing all potential breeding dogs prior to first breeding.	**Strong^** recommendation against breeding carriers (ie: carriers should be removed from breeding programs, do not breed even to clears). **Strong^** recommendation against breeding affected dogs.	CMO is typically a self-limited disease but can have permanent effects on some dogs. While active the disease has significant morbidity and likely cost to owners. While previously thought to be an autosomal recessive condition, there is substantial evidence that this is likely an autosomal dominant condition with incomplete penetrance. This means that if one dog in a breeding pair carries the gene there is risk of affected offspring. Goal: Avoid producing affected puppies. Gene elimination is an ultimate goal, but we need a better understanding of the true gene frequency in Cairn Terriers as some sources indicate a very high gene frequency.
GLD Gene frequency: *1.3%* **AR**	**Strong*** recommendation in favour of testing all potential breeding dogs prior to first breeding. Dogs may be considered clear by descent if both sire and dam are tested and clear.	**Strong*** recommendation against breeding carriers (ie: carriers should be removed from breeding programs, do not breed even to clears).	GLD is a highly lethal condition. Gene frequency is low-moderate. Elimination of the gene from the population should be possible and is desirable but may be at some cost to genetic diversity. Goal: Gene elimination – severe disease, low-moderate frequency. Avoidance of breeding of carriers and affected should be done with some caution as there may be negative impacts on diversity.
PKD Gene frequency: *<0.3%* **AR**	**Strong^** recommendation in favour of testing all potential breeding dogs prior to first breeding. Dogs may be considered clear by descent if both sire and dam are tested and clear.	**Strong*** recommendation against breeding carriers (ie: carriers should be removed from breeding programs, do not breed even to clears).	PKD is a life-threatening disease with significant morbidity and cost. Given the low gene frequency it is reasonable to aim for gene elimination in the breed. Goal: Gene elimination - severe disease, low frequency. Avoiding breeding of carriers and affected should not substantially affect diversity.
CM	**Moderate** recommendation in favour of testing breeding dogs prior to first breeding.	**Moderate** recommendation against breeding an affected dog or carrier to another affected dog or carrier.	CM is a disorder that is typically asymptomatic with affected dogs fully able to lead a normal life. The high gene frequency means that gene elimination is not a

Gene frequency: *~25%* **AR**	**Moderate** recommendation for testing offspring of matings in which both parents carry the CM mutation, to identify affected dogs and inform owners and veterinarians. Dogs may be considered clear by descent if both sire and dam are tested and clear.	In some cases, the benefits of breeding two carriers or an affected to a carrier may be sufficient to proceed with a breeding that will potentially produce affected puppies. **Moderate** recommendation **against** removing carriers & affected dogs from breeding program.	realistic or appropriate goal as efforts to remove carriers and even affected dogs from breeding programs could have serious deleterious effects on breed genetic diversity. Goal: Minimize risk of affected puppies and early diagnosis of affected puppies to minimize harm from in appropriate treatment: mild to minimal disease, high gene frequency. Efforts directed at gene elimination would be detrimental to genetic diversity without substantial improvement in health.
Hemo B Gene frequency: *<0.3%* **XR**	**Strong^** recommendation in favour of testing.	**Strong*** recommendation against breeding affected males or female carriers.	Hemophilia B has high morbidity and, though not generally lethal, will have a significant impact on quality of life for affected dogs, with potential for high cost of ongoing medical care to owners. Breeding carrier females would result in 50% of all male puppies being affected. Breeding an affected male to a clear female would result in all female puppies being carriers. Goal: Gene elimination - severe disease with low gene frequency. Avoiding breeding of carriers and affected dogs should not substantially affect future genetic diversity.
Tier 2 Recommendations (disorders of moderate significance in Cairn Terriers)			
Condition	**Testing Recommendation**	**Breeding Recommendation**	**Rationale**
Hemo A Gene frequency: *unknown* **XR**	Insufficient evidence to make a recommendation for testing using currently available genetic tests for hemophilia A. Genetic testing should not be relied on to detect risk of Hemophilia A due to the	**Strong^** recommendation **against** breeding affected dogs. Dogs from affected lineages should be bred with caution and only to lineages free of disease. Dogs from affected lineages should undergo genetic testing on an investigational basis to facilitate recognition of relevant mutations in Cairns.	Hemophilia A tends to occur through *de novo* spontaneous mutations in the gene for factor VIII in Cairns, rather than a specific mutation common to all dogs in the breed. Since mutations are often new, genetic screening for known mutations would fail to detect many cases.

	high risk of *de novo* mutations.		Goal: Reduce occurrence of affected puppies (gene elimination is not a feasible goal due to the high risk of de novo mutations)
vWD Gene frequency: *9.7%* **Type1 = AD-IP / AR (?)**	**Strong^** recommendation for testing for Type 1 vWD in Cairns.	**Strong^** recommendation to breed carriers only to clears, and only when such a breeding will significantly advance the goals of a breeding program. Offspring should undergo genetic testing prior to placement. **Strong*** recommendation against breeding carrier to carrier due to high risk of producing offspring homozygous for the mutation (severe disease). **Strong^** recommendation that puppies resulting from a carrier to clear mating be tested prior to placement / future breeding decisions. **Strong*** recommendation against breeding affected dogs due to risks associated with breeding and whelping.	vWD is of moderate severity but carries some risk of premature death from excessive bleeding associated with trauma or major surgery (in unrecognized vWD). The inheritance pattern is unclear – either AR or AD-IP. Breeding carriers together should be avoided but cautious breeding of carriers to clears is reasonable – results of such matings can add to our knowledge of the condition. With a gene frequency of 9.7% removal of all carriers from breeding may have undesirable effects on genetic diversity. Goal: Reduce occurrence of affected puppies (gene elimination may not be a feasible goal without significant impact on genetic diversity.)
GBM Gene frequency: *unknown* **AD-IP? Possibly PG or MF**	**Insufficient evidence** to make a recommendation for testing for the ABCB4 gene mutation.	**Insufficient evidence** to make a recommendation for or against breeding. **Moderate** recommendation to avoid line breeding if a lineage is known to have a history of GM in multiple ancestors.	Cairns are thought to be at increased risk of GBM. The disease typically manifests AFTER dogs have completed their breeding career. Morbidity is high, but temporary, if properly treated. Mortality is low if disease is recognized and treated promptly.
CaOx Gene frequency: *unknown* **AR**	**Moderate** recommendation for routine bladder scanning in association with renal ultrasounds (of adult breeding stock or routine screening for puppies) to detect evidence of precipitates or stones. **Insufficient evidence** at this time to make a	**Insufficient evidence** to make a recommendation regarding breeding of dogs with minor precipitates on bladder scanning. **Moderate** recommendation against breeding dogs with overt stone formation. Consider enrolling Cairn Terriers with documented stone formation in a study looking for gene markers for calcium	Cairns are subject to urolithiasis (stone formation), primarily calcium oxalate stones. A mutation for Calcium oxalate stones has been identified in Bulldogs and several other breeds. This gene is thought to be significant in breeds related to bulldogs, but we have no data on this mutation in Cairn Terriers. Bladder scanning may provide for early detection and dietary manipulation to reduce the risk of symptomatic urolithiasis from calcium oxalate stones. If renal

	recommendation for routine use of CaOx1 testing in Cairns.	oxalate stones, such as the CaOx1 gene. Contact University of Minnesota cgl@umn.edu	ultrasounds are being done the additional cost of bladder scanning is minimal to nil.
Condition	**Testing Recommendations**	**Breeding Recommendations**	**Rationale**
Tier 3 Recommendations (disorders for which testing is recommended by some genetic testing companies, but which are of low to no significance in Cairn Terriers, or have not been reported in Cairn Terriers)			
CDPA/CDDY IVDD Gene frequency: *Chr18:100% Chr12: 0%* **A-ID**	**Moderate** recommendation **against** testing. Where testing is included in a panel, users must understand the expected nature of the results.	**Strong*** recommendation **against** using results in breeding decisions	All Cairns will be homozygous for Chromosome 18 mutation (CDPA) & homozygous for wild type Chromosome 12 gene (CDDY), so testing offers no useful information. Dogs are likely to be affected only when mutations are present in both Chromosome 12 and 18. **This disorder is not relevant in Cairns.** Disc related disorders are likely to have other causes in Cairn Terriers (trauma etc.) Goal: Avoid over interpretation of risk of disease if testing is done.
DM Gene frequency: *unknown* **AR (?)**	**Moderate** recommendation **against** testing for the SOD1 gene mutation.	**Moderate** recommendation **against** using results in breeding decisions. The committee recommends proactive monitoring for evidence of DM in Cairn Terriers and suggests supporting the costs of necropsy with spinal cord histology and genetic testing for Cairns euthanized or dying with features of possible DM	DM has not been reported in Cairn Terriers or related breeds. Even if a breeding dog were found to be a carrier based on a panel test, there is currently no evidence that the mutation is responsible for disease in Cairn terriers. A breeder may elect not to breed a carrier but there is insufficient evidence to support a recommendation NOT to breed. Unnecessarily eliminating carriers from the breeding pool may negatively impact genetic diversity of the breed with no benefit to the breed. OFA recommends **against** use of this test in breeds NOT definitively proven at risk through correlation of spinal cord histology and gene testing.
HUU Gene frequency: *Unknown* **AR**	**Insufficient evidence** to make a recommendation FOR testing of Cairn Terriers for HUU.	**Insufficient evidence** to make breeding recommendations if a Cairn is found to carry the SLC2A9 gene mutation	HUU has not been shown to be a disorder of clinical concern in Cairns.

Section B: Phenotypic Testing			
Condition	**Testing recommendations**	**Breeding Recommendations**	**Rationale**
Eye disorders			
Ocular Melanosis	**Strong* recommendation** for OFA eye examinations for breeding stock every 1-2 years, preferably yearly starting at age 2. Testing should be done by board certified ophthalmologists. Breeders are encouraged to not limit testing to breeding stock – broader testing will help identify lineages at risk.	**Strong* recommendation** against breeding affected dogs. **Weak recommendation** against breeding first degree relatives (siblings, offspring, parents) of an affected dog. This recommendation might be increased to Moderate if there are multiple affected dogs in the lineage.	OM is a devastating disease which inevitably leads to blindness from elevated intraocular pressures (glaucoma). Medication and surgery can provide benefit to delay onset of blindness but ultimately dogs do go blind, and many require removal of the eye because of intractable glaucoma and pain. Unfortunately, due to the late onset of clinical signs of disease, many dogs will have already been bred by the time the disease can be diagnosed. Suspected autosomal dominant inheritance pattern based on review of pedigrees but gene not yet identified.
Cataracts	**Strong^ recommendation** for eye examination as per OM **Moderate recommendation** for genetic testing for HSF4 gene mutations (included in panel tests).	**Weak recommendation against** breeding dogs that are carriers for Dominant mutations of the HSF4 gene (at least until relevance in cairns is established). **Moderate recommendation**: Carriers of the autosomal recessive mutations of the HSF4 gene should be bred only to dogs that are clear of HSF4 mutations.	If is important to have a careful veterinary assessment to determine the likely cause of any cataracts identified. Non genetic cataracts have no impact on breeding decisions (although if there are underlying conditions that have caused or contributed to the development of cataracts, these disorders may have an impact on breeding decisions. The link between individual (specific) HSF4 mutations and cataracts in Cairns is unproven.
PRA	**As per OM** – additional testing such as electroretinogram may be considered on a case-by-case basis.	**Strong^ recommendation:** Do not breed affected dogs. Do not breed two carriers together. • Do not repeat a mating that produced affected dogs. • Do not breed together two dogs that have produced affected dogs.	Early onset PRA (retinal dysplasia) is a developmental disorder with onset as early as 6 weeks of age. Late onset PRA is a degenerative disorder with onset around 2-5 years. Both forms of PRA have a genetic etiology. EOPRA is Autosomal recessive. Late onset is polygenic with multiple inheritance patterns. Genetic tests for PRA are breed specific. Clear for PRA on a genetic panel does not provide actionable information for

		Moderate recommendation: Do not breed parents, siblings, or offspring of affected dogs. If considering such a breeding, consultation with veterinary ophthalmologist / geneticist is recommended.	Cairn Terriers. There is no reliable genetic test available in Cairn Terriers at present.
Glaucoma	**As per OM** – additional testing such as High Frequency Ultrasound or Gonioscopy may allow early detection of glaucoma in dogs at risk and should be considered on a case-by-case basis.	**Weak recommendation:** Use caution in breeding affected dogs. • Use pedigree information to avoid doubling up on possible genetic factors. • Consult with a veterinary ophthalmologist / geneticist	Primary Angle Closure Glaucoma (PACG) is suspected to have a genetic basis. Onset of Glaucoma will often not occur until after breeding is concluded. Cairns may be at risk for Primary Angle Closure Glaucoma.
Persistent Pupillary Membranes	**Eye examination once prior to breeding.**	Iris to iris PPMs (most common) – not breeding restrictions Iris to lens or Iris to Cornea PPMs – submit results to OFA for breeding recommendations.	PPMs are common in Cairns (~11% based on OFA data from 1991-2020). Most PPMS (~95%) are Iris to Iris and do not have any breeding implications. More serious PPMs can impair vision and OFA will provide breeding recommendations.
Primary Lens Luxation (PPL)	Although several references suggest that Cairns may be at risk for PLL there is insufficient evidence to support this, although related breeds (Scottish Terriers, West Highland White Terriers) have been reported to be at risk. The ADAMST17 mutation, known to be associated with PLL in other breeds has not been identified in Cairn Terriers. **No specific testing recommendations are needed at this time.** Genetic panel tests will generally include the ADAMST17 mutation.	Should a Cairn be found to have the ADAMST14 mutation on genetic panel testing the following recommendations apply. 1. Monitor closely for development of PLL. 2. Consider excluding from breeding program – if bred, consider a test breeding and monitor offspring closely, do genetic testing on all offspring.	Consider collaborating through CTCC with researchers in the field such as Contact Cathryn Mellersh, Senior Research Associate, Department of Veterinary Medicine, University of Cambridge, Madingley Road, Cambridge CB3 0ES

Liver, kidney, and cardiac conditions			
Renal Dysplasia / Aplasia and **Polycystic kidney disease**	**Strong* recommendation** for renal ultrasound of all breeding stock prior to first breeding. **Consider the benefits** of performing ultrasound on all puppies at 12 weeks prior to placement. This will assist in selection of dogs to be retained in breeding programs. Scanning should be done by an experienced ultrasonographer. Scanning at 12 weeks requires experience to differentiate normal developmental changes from disease.	**Strong* recommendation** against breeding dogs with Renal dysplasia, unilateral renal aplasia, or Polycystic Kidney Disease. **Strong^ recommendation** against breeding two dogs with speckling. A dog with speckling should be bred only to clear dogs with normal kidneys. **Moderate recommendation** to NOT eliminate dogs from breeding programs with ultrasound findings limited to speckling	Renal dysplasia causes significant morbidity and early mortality. We can identify renal dysplasia in the pre-clinical stage using ultrasound. Subtle changes on ultrasound should be interpreted with caution. Key Ultrasonographic Features of renal dysplasia include: • Loss of definition of the corticomedullary junction • Multifocal hyperechoic speckling in the renal medulla • Hyperechogenicity of the renal cortex • Decreased medullary thickness • Irregular renal surface
Cardiac testing	**Strong^ recommendation** for puppies to have a veterinary cardiac exam prior to placement. No special investigations are required for asymptomatic puppies with murmurs with characteristics of an innocent murmur. These puppies should be followed prospectively to document resolution of the murmur. The breeder should disclose the presence of a murmur and plan to new owners. **Strong* recommendation** for breeding stock to have a cardiac exam after reaching adulthood and prior to breeding	**Strong^** recommendation against breeding a dog with congenital heart disease. **Weak recommendation** against breeding dogs with Mitral valve myxomatous degeneration.	Studies of Patent Ductus Arteriosus, Pulmonic stenosis, Subaortic stenosis (HOCM), ventricular septal defects, Tetralogy of Fallot and Persistent Right Aortic Arch have confirmed inheritability. MVMD is believed to have a genetic basis. It is largely a disorder of aging and most cases will not be identified until breeding has concluded. Examination for murmurs can be done by general veterinarians – but breeders should seek out force free veterinarians with genuine interest in caring for litters. Optimal identification of murmurs requires gentle handling, a quiet environment, a quality stethoscope, and a patient vet. It is strongly recommended that breeders seek out veterinarians who allow the breeder into the exam room with the puppy to help the puppy be more comfortable and relaxed. Pre-vet visit preparation of the puppy (practice calm behaviours on a table / with handling / around strangers and use a cheap or toy

	Breeding stock with murmurs should have further investigations (cardiologist exam +/- echo) prior to breeding to rule out structural reasons for the murmur.		stethoscope with positive reinforcement to make the exam process familiar). If a murmur is identified and is persistent or has features inconsistent with an innocent murmur, further investigations should be done by a veterinary cardiologist.
Porto-Systemic Shunt **Micro-vascular dysplasia**	**Strong*** recommendation in favour of screening all puppies for CPSS / MVD with EITHER Bile acid or Fasting ammonia test. **Moderate** recommendation in favour of screening puppies as LATE as possible before placement, preferably not before 12 weeks. **Insufficient** evidence is available to recommend a specific type of meal prior to post prandial testing. **Testing notes** Ammonia testing is an appropriate alternative to Bile Acid testing if available and is preferred if testing early (can be done as early as 6 weeks). Ammonia testing must be done in specialized centers due to strict testing requirements. Most breeders currently do 2 hr post prandial bile acid test rather than pre and post bile acids. There is **insufficient evidence** to recommend one strategy over the other. If post bile acids are abnormal then	**Strong*** recommendation against breeding any dogs with CPSS or MVD	CPSS is a potentially life-threatening disorder with significant morbidity and cost. There is concern that testing prior to 16 weeks may be less sensitive / specific – however this is not a universal concern and delayed testing creates issues for breeders in timing of testing and placement. Once a puppy has left the control of the breeder it can be difficult to get properly timed samples. Rarely dogs may have asymptomatic PSS. Dogs with MVD may be less likely to show abnormal results as puppies. Early BA testing may be less sensitive than later testing. Risk of PSS and MVD is increased in lineages with known PSS / MVD. Higher risk of affected offspring in these dogs. Recommended meals listed in literature include: • 2 tsp canned food (<10 lbs), 2 tbsp (>10 lbs) • Normal (usual) meal • Replace kibble with canned food • Avoid too large a meal Key is to provide a small amount of fat to trigger gall baldder contraction but not excessive amounts that would cause lipemia (which would interfere with testing).

	repeat testing with pre and post prandial bile acids is recommended.		
Musculoskeletal conditions			
Hip Dysplasia	**Strong^** recommendation in favour of standardized radiologic assessments for HD (OFA / PENN hip) prior to breeding: • if there is a significant pedigree history of HD • For any dog with clinical signs of HD Follow the minimum age requirements for standardized radiologic assessments: OFA: 2 years Penn Hip: 8 months FCI: 1 year **Insufficient** evidence to recommend universal screening for all breeding dogs.	**Strong^** recommendation against breeding dogs with **symptomatic** HD **Moderate** recommendation against breeding dogs with a strong pedigree history of HD (multiple affected dogs in parents, grandparents and siblings of parents and grandparents). If breeding such a dog is considered important to a breeding program, • Ensure that the breeding partner is from a lineage free of HD. • Move forward with puppies free of HD from resulting litters.	Hip dysplasia is caused by a combination of genetic and environmental factors. The early weeks and months are a critical development period for the hip joint. Ensuring that the femoral head remains firmly seated in the developing acetabulum during this period will help promote proper development of the acetabulum and reduce the risk of HD. Pedigree is important in determining the risks of HD. The presence of multiple progenitors (parents, grandparents, and their siblings) with OFA hip scores of FAIR or lower is an important correlate with the risk of HD in the offspring of a particular dog and may be more important than the hip score of the individual dog. A Danish study found that there was no correlation between radiologic HD scores (using a different system of evaluation than PennHip or OFA) and clinical signs of disease or evidence of osteoarthritis, nor was there progression of laxity or deformity during a three-year follow-up period. The majority of Cairns in this study had scores that would be diagnosed as mild or worse HD. This study does give rise to questions as to the validity of hip scoring in Cairn Terriers – but it is unknown if this would be true for OFA or PennHip scoring methods. **Strategies to reduce the risk of HD in puppies.** 1. Ensure good traction for developing puppies starting in the whelping box. 2. Maintain puppies on the lean side during growth and development. 3. Defer desexing until after 18 months of age 4. Do not allow puppies unsupervised / unassisted access to stairs until at least 3 months of age.
Patellar luxation	**Moderate** recommendation for testing puppies prior to placement:	**Moderate** recommendation against breeding dogs with PL.	Dutch study (Dutch Flat coated Retrievers) showed the risk of PL from a breeding with one affected parent increases 45% compared to breeding two unaffected dogs.

	Moderate recommendation for all puppies to be examined for PL at one year of age. **Strong^** recommendation for potential breeding dogs to be examined for PL prior to breeding. (> 1 year of age at exam)	(This does not apply to dogs with traumatic PL). **Strong^** recommendation to avoid breeding two dogs with PL of any severity	Selective breeding has been successful in in reducing the prevalence of PL in Dutch FCR. Generalizability to small breeds is uncertain. Although the sensitivity and specificity of physical examination for PL is unknown, there is some evidence that testing after one year of age is more reliable. Dogs from affected lineages will be more likely to produce affected offspring – awareness of PL in the lineage can allow for better breeding choices and using outcrosses. There is no data on the benefits of screening examination by orthopedic vs general vets although it is likely that there would be better precision in physical examination by specialist vets. Breeders are encouraged to consider exam by orthopedic specialist to further assess dogs with questionable results, or for dogs intended for breeding where there is PL in the lineage – however there is insufficient data to make a recommendation.
Legg-Calves-Perthes	**Insufficient evidence** to recommend routine screening hip xrays for LCP in breeding dogs. ********** **For dogs from lineages with multiple cases of LCP:** Consider screening Xrays prior to breeding.	**Moderate** recommendation against breeding dogs with symptomatic LCP. **Strong**^ recommendation against breedings where both sire and dam have LCP. ********** **For dogs from lineages with multiple cases of LCP:** **Moderate** recommendation against breeding asymptomatic dogs with radiologic evidence of LCP. *If a dog with symptomatic or radiologic LCP offers significant*	Although a lineage of Fox Terriers has been identified with subclinical LCP (not detectable on clinical exam but radiologically evident) it is unclear to what extent this is common in other lineages or breeds. There is NO data on the sensitivity and specificity of xray exam of asymptomatic dogs and risk of future offspring with LCP.

		benefits to a breeding program, breed ONLY to a dog with a lineage clear of LCP.	
Endocrine conditions			
Addison's Disease (Hyper adreno-corticism: HOAC)	**No** recommendation for screening tests however owners should be aware of symptoms and seek rapid diagnosis if suspected. While studies of Addison's disease vary in whether or not Cairns were identified in the study population, there is sufficient evidence to suggest that Cairns are at some increased risk of Addison's disease compared to other breeds.	**Strong^** recommendation against breeding any dogs identified with HOAC. **Insufficient evidence** to make a recommendation for or against breeding first degree relatives of affected animals. **Weak recommendation** to avoid breeding two dogs that both have Addison's in the pedigree	The presumed genetic nature of HOAC and the serious, potentially life-threatening nature of HOAC warrants a strong recommendation against breeding affected animals. HOAC is potentially a life-threatening disease without proper diagnosis. Although properly treated disease carries minimal morbidity, there is always a risk of the dog going into crisis at times of stress and there is lifelong cost for medication and monitoring. Risk of adrenal crisis during pregnancy / whelping should preclude any consideration of breeding an affected animal. The presumably complex genetic inheritance pattern plus the likelihood of additional non genetic factors contributing to disease expression make recommendations regarding breeding relatives difficult. Evidence so far supports a major gene with Autosomal recessive inheritance (though not necessarily a simple AR pattern) but there are no available genetic markers for testing.
Cushing's Disease	**No** recommendation for screening tests however owners should be aware of symptoms and seek rapid diagnosis if suspected.	**Strong^** recommendation against breeding affected dogs because of adverse pregnancy outcomes related to treatment. **Insufficient evidence** to make a recommendation for or against breeding first degree relatives of affected dogs or breeding two dogs that both have Cushing's Disease in their pedigrees.	Cushing's disease is not a clearly defined genetic condition although there is likely to be complex genetic factors involved. Cushing's disease will usually only be diagnosed after the conclusion of a dog's breeding career. Breeding dogs with Cushing's disease is ill-advised due adverse effects of medications used to control Cushing's disease (teratogenicity, preterm births, pregnancy losses, unknown risk)

Hypo-thyroidism	**No** recommendation for routine screening with thyroid autoantibody testing because of low disease prevalence in Cairn Terriers. **Moderate recommendation** for thyroglobulin autoantibody testing of asymptomatic breeding dogs with affected first degree relatives. Test annually for the first 4 years then every other year.	**Insufficient evidence** to make a recommendation for or against breeding affected dogs. **Strong^** recommendation against breeding dogs with congenital hypothyroidism. Both parents of a puppy with Congenital hypothyroidism should be assumed to be carriers. Do not repeat matings that produce congenital hypothyroidism. **Insufficient evidence** to make recommendations for or against breeding first degree relatives of affected dogs. **Weak recommendation** to minimize doubling up on hypothyroidism on both sides of the pedigree.	Congenital hypothyroidism is an autosomal recessive condition resulting from a mutation in the TPO gene (Thyroid Peroxidase) on Chromosome 17. This gene has been reported in two terrier breeds: Toy Fox Terriers, and Tenterfield Terriers. Several different mutations in the TPO gene have been identified and more breeds are being discovered with TPO mutations. Cairn Terriers are a low risk breed for hypothyroidism (< 3% of affected dogs, rank position 91)
Diabetes Mellitus	**No** recommendation for screening tests however owners should be aware of symptoms and seek rapid diagnosis if suspected.	**Strong^** recommendation against breeding affected dogs – breeding bitches with diabetes is a high-risk situation to both the dam and her puppies. **Insufficient evidence** to make a recommendation against breeding first-degree relatives of affected dogs. *	Diabetes is a complex disorder: polygenic (multiple genes involved) and sporadic (absence of affected family members). Furthermore, from an etiologic perspective, diabetes is not a single disorder. *The Universities Federation for Animal Welfare recommends against breeding both first- and second-degree relatives of affected dogs, however this is a blanket statement applied to many conditions and is not a recommendation specific to Cairn Terriers or diabetes (personal communication from Dr Stephen Wickens UFAW). It does not give any consideration to genetic diversity issues and is not evidence based. The committee disagrees with this recommendation and is concerned about removing so many dogs from breeding programs and the potential impact on genetic diversity. Most cases of diabetes are likely due to complex genetic factors and

			so many of the eliminated dogs under this strategy would be at low risk of affected offspring.

- When considering breeding dogs with endocrine disease in the pedigree number of cases and proximity to the dog in question should be considered.

Allergic / Immune conditions			
<u>Atopic disease</u>	**No** testing recommendations. There are no tests that can predict the risk of atopic disease prior to the development of clinical disease. <u>Diagnostic testing</u>: **Strong** recommendation against use of hair and saliva tests for diagnosis due to unreliability of currently available tests.	**Insufficient evidence** to recommend against breeding dogs with atopy, or first-degree relatives of affected dogs. **Moderate** recommendation against removing dogs with mild to moderate atopy from breeding due to potential adverse effects on genetic diversity. **Weak** recommendation against matings in which both dogs are affected by moderate to severe atopy.	The prevalence of Atopic disease in Cairn Terriers is unclear. Several studies from the 1980-90's suggest an increased prevalence in Cairns, with possible rates of 20%. Other studies have not identified Cairns to be at high risk. Atopy is a complex disorder with polygenic influences and environmental factors. Breeders should monitor the occurrence of Atopy in their lineages and explore methods proposed to reduce the occurrence of atopic disease (see briefing document for references). - Inclusion of non-commercial meat in the bitch's diet during lactation - More outdoor exposure as young puppies - Multi-dog households (would exposure to a good day care for puppies be an alternative?) - Avoidance of unnecessary antibiotics (disruption of microbiome) - Avoidance of second-hand smoke - Probiotic use in puppies may provide some protection against development of Atopic disease