Why You Should Test for CMO in Breeding Cairns

by Leslie Klipper Stewart

General Overview

Craniomandibular Osteopathy (CMO) is a long name for an inherited condition that affects young puppies. CMO has also been nicknamed “Lion Jaw.” It is a non-cancerous condition that affects the formation of bones in puppies, usually, but not limited to, the lower jaw or maxilla. This condition can also affect the long bones of the leg, but is not as common.

Symptoms and Identification

Also found in West Highland White Terriers, Scottish Terriers, Australian Shepherds and Lancashire Heelers, (1) CMO is first noticed during the initial month or two after birth and usually resolves itself by one year of age. Typical onset is about 4 months of age. Puppies that exhibit symptoms of CMO will experience periodic jaw pain and can also have a noticeable lump of extra bone on the mandible. Symptoms usually occur as episodes, from mild where the puppy is off food for a few days, to severe where the pup is unable to open its mouth and cries in pain. Excessive drooling, intermittent fever, lethargy, swollen jaws, mouth not opening well and pain during chewing are all symptoms of the condition. (2) Veterinarians diagnose this condition via x-ray. How can you tell if a puppy has CMO? Typically an energetic pup will change behavior to become quiet and more lethargic. Even though the puppy may eat, he or she may stop playing with its littermates. Or the pup may not eat, because opening the jaw is painful. If your pup is suddenly quiet and stops playing with its littermates, or if the pup stops eating, try to open the pup’s mouth, GENTLY. If this causes your puppy to exhibit pain, take the pup to your vet immediately. If an x-ray confirms CMO, treatment may include administering aspirin or steroids to the pup. In the most severe cases, though rare, a pup may need to be euthanized.

Modes of Inheritance

CMO is an inherited condition and researchers have only recently identified and isolated the gene that causes the condition. There is finally a cheek swab test that is now widely available from Optigen and Optimal Selection. The test will reveal whether your dog is clear, a carrier of the gene that causes CMO and thus can pass the gene on to offspring, or affected. How could a dog be affected and not exhibit signs of the disease? That is because some pups will only experience mild discomfort for a short period of time and others will exhibit more intense symptoms. As with humans, every dog is different and experiences pain differently. And we know that Cairns are a stoic breed and may not show any signs of discomfort outwardly.

According to Optigen's website, the following is how the mutation occurs.

CMO mutation:

Recently, a single causal DNA mutation for CMO has been identified by researchers at the Institute of Genetics, Vetsuisse faculty, University of Bern, Switzerland, and the Department of Veterinary Biosciences and Research Programs Unit, Molecular Medicine, University of Helsinki and Folkhälsan Research Center, Finland. The mutation is highly associated with CMO in Cairn Terriers, Scottish Terriers, and West Highland White Terriers. In this study, about 85% of the CMO affected dogs had two copies of the mutation, 10% had a single copy of the mutation and 5% of CMO diagnosed dogs did not carry the mutation. The development of the CMO disease is obviously dependent on the genetic status of a dog for the CMO mutation, but is also influenced by other unknown genetic and/or environmental factors. The mode of inheritance of the CMO mutation is best described as autosomal dominant with incomplete penetrance, meaning that dogs of both sexes that are homozygous mutant (with two copies of the mutation) have a comparably higher risk to develop CMO. Dogs heterozygous for the mutation (one copy of the mutation) might also develop the disease, but some of the dogs carrying the CMO mutation will live without showing clinical signs. (3)

CMO test:

The CMO test is based on the CMO causing mutation and it will accurately provide the genotype of a tested dog as follows:

Homozygous Normal: These dogs have two copies of normal gene and are highly likely to be clear of CMO.

Carriers (low risk): These dogs have one copy of the CMO mutation and one copy of the normal gene. These dogs are at low risk to develop CMO themselves as a result of the CMO mutation and they will pass the mutation on to approximately 50% of their offspring. The other 50% of their offspring will receive a normal copy of the gene.

Homozygous Affected (high risk): These dogs have two copies of the CMO mutation and have a high chance of developing CMO (more than 57 % of dogs studied in the research program with two copies of the CMO mutation were clinically affected with CMO and 84% of the dogs exhibiting symptoms of CMO were Homozygous Affected). Veterinarians and breeders should be aware that some of the homozygous affected dogs may look normal, without showing obvious signs of CMO disease, but they will transmit the mutation to all their offspring.

Note: There may be other causes of CMO in the breeds so there is a possibility that dogs can develop a genetically different form of CMO due to other mutations that are not detected by this test. (4)

Testing is Recommended

It is highly recommended that breeding dogs be tested for the CMO gene before any litters are conceived. This way, breeders will know if they have a potential risk of CMO in a litter. The mode of inheritance of the gene is straightforward as explained above. Researchers and vets warn to not "throw the baby out with the bath water" meaning that you may have a Cairn who is a standout in many ways. If that Cairn is a carrier, make sure to breed to a clear dog. Since the test for the marker gene is relatively recent, breeders had no way of knowing if their dogs were carriers or even in some cases, mildly affected. So please, NO JUDGEMENT! You may find that your top Cairns are carriers because there was no way of really knowing who was a carrier in the early years of breeding! Remember, breeders strive to breed the healthiest, best dogs they can! Now that a test has been developed, please test your breeding stock. Only you can make the decision on what to do.

Testing Procedures

Optigen and Optimal Selection now provide a simple cheek swab test for CMO. It is based on the research and work of Dr. Patrick Venta at Michigan State University. Currently, The Foundation has negotiated a discount for all CTCA members with Optigen. When contacting Optigen, mention specifically that you are a member of the CTCA and The Foundation of the Cairn Terrier Club of America gets a discount on the cheek swab test. After procuring a cheek swab kit from Optigen or from a health clinic follow these procedures:

- The dog to be sampled should NOT eat or drink for at least one hour prior to having the sample collected. This is to reduce the chance of contamination.
- The dog should be isolated from other dogs, toys and possible sources of oral contamination for at least several hours, preferably one day before sampling. This is to reduce the chance of dog to dog contamination.
- Just prior to sampling, check the dog's mouth to see that no food or other material is obviously present. If there is, clean/rinse the dog's mouth to remove it. Wait another hour before collecting the sample.
- The person taking the sample should avoid touching the inside of the dog's mouth. Disposable latex gloves will help reduce contamination by the handler.
- If doing more than one dog, the person doing the sample must wash his or her hands or change gloves between collection.
- Never allow the sterile swab to touch anything other than the inside of the dog's mouth and the inside of the package the swab came in. Especially never allow contact between swabs from different dogs.
- Prepare a clean surface on which to place the opened swab package. (5)

You can contact Optigen at https://www.optigen.com/opt9_CMO_test.html, OptiGen®, LLC Cornell Business & Technology Park · 767 Warren Road, Suite 300 Ithaca, New York 14850 Tel: 607 257 0301 · Fax: 607 257 0353 email: dianna@optigen.com. Optigen was recently sold to Mars Petcare. But as of this writing, Optigen is still offering the test.

A second genetic testing company, Optimal Selection, offers comprehensive genetic testing from a cheek swab sample. According to their website, they can provide a variety of information from the test. Results are available four weeks after submitting the cheek swab from your Cairn. At that time, you will receive a comprehensive report with results for the disease, trait and diversity (dogs only) testing and much more, including CMO! (6) This may be a service worth investigating. You can access Optimal Selection's website at https://www.optimal-selection.com/.

Notes:

1. Optigen Website

2. Scottish Terrier Club of America, SCTA

   https://www.stca.biz/health/325-scottie-health/scottiephile-list/craniomandibular-osteopathy-cmo/336-craniomandibular- osteopathy-cmo-in-the-scottish-terrier- tca-htf-health-series-no-2-?highlight=WyJjbW8iLCJjbW8ncyIsIidjbW8iXQ==

3. Optigen Website

4. Optigen Website

5. Westie Health Foundation website, Westie Foundation

6. Optimal Selection, Optimal Selection Website

Further Reading:

Alexander, JW. *Selected skeletal dysplasia: Craniomandibular Osteopathy, multiple cartilaginous exostosis, and hypertrophic osteodystrophy*. Vet Clin North America: Small Animal 13:5570, 1983.

Riser, W, Newton, CD. "*Craniomandibular Osteopathy." Textbook of Small Animal Orthopedics*. Ed. Newton, CD, Nunamaker, DM. Philadelphia: Lippincott Co, 1985. 621-626. Print.

Watson, ADJ, Adams, WM, Thomas, CB. *Craniomandibular Osteopathy in dogs*. Compendium Vet Med Small Animal (July): 911922, 1995.

https://www.westiefoundation.org/assets/cmo_swissresearcher.pdf

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