

CMO: *Breeders Say...*
BY CAROLE OWEN

Craniomandibular Osteopathy (CMO) is a disease of the Scottish Terrier which canine geneticists prioritize high on the list of diseases breeders should avoid. Sharing information is the most basic step to gain control of a disease. The Scottish Terrier breed owes much to the breeders who contributed to this article. You will notice divergent opinions on how a disorder like CMO should be handled in breeding programs.

Though she has not seen CMO produced in her own kennel or by her stud dogs in years, Miriam Stamm (Anstamm, Kalamazoo, MI) says, "I still see this one puppy - huddled in a corner ... miserable. Puppies withdraw for a few months. They run fever off and on. Pain comes and goes. Sometimes they don't eat at all."

"The first case we had was when my husband was alive," remembers Stamm. "We didn't know what it was, and the vet didn't know, but he started the dog on prednisone, and that helped. We read an article in a Westie magazine and figured out it was CMO."

"It is relatively easy to reduce incidence of CMO in your line, emphasizes Stamm who has perhaps the most seniority of any active U.S. Scottie breeder. She has bred Scotties since the 1950s, and her late husband Anthony Stamm started in the breed during the 1940s. "Dogs that produce it: neuter and place them. It's a hard choice!"

"We have not had a stud dog produce CMO in 15 years," stated Stamm. "We're very wary of it. The only thing you can do if you find it in your line is not use the dog that produces it again - ever. Those who do, had they experienced it; they wouldn't. We haven't had to stop using any stud dogs recently. We once had a nice young stud doing some good winning that produced it. We neutered and placed him in a home."

"We did some test breeding with one of our past stud dogs and his sons to insure the sons were not carriers," added Stamm's partner, Cindy Cooke. Though Cooke did not indicate the number of puppies from the two specific CMO test breedings she mentioned or the resulting percentage of being clear of the gene, she said "We test bred Ch. Anstamm Summer Lightning and Ch. Make My Day Of Mayson. We knew they were clear, so those were dogs we went forward with."

Health Survey Results

The STCA Health Survey of 1995 covered 1,540 Scotties. Only two CMO-affected dogs were reported. STCA genetic consultant Dr. George Padgett "guestimated" those figures meant 4.7% of Scotties carried the recessive CMO gene.

Our kindred breeders, the Cairn and the Westie, have appeared to have a higher incidence of CMO than the Scottish Terriers. A 1988 survey by the West Highland White Terrier Club (WHWRCA) showed an estimated 19% of Westies were carriers. The Cairn Terrier Club of America (CTCA) 1987 health survey showed an estimated 17% of Cairns were CMO carriers. Current CMO figures will be available later in 1998 from new health surveys of both the CTCA and WHWTCA.

CMO DNA Collection

Sample collection for the CMO DNA research which STCA, CTCA and the WHWTCA have endorsed is providing interesting numbers. Though the STCA survey noted only two CMO-affected Scotties in 1995, Michigan State University researcher Dr. Patrick Venta reported April 24 that he has received DNA from 15 affected Scotties, with samples promised from two more affected. By late April, Dr. Venta had received 177 DNA samples from the three breeds (including 36 affecteds and relatives: 88 Scotties (15 affected), 51 Cairns (9 affected), 38 Westies (12 affected). While the Scottie CMO incidence appeared low in 1995, it has not been hard to find affected Scotties and relatives in 1997-98. Dr. Venta says Scottie CMO DNA samples have come from the U.S., Canada, Great Britain and New Zealand.

Fifteen CMO-affected Scotties in 1998! Only two in 1995? The difference is intriguing, though it doesn't necessarily mean we have more CMO now. The 1995 STCA Health Survey covered only U.S. and Canadian Scotties and collected breeder data from a short period.

Before 1995's STCA Health Survey, I was curious about what might be happening with the CMO gene in Scotties. I used *AKC Stud Book* records as a database. The work was tedious. Each generation further removed from one known carrier dog made it more difficult to identify new listings of descendants as they were bred. Many later dogs carried unfamiliar prefixes because they were bred or owned by non-STCA members. I simply couldn't find them all!

Though an incomplete record, my cards on possible CMO carriers tracing ancestry from *just one* known CMO carrier filled an entire recipe file box. These descendants were only the ones that had *already* been bred. I showed my research to geneticist Dr. George Padgett in Fall, 1995, and he seemed surprised at the apparent depth of the CMO gene in Scotties.

With other key CMO carriers dispersing the CMO gene before, during and after the period I checked, I feared that CMO genes would link up in greater numbers and produce increasing numbers of CMO-affecteds. That may have happened.

I had my own fears. The sire of the bitch I planned to breed in 1995 had recently produced CMO after many breedings. My "Tina" had a 50/50 chance of being a carrier.

STCA Survey's 2 CMO Pups

Barbara Casey (Casi's, Tucson, AZ) says she bred the two CMO puppies reported in the STCA Health Survey of 1995. She has bred and exhibited Scotties for 15 years, but had never produced CMO. Casey didn't know of the possibility of CMO when she bred her bitch "Jennifer."

The first sign of CMO was two puppies screaming and not wanting their heads touched when she gave them shots at seven weeks. "I thought CMO was what I had," said Casey. Her vet had seen CMO in Scotties and told Casey, "You have a huge decision. Do you want to medicate, or do you want to put down?" Casey chose life for the puppies. (Note: Dr. Padgett emphasizes that euthanasia is not generally necessary for CMO.)

"Mine always ate," said Casey. "They took well to their medicine. They didn't have a totally locked-shut jaw. I was fortunate. It was not severe. But then it was not mild either. The pups had

waves of pain. I didn't want to handle them too much when in pain. I would play with them on their good days. One puppy was OK by nine months; one took a full year to be OK.

Casey worked with the owners of the litter's sire to confirm the CMO diagnosis. Though all systems pointed to CMO, diagnostic x-rays did not at first prove CMO.

Jorge and Pat Torrejon (Nazca, Vancouver, B.C., Canada) owned "Joey", the sire of Casey's puppies. "We were floored to find out only two CMO Scotties were reported on the STCA Health Survey. They were out of our dog. Now two years later there are 15 or more CMO-affecteds. I think we're all fooling ourselves a lot!" said Jorge Torrejon.

Torrejon is immediate past president of the Canadian Scottish Terrier Club. He points out, "It can be very hard for a person to establish that a dog has CMO." Three or four x-rays were done between eight weeks and one year on the affected female. The radiologist who examined the early x-rays saw no indication of CMO.

"We could have stopped there," said Torrejon, "and had our letter that it wasn't CMO. But there were the continued physical symptoms in the puppy. She couldn't be without prednisone for more than three days. Only on the last x-ray at about 12 months was CMO diagnosed." (Note: Veterinary radiologists recommend six to seven months as the best age for diagnostic x-rays, though some cases may need to be x-rayed again later.)

Hard Calls

At that point, the Torrejons made what must have been the hardest calls of their lives. Said Torrejon, "As soon as it was established that our dog was a carrier, we notified all the persons who had bred to him. He had a dozen litters before CMO was confirmed-several handfuls of breeders we had to talk with. It was demolishing. People seemed surprised someone would call."

"I appreciated Jorge pulling his dog. That took a lot of courage," said Casey. "He was producing lovely puppies that moved well and had lovely temperaments." Casey added that she spayed her own CMO carrier bitch.

"If you want to have control of a gene, you have to be in the driver's seat," emphasizes Torrejon. Except for special cases, he has removed his carrier dog from stud use. "The only way I can be in control is to do what I'm doing and keep an eye on the dogs produced out of the carrier. To exercise control, you close the factory. The hardest part is adding still another limitation to a breeding program."

Out of this devastating experience for Casey and the Torrejons have come several benefits for the entire breed. First, Casey says DNA samples from her two affected puppies, their five littermates, their parents, several grandparents and associated relatives have been provided for the upcoming CMO DNA project. These and additional samples will provide essential sub-cellular clues to enable development of a DNA test to identify CMO carrier status in Scotties, Cairns and Westies.

Test Bred Stud

Second, our breed owes to Casey's litter the first publicly advertised CMO test breeding of a major Scottie stud to have a high likelihood of being clear of the CMO gene. "Dolly," Casey's CMO-affected bitch, went to Christine Stephens (Glenby, Oregon City, OR), breeder of "Dolly's" dam. Stephens would raise 'Dolly' and complete her CMO treatment, with the intention to later test breed her to Am./Can. Ch. Glenby Royal Viking ("Warren").

"Warren" has produced 30 champions, according to Stephens, and in 1994 won the STCA's stud dog trophy for producing the most champions. Stephens had been confident "Warren" was clear of the CMO gene because of the numbers of litters he had produced with no known CMO. An STCA board member, Stephens was willing to risk a test-breeding to try to prove "Warren's" clear status.

"Dolly" is the only CMO-affected Scottie that Stephens has raised personally. Though she has bred Scotties for 30 years, Stephens says she never to her knowledge has produced a case of CMO in any litters she has bred in her kennel. Her acquaintance with the CMO gene came when she earlier discovered her import Scottie, "Benjamin," a dog that had been used widely at stud, carried the gene, as did some of "Benjamin's" offspring.

How did Stephens feel when she discovered her popular import was a carrier? "It crushed me. I sat and cried for two hours. It's still affecting me. It haunts me," said Stephens.

Stephens' advice to other breeders who are dealing with the CMO gene, or other recessive genes: "Don't throw the baby out with the bath water. You don't trash the line. Better to know the problems and deal with them than to breed helter-skelter to avoid problems. Then when you get a problem, you don't know where it came from. Rather dive right in and find what your problems are and deal with them. Don't panic and throw everything out."

As a person with a bitch having a 50/50 chance of carrying CMO, I applaud Christine Stephens as the first breeder who is advertising a major Scottie stud as being test bred and that has a high percentage chance of being clear of the CMO gene. Stephens says she advertised "Warren" with his test breeding results in the 1998 Stud Dog Issue of *The Bagpiper*. Christine Stephens is a leader. She deserves the admiration of the fancy. I would feel safe taking my possible carrier bitch to a stud like her test bred "Warren".

"Dolly's" 4 Puppies

"Dolly" and 'Warren's' test breeding produced four puppies. "I kept them until they were eight months to one year old. There was never any physical sign of CMO in the puppies. They were x-rayed at the recommended time of seven to nine months old with no evidence of CMO," said Stephens. "There's no registry for CMO in Scotties yet, so I couldn't register the test breeding."

Genetics of the Dog by Malcolm B. Willis (Table 100) charts test mating for a simple autosomal recessive like CMO. It shows that when a test animal is bred to an affected animal and produces four normal offspring, there is only a 6.25% chance of being wrong in assuming that the test animal is free of the gene. Conversely, a tested dog, in this case Stephens' "Warren", has a 93.75% chance of being clear of the gene in question.

If any known carrier bitches were among those that have been bred to Stephens' "Warren" without producing CMO, "Warren" could be certified clear to an even higher degree, Michigan State University geneticist Dr. George A. Padgett told Stephens.

"If anyone has bred a known carrier bitch to 'Warren,' please let me know," requests Stephens. Such breedings are known in genetics circles as retrospective test breedings. The knowledge would increase evidence of Stephens' "Warren" being CMO clear.

Historically, CMO was identified in the 1950s. It is nothing new, say geneticist Dr. George Padgett and radiologist Dr. Ulreh V. Mostosky. The two Michigan State University College of Veterinary Medicine scientists co-authored the 1986 article "Animal Model: The Mode of Inheritance of Craniomandibular Osteopathy in West Highland White Terriers" in the *American Journal of Medical Genetics*. Scottish Terriers were the first breed to be identified with CMO.

Expect Advice

Best time to diagnose CMO by x-ray is at six to seven months, according to Dr. Mostosky: "Some dogs have early onset, and you may be able to see it minimally on x-ray; then it may disappear. Other dogs, if you x-ray too early, you may miss it. The bulk of dogs will be picked up with x-rays at six or seven months old. If the dog is normal until that point, then shows clinical evidence of CMO, re-x-ray to establish whether it is CMO."

Certain cases of CMO are diagnosed only by x-ray. 'The 'silent' form of the disease sometimes cannot be diagnosed by symptoms, but only by x-ray," emphasized Dr. Mostosky. If one puppy in a litter clinically shows signs of CMO, littermates should be x-rayed." Such x-rays of puppies closely linked to a CMO-affected can help keep affecteds out of breeding stock.

"Since there are very mild cases that are almost transient that we are diagnosing with x-ray, I have a gut feeling there are some cases so mild they don't produce any boney changes. That's why DNA tests will be so fruitful!" says Dr. Mostovsky.

Geneticist Dr. Padgett advises national clubs to use a genetic registry for diseases like CMO and vWD. "Get into an open registry," urges Dr. Padgett. "Other than using a registry, how else would breeders get information? The way we get it now is gossip!" Padgett mentioned that the national Cairn club has set up an open registry for CMO (and other diseases) with Genetic Disease Control (GDC). West Highland Anomal Task Council (WatchH) has maintained a CMO registry for Westies for about 10 years. Now the national Westie club is setting up an open registry with GDC, and WatchH may transfer CMO data there.

Using a registry for a disease is only the first step for a national club, emphasize both Dr. Padgett and Dr. Mostosky. How the registry's data is used by a club and its breeders is what will make the difference. "If there is no dissemination of data, you're no better off," said Dr. Padgett.

Establishing an advisory board or a master plan committee for a disease like CMO is a good additional step for a national club, suggests Dr. Mostosky. He mentioned this technique helped the Alaskan Malamute breed markedly reduce the incidence of achondroplasia, a disease inherited recessively like CMO.

"This seems a good place to insert some genetics facts about an autosomal recessive gene like CMO that many breeders don't realize:

- 1) Dogs with one CMO carrier parent have a 50% chance of carrying the CMO gene.
- 2) Littermates of a CMO-affected have a 66 2/3% chance of carrying the CMO gene.
- 3) Dogs that have one grandparent that carries CMO have a 25% chance of carrying the CMO gene.

Breeders interested in learning more about how to make genetics probabilities and gene mapping work in their own breeding programs may wish to reference *Control of Canine Genetic Disease* (Howell Book House), Dr. Padgett's new book on canine genetics for breeders which will be published in August, 1998.

Like the Torrejons, Maurine and Ron McConnell (Barbary, Homer, MI) two years ago experienced the sorrow of having an outstanding male produce what was highly suspected to be CMO. Also, like Torrejons, the McConnells did not produce CMO in their own kennel; but the distress was no less.

"It is devastating-to think about such a puppy caused by me," said Maurine McConnell. "I had no idea what CMO was until this happened. I'd been going along for 13 years with nothing bad happening. I never even had any sickness. I used to tell people, "You don't have to worry about my dogs. I have nothing bad in the background. I am clear."

Their probable carrier was the McConnell's pride and joy, "Maverick," a dog that had been Winners Dog at three specialties, including a National Rotating weekend. "It happened in his first litter of two pups. I think, 'Why?' I cry when I see him. But he will never produce another CMO puppy while I'm alive," insists McConnell.

"I felt like I was taking the whole burden on myself," remembers McConnell. "Once we got this sickness we were on our own. We were hanging our heads for months. Who do we talk to? What do we do now? It took a good six months of anger and pain before I could realize that I'm not the only one out there who's produced CMO."

Responsibilities

What is the responsibility of stud owners? McConnell suggests they ask, "Have you ever seen CMO? It's in Scotties. It's bad, and it's in the background of my dog. It may come. It may never come. If you like my male, if he's the best thing for you, you will have to worry about this from generation to generation." McConnell also suggests the same kind of sharing for persons selling breeding stock.

There are responsibilities for persons who buy a puppy or use a stud dog, too, says McConnell: "If a puppy or litter ends up with some kind of sickness, it is their responsibility to let the stud owner or the breeder know and let them be totally involved in the diagnosis."

"The light at the end of the tunnel," says McConnell, "will be the CMO DNA test. I'll be able to test "'Maverick" myself and verify if he is a carrier."

Betty Cooper (Besscotts, Arvada, CO) is one of our old-timers. She's had Scotties since 1969. "Scotties seem a tough, healthy breed. I personally have not seen CMO. But when "Playboy" was being used at stud, I did get a call," said Cooper. "The breeder said one puppy from a litter had CMO. "Playboy" had sired over 100 pups at this time, with no other CMO."

"Margaret Macdonald bred to another dog I imported, 'Just William,' added Cooper. "She and her vet diagnosed CMO. I had no input into the diagnosis. I would have liked to have an expert in CMO involved in the diagnosis. Those are my only personal associations with CMO."

We All Share Genes!

"Our Scottie gene pool is rather small. When you go back several generations, you're into the same genes. Eventually, you're going to double up on the bad genes," said Cooper. You should say, "OK, I'm not going to do that breeding again. You try other combinations. The biggest mistake you can make is to panic. You use common sense."

"When something as devastating as CMO or vWD comes along, you breed in a different direction. If it happens again, reevaluate your program," suggests Cooper. "The gentle thing is to let the dog disappear from breeding, placing it in a good home, but be prepared to be honest when people ask you about the dog!"

Margaret MacDonald (MacDonald, Kansas City, MO) wrote about raising her CMO puppies in *The Bagpiper* (Spring, 1988). Her article, "One Person's Experience with CMO" is worth reading. MacDonald has received many calls over the years from persons around the world (England, Australia, Hawaii and mainland U.S.) seeking advice about CMO-affected puppies.

There were three affected puppies in MacDonald's litter-one very mild. "Two vets didn't recognize CMO at first. I suggested the diagnosis, and they agreed it was CMO. The first two puppies were diagnosed at seven weeks."

MacDonald said that geneticist Dr. George Padgett called her after reading her article about CMO puppies. "He said on a scale of one to ten for severity, my puppies would be about a nine," recalled MacDonald.

A pedigree of the CMO litter out of MacDonald's bitch and Cooper's import was printed in *The Bagpiper* (Summer, 1988) under the title "For Your Consideration." The pedigree is not identified having produced CMO, but Cooper and MacDonald both gave permission for the printed pedigree to be mentioned here. It is interesting to note that important dogs which are behind most U.S. and British dogs are in the pedigree.

Honesty and Openness

Marg McQuinn (Hopscotch, Regina, Sask., Canada) is another Scottie breeder who has never seen CMO herself, but a puppy she bred and sold several years ago was diagnosed with CMO. McQuinn was quite open about the CMO. She told several persons at a Montgomery weekend. "By the end of the day, someone came up to me, advising me about being more judicious about what I said my animal produced," said McQuinn.

McQuinn doesn't agree: "If I hear about someone else producing something, it's not my information, and I don't have a place to share it. If I breed to a dog and get a condition, then I can talk about the condition."

"I recently posed this question on the Internet," said McQuinn: "Wouldn't it be better if everybody could speak more freely... if when giving 'commercials' about a dog, breeders would also say, 'By the way, he also produces this or that?'"

McQuinn says that her bitch that produced a CMO puppy was "Lucky," a Scottish Terrier that won two STCA national specialties, some U.S. regional specialties, 17 Canadian Best in Shows and Terrier Group 2 at Montgomery County Kennel Club.

"You don't throw out the baby with the bathwater," McQuinn echoes Christine Stephens. "This was the first time I had produced CMO in 20 years of breeding. Bred another way, CMO may not surface. You don't necessarily withdraw a dog from breeding. You are careful where you breed it!"

"Old-timers have an advantage," reminds McQuinn: "New people won't have a history that a grandmother bred a certain way produced something."

McQuinn's experience demonstrates the ironies that long-time breeders eventually discover: "I had earlier bred to a dog that everyone said was a known CMO carrier. I bred to him two or three times, with relatives of 'Lucky.' Then, breeding 'Lucky' to a dog that to the best of my knowledge had not produced CMO, I got it," marveled McQuinn.

There is a concept that if you breed long enough, you will get everything known in dogdom,' said McQuinn. "Breeding an animal that can produce a problem doesn't make you a bad person or the dog or its sire and dam bad dogs. Breeding is about making tradeoffs, and how you manage those tradeoffs. "

McQuinn said her breeding ideas apply to more than CMO: "If you choose to breed an animal that might produce a problem, that doesn't excuse you from an obligation to disclose that possibility. The course of action you take with an outstanding animal might be different than with a lesser animal. The rules also are a little different if you're breeding a dog than a bitch. Proceed at your own risk, but be up front about it!"

"I definitely don't want to produce it again. If a dog has produced CMO, I would want to know about it before breeding," says Jeannie Passmore (Passmore's, Seattle, WA).

Passmore's first Scottie litter was about 30 years ago. Her first case of CMO came about two years ago. The dog that produced CMO has been bred many times without producing CMO, and produced it only with an outcross breeding.

"I felt badly I didn't even recognize something was wrong with the puppy's mouth," remembered Passmore. "I'd put her collar on, and she'd scream. For a few days, she didn't want me to touch her

jaw or skull. The main thing to emphasize is to recognize the symptoms right away, so you can help the dog."

Passmore's puppy was diagnosed from symptoms at about four months old. "CMO didn't seem too harsh on her. It wasn't as bad as I thought it would be," said Passmore.

Passmore's experience points out that diagnosis may sometimes be determined by physical symptoms alone. Working on the case with geneticist Dr. George Padgett, Passmore x-rayed her puppy twice. Neither film confirmed the presence of CMO. "But what I saw was typical symptoms of CMO," said Passmore. "People can't take a clear x-ray as absolute truth, at least when symptoms are present.

"If I 'go out' for a breeding, I would like to know if there's been CMO. It wouldn't hurt people to ask that before breeding," suggests Passmore. "What people should ask is not if the stud owner has ever 'had' CMO, but has the dog or have the parents of the dog in question produced it. Ask specifically about whether a certain dog has produced it, rather than about the overall line."

A Tough Little Guy

Breeder X's CMO puppy had a totally different time with CMO than Passmore's affected puppy. Puppy X had several crises and almost died. His CMO was first suspected at 10 weeks old. The dog is 2 1/2 years old now, and until recently had relapses caused by after-effects of his treatment. He's been hospitalized several times, including one week at a veterinary university.

"His life wasn't in jeopardy because of the CMO, but from the indirect effects of the treatments," said Breeder X. She attributes the puppy's problems to high doses of prednisone and a weakened immune system.

"I still have my boy. Some told me to put him down. I'm glad I didn't. I will always have him. I didn't realize something was wrong with him until friends said I should have him checked. One lesson I learned-when CMO is very severe, you can keep them alive...you can, but it takes a lot of work. I think the treatment stunted his growth. He's not as big as a male should be, but is a very happy boy for going through all he did. He's been neutered, and his mother has been spayed. His aunt was bred once, but I won't breed her again. I'm so glad this DNA study is going on."

Gail Gaines (Neidfyre, Nashville, TN) had her experience with CMO 35 years ago with her first bitch. "I bred her four times. The last three litters were to the same dog. Three in the fourth litter were affected. I was flabbergasted. One puppy had to be fed through a straw. Its mouth was 'glued' shut."

One of the three affecteds was not diagnosed by a vet. When the owners brought it for grooming, said Gaines, "I could feel the deformed jaw. I knew what it was. That puppy had no pain. He never missed a meal and lived to be 17 years old. I never had CMO again myself."

Gaines did have a male about 10 years ago that produced CMO with an outside bitch. She was surprised because, "I had bred so tightly for so many years...then had it show up with an outcross."

Gaines is asked, "Can Scotties have CMO 'secretly?' I answer, "Yes," said Gaines. "Some dogs don't seem to be bothered by it."

Should breeders ask about health problems like CMO when breeding? "I would!" said Gaines.

Gaines has a clause in her stud contract that could be a model in encouraging open give-and-take between breeders: "All breedings are a joint project of the owners of the sire and dam. It is hoped that an honest discussion of what each has to offer and of concerns on each side can be held prior to the breeding to produce the best possible offspring. We hope for the best possible offspring. We hope for the best the breed can be.

Enough to Make You Quit

Carla LaCoe (Whiskybae, Fort Worth, TX) is another breeder who produced CMO long ago. Her affecteds came in the late 1970s and early 1980s. LaCoe's surprising experience emphasizes the fact that the gene can turn up when least expected. LaCoe purchased within eight months two bitches from two top, unrelated lines. She bred the bitches to two leading dogs and produced CMO in two of the three litters.

One affected litter was the repeat of the breeding that produced four champions in a six-puppy litter with no CMO-affecteds. The repeat breeding produced one CMO-affected puppy and three normals.

The second bitch was bred back to a dog from the bitch's own line and produced one CMO-affected out of six puppies. The co-owner of that litter put down her pick puppy when CMO was diagnosed. LaCoe spayed/neutered the rest of the litter except the second pick bitch. With the idea to bring CMO out if the gene was there, LaCoe bred that littermate of the affected back to a dog in the same line as her sire and dam. The five puppies included two affecteds.

The experience finished LaCoe's co-owner of the two CMO-producing bitches as a breeder of Scottish Terriers. Instead of giving up, LaCoe went back to her original line, retaining only one animal from the last affected litter. LaCoe bred that bitch carefully to distance herself from the CMO gene. The strategy has worked for LaCoe. She is five generations from the last CMO-affected litter, and has never produced CMO again.

LaCoe used Azium^R (dexamethasone, an anti-inflammatory corticosteroid) with success in treating her CMO puppies. Her daughter raised "Shafer," the affected male from the last CMO litter. They discovered "Teddy," the daughter's Norwich Terrier, could predict the Scottie's CMO attacks. "Teddy" would start licking "Shafer's" head 24 to 36 hours before the pain would start, apparently because "Shafer's" head felt hot. Before long, whenever "Teddy" began licking "Shafer's" head, LaCoe's daughter administered additional Azium^R. "Shafer's attacks were milder and more widely spaced than those of his affected littermate, which LaCoe thinks may be because the Norwich prompted early treatment.

LaCoe says that her last CMO puppies received low doses of Azium^R every day after their diagnosis until about a month after the last attacks, with additional multiple doses during attacks.

She thinks continuous treatment of CMO puppies may be more effective than treating only during attacks.

Make It a Learning Experience

Kieris Q'Neill (Scotwynd, Whonnock, B. C., Canada) is philosophical about her exposure to CMO. "It's a learning experience. I was devastated when I first saw it. I had no idea how much pain the puppies go through. On the other hand, I'm glad I had it. I can objectively look at my breeding program. I might not have bred Gavin to a carrier bitch for a dozen breedings, but instead did it on his very first breeding. I know more about my bitch and dog."

O'Neill's CMO litter came less than two years ago with two affecteds among the five puppies. Like other breeders, O'Neill worked with geneticist Dr. George Padgett. She x-rayed all five in the affected litter - at four months, seven months, one year and at 18 months.

O'Neill, who holds an undergraduate degree in physiology and medical genetics, worked as a lab tech for 14 years and completed two years of medical school. She's used her experience with CMO to learn; she says, "I'm using my CMO as a teaching tool. I'm taking the x-rays to veterinarians in the area."

Test breeding is a tool O'Neill also has used. She's done three test breedings, though different than Stephens' test. O'Neill used two known carriers instead of an affected animal as breeding partners for the two Scotties she hoped to "clear." Test breedings using a carrier instead of an affected animal take more clear puppies to establish a high percentage chance of "clear."

"In the two breedings on 'Quin,'" said O'Neill, 'Willis' genetics text notes that eight normal puppies give 'Quin' a 90% chance of being clear of the CMO gene." O'Neill's other test breeding produced three normal puppies, but that few give only, a 57.8% chance of being clear of the CMO gene.

Do persons ask about CMO before breeding? I asked a few breeders with widely-used stud dogs.

"People are not asking about CMO-as about some other things like Scottie Cramp,' said Charla Hill (Charthill, Piedmont, SC). "The questions are more like, 'What have you seen genetically?' People who know me don't even ask about certain things-like vWD-because they know I test. Our dogs have never produced CMO. I would hesitate to use someone's dog without asking a lot of questions!"

"Do people ask if 'Tony's' produced CMO?" I asked Jane Phelan (Caevnes, Dallas, TX). I had inquired myself before breeding my possible carrier bitch to "Tony" in late 1995.

"No" is still the answer, Phelan says, "'Tony' has never produced CMO that I am aware of, but people don't ask about CMO, or about health problems, in general." She remembers being asked directly about CMO just once besides my query.

"I would welcome people asking me about 'Tony's' genetic history: what he produces or does not produce. People truly do not ask about health problems, but when they know a dog produces a

problem (like Scottie Cramp), they will go to great lengths-maybe breed to a dog that hasn't been used much and hasn't had enough puppies to know what he produces, rather than to a dog known not to produce CMO, vWD, epilepsy, skin problems, etc."

Regarding pre-breeding questions about her stud dogs, Barbara DeSaye (Sandgreg, Lpeer, MI) also says she gets few questions about health: "People ask the faults of a dog, but not about health. I've never been asked about CMO. We've never produced a case of CMO in all our years of breeding, and I do breed pretty tight." DeSaye and husband John have bred Scotties for 32 years.

"I have great hopes for the CMO DNA test," added DeSaye, STCA Health Trust Fund chairperson. "I would like to see everyone who possibly can donate, donate something. This is for the entire breed! We need every bit of help-even with ideas."

What pre-breeding advice would you give owners who know the CMO gene is in their backgrounds? I asked Miriam Stamm, of Anstamm. "I would ask the owners of the studs if there have been any recent incidences of CMO in their kennels, if any of the stud dogs they're using have produced it," replied Stamm. Like Hill, Phelan and DeSaye, Stamm says most persons with bitches to breed aren't asking many health questions.

If the AKC's Canine Health Foundation approves matching funds for the joint Scottie/Cairn/Westie CMO DNA research, we could have a linkage-based DNA test for CMO within 3 1/2 years. Until that time, our protection against producing CMO lies in asking questions; specific questions; making judicious breeding choices; utilizing studs test-bred "clear" of CMO (especially for bitches with high carrier risk); beginning a CMO registry for Scottish Terriers; and perhaps establishing an STCA CMO Advisory Committee.

Author's Note: "Breeders quoted in this article approved use of their names, the names of dogs mentioned and material used. Breeder X approved use of the material if used without a name."