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TRICUSPID VALVE DYSPLASIA

Study Underway to Identify Genetic Marker

TRICUSPID VALVE DYSPLASIA STUDY

IN LABRADOR RETRIEVERS FOCUSES ON GENETICS

“Crosby” (Southern Cross At Sight To Sea MH QAA) was diagnosed with moderate tricuspid valve dysplasia after siring a litter that produced two affected puppies.

Bridget Bodine never worried about cardiac diseases in her field trial Labrador Retrievers because she had been told they occurred rarely. When her Master Hunter retriever, “Crosby” (Southern Cross At Sight To Sea MH QAA), was diagnosed with tricuspid valve dysplasia (TVD)

at 4 years old in early 2016, it was devastating.

“The veterinarian picked up a heart murmur during an examination after Crosby sired a litter with affected puppies,” says Bodine, of Factoryville, Pennsylvania. “We were referred to a veterinary cardiologist





for an echocardiogram. The report indicated Crosby's defect was moderate in severity and unlikely to cause clinical signs, though he should not be bred."

Crosby's case was a classic example of TVD being discovered in a seemingly healthy dog after the dog produces puppies with the heart disease. Before the diagnosis, Bodine bred Crosby to her bitch, "Faye" (Briarglenn's Running On Faith JH), whose lineage was three-quarters conformation and one-quarter field performance, producing two affected puppies from the litter of six puppies.

A potentially fatal disease, TVD is the most common heart defect in Labrador Retrievers, though the disease incidence is not known. Historically, the defect seldom has been seen in field trial lines. In contrast, those with conformation

lines are likely aware of TVD, as the disease has affected show-bred dogs for many years.

A congenital condition, TVD occurs when the tricuspid valve forms improperly during embryonic development. The valve, an irregularly shaped flap, adheres to the ventricle wall in utero and then detaches during normal cellular degeneration. In dogs with TVD, the flap remains connected to the ventricle wall, hampering the tricuspid valve from preventing oxygen-depleted blood from seeping back into the right atrium. In normal dogs, the blood flows from the right atrium to the right ventricle, then the pulmonary artery and on to the lungs to become oxygenated.

The defect ranges from mild to severe based on whether the malformation causes a small or signif-

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icant leakage. In severe cases, the right side of the heart works hard to compensate for the deficient tricuspid valve, typically resulting in congestive heart failure within a dog's first few years. A dog with mild or moderate TVD may have a subtle heart murmur and appear normal for years while enjoying an active lifestyle. Some affected dogs live comfortably and have a normal life span.

Since a heart murmur, usually the first indication of a possible problem, can be subtle, this makes it challenging to diagnose TVD. An echocardiogram, or ultrasound of the heart, provides a definitive diagnosis. Other diagnostic tools include a radiograph, or X-ray,

which may show enlargement of the right side of the heart, and an electrocardiogram (EKG) can be used to detect atrial arrhythmia associated with enlargement of the right atrium.

"Tricuspid valve dysplasia often is not picked up in a young dog, and sometimes even when they are older, it can be missed until they develop signs of heart failure," says Kate Meurs, DVM, PhD, DACVIM (Cardiology), professor and associate dean for research and graduate studies at North Carolina State University.

Dr. Meurs is the lead investigator of a [recently funded AKC \(American Kennel Club\) Canine Health Foundation study](#) that aims to identify the genetic variant, or possibly variants,

THE ABC'S OF TRISCUSPID VALVE DISEASE IN LABRADOR RETRIEVERS

By Fran Smith, DVM, PhD, DACT

Vice President and Health Chair of the Labrador Retriever Club

A Always have every puppy auscultated by a veterinarian prior to placement in a new home. If a murmur is heard, it needs to be investigated for the significance and impact it may have on the puppy's life.

B Be honest and forthcoming. Be sure to do all the required tests for CHIC (Canine Health Information Center) for your breed and be a top-tier elite breeder who does all the recommended tests as well. Be sure to post the results both normal and abnormal on the OFA (Orthopedic Foundation for Animals)

website. The purpose of this information is to allow owners and breeders to make informed decisions.

C Choose to make a difference in your breed's health. While a bitch contributes both good and bad traits to her puppies, a stud dog if popular can both improve and devastate a breed if he sires many litters. This is particularly important for our big-winning Field Champions and Amateur Field Champions because they sire lots of puppies.

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that causes TVD. The Labrador Retriever Club and the Labrador Retriever Club of the Potomac Top Twenty Gala Foundation are supporting the study. They hope it will provide genetic insights that will enable affected dogs to be recognized early, and thus help breeders minimize the risk of producing affected dogs.

COMPLEX GENETIC PROFILE

The TVD study, which began in June 2018 and will run until May 2020, involves a comparison of the genome sequences of affected and unaffected dogs. Thus far, whole genome sequencing has been performed on 10 affected dogs and compared to a database of 181 unaffected dogs.

One of the first studies of TVD in Labrador Retrievers, conducted in the early 2000s by researchers at the Comparative Cardiovascular Catheterization Laboratory at Cincinnati Children's Hospital, evaluated 234 dogs representing 12 bloodlines. This study indicated that the gene mutation was likely located on canine chromosome 9 and that the defect had a dominant mode of inheritance. Since then, it has been shown that the disease probably has a complex inheritance pattern. Additionally, in a larger

study of less closely related dogs, the mutation did not map to chromosome 9.

The veterinary cardiologist and research team at Cincinnati Children's Hospital were studying the disease in Labrador Retrievers hoping to gain knowledge that would cross over and benefit humans with a similar congenital malformation that sometimes causes sudden death. The rare human condition is known as Ebstein's anomaly.

Testing for heart diseases in Labrador Retrievers is not included in the [breed's CHIC \(Canine Health Information Center\) program](#); however, the Labrador Retriever Club does recommend that breeders obtain cardiac clearances before breeding. An advanced cardiac clearance test is a comprehensive exam that includes an echocardiogram and is performed by a board-certified veterinary cardiologist. A congenital cardiac exam is based on a veterinarian auscultating the dog's heart by listening for abnormalities with a stethoscope.

"The reason the Labrador Retriever Club does not require advanced cardiac health testing and an echocardiogram in its CHIC program is because the test is expensive, ranging from \$300 to \$500, depending on the geographical location of

LABRADOR RETRIEVER OWNERS CAN HELP ADVANCE TVD RESEARCH

By participating in a clinical study underway at North Carolina State University, owners of Labrador Retrievers diagnosed with tricuspid valve dysplasia (TVD) can help advance research to identify a genetic variant, possibly several variants, for the heart disease. To participate, owners should submit a DNA sample and clinical documentation that their dog has been evaluated by a veterinary cardiologist and confirmed to have TVD. For information, contact Kate_Meurs@ncsu.edu

the veterinary clinic, and because the prevalence of this disease and the mode of inheritance is not known,” says Fran Smith, DVM, DACT, vice president and health chair of the Labrador Retriever Club.

“In the case of popular stud dogs, they should definitely have an echocardiogram to be sure they are free of TVD,” she says. “Females also can be carriers and pass this disease to their offspring, but they will not have near the number of puppies as an affected popular sire.”

Another research goal is to gain information about the prevalence of TVD in Labrador Retrievers.

“Like so many things in veterinary medicine, there isn’t good prevalence data on TVD partly because medical records are neither standardized nor electronically shareable across veterinary clinics or even veterinary teaching hospitals,” says Diane Brown, DVM, PhD, DAVCP, CEO of the AKC Canine Health Foundation. “To identify and predict the number of dogs affected by this heart disease is challenging.”

Ultimately, the findings of this study could benefit other breeds

of dog predisposed to TVD. The disease occurs in several large breeds, including Boxers, German Shepherd Dogs, Golden Retrievers, Great Danes, Great Pyrenees, Irish Setters, Mastiffs, Newfoundlands, and Old English Sheepdogs, as well as mixed breeds.

BREEDING ADVICE & TREATING AFFECTED DOGS

Because so little is known about the genetics behind TVD, breeders with affected dogs are advised not to breed them. What’s more, it falls to breeders to ensure puppies are healthy before they go to new homes.

“Puppies should be examined at 7 to 8 weeks of age and have their hearts auscultated before being sold to families,” Dr. Smith says. “The responsibility lies with the breeder and owners of the litter to be sure puppies don’t have TVD. It is heartbreaking for new owners to learn a puppy has what could be a fatal heart defect, and it’s even worse if the puppy dies at an early age.”

Treatment for TVD provides palliative care but is not curative.



Diuretics can help reduce fluid buildup in the lungs or chest cavity, and a medication with positive inotrope effects such as pimobendan can help improve the heart's pumping ability and reduce the heart's workload. The survival rate varies on an individual dog basis.

"Some dogs can live with the disease their whole life and only be mildly affected," Dr. Meurs says. "Other dogs will be unresponsive to medications and live a much shortened life span. Each dog is a little different, and so much depends on the quality of care and how severely malformed the tricuspid valve is."

After Crosby was diagnosed with TVD, Bodine set out to increase awareness of the disease among fellow field trial and hunting test enthusiasts. "I wanted to alert others about the possibility that this gene mutation could affect their dogs as well," she says. "One field trial friend organized a heart health clinic a couple of years ago. Of the 14 dogs that had echocardiograms, three had TVD."

Meanwhile, Crosby, her handsome black Labrador, continues to do well. Since being diagnosed with TVD, Crosby has passed 18 of 19 weekend hunting tests and qualified for three Master Nationals. "We are working on qualifying for the 2019 Master National in Cheraw, South Carolina," Bodine says.

Bodine was so pleased with how well the first breeding of Crosby and Faye turned out that she repeated the breeding before learning about the two affected puppies from the first breeding. One of those puppies had a mild case of TVD, and the other one was moderate.

Addressing the problem head on, Bodine had the seven puppies in the second litter echocardiogram tested at 10 weeks of age. Fortunately, none was affected with TVD.



Although Faye was not tested for TVD, Bodine had her spayed and retired to a pet home.

Crosby, who is affected with TVD but unlikely to develop clinical signs, is living life large. His breeding days are behind him, but it is full speed ahead on practicing water marks and land retrieves getting ready for the 2019 Master National. ■

Purina appreciates the support of the Labrador Retriever Club Inc., particularly Fran Smith, DVM, PhD, DACT, LRC vice president and health chair, in helping to identify this topic for the *Purina Pro Plan Labrador Retriever Update*.

PURINA PUPPY CHOW ENHANCES NUTRITION FOR PUPPIES

During the first year of life, puppies need more protein than adult dogs and essential nutrients to support their growth and development. *Purina Puppy Chow* is launching three newly formulated formulas in October that provide 30 percent more protein than *Purina Dog Chow Complete Adult* dog food. The new formulas have added vitamin C, an antioxidant, and contain DHA, an essential omega-3 fatty acid, for brain and vision development. They also contain antioxidants to support a healthy immune system. Look for new packaging featuring children and puppies on these *Puppy Chow* formulas: Complete, Tender & Crunchy, and Natural. *Purina Puppy Chow* is sold at grocery stores, major pet food retailers and online.



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PURINA DOG CHOW SALUTES VETERANS WITH SERVICE DOG SALUTE CAMPAIGN

Purina Dog Chow is donating up to \$500,000 to support Tony La Russa's Animal Rescue Foundation's (ARF) veteran's program. The campaign, called *Dog Chow Service Dog Salute*, will benefit ARF's expanding veterans program that matches veterans with rescue dogs whom they train to become their own service dogs. Here's how it works: Through Veteran's Day, Nov. 11, *Dog Chow* will donate \$1 for each unique share on Facebook of the BuzzFeed video featuring the powerful stories of veterans and rescue



dogs brought together by ARF (up to \$250,000). In addition, the brand will donate 5 cents from the sale of each specially marked bag of *Purina Dog Chow Complete Adult With Chicken* dog food (up to \$250,000) through Nov. 11. Located in Walnut Creek, California, ARF has rescued more than 38,000 dogs and cats since it began in 1991.

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