


Crucial Facts about

CRUCIATE DISEASE

By Sarah Shull, DVM, CCRT, ACVSMR (Canine) Resident

Part III



A black dog is running through shallow water in a grassy field. The dog's head and front leg are visible on the left side of the frame. The water is splashing around the dog's leg. The background is a blurred green field.

THERE ARE NUMEROUS DISEASES that affect dogs that are in fact preventable; for example, with a simple vaccine series, and minimizing exposure during puppyhood, parvovirus is virtually non-existent in field retrievers. This is not the case with cranial cruciate ligament (CrCL) disease. In this article we will address ways to minimize this disease in an individual dog. However, there should be emphasis on the broader picture, which is how to minimize it within the population as a whole. As it exists right now, CrCL disease is a predisposition that affects many different pedigrees and can have a big impact on their life and career.

I hope one thing you have taken away from this article series is that it wasn't the traumatic event that led to your dog's CrCL rupture. It was a predisposition that could have been caused by many factors: genetics, obesity, inadequate conditioning, and sometimes just bad luck. Only a small number are truly caused by a traumatic event even though it may have seemed

like that was the cause in the moment, but it is likely that the CrCL was not healthy when it happened.

The proof of this condition as a true disease comes from inspection of the CrCL under a microscope. A traumatic injury to a ligament would appear as an organized normal structure that has been disrupted whereas in our affected CrCL disease patients, the ligament is abnormal in composition, without normal scaffolding, and the cells of the ligament are degenerated.

Here are the facts as we know them right now:

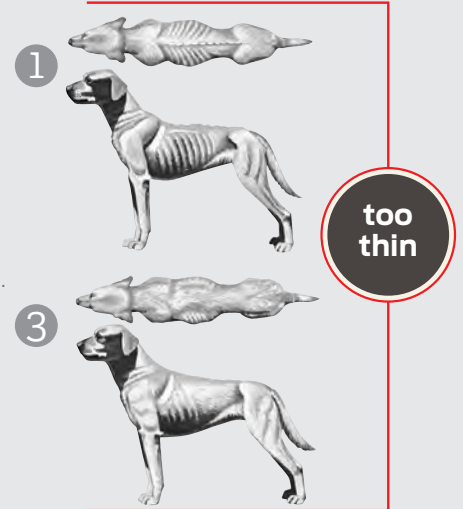
- CrCL disease is a degenerative condition of the cranial cruciate ligament
- Dogs that rupture one side are likely to blow the other (>50% within a year)
- Overweight dogs are 4x more likely to rupture their CrCL
- Spaying/neutering may increase the risk of CrCL
- Based on ongoing research from the University of Wisconsin, CrCL disease is heritable in Labradors

Three Days to Kill, "Vivi," handled by Sarah Shull, DVM;
photo by Sarah Shull.

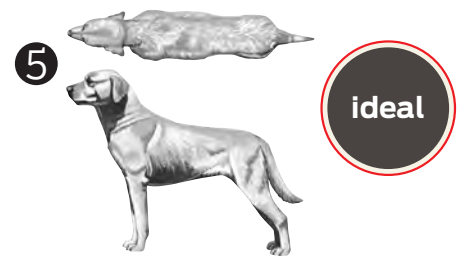
Body Condition System



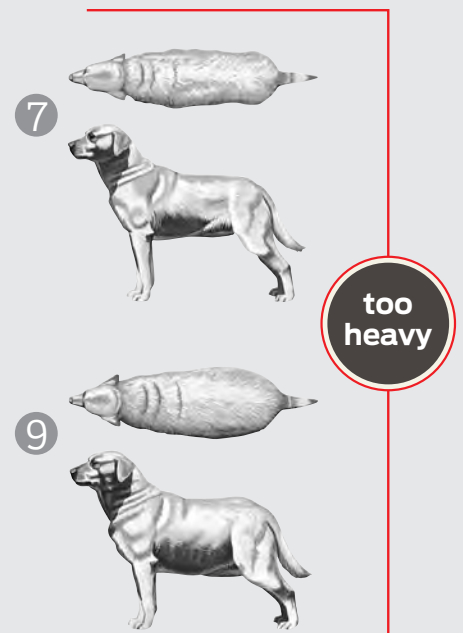
1. Ribs, lumbar vertebrae, pelvic bones and all bony prominences evident from a distance. No discernible body fat. Obvious loss of muscle mass.
2. Ribs, lumbar vertebrae, pelvic bones easily visible. No palpable fat. Some evidence of other bony prominence. Minimal loss of muscle mass.
3. Ribs easily palpated and may be visible with no palpable fat. Tops of lumbar vertebrae visible. Pelvic bones becoming prominent. Obvious waist and abdominal tuck.



4. Ribs easily palpable, with minimal fat covering. Waist easily noted, viewed from above. Abdominal tuck evident.
5. Ribs palpable, without excess fat covering. Waist observed behind ribs when viewed from above. Abdomen tucked up when viewed from side.



6. Ribs palpable with slight excess fat covering. Waist is discernible viewed from above but is not prominent. Abdominal tuck apparent.
7. Ribs palpable with difficulty. Heavy fat cover. Noticeable fat deposits over lumbar area and base of tail. Waist absent or barely visible. Abdominal tuck may be present.
8. Ribs not palpable under very heavy fat cover, or palpable only with significant pressure. Heavy fat deposits over lumbar area and base of tail. Waist absent. No abdominal tuck. Obvious abdominal distention may be present.
9. Massive fat deposits over thorax, spine and base of tail. Waist and abdominal tuck absent. Fat deposits on neck and limbs. Obvious abdominal distention.



Crucial Facts about Cruciate Disease

Body Condition Scoring: Is your dog fat?

Retrievers come in so many shapes, sizes and hair coat thicknesses that variations in weight across a breed are inevitable. Breed standards give general guidelines, but still don't account for the variations in individuals. You can't just say well they weigh x amount so they can't be fat or even assess whether they are out of shape just by looking, you need to feel them. Can you feel and/or see their ribs?

The most common method for assessing proper weight, is using a body condition scoring (BCS) system. As shown in the graphic BCS is a quick assessment evaluating ribs, waistline and tuck of the abdomen from top and side, with the ideal set at 4-5/9 and each unit above 5 representing an additional 10% over the correct body weight. Within the general pet population 55% of dogs in the US were overweight in 2018 and this number had increased by 160% from 10 years prior. Though field retrievers are not always representative of the pet population, the impact of this increase is that we are so used to seeing overweight dogs, it is hard to remember what ideal really is. To add to this frustration, I am sure many of you with dogs at a 4/9 have been told your dogs are underweight or that you should feed them which helps to perpetuate the problem.

Fat puppies are not cute. When fat cells are made and deposited, they never leave. They may shrink and grow, but they are always there. So that fat puppy not only puts extra strain on their growing musculoskeletal structures, they also become harder to maintain in proper body condition throughout their lifetime.

Adipose tissue (a collection of fat cells) is an active organ, and when there is an increased amount of it, it not only adds to the mechanical stress on a body, it also creates inflammation and chemicals that directly degrade and break down cartilage.

A groundbreaking 14-year study by Purina researchers showed that feeding dogs to an ideal body condition throughout their lives can significantly extend a dog's lifetime by almost 2 years. Forty-eight eight-week-old Labradors were paired by sex and litter, then randomly assigned to either a control or restricted-fed group. Dogs in the control group were free fed as puppies and then given a consistent amount of food beginning at about 3 years old. Dogs in the restricted-fed group received 25% less than the amount eaten by their paired littermates. Although the restricted-fed dogs enrolled generally developed the same chronic conditions as they aged, the need for treatment of those conditions was delayed. Long-term treatment of osteoarthritis was begun an average of 3 years later and treatment for other various chronic conditions was initiated an average of 2 years later in the restricted-fed dogs.

How to achieve ideal body condition

Feeding is not something that stays the same week to week and month to month. Dogs change, therefore, their diet should be adjusted as needed by monitoring body condition and basing their diet on the results. Time of year, environment, age, and exercise all directly affect nutritional needs.

Weight loss in dogs does not have to be complicated. It is likely your dog already exercises a fair amount therefore the key is calorie control. I start by calculating the daily calories being consumed on their current diet and decrease the daily amount by approximately 25%. In athletic dogs, maintenance of muscle is extremely important therefore finding the right food to feed your dog to keep their muscles healthy is vital. Most light or less active foods may not have sufficient levels of protein and fat so learning everything you can about your dog's food and discussing nutrition choices with your veterinarian are both important when developing the proper diet plan.



BCS 4 Even with the thicker haircoat, can see last rib and tuck of waist and abdomen.



BCS 6-7 Waist and abdominal tuck minimal but present. Ribs not visible. 10-20% overweight, very common body condition seen at field events.

BCS 6-7
Waist is minimal when viewed from above. Abdominal tuck minimal but present. Fat deposits over lumbar area and base of tail.



If making the changes to diet and lifestyle do not seem to be helping alleviate the weight problem, there may be another issue causing the weight gain. Some dogs have metabolic diseases such as low thyroid hormone (hypothyroidism) or hyperadrenocorticism (Cushing's) that make weight loss extremely difficult, so if weight loss continues to be a struggle, simple blood tests can be done to screen for these diseases.

Crucial Facts about Cruciate Disease

Predisposing Factors to CrCL Disease

Breed – Although the five most commonly affected breeds have been found to be the Newfoundland, Rottweiler, Labrador Retriever, Bulldog and Boxer, studies have shown an increased prevalence in Golden Retrievers, and Chesapeake Bay Retrievers as well.

Ageing – As a dog ages, the strength of their CrCL decreases. This change is shown to be more severe in larger breed dogs. For example, a dog greater than 15 kg (33 pounds) has measurable decreases by 5 years old whereas dogs less than 15kg (33 pounds) are affected closer to 7 years old. This difference in ligament degeneration leads to smaller dogs being affected later in life by a cruciate rupture than large breed dogs.

Spaying and Neutering – Research surrounding the effect of neuter status on CrCL disease has become popular in recent years. The majority of this research supports the idea that there is a correlation with presence of CrCL problems, and a dog being spayed or neutered. This issue seems to be more prominent in spayed females, potentially with up to a two times higher risk in this population compared to intact females. However, there may be complications with interpreting this research as spayed females also tend to be overweight, so the resulting CrCL disease may be related to the fat vs the neuter status. Age of alteration in relationship to skeletal maturity is also being investigated as sex hormones play a role in the timing of proper growth plate closure which in turn controls bone length.

Genetics – The overrepresentation of certain breeds in cases of CrCL disease, along with the high prevalence of bilateral cases among these breeds have been the basis behind the existence of a genetic component. In combination with environmental factors, the genetic influence may be direct and result in altered structural properties of the CrCL or indirect in controlling the conformation factors predisposing our dogs to increased stresses on the CrCL. Known genetic orthopedic diseases such as hip dysplasia and luxating patella can be present often in the retriever population and directly contribute to increase stresses on the CrCL as well. Regardless of whether the genetic influence is direct or indirect, there is notable evidence that genetics play a part in CrCL disease.

Conformation – Conformational factors that have been implicated with CrCL deficiency include an upright/straight hind limb stance, a bow-legged stance (bulldog like), narrowing of the notch at the end of the femur where the cruciate begins, increased tibial plateau angle (TPA) and size of the tibial tuberosity. Straight legged dogs have less angle to their stifle/knee and are thought to have relative steeper TPA slopes and increased CrCL rupture. Bow-stance stance can possibly lead to increased CrCL stretching and laxity over time. Structural issues are very difficult to study as the issue can be difficult to measure and difficult to replicate while controlling all other variables.

Tibial Plateau Angle (TPA) – As discussed in Part 2, a steep TPA contributes to increased forces on a CrCL. A steep TPA without ligament degeneration may not cause rupture. Some studies have shown increased TPAs in dogs with clinical CrCL disease versus those without clinical CrCL disease, whereas other studies have found opposite results showing the steepest angles in unaffected Labradors. At this time, TPA alone does not make a diagnosis of CrCL disease, it is used for surgical planning and to support the diagnosis.

Prevention

Maintaining proper body condition is currently the most concrete prevention recommendation. It not only helps to prevent CrCL disease, it modulates diseases in other joints throughout the body and helps

prevent other diseases such as diabetes. Avoiding spaying and neutering as a prevention strategy may not be the most effective strategy as the studies are not always clear on its effects on the CrCL. In addition, there are many other things to take into consideration when talking about removal of the organs of reproduction.

Although exercise and conditioning are discussed often around the CrCL disease topic, no solid conclusions can be made at this time. The ongoing trend of training and exercising our dogs harder earlier in their career make for great discussions, and potential for learning more about the effects. Our derby age dogs are doing more complicated and longer marks over terrain of increasing difficulty. Many are learning to handle and stop on whistles at high speeds younger and younger. All dogs have a tendency or “handedness” to naturally turn consistently to one side or the other so as with horse racing around tracks, a certain side may be subjected to higher repetitive forces chronically. Our retriever breeds are typically not skeletally mature until around 18 months and have growth plates active, soft and open during the 6-12 month active age during early yardwork transition therefore that is when they are most vulnerable, and why there is some speculation that early intense training may impact the CrCL.

By avoiding certain exercises, we are controlling factors we perceive we can control, and we could in turn be minimizing or delaying risk, and not just for CrCL disease. Minimizing high impact repetitive activities when we can could help with chronic ligamentous breakdown of wrist (carpus), ankle (tarsus/hock), and shoulder or even help with osteoarthritic inflammation in hips, elbows and all joints of the body. No matter what prevention strategy employed, risk may not be completely eliminated in a predisposed dog.

Joint health supplements and treatments previously discussed in the treatment of osteoarthritis such as the oral products of Dasuquin and Wellactin (omega fatty acids) and injectable Adequan are often used within a prevention plan, although little is known about the effectiveness of these before the disease has begun. If these products could minimize inflammation from small daily microtraumas as they engage in training, trialing, and being a dog, we may be able to slow the inevitable progression of some joint diseases. Keeping the joints healthy in our athletic dogs can never be a disadvantage, so I fully support the use of these products in this way.

Screening

In purchasing an adult dog or puppy, there is no absolute way to screen and eliminate all chances of CrCL disease occurring in the future. A thorough veterinary physical examination and history can assist with detection of underlying disease by assessing for gait abnormalities/lameness, changes in ranges of motion of stifle and by palpating for medial buttress, joint swelling or instability. Good quality and well positioned radiographs (X-rays) can be taken of both stifles to evaluate TPA and to look for active inflammation or early joint changes. Although abnormal radiographic findings would indicate potential imminent disease, normal radiographs would not clear the dog for the development of future issues as the ligament itself cannot be viewed, only what it affects.

Breeding decisions

Once the heredity of CrCL disease is more widely accepted, effective conversations can begin. Current complicating factors include the fact that CrCL disease may not show up until 4-5 years of age often after litters have been produced. Also, breeders may not have all of the information on the dogs involved as dog owners may not even think to report the cruciate rupture of progeny. Lastly there are so many other issues such as obesity and injury that play causative roles as well that it is hard to cover all the bases.

The worst thing in my opinion is to take too aggressive of an approach to eliminate this disease quickly in a population. The “throw the baby out with the bath water” approach to genetic diseases within populations often leads to elimination of other desirable characteristics as well as the propagation of other more dangerous diseases. An accusatory approach is also discouraged. This is not a Nancy Kerrigan/Tonya Harding situation, no one purposefully ruptured your dog’s cruciate ligament. This is an ongoing discussion with new information constantly being presented, and so merely being aware of the situation and taking steps to start an open discussion within the community is a good start.

There are various strategies within a breeding program to decrease diseases such as CrCL. Delaying breeding of stud dogs or dams until they are known to be clear of the disease after the typical age of onset of disease can be considered. In cases where the parents of the stud and dam are free from clinical disease at a later age, pairings at younger ages than age of onset of disease can be considered. Additionally, inquiring into not just the vertical pedigree of parents and grandparents, but also into the horizontal pedigree of the siblings of parents and the offspring from previous litters may be beneficial when making breeding decisions. Following entire litters of dogs produced by our stud dogs and dams throughout their lifespan and knowing more information about other relatives only strengthens our decision making. Breeding decisions and puppy buying decisions are complex and are made by balancing many factors and weighing individual preferences. Eventually we will have a genetic test for CrCL disease, but even that will just be a tool for assessing risk, and there still won’t be a black and white answer in every case.

COMING IN THE NEXT ISSUE

Part IV – Rehabilitation

Adjunct treatments

FACTPLO patient from Part II is recovering after surgery very well. His leg use and comfort continues to improve as he is doing his daily therapeutic exercises, walks and swims. We will focus more about his specific recovery in the next issue.

Does the genetic predisposition indicate that you can only do so much to delay the inevitable?

Here is the obvious conclusion to be drawn: We owe it to the dogs to maintain ideal weight through body condition assessment and keep them in excellent condition specifically designed to prepare them for the sport and their activities. Avoiding unsafe terrain and unnecessary impact and trauma is our duty not just to help prevent cruciate rupture, but to minimize risk for the multitude of injuries that could occur. What truly defines a trauma? Many of these dogs are doing the same activity they have thousands of times when they rupture their cranial cruciate ligament. I’ve seen them even rupture on leash. So is that truly a trauma or just a naturally occurring force that they should be able to handle and can’t due to their predisposition.

CrCL rupture can of course be caused by a traumatic event just as a dog predisposed to CrCL disease can function through a career without a rupture. However, it’s more likely than not than the incidental “trauma” was preceded by the disease, which is why the cruciate disease in the other leg is often symptomatic a short time later.

You should have found the survey link in your recent emails ...

We are contacting you as an active member of the retriever field sport community. My name is Sarah Shull DVM, and I am reaching out to you both as the Service Head of the Sports Medicine and Rehabilitation Service at Michigan State University and as an owner/handler/breeder and judge passionate about dogs in the field. Together with Retriever News, we have been working to provide condition specific education and research dedicated to this population of dogs.

Here’s your chance to make a difference with the future health of your field dogs. Cruciate disease is a significant cause of hind leg issues in large breed dogs. We are collecting information about this disease within this population to help direct future research and to develop tailored treatment and prevention strategies.

Please help us by clicking the link and providing us with your experiences and thoughts about this disease. Your input is valuable even if you do not have personal experience with this condition in your dogs. The more people that participate, the more valid and complete the information will be. The survey should take no longer than 10 minutes and can be done on any computer or mobile device.

https://msu.co1.qualtrics.com/jfe/form/SV_6L2tJPtGV6n9V5P

If you have any questions about the study, you can contact Dr. Sarah Shull at shulldvm@cvm.msu.edu or 616-894-5887.

Thank You!

Thank You to the LRC & the Retriever Community for Your \$144K+ Contribution!

If you belong to the LRC or donate at checkout on EE – **THANK YOU!**

The Labrador Club and the Retriever Community

have combined to donate \$144,000 to

twelve (12) Canine Health Foundation Research Grants.

00741 – Polymicrobial Bacteria-Associated Inflammatory Stifle Arthritis/Degenerative Cranial Cruciate Ligament Rupture in Dogs

Labrador Retriever Club, Inc. – \$20,000

00833-A – Synovocyte Phenotypes and Antibodies Associated with Partially Disrupted Canine Cranial Cruciate Ligaments

Labrador Retriever Club, Inc. – \$6,000

01037-A – The Accuracy of Magnetic Resonance Imaging (MRI) for the Diagnosis of Meniscal Lesions in Dogs with Naturally Occurring Cranial Cruciate Ligament Insufficiency

Labrador Retriever Club, Inc. – \$1,000

01533-A – Development of a Canine Stifle Computer Model for Evaluation of Cranial Cruciate Ligament Deficiency

Labrador Retriever Club, Inc. – \$6,882

01584 – Conformation in Cranial Cruciate Ligament Deficiency in Dogs

Labrador Retriever Club, Inc. – \$11,118

01762 – Use of a platelet rich plasma-collagen scaffold to stimulate healing of cruciate rupture in dogs

Labrador Retriever Club, Inc. – \$30,000

01782 – Evaluation of Canine Stifle Cranial Cruciate Ligament Deficiency Surgical Stabilization Procedures Using a Computer Model

Labrador Retriever Club, Inc. – \$5,000

02229-A – Comparing the Functional Recovery of Dogs Undergoing TPLO Surgery with Arthroscopy or Arthrotomy: a Pilot Study

Labrador Retriever Club, Inc. – \$2,500

02624 – Embracing polygenicity of common complex disease in dogs: Genome-wide association of cruciate ligament rupture

Labrador Retriever Club, Inc. – \$20,000

0002405/0167 – Inhibition of Collagenolysis in Canine Cranial Cruciate Ligament During Rupture

Retriever News / Entry Express – \$6,000

01762 – Use of a platelet rich plasma-collagen scaffold to stimulate healing of cruciate rupture in dogs

Retriever News / Entry Express – \$2,500

02624 – Embracing polygenicity of common complex disease in dogs: Genome-wide association of cruciate ligament rupture

Retriever News / Entry Express – \$33,250

Research opportunities

Michigan State University Survey on CrCL disease

By now, you should have received an email with a survey link. Thank you to those of you that have provided information to this project so far. The survey is still open, please consider taking the survey if you haven't already. This is the first project dedicated to CrCL disease in field retrievers. This study is investigating the prevalence and impact of CrCL disease within this community. The information gained will be used as a springboard for other projects, funding, and to tailor treatment and prevention protocols.

University of Wisconsin Genetic Basis of CrCL Rupture

A long-term study at the University of Wisconsin-Madison School of Veterinary Medicine is focused on identifying the genetic basis for cruciate disease in the Labrador Retriever. They still need more samples, please consider supporting their mission. More information about this project and how to submit is provided in this issue.

Future Research

A study has been performed in agility dogs demonstrating the effects of the TPLO on their return to sport and the effects CrCL disease has on their future performance. Our next study will be to replicate a similar project in retrievers competing in field events so we can make the best treatment decisions for dogs within this sport.

As discussed with exercises and prevention, there is a lot we don't know about forces that go into the actions within a retrieve. We have begun the study design of kinematics of the retrieve using digital videography. This information will be used to quantify the motions so as we make changes in training or exercises, we can measure the difference. I am working with Dr. Rob Gillette on this project who has characterized these motions in racing Greyhounds.

There is ongoing research all over the world happening looking at ways to identify predisposing risk factors and to utilize targeted prevention strategies.

Summary

There is always more to learn and plenty to discuss about CrCL disease. You can be part of the solution by keeping up to date on the latest information, treatments, and prevention. This all will progress the most efficiently if we begin talking to each other, sharing our experiences and asking questions. CrCL deficiency is a complex and multifactorial disease and is yet to be fully understood. Genetics, structure, and exercise may be predisposing causes of this disease, while being overweight is directly correlated to risk of disease. Prevention and breeding strategies can be explored to minimize the disease in an individual dog as well as in the population as a whole. Exciting research is ongoing with more needed to fully comprehend all aspects of this impactful disease. One day the impact of this disease can be diminished in field retrievers, but this will only be possible if we all play a role in making this happen. ■

Information compiled in this article is from lectures from Dr. Loic Dejaradin, Michigan State University, Canine Cranial Cruciate Ligament Disease Part 1-Pathophysiology and 3 – Treatment and Prognosis, Drs. Fauron and Perry, Veterinary Times, 2017.

Content editing assisted by Jessica Hynes, 2nd year DVM student, Michigan State University.

Sarah Shull, DVM, CCRT, ACVSMR (Canine) Resident

Dr. Shull is an Assistant Professor in Small Animal Clinical Sciences and the Head of the Sports Medicine and Rehabilitation Service at Michigan State University in East Lansing, MI. Her special interests include field dogs and sporting breeds. She trains and competes in field trials and hunt tests with her own Curly-Coated Retrievers (and is even seen with Labradors these days) in Michigan. She can be contacted by email shulldvm@msu.edu.



UW Veterinary Care
UNIVERSITY OF WISCONSIN-MADISON

WANTED

Labrador Retrievers and Rottweilers for Study of Cruciate Rupture

The Study

The cranial cruciate ligament, also known as the ACL, is a major stabilizing structure in the knee of dogs and people. Non-contact cruciate rupture (rupture not associated with any known trauma) occurs in about 6% of Labrador Retrievers and 9% of Rottweilers. It is responsible for 20% of canine lameness and burdens U.S. pet owners with at least \$1 billion in healthcare costs each year. It is accepted that a majority of ruptures are not associated with trauma, but the reason dogs rupture their ligament is not known. It is likely that part of the risk that an animal has for developing this condition is genetic (inherited). We are working to determine the genetic contributions to the development of cruciate ligament rupture in dogs.

Who Qualifies

There are 2 groups of dogs that currently qualify for the study:

- Labrador Retrievers and Rottweilers with knee problems due to a torn cruciate ligament (torn ACL)
- Any Labrador Retriever or Rottweiler over 8 years of age

What Happens

This study requires one visit to UW Veterinary Care and no sedation is required. All patients receive a free orthopedic examination from a

board-certified surgeon. Free radiographs (x-rays) are taken of both knees. Blood is collected for DNA analysis. Owners are asked to provide pedigree or registration papers, if available.

Why Participate

This work is expected to result in the development of a genetic test for cruciate ligament rupture in dogs. This test would be available for use by any veterinarian. A blood or saliva sample taken in puppyhood would identify dogs at risk for non-contact cruciate rupture. This will provide information for purchasing and breeding decisions and allow medical intervention to slow disease progression.

Moreover, it has long been established that dogs and humans share a similar profile of diseases, and cruciate rupture is no exception. Evidence exists for genetic contribution to ACL (anterior cruciate ligament) rupture in humans. Therefore, it is possible that this research will contribute to human as well as veterinary medical knowledge. There is no charge to participate in this study.

More Information

Please contact:

Dr. Susannah Sample in the UW Veterinary Care genetics laboratory at genetics@vetmed.wisc.edu

For more information:

<http://www.vetmed.wisc.edu/lab/corl>

Revised AMP 2/10/16

Cruciate disease is a complex trait, which means that risk for developing a rupture is determined by environmental risk factors (e.g. being overweight) as well as genetic predisposition. Certain breeds are far more likely to develop cruciate disease than others. Newfoundlands, Rottweilers, and Labrador Retrievers are most often affected. A long-term study at the University of Wisconsin-Madison School of Veterinary Medicine is focused on identifying the genetic basis for cruciate disease in the Labrador Retriever. Pinpointing the genes that are associated with cruciate disease would enable development of novel treatments that could either prevent rupture or slow progression of the disease. The group also plans to use this information to develop a genetic test to identify dogs at high genetic risk for developing

the disease. Their initial studies show that cruciate disease is moderately heritable and highly polygenic--meaning many genes are involved in risk (not just one or a few). To identify which genes are most important to disease development, and to create an algorithm that could be used to predict dogs at high risk, the group needs genetic data from a very large number of Labradors that are both affected and unaffected. This work is supported by the AKC Canine Health Foundation. Owners can participate in-person at UW-Madison or through the mail. All dogs must be purebred Labrador Retrievers. Affected dogs can be any age. Unaffected dogs must be 8 years of age or older. For more information, contact genetics@vetmed.wisc.edu or call the Comparative Genetics Laboratory at (608) 265-5828.