

Juvenile Laryngeal Paralysis & Polyneuropathy

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Researchers at the University of Missouri, College of Veterinary Medicine, working with collaborators around the world, have found the mutation associated with Juvenile Laryngeal Paralysis & Polyneuropathy (JLPP) in Black Russian Terriers and Rottweilers. Using the latest whole genome sequencing approach to identify disease causing genes, the researchers were able to find a mutation that was only present in dogs with JLPP and not in any normal dogs or dogs with unrelated diseases.

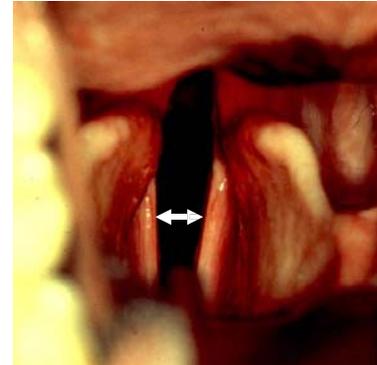
A DNA test is now available to determine if a dog is a carrier of the mutation or at risk for developing JLPP. If you suspect your dog has JLPP, see your veterinarian. As discussed below, there are other conditions that can cause these symptoms. Your veterinarian will be able examine dog to see if one of these more common, potentially treatable diseases is causing your pet's difficulties and help you interpret results of a DNA test.

What is Juvenile Laryngeal Paralysis & Polyneuropathy?

The brain controls muscles via signals that travel through nerves. A disease that affects the nerves is called a polyneuropathy: poly- (many), neuro- (nerves), -pathy (a disease). Due to a quirk in the way an embryo develops, one of the longest nerves in the body supplies the muscles of the voice box (larynx). The vocal folds vibrate as air moves over them allowing a dog to bark. When the dog breathes in, muscles in the larynx pull the vocal folds aside so that air can move easily into their lungs. If nerves are unable to convey that message properly, the muscles become weak or paralyzed. The longest nerves are often affected first; hence laryngeal paralysis is the first symptom. The vocal folds cannot be pulled out of the way as the dog breathes in. They vibrate noisily and can obstruct the flow of air into the lungs particularly when exercised or hot. The dog may also choke on their food or water or regurgitate, which can result in pneumonia.

The next longest nerves in the body go to the back legs, thus they are affected next. The dogs have difficulty getting up and wobble as they walk. Eventually the front legs will also be affected. The symptoms do not occur until after weaning age, and thus the disease is called juvenile laryngeal paralysis/polyneuropathy or JLPP for short.

Additionally, in the affected pups where the eyes were carefully examined, they all also had abnormalities in eye development. The eyes were smaller than normal (microphthalmia) and had cataracts as well as other changes. Finally, we have also found degenerative changes within the brains of affected dogs. In Rottweilers, these changes are associated with cerebellar ataxia, a loss of coordination. Black Russian Terriers have similar degenerative changes in the brain, but the changes are milder and cerebellar ataxia has not been reported in that breed.



If you look down the throat of a dog with laryngeal paralysis, the vocal folds (arrows) do not pull out of the way like they should as the dog inhales. The airway cannot then open up completely when the dog is breathing hard, and they have trouble getting enough air.

What else can look like JLPP?

There are other, much more common diseases that can affect a pup's ability to breathe. The windpipe (trachea) is stiff to keep it open when the dog is breathing hard. In some dogs, particularly toy breeds, the trachea does not have the proper stiffness and it can collapse as the dog breathes producing a honking cough. This condition is called collapsing trachea. An infection of the trachea such as kennel cough can cause irritation to the trachea and a similar sounding cough. Infections can cause swelling of the tonsils & lymph nodes around the throat in a young pup and "strangles". Finally, infections, such as distemper, or other diseases of the nervous system can affect nerves producing signs of weakness, sometimes with pneumonia. Laryngeal paralysis also occurs in older dogs, but JLPP is different because the dogs develop paralysis at such a young age.

How is JLPP inherited?

JLPP is inherited as a recessive trait. In a recessive disease, both parents of an affected pup show no signs of disease. All animals have two copies of each gene, one that is inherited from the mother and one inherited from the father. A dog that has one normal gene and one gene that causes the disease is a carrier of the trait. They show no symptoms because the one good gene is enough for their nerves to develop normally, but they will pass that bad gene on to about half of their offspring. If a carrier dog is bred to another carrier, then some of the pups (25% on average) will get a bad gene from each parent. Without one good gene to carry the day, the nerves cannot function normally and the unlucky pup has JLPP.

What do we do with a DNA test?

Now that we have a DNA test that can identify carriers of JLPP, we simply eliminate all the carriers from the breeding pool and eliminate the disease, right?

WRONG!

When dealing with a genetic disease we need to consider the overall genetic health of the entire population of the breed. Unless wise breeding strategies are used, you simply end up trading the devil you know for the devil you don't. A good example comes from the experience of another breed with a similar size gene pool. A hereditary neurodegenerative disease had become prevalent in the

breed, and a DNA test was developed. Breeding dogs were tested and dogs that were carriers of the trait were removed from breeding. The next generation, everyone was patting themselves on the back for eliminating that disease from the breed. Over the next couple generations, however, a dramatic increase in the incidence hereditary blindness and bladder stones was noted. The problem is that ALL DOGS are carriers of potential disease causing mutations. The recessive mutations aren't recognized until they become widespread enough in the breed that the odds of two carriers breeding become high. Abandoning one entire line for another only ensures that whatever mutations are lurking in the new line will be the next problem to be dealt with. In addition, all the desirable traits that made that first line popular to begin with were thrown out with the bathwater.

With a DNA test, carriers of a trait can still be used in a wise breeding program. As long as both parents are tested and one is clear of the mutation, no affected pups will be born. The offspring of a carrier breeding to a clear dog will produce about 50% carriers, but DNA testing can identify those carriers. If a clear dog from the litter has all the good traits a breeder desires, then that is the dog to keep for the next generation. If a carrier is the pick of the litter in every other respect, then that dog can still be used, it must just be mated to a clear dog. Thus the DNA status of the dog just becomes one factor in an overall breeding program that looks at the entire dog. Over time the disease causing mutation can be reduced without losing desirable genetic diversity in the breed that provides the raw materials from which to select the best traits as we move forward.

How do we test?

A DNA test for JLPP is now available. For routine screening of potential breeding stock or any dog, the test can be ordered on the OFA (Orthopedic Foundation for Animals) website. OFA and the Animal Molecular Genetics Lab have partnered to offer this, and several other DNA tests. The sample is collected using a cheek swab and applied to a specially treated card that stabilizes the DNA. It then can be sent to the lab for testing with no special handling needed. To order, go to www.OFFA.org, and click on the left side of the page that says "ORDER DNA TESTS", and follow the links to place your order.

If you suspect you may have a pup affected with JLPP, please contact us – email Liz Hansen at HansenL@missouri.edu, or call 573-884-3712. There is ongoing research, and we will work with you and your local veterinarian or neurologist to help evaluate the pup and confirm diagnosis.

Need More Information?

Please contact us with any additional questions. Email Liz Hansen at HansenL@missouri.edu or call 573-884-3712.

