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Risk of Hypertrophic Osteodystrophy in Great Danes Increases With Overfeeding and Supplementation

Hypertrophic osteodystrophy (HOD), a skeletal disorder of rapidly growing large and giant breed puppies, is more likely to affect Great Dane puppies than any other breed, according to the results from a survey conducted in 1998 [Munjar TA; Austin CC; Bruer GJ].

"HOD occurs unexpectedly in puppies 4 to 6 months old," says Herman Hazewinkel, D.V.M., Ph.D., professor of veterinary medicine at Utrecht University in the Netherlands. "The disease is painful and crippling, affecting both front or both back limbs, or all four."

The condition may begin with uncharacteristic listlessness, fever, or even partial paralysis, usually in the

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rear. A puppy may be lame, refuse to stand, lose appetite and weight, and its temperature may skyrocket to 104 degrees Fahrenheit.

When a veterinarian examines the X-ray of a puppy suffering from HOD, he or she sees clinical manifestations exclusive to the disease, Hazewinkel says. "A small, irregular black line appears just above and parallel

to the growth plate, but separated from it by a dense band at a distance of 2 to 3 millimeters. The black line represents a fracture or a break in the bone. The dog is more or less suffering from a broken leg, but not just one leg — all legs. The fever probably is from the pain."

Dogs with HOD have severe swelling near the growth plates, which are warm to the touch. Growth plates, which are located between the tabular part and bony ends of long bones, are responsible for the growth of bones and are softer than other areas of bone. It is the bony ends that swell, not the joints as is often thought. Since the longitudinal

growth of bones continues for eight to 12 months, an injury during this time can be devastating. The growth plate is the weak link in the architecture of the bone.

Young bone is fragile as it undergoes continuous modeling, being built and resorbed or removed by

Auburn University also reported a connection between HOD and high calcium and phosphorus intake in Great Danes, even in conjunction with cranio mandibular osteopathy (CMO), a thickening of the jaw bone, in selected cases. "It's very hard to say if there's a link between food

Defining Hypertrophic Osteodystrophy (HOD)

Hypertrophic is a considerable increase in the size of an organ or tissue caused by enlargement of its cellular components. Osteo means bone or bones. Dystrophy means having to do with faulty nutrition.

Hypertrophic Osteodystrophy Is Sometimes Called:
Osteodystrophy I and/or II
Skeletal Scurvy
Metaphyseal Osteopathy
Barlow's or Moeller-Barlow's Disease

bone-eating cells called osteoclasts. Researchers speculate that in HOD the osteoclasts are overactive, removing too much bone. Several theories have been studied to explain the process.

Seeking Causes of HOD

Hazewinkel, a diplomat of the European College of Veterinary Surgeons and the European College for Veterinary and Comparative Nutrition, has conducted nutritional studies on Great Danes for many years. His research and other dietary studies on rapidly growing puppies suggest high levels of calcium and phosphorus in the diet and free access to food as contributing factors.

A nutritional study on Great Danes in 1974 at Cornell University compared development of dogs that were given free access to food against a control group that was fed normally. Signs of HOD were found in the group with free access to food. Other studies, including one in 1986 at Utrecht University, seem to connect diets high in calcium and phosphorus with development of HOD in young growing Great Danes.

In 1999, a group of scientists at

and HOD, although it can't all be coincidental," says Hazewinkel.

HOD Treatment

HOD strikes hard and fast, but usually in three weeks, puppies can walk again spontaneously. However, owners should not allow them to walk, Hazewinkel says. In dogs with severe or chronic HOD, a calcified cuff of new bone may form around the periosteum, the soft tissue layer that covers the bone, adding length and diameter, further hobbling victims.

In mild cases, the bone may remodel to a nearly normal shape. Still, owners should keep dogs quiet and still for the duration, or at least six weeks from the onset, to prevent further damage to the bone. Relapses may occur until the dog is grown.

"There is little an owner can do besides nurse and nurture a puppy with HOD," Hazewinkel says. "It takes time for a puppy to heal. It is important to provide a clean, soft bed, medicine such as aspirin to suppress fever and, if possible, intravenous fluids to help with hydration. Antibiotics may be indicated. It also is

Hypertrophic Osteodystrophy

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important to provide physical and moral support in the form of tender loving care."

Dogs that are suffering from canine distemper virus have little

recourse but to wait until their body builds up resistance to the virus. Dogs responding quickly to treatment for high fever have a good prognosis; however, they should be kept on fluids. In most cases, the fever eventually goes away.

There are no early warning signals

for HOD. Prevention leans heavily on moderation. "Puppies should not be overfed or supplemented," Hazewinkel says. "Study after study has shown that when you overfeed, you shorten the lifespan. Particularly, do not supplement with calcium and phosphorous or vitamin D." ■

First Comparative Canine & Feline Conference Covers Similar Genetic Mutations in Human Diseases

Some of the leading scientists studying canine and feline genetic diseases attended the first comparative genomics conference in May in St. Louis to review their findings and to discuss how mutations in genes that can cause diseases in dogs and cats sometimes occur in the same genes in humans.

Humans and dogs, for example, share similarities in gene defects resulting in hemophilia, muscular dystrophy, narcolepsy and von Willebrand's disease. Humans and cats have defects in the same genes causing muscular dystrophy, hemophilia, progressive retinal atrophy, narcolepsy and several lysosomal enzyme diseases.

More than 100 international scientists took part in the program, titled "Advances in Canine and Feline Genomics: Comparative Genome Anatomy and Genetic Disease." The conference was sponsored by Nestlé Purina PetCare Company, the Cat Fanciers' Association, the Winn Feline Foundation, the American Kennel Club (AKC), and the AKC Canine Health Foundation.

Steven S. Hannah, Ph.D., Managing Scientist, Nestlé Purina Pet Nutrition and Care Research Department, says, "This conference provided an important opportunity for geneticists, molecular biologists and veterinarians to collaborate their findings. The forum was intended to promote understanding and produce information that ultimately will help us learn how genes

can be regulated through health and nutrition."

Development of the canine and feline genome maps has led to the discovery that genes of interest for human medicine are sometimes most quickly identified by mapping corresponding illnesses in cats and dogs.

For example, human cancer geneticist Elaine Ostrander, Ph.D., of the Division of Human Biology and Clinical Research at the Fred Hutchinson Cancer Research Center in Seattle, found that dogs provided advantages in mapping cancer susceptibility genes. Ostrander coordinates development of the canine genetic map, which first was published in 1997 but has increased significantly in density and accuracy. The map now can be used to determine the likely location of genes responsible for a particular disease in humans. Follow-up studies then can be undertaken to identify specific mutations causing the disorder.

Likewise, at the National Cancer Institute (NCI) Laboratory of Genomic Diversity in Frederick, Md., development of the feline genetic map has been under way since 1979. Stephen O'Brien, Ph.D., who leads the NCI map, found that cats and humans share almost 60 inheritable diseases. If the same genes are at fault in both cats and humans, then cats provide a good model for understanding human disease, he says.

Diseases that are difficult to study in humans because of their rarity and

limitations posed by generations averaging 20 years may be easier studied in cat and dog models. Animal models also offer the potential for controlled breedings. Examples of correlating diseases reviewed at the conference include:

- Cancer in dogs and similarities between the human and canine genome sequence;
- The dog as a model for identifying lesion-specific genetic defects in cardiovascular development;
- Inherited motor neuron disease in domestic cats and its similarity to spinal muscular atrophy Type III in humans; and
- Feline progressive retinal atrophy at it relates to humans.

The program included sessions on development of the feline and canine genetic maps; large-scale genomic analysis; evolutionary history and analysis of cats and dogs; comparative carnivore genomics; genetic mapping and molecular characterization; and gene therapy.

The *Journal of Heredity* plans to publish a special symposium issue in the future that will contain papers presented at the conference. The issue will be available for \$11 each. For information, please contact the customer service department of Oxford University Press at 1-800-852-7323 or wilsonc@oup-usa.org. Copies also may be ordered online at www.oup.co.uk/jhered. ■

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