



PURINA Pro Club

German Shepherd Dog Update

Vol. 6, No. 2 ■ July 2007

Researchers Study Genetic Basis of Bloat in High-Risk Breeds

Windwood Shepherds breeder Joan Tauer recalls vividly the agony of losing a recently finished champion German Shepherd Dog to bloat. Having just started to breed shepherds nearly 30 years ago, Tauer was excited about the possibility of breeding the 3-year-old dark black-and-tan shepherd.

Then one day a kennel worker noticed that CH Windwood Gieve had a largely extended abdomen that was tight as a drum. Tauer of Lake Elmo, Minn., owns a boarding kennel and devotes part of the kennel to her show dogs. Fortunately, she trains all employees to recognize the signs of bloat. "Gwen" was rushed to the veterinary clinic for emergency care.

"They took an X-ray of the stomach and found the spleen was enlarged, but the stomach had not twisted though it had a lot of gas," Tauer says. "The veterinarian inserted a tube into the stomach to release the air and then waited about three hours, watching Gwen closely, to see if the spleen reduced in size. It did not, so eventually she underwent surgery to remove the spleen. By this time, the stomach had twisted. The veterinarian repositioned the stomach and performed gastropexy to tack down the stomach."

It was touch and go following surgery. "Gwen quit breathing two times,

but then she recovered. The next day I brought her home. She recovered fine, but then four months later, her intestines twisted. I found her dead in the kennel one morning. I had a necropsy performed to know the exact cause of death because I had wanted to breed the bloodline. It was the most heart-wrenching experience."

Gwen was the first dog to bloat in which Tauer experienced removal of the spleen and subsequent twisting of the intestines. Since then, other German Shepherd Dogs, as well as various breeds of dogs boarded at the kennel, have bloated. "No one case is the same," Tauer says. "The circumstances leading up to bloat are all different. Each time it depends on the individual dog."

Tauer always takes time to train kennel workers so they will recognize the signs of bloat and take action immediately. "Urgency of care is the biggest battle," she says. "Time is a big factor. We look for strange behavior, like whether a dog is standing off in a corner or looks like he is largely extended in the abdomen. Lethargy, frothing and failure to eat are telltale signs."

Understanding Canine Bloat

Gastric dilatation-volvulus (GDV), commonly called canine bloat, can be a life-threatening condition. It occurs

when a dog's stomach distends, or bloats, and then rotates or twists. This is called torsion but is technically referred to as volvulus. The twisting blocks the passage of food and interferes with the blood supply to the

GASTRIC DILATATION-VOLVULUS (GDV), COMMONLY CALLED CANINE BLOAT OCCURS WHEN A DOG'S STOMACH DISTENDS, OR BLOATS, AND THEN ROTATES OR TWISTS. THE TWISTING BLOCKS THE PASSAGE OF FOOD AND INTERFERES WITH THE BLOOD SUPPLY TO THE STOMACH AND OTHER DIGESTIVE ORGANS. IT ALSO IMPEDES THE RETURN OF BLOOD TO THE HEART, CAUSING REDUCED CARDIAC OUTPUT AND DECREASED BLOOD PRESSURE.

stomach and other digestive organs. It also impedes the return of blood to the heart, causing reduced cardiac output and decreased blood pressure.

In other words, in dilatation, the stomach swells from a rapid accumulation of air, and in volvulus, the stomach, spleen or other abdominal structures twist. GDV rapidly progresses and thus requires immediate veterinary attention.

In a genetic study at Scripps Florida in Jupiter, Fla., a division of the Scripps Research Institute in La Jolla, Calif., researchers aim to learn whether bloat is a genetic condition, and if so, to determine the mode of inheritance. The researchers are studying pedigrees from German Shepherd Dogs and Great Danes.

Lead researcher Matthew Pletcher, Ph.D., assistant professor of genetics, says, "We first need to determine if there is a breed-defining genetic risk factor or whether random environmental events are responsible for the disease."

Recognizing Signs of Gastric Dilatation-Volvulus

Owners of German Shepherd Dogs, a breed considered at risk for developing gastric dilatation-volvulus (GDV) should be aware of the signs of this potentially life-threatening condition. A dog that appears to be bloating should be taken immediately to the veterinarian. The sooner a dog receives veterinary attention, the better the prognosis.

Here are signs of GDV:

- Nonproductive retching, or unsuccessful attempts to vomit;
- Heavy salivation or drooling;
- Weakness or collapse;
- Depression;
- General unease, including pacing, whining, or unwillingness to lie down;
- Very pale or very dark gums as shock sets in;
- Increasing pain;
- Progressive abdominal distention; and
- Repeated cycle of drinking water and vomiting clear liquid.

Genetic Basis of Bloat

continued from page 1

Large, deep-chested breeds are considered susceptible to developing GDV. Though it is not known exactly why these breeds are more at risk, experts theorize that a deep, narrow chest allows the ligaments of the stomach to stretch further when the stomach is weighted with food. Over time, the stretched ligaments allow the stomach to move within the abdominal cavity increasing the risk of twisting, or volvulus.

German Shepherd Dogs, Great Danes, Bloodhounds, Boxers, Weimaraners and Standard Poodles are considered at risk. Sadly, bloat is considered the second leading cause of death, after cancer, among many large and giant breeds. Age and gender may be factors. For example, in large breed dogs weighing between 50 pounds and 99

SADLY, BLOAT IS CONSIDERED THE SECOND LEADING CAUSE OF DEATH, AFTER CANCER, AMONG MANY LARGE AND GIANT BREEDS. AGE AND GENDER MAY BE FACTORS. THERE ARE NO DEFINITIVE ANSWERS TO WHAT CAUSES BLOAT.

pounds, the typical age of onset is 8 to 11 years old, and in giant breeds weighing more than 99 pounds, the typical age of onset is 7 to 9 years old. Males are believed to be twice as likely as females to suffer from bloat. Unfortunately, there are no definitive answers as to what causes bloat.

Some factors that may contribute to bloat are overeating, rapid eating, high water consumption, stress, and exercise after eating. "We recommend avoiding exercise two hours following a meal," says Daniel A. Degner, D.V.M., DACVS, who practices at Michigan Veterinary Specialists in Auburn Hills, Mich.

"GDV is a condition that can rapidly become a veterinary emergency," he says. "It is important for owners of susceptible breeds to recognize the signs of bloat. Some of the more common signs are unsuccessful attempts to vomit, heavy salivation, progressive abdominal distention, and general unease such as pacing, whining and unwillingness to lie down."

Once the disease progresses, a dog becomes increasingly uncomfortable. "The gums may be very pale or turn very dark as shock sets in," he says. "Without treatment, a dog will die. Rapid recognition of the signs of bloat and quick intervention by a competent veterinary surgical team are necessary for a dog to survive. Fortunately, if caught early, survival after surgery runs about 90 percent."

How to Contribute to GDV Research

Researchers at Scripps Florida in Jupiter, Fla., are studying gastric dilatation-volvulus (GDV) to determine whether there is a genetic basis, and potentially to identify the genetic mutation. Owners of German Shepherd Dogs and Great Danes are asked to submit pedigree information of both affected and unaffected dogs. It is important to know whether bloat has occurred in at least two generations behind the submitted pedigree.

To participate, a dog must be registered with one of the following registries: the American Kennel Club, Canadian Kennel Club or Fédération Cynologique Internationale. For information, contact Laura Schultz at Scripps Florida at (561) 799-8830 or send an e-mail to laura@scripps.edu.

In treating bloat, a veterinarian first decompresses air in the stomach. This is accomplished either by passing a stomach tube or putting a large needle into the stomach through the body wall. After the air is decompressed, a veterinary surgeon untwists the stomach, and then performs a gastropexy to tack the stomach to the body wall. If a portion of the stomach is compromised, it is removed. In some cases, the spleen also is compromised and is removed. Dogs receive intensive care for several days following surgery.

Bloat can be financially and emotionally devastating for owners and breeders. Emergency surgery and follow-up care can cost thousands of dollars. As a result, owners of high-risk breeds sometimes opt to have preventive surgery to reduce the threat.

Prophylactic gastropexy is one such procedure in which the stomach is surgically attached to the abdominal wall to help prevent volvulus. Traditional prophylactic gastropexy has been performed through a 12-inch incision at the time of neutering. The same procedure may be done using laparoscopy, a minimally invasive procedure in which instruments attached to a scope are inserted through a small slit in the abdomen. Both techniques greatly reduce the chance of a dog suffering from bloat.

"Prophylactic gastropexy has minimal morbidity, less anesthesia and less surgical time than an emergency GDV," Degner says. "It also has a shorter hospital stay and is less expensive."

Because the genetic cause of GDV has not been determined, experts recommend not breeding dogs that have bloated to not risk increasing the pool of dogs prone to develop GDV. It is recommended that dogs that have prophylactic gastropexy after bloating should be surgically neutered.

An Understudied Disease

Little research has been conducted so far to understand the genetic cause of bloat. "This is an understudied disease," Pletcher says. "There is little in the literature on the genetics of GDV, but the fact that it is mostly restricted to certain breeds is a good indication that it is a genetic condition. What exactly connects bloat to the breeds it affects is still unknown."

In his research of bloat at Scripps

Florida, Pletcher is looking at the genetic traits of families of dogs in which bloat has never occurred and those in which relatives have experienced bloat. Pedigrees from dogs with no bloat history are especially valuable in establishing a control group.

Among the DNA-processing techniques Pletcher and his research team are using to study GDV is haplotype mapping. A haplotype represents a set of SNPs, or single nucleotide polymorphisms, found to be linked to the condition of interest. These can provide valuable information to investigate the genetics behind disease.

Chromosomes vary widely, with roughly every 1,000th letter being different. The majority of these differences are SNPs (single letter changes, such as A or C in a particular spot). Some SNPs have functional effects that alter the biology of an animal, but the majority can just be used as markers to identify the chromosome variation carrying a mutation.

"Our goal is to identify whether genetic mutation is the primary cause of bloat," Pletcher says. "In reality, GDV could be a polygenic disease in which several genes work in combination to produce the bloat phenotype. If we find a mutation and thus determine mode of inheritance, breeders could potentially breed away GDV."

"Bloat is a devastating disease. "This project will hopefully provide some answers for owners and breeders to use in their breeding programs."

In the meantime, owners of high-risk breeds, such as German Shepherd Dogs, should be sure they understand bloat and are familiar with the signs of disease. Though GDV is challenging and frightening for owners to encounter in their dogs, many dogs survive and go on to live normal lives. ■

Purina appreciates the support of the American German Shepherd Dog Charitable Foundation and particularly Ginny Altman, AGS-DCF health liaison and immediate past president of the German Shepherd Dog Club of America Inc., in helping to identify topics for the *Purina Pro Club German Shepherd Dog Update* newsletter.