

# ***BLOAT: A Major Breakthrough!***

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*Animals, Dog Breeding, Dogs, Great Dane, Health, Nature*

**Canine Bloat Study**  
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Bloat, known to veterinarians as gastric dilatation-volvulus (or GDV), is an acute, life-threatening condition that occurs at high frequency in many large and giant breeds of dogs. Great Danes are unusually susceptible to this condition. About 37% of Great Danes will experience bloat at some time in their life, and the majority of them will die without immediate medical intervention. Other large and giant breeds are also way too prone to this condition. Yet the causes of this condition have remained a mystery for decades. The goal of our study is to identify the causes of bloat. This information could then lead to diagnostic and therapeutic strategies to minimize the occurrence of this deadly condition.

Our effort over the last two years has been supported by donations from generous pet owners who care deeply about dogs and want to find a cure for bloat. This study could not have happened without the help of all the Dane owners that enrolled their dogs, answered lots of questions, and sent samples for testing. We focused on Great Danes, because the high frequency of bloat in this breed guaranteed a large group of affected animals and increased the statistical power of the analysis. This effort has already produced results that will profoundly affect the community of Great Dane owners, who deal with this disease constantly. Hopefully, these results will soon translate to other breeds.

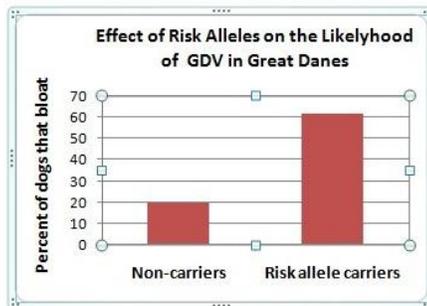
*Two contributors to the bloat study.  
Below: Richard Parker recovering from emergency bloat surgery. Right: Clark Rose, a bloat survivor, at his 8<sup>th</sup> birthday party.*



Importantly, bloat correlates strongly with an underlying condition of inflammatory bowel disease (IBD), suggesting a possible pre-existing state in the gut that contributes to bloat. We hypothesized that, since IBD and bloat are co-existing conditions, they may have the same root causes. In both humans and dogs IBD is linked to specific genes of the immune system. It is thought that molecular variants of these genes (alleles) cause changes in the bacterial population of the gut (the gut microbiome), which in turn, sets up an unhealthy condition in the gut. This unhealthy microbiome contributes to chronic, low-level IBD. According to our hypothesis, it also predisposes a dog to bloat. While the causes of bloat are not clearly understood, several risk factors have been described in the scientific literature, including age, dietary, behavioral, pre-existing health and genetic factors. The most significant risk factors appear to be genetic, since strong correlations with bloat exist for breeds, families and gender. The best way to combine all of these factors is envision a genetic predisposition in some dogs, and a non-genetic trigger, such as stress, that sets off the bloat event.

To test this hypothesis, we enrolled two groups of Great Danes, a “bloat” group in which all members survived bloat through surgical intervention, and a “control” group that had never experienced bloat. In a genetic study, five immune genes were sequenced from each dog, looking for genetic variations that associate with bloat. In a microbiome study, the gut bacterial population of each dog was analyzed from stool samples, looking for particular species that are unusually low or high in the bloat group.

We have just submitted the genetic study to the scientific journal, **PLoS one**, to be reviewed for publication. We have established three genes that contribute to bloat in Great Danes. For each of these genes, several alleles (molecular variants) are found in the Great Dane population, and in other breeds. One allele from each gene was found to significantly increase the risk of bloat in Great Danes. As shown in the graph below, those Danes that carried at least one of these risk alleles had a 3-fold higher risk of bloat. In fact, 62% of the dogs carrying a risk allele had to undergo emergency surgery to survive a bloat episode. This information will be crucial for owners and breeders that are trying to decide if preventative gastropexy surgery is appropriate for their dog, or if their dog should be bred. For this reason,



*The life-time risk of bloat in Great Danes rises from 20% in dogs that do not carry a risk allele, to 62% in dogs that carry one or more of the three identified risk alleles*

We have designed genetic tests for these risk alleles. The tests will be offered to owners and breeders of Great Danes.

The second study, microbiome analysis, should be completed in the next couple of months. Since the genetic side of our hypothesis proved to be true, we have reason to expect to see specific microbiome abnormalities in the bloat group. If we do discover that bloat is caused by specific imbalances of the microbiome, then a whole array of therapeutic strategies will be available to combat the disease. For example, probiotics or specific dietary changes may be used to re-balance the microbiome, and thus, prevent bloat.

As you can see, the study has already generated some very significant results and we are excited to push forward with the next phase. We could not have done this without the generous support of our sponsors, and the efforts of all the Dane lovers who contributed their time, information and enthusiasm to this study. Thank you!!!

Many questions still remain: Will the findings for Great Danes carry over to other breeds? Are additional immune genes involved? Did we miss risk factors from very severe cases that were not survived? Will the microbiome data point to therapeutic strategies? All of these questions can be addressed in future studies, if we can find additional funding. We are asking the AKC to help us with the next phase.

**UPDATE** this is the manuscript of the study: [GDV \(Bloat\)](#) with all the supporting data. Click on the link to open the pdf file.

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