

**Bloat / Gastric Torsion:**  
**A Compilation of Available Information (or the lack thereof)**

*By: Jennifer Kaiser, October 2009*

**Prelude**

I write this shortly after having a terrifying episode of bloat with Moses, our 1 ½ year old Newfoundland. The severity and unexpected nature of the problem prompted me to, in my typical fashion, immediately start to learn everything about bloat that I possibly could, and find an answer to my favourite question: why? Thankfully, Moses survived and is recovering well after emergency surgery. Our emergency veterinarian credited our quick response and his young age to his speedy recovery. And, for those of you who are curious, the surgery – at a 24 hour vet at midnight on a Friday – cost us \$4,500. But it's Moses, and he's absolutely worth it.

The information that follows is easy to come by. As soon as Moses was in surgery, I began reading everything I could find online. I am confident I have read nearly every article in the first 10 pages of Google Search and Google Scholar (the free ones, anyway) that come up with any sort of search for "bloat" or "gastric torsion".

Anyone who undertakes a similar task will likely meet the same frustrated realisation about the lack of empirical, scientific research concerning bloat/gastric torsion. Many of the resources conflict and many are even internally inconsistent. A lot is based on opinion and personal experience of reputable breeders, but there is limited information from the veterinary sciences. The most-quoted is the Purdue University study by Lawrence T. Glickman, VMD *et al.*, which, while it does provide limited insight, still falls short of providing an understanding of the causes of bloat, and definitive methods of prevention for those of us with at-risk dogs.

One resounding fact is that any actual causes of bloat remain unknown, despite the multitude of speculations. Even the renowned Dog Whisperer Cesar Milan's website simply states "the causes of bloat are not yet well understood".

My ultimate goal herein is to compile the research and information on bloat available to the layperson. This will undoubtedly expose the shortfalls, but more importantly, I aim to educate fellow dog owners to the best of my ability.

I also specifically note I cannot claim any authority or expertise with respect to the enclosed information. I do not have a degree in veterinary medicine or anything of the sort. On the whole, most of the information below is accessible to anyone with an internet connection. The Purdue study results are easy to find and oft-cited by breeders and kennel clubs, and what is mostly found is the same information repeated over and over. In addition, I have inquired of three different veterinarians on the issue: our emergency vet from Vancouver, our vet here in Calgary, and another local vet here who came highly recommended by our regular vet. The bottom line remains, and they all agree: there is no known cause of bloat, yet it statistically remains the second leading killer of dogs. No theories on the cause of bloat have been scientifically proven and all seem to be only partially true.

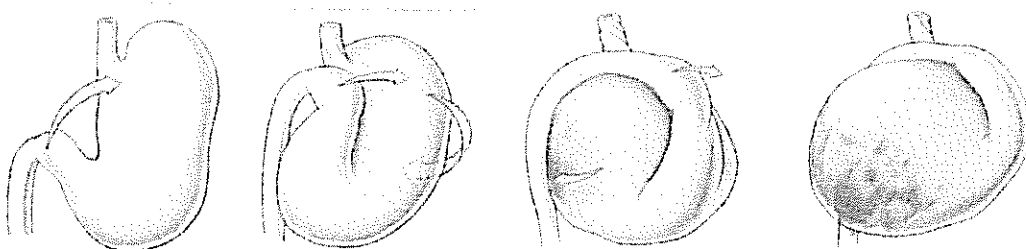
## What is “bloat”?

Bloat is a generic term for two occurrences:

1. Gastric Dilation-Volvulus (GDV): the accumulation of gas and fluid in the stomach that cannot be expelled. GDV can and often does escalate to Gastric Torsion.
2. Gastric Torsion: the rapid enlargement of the stomach caused by the twisting of the stomach in such a way that it is impossible for contained gases and fluid to escape. GDV may result in a stomach that is rotated by anywhere from 90° to 360°.

GDV results in physiological changes that create a medical and surgical emergency. Changes are both localized (limited to the organs involved, i.e. the stomach and the spleen) and systemic (affecting other vital organs in the body). Increased pressure inside the stomach causes blood flow there to slow and eventually stop. Severe torsion can tear the short branches of the artery between the spleen and the stomach, thus increasing the potential for necrosis (death of cells) of the stomach wall. Displacement of the spleen can cause blood clots in the blood vessels there or even torsion of the spleen. Obstruction of blood flow from these abdominal organs to the heart causes systemic changes. The rapid and often massive reduction of blood returning to the heart reduces cardiac output and therefore deprives tissues of sufficient nutrients and oxygen. Furthermore, the abdominal organs become engorged with blood, which makes the intestines more permeable to the bacteria and bacterial products within them, thus releasing bacteria and their toxic substances (endotoxin) into the bloodstream. The reduced blood flow to the heart, coupled with the circulation of substances released from the pancreas, spleen and other organs severely impair cardiac functions, and cause cardiac arrhythmia (irregular heartbeats). Blood flow to the kidneys falls which increases the risk of acute kidney damage. A condition called Disseminated Intravascular Coagulation (DIC, a life threatening bleeding disorder of the blood clotting mechanism) may occur. Finally, the stomach and/or intestines may perforate, resulting in the contamination of the abdominal cavity with stomach contents and bacteria. A combination of shock, septic peritonitis (acute and painful inflammation of the membranes lining the abdominal and organ walls), and DIC, together with multiple organ failures, results in death within hours of the initial signs of bloat.

A diagram of how the stomach bloats from [veterinarypartner.com](http://veterinarypartner.com):



## **Treatment**

In a simple case of GDV, in which the stomach fills with gas, the veterinarian will insert a tube down the throat, relieve the gas, pump out the stomach and give the stomach a thorough washing. Acute GDV or torsion requires immediate veterinary care and surgery. Post-operative treatment for shock often requires prolonged hospitalization. In the case of torsion, the stomach is surgically "tacked down" to the body wall to prevent the twist from occurring again (called "gastropexy"), because once a dog suffers from bloat, there is a 75 to 90% chance it will happen again, often within days of the first attack. After the stomach has been "tacked down", the chances of torsion occurring again are reported to be between 2 and 6%.

The reported mortality rates in dogs suffering from bloat ranges from 10 to 60%, even with treatment. With surgery, the mortality rate is reported between 15 to 33%. If tissue damage is so bad that part of the stomach must be removed during surgery, the mortality rate is said to be between 28 and 38%. If the tissue damage is so bad that the spleen must be removed, the mortality rate is 32 to 38%.

The immediate aim of surgery is to return the stomach to its normal position and to evaluate it and the spleen for signs of irreversible damage (such as tissue necrosis – cell death). Long-standing or severe twisting may occasionally cause necrosis in portions of the esophagus (the food canal down the throat). If so, chances for survival are poor. If gastric perforation at any site (perforation of the organ wall) has occurred, then the chance for survival is extremely poor. Barring any sign of irreversible damage, the veterinarian will perform gastropexy. There are a number of techniques of gastropexy, and debate continues as to which method is more effective. The fact that there is still heated debate in the techniques indicates that none is currently totally satisfactory. Medical and dietary management after GDV is important to help prevent recurrence.

## **Diagnosing Bloat**

If you think your dog is suffering from bloat, the most important thing is to get him/her to a vet immediately for treatment. Call your veterinary clinic to tell them you're on your way with a suspected case of bloat. Early diagnosis and treatment are the most important factors for a successful outcome and speedy recovery.

Symptoms to watch for include extreme restlessness, excessive panting, salivation, drooling, and unsuccessful attempts to vomit or defecate. The dog may whine, and will seem to have trouble getting comfortable. As the condition progresses, the stomach area appears swollen and distended. Bloat can usually be detected when you make the dog stand up and you gently feel his/her abdomen. The abdomen should feel soft and tapered inward when the dog is relaxed; with bloat, the abdomen feels hard, and will have a hollow "thump" when gently tapped. Rapid breathing, pale-coloured mouth membranes, and collapse are signs of shock due to a more advanced phase of bloat. High numbers of dogs with bloat have cardiac arrhythmias (40% according to one study).

If bloat is untreated, the dog will die within hours, and in a worst-case scenario, the dog may die within 30 minutes of the first recognised symptom. Sometimes a dog will progress from bloat to torsion in minutes, so do not attempt home remedies yourself: get him/her to a veterinarian immediately.

Of course, because immediate treatment is the most important factor in a favourable prognosis, it is a good idea to know where your local emergency veterinary clinic is located and the quickest routes there. If you're not convinced your dog has bloat, it is better to err on the side of caution.

### **Which dogs are at risk for bloat?**

#### *Breed*

While any dog can suffer from bloat/gastric torsion, it is largely agreed that large-chested breeds are at the greatest risk for bloat. According to the University of Purdue, the following breeds, in order, have the most reported incidents of bloat:

- |                                |                              |
|--------------------------------|------------------------------|
| 1. Great Dane                  | 14. Alaskan Malamute         |
| 2. Saint Bernard               | 15. Chesapeake Bay Retriever |
| 3. Weimaraner                  | 16. Boxer                    |
| 4. Irish Setter                | 17. Collie                   |
| 5. Gordon Setter               | 18. Labrador Retriever       |
| 6. Standard Poodle             | 19. English Springer Spaniel |
| 7. Bassett Hound               | 20. Samoyed                  |
| 8. Doberman Pinscher'          | 21. Dachshund                |
| 9. Old English Sheepdog        | 22. Golden Retriever         |
| 10. German Shorthaired Pointer | 23. Rottweiler               |
| 11. Newfoundland               | 24. Mixed                    |
| 12. German Shepherd            | 25. Miniature Poodle         |
| 13. Airedale Terrier           |                              |

The sources are split on whether or not bloat is a hereditary condition, and some even disagree with themselves on this issue, stating that while bloat is not hereditary, you shouldn't breed dogs with a history of bloat. The Purdue University study suggests that the incidence of GDV is closely correlated to the depth and width of the dog's chest, and several different genes from the parents determine these traits. If both parents have particularly deep and narrow chests, then it is highly likely that their offspring will have deep and narrow chests and the resulting problems that may go with it.

#### *Age*

The Purdue University study concluded that dogs over 7 years of age are more than twice as likely to develop gastric torsion than dogs 2-4 years old. Some believe that the ligaments that hold the stomach in its normal position stretch with age, causing the

increased risk. This does not mean bloat in young dogs is unheard of, and stories of bloat in young puppies thought to have over-eaten are common.

### *Sex*

While many sources report that male dogs are at an increased risk for bloat, many other sources report that male and female dogs are at an equal risk. It is widely agreed that spaying/neutering your dog has no impact on the dog's potential for bloat.

### **Non-genetic factors which may or may not affect the risk of bloat**

The other factors which may or may not have an impact on the risk of bloat are largely disagreed upon from one source to the next. Most, if not all, have no scientific backing or research evidencing the claim, and many are simply based on common sense or personal experiences. It is important to note that since the veterinary community acknowledges there is no known "cause" for bloat, much of the following is speculation.

### *Eating Habits*

The Purdue study suggests that dogs fed once a day were twice as likely to develop bloat as those fed twice per day, and it is widely recommended to feed your dog 2 or 3 smaller meals per day. The reasoning behind this is that dogs that eat more hurriedly are at a greater risk for bloat because they gulp air. Smaller, more frequent meals will help prevent this. All three vets I spoke to recommended this as a basic preventative measure, although doing so will not guarantee prevention of gastric torsion, and many dogs who are fed two or more meals in a day have still experienced bloat. It is also recommended that dogs be fed individually if possible and in a quiet location. Dietary changes should be made over the course of 3-5 days.

### *Raised Food/Water Dishes*

As the older sources demonstrate, it used to be widely believed that feeding your dog from raised food and water dishes was an important measure to help reduce the risk of bloat, and many breeders still recommend this practice. However, recent studies suggest that eating off raised dishes actually significantly increases the risk of bloat, with some sources suggesting the risk is increased as much as 200%. It appears that the more recent sources (2007 and newer) seem to agree that eating off of raised dishes is not recommended, and the Purdue research says that dogs at an increased risk should eat at floor level.

### *Access to Water*

While opinions here differ, it is often suggested that providing your dog constant access to water throughout the day will help prevent bloat – perhaps because it will prevent them from becoming overly thirsty and gulping water. However, a number of sources recommend limiting the dog's access to water during meals and shortly thereafter.

### *Exercise*

While the cause of bloat is unknown, all sources consulted agree that vigorous exercise, excitement, and stress should be avoided after meals for up to two hours. Cases of stomach torsion resulting from a dog engaging in high-energy activity after a meal are common according to the vets consulted.

### *Temperament*

The Purdue University study advises that dogs that tend to be more aggressive, fearful, or anxious appear to be at an increased risk of developing bloat.

### *Weight*

It is often reported that dogs that are lean or underweight are at an increased risk for bloat. Some believe it is because fat takes up space in the abdomen allowing less space for the stomach to "rotate" or move around, but there is really no scientific basis for this suggestion.

### *Stress*

Many sources agree that stress, such as that which occurs during kennelling, can be a significant factor in the increased risk of bloat. There are many reported cases of dogs experiencing bloat following their first meal once returning home after a major surgical procedure.

### *Gas*

There is believed to be a relationship between dogs with intestinal gas and dogs that bloat. Dogs that belch or have frequent bouts of flatulence are believed to be at an increased risk. Whether the cause is due to physiology or diet is not speculated upon. Many sources recommend avoiding feeding foods that are known to cause flatulence, including beans, peas, onions, beet pulp, etc, as a preventative measure. Many sources also recommend avoiding soy in a dog's diet, while there still has been no study that links soy with bloat. Some sources also advocate the feeding of large pieces of fresh/raw fruits and vegetables (e.g. apples, oranges, carrots) 3 to 4 times a week, effectively adding roughage, to ensure the digestive system functions properly.

Some people even give their dogs over-the-counter anti-flatulent (simethicone products such as Gas X®), just before or after they put their dogs through stressful situations. It may also be useful when the dog appears to have a lot of gas. Some sources even suggest providing your dog with anti-flatulent drugs as a short-term remedy for GDV, as it may help as long as torsion hasn't already begun. While this and a number of other home-remedies are sometimes discussed, no treatment is equivalent to proper veterinary care.

## *Diet*

When asked, all three veterinarians I spoke to informed me that there is no correlation between diet and instances of bloat, and no scientific research exists to suggest such a relationship. Despite the hypotheses from a large number of sources, no specific diet or dietary ingredient has been proven to be associated with bloat. The Purdue study also states that at this time, no cause-and-result relationships between dietary factors and bloat have been established.

It is sometimes suggested that feeding your dog a raw diet may aid in the prevention of bloat, although there is no study supporting this, and there have still been many reports of dogs on raw, natural, or BARF diets that have experienced bloat. A raw diet is not an insurance policy against bloat.

One source suggests that the raw diet is beneficial because it does not expand in the stomach and is digested faster, thus remaining in the dog's stomach for a shorter period of time. On the other hand, it has also been reported that some dogs fed wet or raw food were actually more likely to bloat due to the increased speed at which they ate. Many studies have found little difference between wet, raw, and dry foods and their effect on bloat.

There has also been speculation regarding specific ingredients in dog food and their relationship to bloat, and many websites advocate avoid feeding your dog food preserved with citric acid, or foods with an oil or fat listed among the first four ingredients. A nested case-control study was conducted with 85 GDV cases (and 194 controls) consuming a single brand and variety of dry food. Neither an increasing number of animal-protein ingredients nor an increasing number of soy and cereal ingredients among the first four ingredients significantly influenced GDV risk. It was found that dry foods containing an oil or fat ingredient (e.g., sunflower oil, animal fat) among the first four ingredients seemed to be associated with an increased risk (2.4 times more likely) of GDV. These findings suggest that the feeding of dry dog foods that list oils or fats among the first four label ingredients predispose a high-risk dog to GDV, but this is based only on a single study, and more research must be done to confirm the finding.

For those feeding dry dog foods – kibble – the sources seem split on whether or not you should moisten the food prior to feeding or not, as a prevention of bloat. Many sources say moistening food preserved with citric acid will increase the risk of bloat, while others recommend you moisten the food so it expands before reaching the dog's stomach. Again, no cause-and-effect relationship has been established with respect to kibble and bloat. Occurrences of GDV are still reported even when kibble is moistened prior to being fed.

Basically, and according to the veterinarians spoken to, it is simply advisable to feed your dog a quality diet regardless of any speculations concerning bloat, simply for all the other overall health benefits provided to your dog.

### *Vaccinations and Bloat*

It is reported that the instances of bloat in dogs have increased significantly since the 1960s. According to one source, this increase is unlikely to reflect changing diagnostic criteria, disease recognition, or genetic factors, but that it could be related to changes in canine vaccines or their pattern of use (i.e. multivalent vaccines). One specific example speaks of a breeder in the U.S.A. of Standard Poodles who had major problems with bloat in her dogs when multiple modified live virus vaccines started to be given as a matter of course. When she stopped giving these vaccines and followed a vaccine protocol of giving only single killed vaccines, she stopped getting bloat in her Poodles.

However, there seems to be no study dedicated to this issue, and it appears to be speculation without much evidentiary backing.

### *Is Bloat a Neurological Disease?*

Only one source touched on this possible issue, and suggests that neurotoxins in the environment have begun affecting the production of the hormone motilin in dogs.

Motilin is an important factor in controlling the pattern of smooth muscle contractions in the upper gastrointestinal tract in dogs. It is controlled by the central nervous system and is secreted into the circulation at intervals of every one hundred minutes to sweep out undigested material from the stomach and small intestine. Motilin also stimulates secretions of bile and pancreatic enzymes into the duodenum.

The study cited suggests that neurotoxic chemicals, which now persist in the residential environment due to pesticide use, bioaccumulate (meaning the chemicals are taken up and stored in fatty tissue faster than they are metabolized or excreted) in the bodies of our canine companions (and ourselves, for that matter). Recent studies show that such chemicals are consistently present in the air, rain and surface waters, suggesting a long environmental half-life. These pesticides (neurotoxins) build up in the dog's body to lead to the degradation of certain neurotransmitters in the brain, leading to improper and insufficient release of motilin, thus increasing the risk of bloat.

### **Preventing Bloat**

Since the causes of bloat are virtually unknown, it is nearly impossible to prevent it and many dogs that would seem to be at a low risk for bloat still manage to get it.

All veterinarians spoken to recommend feeding more frequent, small meals throughout the day as a common-sense preventative measure. They also recommend keeping exercise and activity to a minimum after meals.

As for the other possible factors listed above, they are left to personal preference and judgment.

One preventative option recommended by some parties is to have your dog in for gastroplexy (stomach tacking) before the first instance of bloat occurs. Provided the



stitches heal properly, once the stomach is tacked to the side cavity, it cannot flip, therefore preventing torsion. To get this done in advance – often when the dog gets spayed or neutered – is significantly less expensive than to proceed with late-night surgery at an emergency clinic (not surprisingly, most bloat cases occur after 6:00pm).

One source mentions that for dogs known to be highly susceptible to GDV (e.g. ones that have already bloated before), owners may wish to discuss the use of medicinal prevention (such as Metoclopramide Hydrochloride, or Reglan®) with their veterinarian. The medicine is widely used in humans after abdominal surgery to combat painful intestinal flatulence. It chemically decompresses the stomach and intestines, forcing the gas out. Like all drugs, there are side effects, so the benefits and problems of long term use should be carefully weighed and discussed.

### **Conclusion**

Unfortunately, there are very few conclusions concerning bloat at present. Most importantly, it is a serious medical situation which can be faced by any dog and any owner. Ultimately, and regardless of any preventative measures taken, or how low-risk you believe your dog to be, the most important thing is to be aware of the signs and symptoms so you can respond quickly when you suspect your dog may be suffering from gastric torsion.

## References / Further Reading

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