

Is Your Dog at Risk for Fatal Bleeding?

Many breeds are at risk, unfortunately. This mutated gene has now been identified in 36 breeds, and even routine surgeries, like spay and neuter procedures, could result in life-threatening bleeding. There's a new test to identify dogs at risk – should you get it for your pet?

Analysis by Dr. Karen Shaw Becker

STORY AT-A-GLANCE

- Delayed postoperative hemorrhage (DEPOH) is a potentially deadly condition in dogs that causes excessive bleeding and bruising following a surgical procedure
- DEPOH, which is the result of a gene mutation, is common in Greyhounds, Irish Wolfhounds, and other sighthound breeds; veterinary researchers at Washington State University are in the process of identifying what other breeds and breed mixes also carry the mutation
- The only way to know if an individual dog has the mutated DEPOH gene is through testing; tests are now available for both home use (cheek swab) and veterinary use (blood test)
- Sighthounds and a number of other breeds, along with dogs with certain medical conditions, also require special handling for general anesthesia
- It's crucial that pet parents and veterinarians partner up to understand and mitigate the potential risks of both surgery and anesthesia for each individual dog

Delayed postoperative hemorrhage (DEPOH) is a condition in dogs that causes excessive bleeding and bruising in the hours and days following a surgical procedure.¹ It typically occurs one to four days after major surgery when blood clots begin to break down too soon in a process called hyperfibrinolysis. The severity can range from minor bruising to life-threatening hemorrhaging.²

This potentially fatal disorder is known to be quite common in Greyhounds, Irish Wolfhounds, and other sighthounds.

According to the Washington State University (WSU) College of Veterinary Medicine, the disorder was first identified in retired racing Greyhounds in the U.S. in 2007.³ Pet owner survey results showed that bleeding disorders were one of the four most reported causes of death in Greyhounds. A significant proportion of those deaths were attributed to postoperative bleeding.

A later study of Greyhounds undergoing routine spay/neuter procedures showed unexpected postoperative hemorrhage in 26% of dogs starting 36 to 48 hours after the procedure. Signs of abnormal bleeding ranged from severe skin bruising around the surgical site to oozing of blood from the wound.

Many Breeds, Breed Mixes Are Potentially Predisposed

Researchers at WSU analyzed samples from family pets and the university's pet DNA bank for the presence of a mutation in the DEPOH gene that is associated with the condition. This gene encodes alpha-2 antiplasmin, which plays a key role in preventing the breakdown of blood clots. Dogs with this mutation have been observed to have reduced alpha-2 antiplasmin activity, which predisposes them to premature clot dissolution.

The WSU team found the mutated gene not only in many sighthound breeds, but several other breeds, and mixed breeds as well:⁴

- Greyhound
- Longhaired Whippet
- Great Pyrenees
- Irish Wolfhound
- English Bulldog
- Miniature Schnauzer
- Scottish Deerhound
- Shetland Sheepdog
- German Shepherd
- Basenji
- Jack Russell Terrier
- American Staffordshire Terrier
- Italian Greyhound
- French Bulldog
- Border Collie
- Galgo Español
- Boston Terrier
- Pitbull
- Azawakh
- Newfoundland
- Chesapeake Bay Retriever
- Whippet
- Australian Cattle Dog
- Beagle
- Saluki
- Boxer
- Labrador Retriever
- Peruvian Inca Orchid

- Golden Retriever
- Chow Chow
- Rhodesian Ridgeback
- Yorkshire Terrier
- Rottweiler
- Borzoi
- Cairn Terrier
- Mixed breeds

The above list is the result of an initial screening of 75 breeds, and research is continuing to determine just how common the mutation is. The only way to know if an individual dog has the mutated DEPOH gene is to have him or her tested.

Cheek Swab and Blood Tests Are Now Available

The good news in this unsettling situation is that the WSU researchers have developed a test to identify dogs at risk of delayed postoperative hemorrhage. It's a genetic test called DEPOHGEN™. A positive test result alerts veterinarians to the condition and allows them to administer appropriate medications before non-emergency surgeries.

Pet parents can test their animals at any time to understand whether they're at risk, and if so, they and their veterinarians can plan for it, potentially saving dogs' lives.

The test (available [here](#)) can be done using a cheek swab dog owners collect at home. Veterinary clinics and hospitals can submit either blood (2 mL of whole blood in a purple top / EDTA tube) or DNA collection brush samples.

Anesthesia Risks in Certain Dogs

Delayed postoperative hemorrhage isn't the only surgery risk in certain dogs. Just as in human medicine, general anesthesia is necessary in veterinary medicine to help relax the muscles of your pet's body, remove his ability to fight against the procedure, and ensure he feels no pain during the procedure.

However, for many pet guardians, there are few things as anxiety-producing as the thought of their precious animal companion "going under." Whereas local anesthesia is used to numb a specific area of the body, general anesthesia renders the patient unconscious. For many people, the mental image of a helpless furry family member lying unconscious on a steel table can be extremely unsettling.

The good news is that veterinary medicine has seen significant improvements in recent years in anesthetic agents. Most anesthesia drugs used in today's vet clinics are highly predictable and reversible.

All dogs, from the tiniest lap dog to the giant Newfoundland, are descendants of wolves and share a common physiology. However, different breeds have different needs when it comes to receiving anesthesia.

Genetic differences among breeds, along with differences in anatomy (conformation), play a critical role in the safe delivery of anesthesia drugs. For example, **brachycephalic dogs** (breeds with pushed in faces, such as the French Bulldog) are at higher risk for airway obstruction than breeds with longer muzzles.

There are also breeds predisposed to increased responsiveness to anesthesia, which means it takes less of the drug to produce the desired effect, which increases the risk for overdose. And there are breeds that take much longer to recover from anesthesia than others.

Pets with heart disease are another high-risk group. If heart problems, either acquired or congenital, are known or suspected, a veterinary cardiologist should be consulted before a procedure that requires anesthesia is performed. Higher risk breeds suffering from metabolic disorders are an even greater anesthetic risk.

Diabetes, hypothyroidism, Cushing's, and Addison's disease (adrenal disease, at both ends of the spectrum) as well as obese animals and those suffering from liver or kidney disease, all require additional special consideration when it comes to calculating pre-anesthetic drug doses, fluid choice and load, as well as the type and amount of maintenance anesthesia through surgery.

Breed-Specific Anesthesia Protocols

Your veterinarian and his or her staff should be aware of breed-related sensitivities, as well as potential metabolic complications, and take all necessary precautions before, during and after anesthesia.

If your dog belongs to any of the following groups, as an informed pet owner you can provide a double layer of protection in the care of your beloved four-legged companion.

- **Brachycephalic breeds** — Most brachys (for example, Bulldogs, Pugs, Boxers, Boston Terriers, Shih Tzus, as well as cats with flat faces) have some degree of brachycephalic airway syndrome. The stress placed on the airways from the use of anesthesia can result in additional airway contraction, which can cause obstruction.

Brachycephalic pets must be closely monitored from the point of premedication through the final step of extubation. Extubation (removal of the breathing tube) shouldn't be attempted until the pet is awake, alert and swallowing. Removing the tube while the animal is still groggy from anesthesia increases the risk for upper airway obstruction.

Throughout the recovery period, brachycephalic dogs should be monitored with extreme care. It takes just seconds for a brachy to get into serious trouble while recovering from anesthesia. Endotracheal tubes placed in brachycephalic breeds are often left in place for much longer periods of time compared to longer-snouted dogs.

Unfortunately, many brachys are overweight or obese and must be ventilated while anesthetized. One way to reduce your brachy's anesthesia risk (and increase his overall quality of life) is to keep your pet at a healthy weight.

- **Sighthounds** — These breeds, especially Greyhounds, metabolize drugs differently than other breeds. Many anesthetic drugs are absorbed by fat tissues. Since sighthounds tend to be much leaner and more muscular than other breeds, lack of fatty tissues may limit uptake of anesthetic drugs. This means more of the drug is circulating in the bloodstream, which explains why lower dosages are better tolerated by many sighthounds.

Prior to any procedure that requires anesthesia, sighthounds should be tested for heart abnormalities like dilated cardiomyopathy. Other considerations for these breeds:

- They tend to experience "white-coat effect" (hospitalization-related stress).
- They metabolize drugs more slowly than other dogs, and sometimes recover more slowly as well. Prolonged recovery is the result of a deficiency of a specific liver enzyme.
- They are at higher-than-normal risk for hyper/hypothermia while anesthetized because they have only about half the body fat of other dogs. If they are over or under heated, problems can develop very quickly.
- **Herding breeds** — Herding dogs like the Collie, Border Collie, Australian Shepherd and the Shetland Sheepdog often have a genetic mutation in the ABCB1 (formerly MDR1 for "multi-drug resistance") gene that allows certain drugs to accumulate in the brain – including some anesthesia agents.

Without proper dosing and monitoring, these breeds can be over-sedated and experience respiratory depression

- **Toy breeds** — The smaller the animal, the higher the risk when administering any kind of drug, including anesthesia.

Small dogs must be carefully weighed, and the appropriate dose of anesthetic given based on their size. Monitoring during the procedure is crucial (as it is for all patients, but in particular the tiny ones), including accurate blood pressure measurements.

Small dogs tend to have low body temperatures, so it's important they be kept warm with appropriate heating devices during the procedure and throughout recovery. It can be beneficial to use warmed intravenous fluids rather than cold or room temperature fluids. Body temp should be monitored frequently.

Many tiny dogs are also frequently hypoglycemic (have low blood sugar), so it can be beneficial to add dextrose to intravenous fluids. Blood sugar levels should be monitored before, during, and following the procedure.

- **Giant breeds** — It may seem to make sense that very large dogs like the Great Dane, for example, are so massive they need higher doses of anesthesia. But actually, giant dogs often respond profoundly – in other words, they over-respond – to normal therapeutic doses of sedatives.

It's important that these dogs are dosed according to lean body mass or surface area rather than actual body weight.

In addition, giant breeds age faster than smaller dogs, so it's important to take the age of these dogs into consideration when deciding appropriate anesthesia dosages.

- **Doberman Pinscher** — Dobies have a genetic variation that can cause von Willebrand disease, a problem with blood clotting. They should be evaluated for the condition before any surgery is scheduled. If von Willebrand is suspected, a drug can be given prior to surgery.

Also, the use of NSAIDs (non-steroidal anti-inflammatory drugs) in Dobies with von Willebrand disease is controversial, so other types of painkilling agents should be considered.

Dobermans are also predisposed to develop heart disease (cardiomyopathy), as are a number of other breeds, including Boxers, Cocker Spaniels, Great Danes, and Irish Wolfhounds.

These breeds should undergo a pre-anesthetic electrocardiogram (ECG), as well have a continuous ECG while under anesthesia and during recovery.

Anesthesia Protocols Must Be Customized for Each Pet

Despite breed-related variations, what's most important is that your veterinarian customizes an anesthesia protocol for your individual dog.

As long as the proper pre-operative workup is accomplished, and the pet is appropriately monitored — beginning with premedication and ending only after well-timed extubation — anesthesia can be safe for any breed of dog.

Making sure you're partnered with a veterinarian that understands and implements all these steps, safeguards and precautions is, of course, your responsibility. So don't hesitate to ask a lot of questions!

Sources and References

[Columbia Basin Herald, February 16, 2023](#)

[1,3,4 Washington State University College of Veterinary Medicine, December 15, 2022](#)

[2 WSU Pharmacogenomics Laboratory](#)
