

Anesthetic Malignant Hyperthermia: Separating the Contenders from the Pretenders

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Anesthesia is a term that strikes fear into the hearts of many Greyhound owners. One of the origins of that fear is a condition called malignant hyperthermia. Some Greyhound owners may have lost a pet to this condition or know someone who has. Others may think their pet has suffered from an episode of malignant hyperthermia when in fact they may have not.

Malignant hyperthermia (MH) is a rare inherited genetic disorder of skeletal muscle which results in the mutation of a calcium channel protein within the muscle cells. This mutation results in muscle contraction and increased metabolism which leads to the production of not only excess carbon dioxide but also excess heat which results in a life threatening hyperthermia (elevated body temperature). The hyperthermia, in combination with the other metabolic changes that are occurring, can result in cardiac (heart) arrhythmias and multiple internal organ failure. MH can be triggered by gas anesthetics (not injectable anesthetics), extreme exercise, and stress. The only treatment for true episodes of MH is an intravenous injection of the muscle relaxant *Dantrolene* in addition to supportive intravenous fluid therapy, immediate removal of the patient from gas anesthetics, external cooling and respiratory support. Even with appropriate treatment this disease can be fatal.

The difficulty in diagnosing MH is that there is no blood test available. A muscle biopsy can be taken and a caffeine contracture test can be performed on the fresh specimen. The way the muscle biopsy responds to various concentrations of caffeine is considered diagnostic for malignant hyperthermia. Because this test requires fresh tissue,

it is not routinely run by most commercial laboratories. Your vet may even find it difficult to locate a laboratory that will perform the caffeine contracture test. Because a patient must first be anesthetized in order to collect a muscle biopsy, many veterinarians will not biopsy suspected animals after an episode of hyperthermia because of the risk of inducing hyperthermia again.

The other difficulty for making a MH diagnosis is that some Greyhounds can have significant hyperthermia (>105 degrees Fahrenheit) without having the disease. The same life threatening clinical signs that occur secondary to the elevated temperatures associated with malignant hyperthermia can also occur secondary to non-malignant hyperthermia (non-MH).

Greyhounds are a breed well known for their large muscle mass. Many also suffer from separation anxiety and can become stressed in a veterinary hospital setting. This combination is why, I believe, Greyhounds seem to suffer from non-MH hyperthermia more than other breeds. As animals awake from anesthesia, many shake or shiver as a natural response to a mild hypothermia (a low body temperature; this commonly occurs while under anesthesia), pain or disorientation. In some Greyhounds, this response seems to be exaggerated and the shivering results in warming beyond normal temperatures and in excess of 105 degrees Fahrenheit. These animals may respond well to supportive treatment (anti-inflammatories, intravenous fluids, external cooling and respiratory support) without the use of *Dantrolene* if they are caught early enough.

Without a muscle biopsy, how can one tell the true cause of the hyperthermia? Many anesthesiologists believe that if the animal survived and did not receive an injection of *Dantrolene*, MH was not the cause for the elevated temperature. If your pet has ever had a previous uneventful anesthetic procedure, it is most likely not MH.

Animals affected by MH are always affected by MH and cannot have an anesthetic procedure with gas anesthesia without triggering the hyperthermia. If your Greyhound was neutered with no report of problems with anesthesia and subsequently developed hyperthermia during an anesthetic event, it is unlikely to be MH. In addition, the calcium pore malfunction that causes the muscles to contract excessively results in other changes in the blood that accompany excess muscle activity. If bloodwork is performed during the suspected MH episode it will show these changes if MH really is occurring.

Why is it important to understand if your dog had MH or non-MH? Because MH is an inherited condition that will reoccur every time your Greyhound is exposed to gas anesthesia. Should surgery become necessary, management with injectable anesthetics only and premedicating with *Dantrolene* may lessen the risks. Greyhounds suffering from non-MH may never again have a similar event and their anesthetics can be adjusted to try to prevent some of the phenomenon (shivering, shaking, etc.) which are known to trigger the event.

The key to manage this disease is to have your veterinarian continually check your Greyhound's temperature before, during and after the procedure, and using an appropriate anesthetic regimen including analgesics (pain medications) as needed. The earlier the treatment is started, the better chance that your Greyhound will recover if he/she will suffer from an episode of hyperthermia (regardless of the cause). If your Greyhound has survived an episode of anesthetic hyperthermia (MH or non-MH), I would highly recommend that you and your veterinarian consult with a board certified veterinary anesthesiologist to discuss the best available anesthetic protocols for your pet.

References

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