Tying Up and What it May Mean For Your Horse
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If you have ever had a horse "tie up" (formally known as exertional rhabdomyolysis) you know how suddenly it can happen, and being able to recognize the signs and know what to do in the short term will help speed recovery. During an episode the horse may seem lazy, have a shifting lameness, tense up the abdomen, and develop tremors. The horse may be painful, stiff, sweat profusely, and may have firm hard muscles, particularly over the hindquarters. If your horse experiences these signs the first thing to do is to stop exercising and call your veterinarian. Move the horse to a box stall containing fresh water and try to minimize stimulation. While your veterinarian is on the way they may have you administer some medications, if they are available, to help relieve pain and anxiety such as Banamine (Flunixin meglumine) and Acepromazine. Your veterinarian will likely provide oral fluids and electrolytes via a nasogastric tube or IV Fluids. Additionally, your horse may be prescribed muscle relaxants.

Occasionally, individual horses can experience tying up episodes more frequently than others. If your horse has experienced one or more of these episodes you may consider the possibility that they could have a heritable trait that may predispose to tie up. The resultant condition is termed polysaccharide storage myopathy (PSSM).

Polysaccharide storage myopathy is a heritable disease with at least two different types. In this article we will discuss type I, which mainly affects quarter horse bloodlines, although it has been found in over 20 breeds. PSSM Type 1 is characterized by abnormal accumulation of the normal form of sugar stored in muscle (glycogen) as well as an abnormal form of sugar (amylase-resistant polysaccharide) in muscle tissue. This happens due to a point mutation in the gene that codes for the enzyme in skeletal muscle that makes glycogen. This mutation causes the gene to be over-active resulting in constant production of glycogen. During this overproduction, the ability to breakdown the glycogen to be used as energy is impaired and this results in a deficit of energy to the muscle cell. The lack of energy to the cell then causes the clinical symptoms that we see.

As far as diagnosing PSSM, fortunately, the gene responsible for PSSM type 1 has been identified; therefore, diagnosis can be established by genetic testing. This means you may simply submit blood or hair for this test. A muscle biopsy may aid in diagnosis if the genetic test is negative and PSSM type 2 is suspected. The muscle biopsy is recommended for particular breeds as PSSM type 1 is rare to non-existent in breeds such as Arabians, Thoroughbreds, and Standardbreds. PSSM1 can occur in Warmbloods but accounts for less than 10% of the cases of PSSM1 (These breeds more commonly are affected by PSSM Type 2).

Once a diagnosis of PSSM 1 is reached there is no easy cure, but fortunately, proper adjustments to diet and exercise effectively eliminates episodes of tying up in more than 75% of horses. When designing a diet for a PSSM1 horse there are several important considerations and the best approach is to consult a nutritionist or internal medicine specialist to design a diet specifically for your individual horse. Generally the diet will involve feeding a hay low in non-structural carbohydrates. If the horse is an easy keeper they will be put on a specific ration calculated based on their bodyweight in order to get down to an appropriate weight. Then, a fat source will likely be added to the diet. Exercise is also a key component in the success of these horses and you should work closely with a veterinarian to design an exercise regimen appropriate for your horse. Regular daily exercise and turnout is extremely important for management of PSSM1 and prolonged periods of rest are undesirable.

The greatest difficulty in owning a horse with PSSM1 proves to be the time commitment to keep the horse fit and on a routine exercise schedule as well as potential expense of special feeds.

PSSM2 – What We Know So Far

Polysaccharide Storage Myopathy is a complex disease in horses, which has been on the forefront of veterinary research in recent years. It is now known that there is more than one form of the disease. PSSM1 is caused by the glycogen synthase 1 gene (GYS1). Researchers are working to identify a gene(s) associated with type 2, but currently the only way to diagnose this condition is through muscle biopsy rather than DNA. The form(s) of PSSM that are not associated with this gene mutation are for now termed PSSM2 although there are likely additional subsets of type 2 that researchers are currently working to elucidate. Both type 1 and 2 are associated with abnormal accumulation of glycogen, a storage form of sugar, within the muscle. Basically, a diagnosis of PSSM2 represents those horses whose muscle biopsies show glycogen

clumping, yet they do not contain the afore mentioned gene. In addition to simplifying diagnostic testing, research about the underlying cause(s) of PSSM2 is important for the identification of steps which can prevent the disease, as well as for helping veterinarians and owners better manage affected horses.

PSSM2 affects a variety of breeds. Quarter horses are frequently affected and approximately 70% of diagnosed PSSM Quarter Horses have type 2. For reasons not yet identified, PSSM2 appears to be more common in performance-type horses such as barrel racing, reigning, and cutting horses, compared to a higher prevalence of PSSM1 in halter horses. About 80% of Warmbloods diagnosed with PSSM are type 2. Other breeds that have been diagnosed with PSSM2 include Morgans, Arabians, Thoroughbreds and Standardbreds.

Clinical signs of this myopathy can vary based on the breed of horse. In Arabians and Quarter Horses the most common clinical sign is tying up with increased levels of muscle enzymes on blood work (CK and AST). On the other hand in Warmbloods, tying up with elevated muscle enzymes is less common and typically they present with more obscure signs such as poor performance and low energy level after 5-10 minutes of work, muscle soreness (typically in the hindquarters), and an undiagnosed gait abnormality. While the mean age of onset in Warmbloods is 8-11 years old, Quarter Horses may be recognized as young as 1-2 years old, especially if concurrent myopathies such as HYPP or malignant hyperthermia are also present.

Managing theses horses will depend on their clinical signs. Horses showing signs of tying up with elevated muscle enzymes on blood work should be managed similar to recommendations for horses with Recurrent Exertional Rhabdomyolysis. This will include a well-designed exercise program to promote conditioning (after a period of time to allow for healing of damaged muscles after tying up), and a nutritionally balanced diet with appropriate calories and adequate Vitamin E and Selenium supplementation as needed.

For horses that do not have signs of tying up or elevated muscle enzymes, the key points for management are to avoid long periods of rest with a consistent exercise regimen, as much turnout time as possible, and a diet supplemented with protein. The exercise should consist of a long warm up with adequate stretching. Periods of collection should not exceed 5-minute intervals (in the initial stages) with stretching allowed in between. This period of collection can be increased slowly over time. It is strongly recommended to work with an experienced equine veterinarian and an equine nutritionist to design a specific diet which is based on the horse's individual metabolic needs. In general, dietary modifications will rely on a relatively higher percentage of calories coming from fat versus carbohydrates, limiting excess sugar intake, and providing an adequate whey based protein source, such as Progressive's Topline Xtreme or Purina's Supersport, among others.

With adherence to the diet and exercise regimens, about 70% of Warmbloods show significant improvement, and can return to acceptable levels of work. Those with more severe, or recurrent, clinical signs will require a stricter adherence to diet and exercise, as well as a lot of patience. Often, several adjustments to the prescribed diet and exercise regimens may be needed before finding what works best for each individual horse. Unfortunately, even with strict adherence to exercise and nutrition, some horses may not be able to get back to the desired level work. This is what makes ongoing research on PSSM2, targeted at establishing an etiology and subsequently recommendations for individual management, so important.

Contact Brandon Equine Medical Center at 813-643-7177 or email info@brandonequine.com with any questions regarding this topic.

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