

Poor Performance Related to Myopathy and Myositis

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Introduction

Lameness and poor performance is a common complaint by owners. Sports medicine is a growing discipline in veterinary medicine. Not all poor performance complaints are related to joints, tendons, and ligaments. There are a variety of muscular problems that occur in exercising horses that practitioners should be familiar with. The proceedings from the Milne lecture at the 2012 AAEP given by Dr. Stephanie Valberg are suggested for parties interested in more specific details regarding the variety of muscle conditions affecting horses.

Exertional Rhabdomyolysis (ER)

ER is a centuries old problem originally investigated in Draft horses. As technology allowed for improved research, multiple different causes have been identified. A detailed history is critical for examining a horse with suspected ER. Attempts to identify any environmental cause of ER, a description of the horse's muscle tone, mass, gait abnormalities, pain, exercise intolerance, and any weakness should be elucidated. Additional information on the horse's temperament, diet, previous performance, exercise schedule, description and duration of episodes, other precipitating factors, and any current medications should be collected.

Horses with ER share common clinical signs, regardless of cause. Classic findings in the acute phase include: muscle stiffness, sweating, firm painful muscles, increased respiratory rate, and reluctance to move. In chronic cases not in an acute episode, may show muscle atrophy and pain with palpation. An underlying lameness or neurologic abnormality should be eliminated. Ultrasound can identify areas of focal muscle damage and edema. Some cases with history supporting ER may have damage of the psoas muscle identifiable by rectal exam and ultrasound.

Elevations in serum CK and AST activity are the classic findings in an acute episode. Elevations may reach in the hundreds of thousands depending on the severity of muscle damage and take several days to return to normal. Release of myoglobin during an episode may lead to hematuria and renal damage. Training and extremely fatiguing exercise can lead to a mild increase in CK/AST that returns to normal within 48 hours. In addition to elevations in the muscle enzymes, electrolyte abnormalities are common findings.

Recognizing that elevations in CK/AST are common, an exercise challenge was developed. 15 minutes of submaximal exercise (trotting or walk/trot) are used to show an abnormal increase in CK/AST activity 4 hours after cessation of exercise. A positive response shows 3 to 4 fold increase from baseline. Biopsy of the semimembranosus or semitendinosus muscle can be sent on ice (not formalin fixed) to specialized Neuromuscular laboratories, such as the University of Minnesota (<http://www.cvm.umn.edu/umec/lab/>)

Sporadic ER

Etiology and Pathogenesis

ER can affect horses of any age, breed, or sex. Sporadic ER develops due to exertion beyond the horse's fitness level. It usually occurs as a single event and is not recurrent. Cases may be induced by overexertion, extreme environmental conditions, underlying lameness, or focal muscle trauma. Dietary imbalances can trigger cases or sporadic ER with diets high in sugar, low in fiber, deficient in electrolytes, and deficient in vitamin E being linked to episodes.

Diagnosis

Diagnosis is based on clinical signs and lack of recurring episodes

Management

Horses should be rested with access to self exercise in a small paddock after the initial pain and stiffness subsides. When turnout is not possible, handwalking daily is indicated. The diet should be evaluated to insure adequate electrolytes and fiber are being fed as recommended by the manufacturer. Addition of NaCl to the diet may provide enough sodium and chloride to horses housed in extreme environmental conditions. Horses should be managed as described until muscle enzymes are normal. At this time a step up daily training program can be prescribed.

Chronic ER

Horses with repeated episodes should be considered chronic ER cases and additional diagnostics performed. To date 5 specific causes of chronic ER have been identified: PSSM type 1, PSSM type 2, malignant hyperthermia, recurrent exertional rhabdomyolysis, and idiopathic.

PSSM type 1

Etiology and Pathogenesis

A mutation in the glycogen synthase 1 gene (GYS1) leads to accumulation of complex polysaccharide in skeletal muscle. However horses with PSSM1 can metabolize glycogen normally and have normal glycolysis during exercise suggesting additional alterations in other pathways of energy metabolism. Additional work is actively being pursued to confirm that the increased glycogen synthase activity may impair oxidative metabolism or pyruvate and fatty acids which are two critical components of muscle metabolism during exercise. Horses with PSSM also have very high insulin sensitivity.

Diagnosis

Horses with PSSM1 develop clinical signs with submaximal exercise. 10% of QH carry the GYS1 gene mutation responsible for PSSM1, with 28% of halter horses and very few racing QH and barrel horses affected. The prevalence is very low in Arabians, TB, and Standardbreds. 72% of QH with polysaccharide accumulation on biopsy carry the GYS1 gene. Diagnosis of type 1 PSSM is based on appropriate history and identification of the GYS1 gene mutation.

Management

Horses with type 1 PSSM should have no more than 48 hours of stall confinement following an episode and then turned out into a paddock or pasture. Forced exercise such as hand walking a horse recovering from PSSM may actually initiate another episode. Once recovered, a horse should have a regular daily exercise regimen prescribed that gradually increases duration of activity. Dietary management is a critical component of management. We believe currently that lowering the daily starch and sugar intake will reduce insulin and therefore reduce the storage of polysaccharide. This diet is also frequently combined with increased levels of fat and vitamin E. A target of NSC less than 12% is desired for hay and grain. The amount of hay, grain, and fat fed is dependent on the body condition and caloric needs of the horse. With appropriate management 70% of QH can return to an acceptable level of performance, but will always be prone to sore muscles and future episodes.

PSSM type 2

Etiology and Pathogenesis

Type 2 PSSM currently encompasses all other forms of PSSM that are not associated with the GYS1 gene mutation. The clinical presentation, diagnosis, and management are the same as for type 1 PSSM.

Malignant Hyperthermia

Horses with a RYR1 mutation may react to anesthesia with Halothane. While not frequently a major cause of ER in horses, concurrent RYR1 and GYS1 mutation present as the more severe PSSM cases.

Recurrent Exertional Rhabdomyolysis

Etiology and Pathogenesis

RER is believed to be caused by a defect in the regulation of muscle contraction and relaxation. Recent research is suggesting an inherent abnormality in intramuscular calcium regulation. The exact defect remains to be determined. A breeding trail at the University of Minnesota suggests an autosomal dominant mode of inheritance.

Clinical Presentation and Diagnosis

Prevalence of RER is 5 – 7 % of Thoroughbreds at racetracks. Cases typically occur in high strung horses with females over represented in the younger horse population. Affected horses are often fed high volumes of grain. Days of rest and underlying lameness may predispose horses to having an episode. Diagnosis is based on clinical signs. Muscle biopsies do not have any characteristic abnormalities and are most useful to rule out other causes of ER.

Management

Multiple factors can be addressed in horses with RER including diet, housing and exercise. The diet for RER is like any other ER. Recommendations include minimizing sugars while maintaining appropriate calories and

electrolyte intake. Maintaining a regular routine and housing horses next to calm stable mates will help to reduce nervousness. Horses with RER should continue to be kept in light work while the CK normalizes. Maintaining some form of daily exercise is critical to keeping horses from tying up. Additional therapies include hormone management, treatment with dantrium sodium or phylloquinone, and massage.

Conclusion

Many causes for exertional rhabdomyolysis have been identified. Tying up can be confused with lameness issues and should be considered as a potential cause for poor performance.

