



Managing Horses With Polysaccharide Storage Myopathy

The Educated Horseman: Health Series



Polysaccharide storage myopathy (PSSM) is a condition that affects the way a horse stores glycogen and causes bouts of exertional rhabdomyolysis commonly referred to as tying up. This disorder mainly affects draft horses and light horses, such as quarter horses, paints and appaloosas.

Currently there are two main forms of this disorder:

- **PSSM1** is due to a mutation in the glycogen synthase-1 gene (GYS1) that causes increased synthesis of amylase-resistant polysaccharide and results in an increased storage of glycogen (sugar) within the muscles. This form is easily diagnosed with a genetic test and requires a hair or blood sample and is included in the AQHA five-panel test.
- **PSSM2** is NOT caused by the GYS1 gene mutation, but a muscle biopsy still shows clumps of stored glycogen. Research has yet to identify the cause of PSSM2. This form is not so easily diagnosed and requires a somewhat invasive muscle biopsy.

Normally, insulin will drive glucose from the bloodstream into muscle cells to be utilized or sent into liver cells to be stored as glycogen to be used later as energy. In PSSM horses there is an accumulation of excess glycogen and abnormal amylase-resistant polysaccharides creating a large bank of “energy” that needs to be used and a bank of abnormal “energy” that cannot be used and remains stored in muscle cells.

Typically, the symptoms associated with PSSM will occur during and after exercise, and, in some breeds, horses with PSSM1 show no signs of the condition. Owners may observe traditional signs of tying up — mild signs include reluctance to work, engaging the hindquarters, shifting lameness and stopping and stretching as if to urinate. As the pain increases, frequent gait changes and stiff, firm and sore hindquarters will occur. In the most severe cases, horses will experience profuse sweating, increased heart rate and respiration, muscle twitching, refusal to move, reddish-brown urine and the inability to stand.

While the symptoms of PSSM can be debilitating and potentially career ending, research advances have discovered management approaches that include strict nutrition and exercise schedules that allow affected horses to return to a normal performance level. Research has suggested that if only nutritional management is used, 50 percent of horses with PSSM will improve. With diet and exercise alterations, 90 percent of horses will improve. Current dietary recommendations for horses with PSSM include a low-starch, high-fat diet.

- **Forages, including pasture and hay, should be utilized as the main source of nutrients.** However, high-sugar grasses and legumes (clover, alfalfa, rye or lucerne) should be limited. If utilizing pasture, low-yield acreage with mature grasses, which contain less energy, is appropriate. A grazing muzzle may be necessary to reduce access to lush grasses. Hay can be also be soaked to reduce the amount of available energy and limit the intake of non-structural carbohydrates.
- **Reduction of concentrates (grain, sweet feeds, etc.) is necessary.** Additional supplementation of high-fat concentrates can be used if the horse is performing at a level that requires additional caloric intake. At the most basic level, supplementing with one-quarter cup to 2 cups of vegetable oil high in omega-3 fatty acids is adequate, but



care should be taken to work the horse into a fat supplement slowly.

- **Vitamin, mineral and vitamin E supplementation should also be a concern.** A mineral block should be sufficient for most horses. The increase of fat within the horse's diet can increase the production of free radicals. To negate the effects, a vitamin E supplement should be fed (approximately 1,000 to 2,000 international units of vitamin E per 1,000 pounds per day).
- **Regular, regimented exercise is necessary to enhance energy metabolism.** If your horse has recently suffered from a bout of tying up as a result of PSSM, exercise should resume within a few days or after the residual pain subsides. Excess time off can predispose PSSM horses to additional episodes. The following guidelines should help your horse return to work:
 - ♦ Regular turnout.
 - ♦ Condition your horse slowly to high-intensity, short-duration workouts (no more than 20 minutes).
 - ♦ Be consistent! Include some kind of exercise daily. Include a warmup, a cool down and stretching exercises.

PSSM is a disorder that has previously been viewed as a career-ending condition. However, with advances in nutrition and management techniques, horses with PSSM have increased longevity within their careers. If you suspect your horse may have PSSM, please contact your local veterinarian for diagnosis and to create an effective management plan.

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References

- Finno, C.J., Spier, S.J., and Valberg, S.J. 2009. Equine diseases caused by known genetic mutations. *Vet J.* 179(3): 336-347.
- Valberg, S.J. 2018. Muscle Conditions Affecting Sport Horses. *Vet Clin North Am Equine Pract.* 34(2):253-276.
- Kentucky Equine Research. "Diet Adjustments Provide Relief for PSSM Horses." Retrieved from:
<https://ker.com/equinewsdiet-adjustments-provide-relief-pssm-horses/>



*Horses with PSSM benefit from high-intensity, short-duration workouts.
Photo provided by Judith Gonzales.*

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