

## ***PSSM (polysaccharide storage myopathy)/Tying-Up***

**PSSM** (Mg) is a gene mutation that causes unregulated glycogen formation in the muscles of horses with **PSSM**. Because this enzyme is constantly active in affected horses, they accumulate excess glycogen in the cells. The muscles of horses with **PSSM** are more sensitive to insulin – the hormone released to help with sugar metabolism.

There are two types of **PSSM**:

Type 1 **PSSM** is predominately inherited as a dominant gene. A genetic test is available for this. Testing (hair sample) is available thru AQHA as part of a 5 panel test for approximately \$85.

Type 2 **PSSM** is where there is excessive accumulation of glycogen without the mutated gene present. Also, believed to be inherited, but a specific gene has not been identified. The only way to determine Type 2 is to do a muscle biopsy.

Acute clinical signs are similar among **PSSM1** and **PSSM2** horses, although chronic signs may differ. Clinical signs in horses with **PSSM1** can include **skin twitching, stiffness, firm painful muscles, sweating, weakness**, and reluctance to move with light exercise. Horses with **PSSM2** often show signs related to **poor performance**, including **undiagnosed gait abnormalities, sore muscles, decreased energy** level after five to 10 minutes of work, firm and painful back and hindquarter muscles, reluctance to collect and/or engage the hind end, and **slow-onset atrophy** (muscle wasting). More information is available from Dr. Valberg and can be found through The University of Minnesota website.

### ***What might cause a Tying-up event?***

Most research recognizes an over-load of **glycogen** (blood sugar) in the muscles can lead to muscle fiber contraction/stiffness and soreness. Excess **glycogen** accumulated in the muscle while a horse is resting/not worked (and still kept on full grain ration) may cause the glycogen to break down into lactic acid when they begin to work. If severe, this results in muscle fiber breakdown/damage and release of myoglobin into the blood and on to the kidney for filtering out (reddish/brown urine). In the event of the episode being prolonged, the kidneys may eventually fail (overload) and death may potentially result.

**Insulin Resistant (IR) horses and/or those that have a lesser ability to utilize excess blood sugar are often potential candidates for Tying-Up and in many cases a more heavily muscled body type horse.**

### ***Tying Up Help***

**Diet:** Reduce and/or eliminate carbohydrates and add fat or fiber. Ex: Rice bran for fat or Beet Pulp for fiber. Researchers suggest that owners or managers feed PSSM horses more hay and significantly less grain (carbohydrates.) Most feed companies have a low starch or metabolic feed option available. Ex: **Purina® Well-Solve® L/S** (low starch), **Nutrena Safe Choice™/Special Care**.

Carbohydrates that are high in starch, such as sweet feed, corn, wheat, oats and barley appear to exacerbate type 1 and type 2 **PSSM**. That is why they should be avoided and extra calories can be provided in the form of fat, such as rice bran. Dietary recommendations include increasing dietary fat to contribute 15-20% of the horse's daily energy requirement and reducing dietary NSC levels to ≤ 20%.

**Exercise:** Daily exercise is recommended as it suppresses uptake of sugars and enhances sugar metabolism. If only the diet is changed, it was found that approximately 50% of horses improve. If both diet and exercise are altered, then 90% of horses have had no or few episodes of tying-up.

# PSSM

## **Supplement key active ingredients for metabolic support/function:**

**Vitamin E** is an essential component to body-wide antioxidant defenses, with one of its most important duties being cell membrane maintenance. Horses with an inadequate reserve of vitamin E may experience muscle soreness or stiffness during an exercise bout and prolonged recovery following strenuous work.

**Selenium** works in conjunction with vitamin E to defend the body's cells from damaging oxidative byproducts known as free radicals.

**Magnesium** is by far the most important mineral, activating over 300 different biochemical reactions all necessary for the body to function properly. Magnesium is an essential macro-mineral for horses that aids in maintaining normal nerve and muscle function.

**DMG** (N, N-DimethylglycineHCL) serves as an antioxidant and helps support a healthy anti-inflammatory response. It is also recognized in some research as an aid in minimizing lactic acid production.

## **SUMMARY**

1. Genetic testing for **PSSM** Type I would be in order to verify condition, especially if it is a mare that might be kept for breeding later. A horse could test negative for **PSSM1**, but have a positive test for **PSSM2** or (*vice versa*) with tying-up symptoms. Dietary and exercise management for the condition is basically the same for either condition.
2. Lower starch (reduced grain/carbohydrates) and higher fiber (hay, beet pulp, rice bran ) diet and daily exercise!
3. Metabolic function support: **In-Sync®** – Formulated for supporting muscle tone, immune and metabolic function by combining key ingredients such as **magnesium, selenium, DMG and natural vitamin E**. The natural vitamin E in **In-Sync®** is 2-2½ time more bioavailable than synthetic vitamin E. It also has a high level of the amino acid (lysine) to help build healthy muscle and B vitamins to support nerves and red blood cells. **In-Sync®** costs approximately **\$1.95** per day to feed.