

# POLYSACCHARIDE STORAGE MYOPATHY

## ETIOLOGY

- Polysaccharide storage myopathy (PSSM) is a genetic disease characterized as a glycogenosis or glycogen storage disease, of which there are two forms: type 1 or “classic” PSSM, and type 2.
- Type 1 PSSM is an autosomal dominant trait (only one copy of the gene is needed for horses to be affected) where a mutation in the glycogen synthase-1 (GYS1) gene is present.
  - Mechanisms resulting in type 2 PSSM have yet to be identified.
- Affected horses demonstrate excessive levels of abnormal amylase-resistant glycogen or polysaccharide (lesser degree of branching vs. normal glycogen) in skeletal muscle, as well as a hypersensitivity to the effects of insulin.
- Blood work may indicate elevated creatine kinase (CK) and aspartate aminotransferase (AST) activities in serum as well.
- Rest for a few days prior to exercise and/or sudden changes in diet, particularly increases in dietary nonstructural carbohydrates (NSC), are common triggering factors.

## SYMPTOMS

- Clinical signs may include:
  - Atrophy in the shoulders and hindquarters (muscle wasting)
  - Painful stiff muscles
  - Reluctance to move or exercise intolerance
  - Gait abnormality
  - Weakness
  - Trembling after exercise
  - Sweating
  - A camped-out stance and hind limb stiffness
  - Difficulty rising
  - A reluctance to pick up feet
  - Lifting or stomping hind limbs
  - Cranky or sour attitude
  - Episodes of mild colic after exercise
- Symptoms typically begin around 2 to 3 years of age.
- Many PSSM horses are obese or described as “easy keepers.”

## FOLLOWING A SEVERE EPISODE

- Turn the horse out for 2 weeks.
- Longe once daily for 3 to 5 minutes at a walk and trot. Gradually increase by 2 minutes per day.
  - If stiffness is observed, stand the horse for 1 to 2 minutes and then resume walking to see if the stiffness persists.
- If stiffness persists, stop; if not, resume walking for 2 minutes and then resume trotting.
- When the horse can trot for 15 minutes, provide a 5-minute break at a walk and gradually increase walking and trotting after this.
- Once the horse has reached 30 minutes of trotting on a longe line (with a break at 15 minutes), then begin to ride for 20 to 30 minutes and gradually increase duration or intensity of exercise.
- It should take at least three weeks of exercise before the horse is ridden.
- Keeping horses aerobically fit increases oxidative metabolism and is the best prevention, in concert with an appropriate diet, for further episodes.

## MANAGEMENT RECOMMENDATIONS

- In addition to nutritional intervention, an appropriate turnout and regular exercise program are essential to successful management of horses with PSSM.
- Minimize stress and provide a regular routine with exercise, turnout and feeding.
- Turn out in large areas, preferably with other horses.
- Exercise therapy consists of daily turnout and as little stall rest as possible. Exercise should be introduced gradually, starting with 3 to 5 min of walk/trot on a longe line or under saddle, working up to 15 min. If no increases in creatine kinase (CK) are evident, the submaximal workload can be gradually increased.
- When the horse can be worked for 30 minutes without difficulty, active riding can be initiated.

## DIETARY RECOMMENDATIONS

- Nutritional recommendations for PSSM mirror those for horses with Malignant Hyperthermia.
- The majority of the diet should be provided by a consistent supply of high-quality forage such as grass or grass/legume mix hays with controlled starch and sugar content.
  - Hay analysis is strongly recommended as nutrient content of forage cannot be determined otherwise.
- Maintaining a balanced diet while minimizing total dietary (hay or forage + grain or supplement products) starch and sugar intake and maximizing fat and fibre intake is recommended.
  - This can be achieved by providing a majority of the daily calories from fat and digestible fibre and limiting energy sourced from nonstructural carbohydrates. A low calorie protein, vitamin and mineral ration balancer may be used to ensure all nutrient requirements are met without introducing excess energy.
- Fat supplements of vegetable oil, soybean oil or ground or extruded flaxseed can be used. One pound of fat/1000 lb horse can be accomplished with 2 cups of oil mixed with a soluble fibre such as alfalfa cubes or non-molassed beet pulp. These recommendations must be modified depending on the individual caloric needs of the horse.
- For horses that are obese, minimizing the caloric density of their ration is needed to facilitate weight loss, which can be difficult with high levels of dietary fat. For these horses, rather than providing high levels of supplemental fat to their diet, fasting prior to exercise (~6 hrs) helps promote increases in plasma-free fatty acids and may help alleviate challenges with energy metabolism in these horses.
- Dietary supplementation with vitamin E (600 to 2000 IU/day) may be beneficial.
- Due to insulin hypersensitivity, chromium supplementation to PSSM horses is contraindicated.
- Consumption of high levels of fructans (plant sugars) can exacerbate clinical symptoms; therefore, horses should be kept off "lush" pastures, new pasture growth (leaves less than 6" high from the ground) and pasture that has been under stress (drought, frost).
  - Depending on management or facility logistics, horses can be muzzled or turned out in a dry lot to limit grass intake and facilitate voluntary exercise.
- Changes in diet should be made gradually, over a minimum of two weeks, to allow for adaptation and reduce the risk of digestive upset.
- Salt should be available free choice. Minerals may be offered.
- Nutritional recommendations for PSSM mirror those for horses with Malignant Hyperthermia.

## SUGGESTED PURINA PRODUCTS:

### FEED NOTES:

- Feed a low, controlled starch and sugar diet with a majority of the digestible energy coming from fat and digestible fibre.
- Supplemental vitamin E may be beneficial.
- Due to insulin hypersensitivity with PSSM horses, chromium supplementation is contraindicated.

### UNDERWEIGHT HORSES

Recommended:

#### **SUPERFIBRA INTEGRI-T**

with an added source of omega-3.

#### **SUPERFIBRA CLASSIC**

with an added source of fat and omega-3.

Depending on the quantity of feed offered, the addition of

#### **EQUILIBRIUM EQUILIZER**

or **EQUILIBRIUM OPTIMAL**

is recommended to fortify the ratio

Supplement:

#### **PUR-ATHLETE,**

provides, a highly digestible source of fat and protein.



### TYPICAL/OVERWEIGHT HORSES

Recommended:

#### **EQUILIBRIUM EQUILIZER / EQUILIBRIUM OPTIMAL**

It is recommended to add two cups of oil to the daily ration to promote insulin response. Preferably use an oil high in omega-3 or a vegetable oil with added ground flaxseed. Forage analysis (hay or pasture) is recommended to determine sugar (fructan) levels.

To make a rational choice when selecting a Purina feed to manage this equine pathology, it is essential to assess the **NSC content** of the feeds. The NSC content of each Purina feed is on its fact sheet which provides additional information of particular interest when selecting a feed to aid in the treatment, control or prevention of an equine pathology.

#### FEED RATE PROTOCOL NOTICE

This feeding protocol described here pertains only to Cargill Limited Horse Feeds. There is not established feeding protocol that all feed companies must follow. Purina provides two feeding rates on their tag a "Minimum" and a "Purina Superior". The "Minimum" meets the levels established by the NRC Nutrient Requirements of Horses (2007), which will prevent all classic nutritional deficiencies. The "Purina Superior" is a greater level of fortification that promotes an optimal level of performance and immunity. By no means does that imply "Minimum" is subpar, and for the non-competitive horse, that stays home year round and has no health issues there is probably no need to exceed this level. However, if you are feeding a true equine athlete, with all the immune stresses associated with that level of competition, then the "Purina Superior" level is paramount to ensure an optimal level of performance and immunity.