

Puzzling Out Answers

A racehorse trainer describes a filly that ties up on the post parade: she sweats, her heart rate accelerates, and the muscles in her hindquarters become rigid. The excitement of the impending race seems to send her muscle cells into a frenzy.

An owner of a Quarter Horse mentions that his young gelding cramps and becomes uncomfortable and unfit to ride some days. There doesn't seem to be any rhyme or reason to why this happens.

The owner of a Belgian colt is perplexed. The three-year-old moves awkwardly and is unable to stand while having his hind feet cleaned or trimmed. He is so weak standing on three legs that it is becoming too dangerous to administer regular hoof care.

All of these horses have a form of tying-up. Researchers have classified the general disease known as tying-up into distinct syndromes.

The definitions. Recurrent exertional rhabdomyolysis (RER), polysaccharide storage myopathy (PSSM), and equine

polysaccharide storage myopathy (EPSM) are common myopathies or muscle disorders. Each is slightly different than the other, but all seem to have a genetic origin.

RER appears to be an abnormality in muscle contraction brought about by excitement and exercise. This discovery was based on research that involved harvesting a sliver of muscle from between two ribs. The muscle was then evaluated to determine how it reacts in various conditions. Muscle from horses with RER reacted differently than muscle from normal horses in that it was much more sensitive to contractions induced by certain agents. The contracture reaction indicated a possible problem with the way calcium is regulated inside the muscle cell. When the researchers tested Quarter Horses, no abnormal reaction was achieved, indicating a distinction between RER and PSSM.

Two forms of RER have been documented, sporadic and chronic. Horses that experience an occasional episode of exercise-induced muscle pathology are diagnosed with sporadic exertional rhabdomyolysis, whereas horses with frequent episodes are labeled as having chronic exertional rhabdomyolysis.

PSSM is caused by an overabundance of glycogen in skeletal muscle. Affected horses are able to use glycogen to fuel their muscles just as normal horses do. However, PSSM horses pull glucose from the bloodstream and deposit it into muscle tissue more quickly than normal horses, thereby creating more glycogen than normal horses. This overproduction of glycogen may be due to insulin sensitivity of muscle tissue, a phenomenon that might begin as early as six months of age. Insulin is a hormone released by the pancreas into the bloodstream in response to digested carbohydrates. Insulin stimulates the muscle to take up sugar from the bloodstream.

EPSM is another syndrome that involves misallocation of glycogen within muscle tissue and is much like PSSM. There are, however, numerous differences in the clinical expression of the two syndromes.

The victims. The three myopathies seem to occur in specific populations with little overlapping. PSSM primarily affects Quarter Horses, Paints, Appaloosas, and crossbreeds with this stock-type breeding. EPSM hits draft horses of all breeds, draft crosses, and warmbloods. Finally, RER occurs in racing Quarter Horses, Thoroughbreds, Standardbreds, and Arabians. Between them, the three syndromes cut a wide swath through the equine population.

The indicators. Signs of the three myopathies may be strikingly similar but there are differences. Close observation of the affected horse could differentiate one from the other.

RER: firm, painful loin and croup muscles at the beginning of exercise; profuse sweating, rapid breathing, reluctance to move, muscle tremors.

PSSM: sweating; stretching as if to urinate; muscle fasciculations; rolling or pawing following exercise; unwillingness to move just following the onset of exercise.

EPSM: mild trembling; tucked-up abdomen; camped-out stance; poor or uneven muscling around the shoulders and over the back, loin, and croup; difficulty rising after lying down; reluctance to lift hooves for daily hoof care or periodic trimming or shoeing

The diagnosis. Definitive determination of disease depends on reliable laboratory results. When an accurate history of signs is drawn, veterinarians should have an inkling as to which myopathy is being presented.

To confirm a diagnosis of RER, a blood sample and muscle biopsy should be collected. Two enzymes, creatine kinase (CK) and aspartate transaminase (AST), are released into the bloodstream within hours of muscle damage. If circulating levels of these two enzymes are markedly increased, RER can be validated. Muscle biopsy is useful in determining which form of RER a horse might have.

For substantiation of a PSSM or EPSM diagnosis, muscle biopsy is recommended. Horses with these myopathies often have glycogen concentrations 1.5 to 4 times greater than in normal horses.

A muscle biopsy can be performed by most veterinarians (see Equine News 8:2 for an in-depth look at how muscle is collected for biopsy).

The diet. Formulating a diet for horses diagnosed with these myopathies takes careful forethought. Many horses can be managed successfully when a suitable diet and other management considerations are in place. Diets should be created in an effort to reduce starch intake and replace those calories with fat and fermentable fiber.

Forage. Good-quality grass or legume hay is acceptable for horses engaged in regular exercise. For those that are idle or perform minimal exercise occasionally, a clean grass hay is sufficient. Because the starch content of most hays is low, regardless of whether they are grasses, legumes, or a combination of both, enough forage can be fed to maintain optimal body weight. At the very minimum, horses should receive at least 1% of their body weight in forage daily.

One notable exception to this plan exists. Grain hays such as oat or barley hays should be avoided because high-starch grain kernels may be clinging to stems, and these will only serve to increase starch in the diet.

Grains. For horses that are being asked to work hard on a regular basis, a high-fat, high-fiber feed will likely be a necessary part of the diet. To answer the call for such a feed, Kentucky Equine Research (KER) collaborated with prominent neuromuscular researcher Dr. Stephanie Valberg to develop a product called Re-Leve.

Re-Leve is chock-full of energy, but the energy comes not from starch but primarily from fat and fermentable fiber. The energy breakdown of a conventional sweet feed would be approximately 63% starch, 14% protein, 14% fat, and 9% fiber. An analysis of the energy in Re-Leve reveals an altogether different profile: 44% fiber, 30% fat, and only 10% starch.

Recently, KERx, a subsidiary of KER, released two distinct Re-Leve formulas. One formula, called Re-Leve Original, addresses the energy needs of horses that perform strenuous exercise such as racing or three-day eventing. The other, named Re-Leve Concentrate, supplies energy to horses that require fewer calories while still conveying all of the vitamins and minerals needed for optimal health. For a list of Re-Leve distributors, go to www.kerx.com.


If Re-Leve is not available, look for other low-starch feeds. As protein and fat levels rise in a feed, starch levels usually drop. If it is not clear whether a feed is low in starch and sugar, check out the ingredient list. It might reveal low-starch feedstuffs like soy hulls and beet pulp. Other low-starch, low-sugar feedstuffs include alfalfa-based products such as pellets and cubes, complete feeds intended to replace hay, and chopped hay products.

Remember, changes in diet should be accomplished over a period of several weeks. By switching slowly from one diet to another, the horse's gastrointestinal tract is given adequate time to acclimate to the changes. If done hurriedly, problems such as colic may occur.

The exercise. Management of exercise is a vital part of the treatment plan and should be discussed with the veterinarian who is treating the horse. If at all possible, horses diagnosed with myopathies should have access to daily turnout with only limited time allotted to stall confinement. Formal work such as trail riding, longeing, driving, or arena exercise is encouraged. In fact, some horses cannot ward off future problems with diet alone, showing improvement only when daily exercise is begun and maintained. This fact underscores the importance of exercise during treatment.

The changeover. Give the treatment time to work. After a horse has been diagnosed with one of these syndromes and the aforementioned changes to diet and exercise have been put into place, the timeline for recovery must be realistic. Because the horse's caloric requirements are being met through a different source of energy—fat and fiber instead of starch—it will take a few months for the gastrointestinal tract to adapt and for the metabolic changes to kick in. Signs of the diseases usually fade away as management practices continue over the course of several months.

The prognosis. Long-term usefulness of horses with RER, PSSM, and EPSM depends on the severity of the disease. Almost all horses with mild forms of the diseases, and many of those with more severe forms, will return to a normal life once a low-starch, high-fat diet is implemented and free-choice exercise is granted.

Because of the familial nature of the disease, serious thought should be given to eliminating affected animals from a breeding program. While managing the myopathies is certainly possible in most cases, it requires a substantial shift from ordinary feeding practices. 



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