

Optimal diet and management for horses subject to Tying-up (also referred to as azoturia or exertional rhabdomyolysis).

Vetoquinol advises you to consult your veterinary surgeon concerning any specific health questions about your horse. The information contained in this document is intended for educational purposes only.

Exertional rhabdomyolysis (ER) has been recognized in horses for more than 100 years as a syndrome of muscle pain and cramping associated with exercise. Recently it has been recognized that this syndrome has numerous possible causes. Sporadic forms of ER are due to over-training and muscle strain, dietary deficiencies of electrolytes, vitamin E and selenium or exercise in conjunction with herpes or influenza virus infections. Chronic forms are due to specific inherited abnormalities such as polysaccharide storage myopathy (PSSM) in Quarter Horses, Warmbloods and Draft breeds or recurrent exertional rhabdomyolysis (RER) in Thoroughbreds, Standardbreds and Arabians.



What are the signs that might suggest your horse is having a tying-up episode

Clinical signs of exertional rhabdomyolysis usually occur shortly after the beginning of exercise.

- **The most common sign**
 - Firm and painful muscles over the lumbar (loin) and sacral (croup) Regions of the topline, including the large gluteal muscles.
 - Excessive sweating
 - Quick, shallow breathing, rapid heart rate
 - Muscle tremors
- **In extreme cases:**
 - Reluctance or refusal to move
 - Discolored urine due to the release of myoglobin from damaged muscle tissue.

The veterinary surgeon should be called out if a "Tying-up"/ER episode is suspected.

Confirmation of ER diagnosis

- **Blood samples should be obtained**
 - The blood concentration of the enzymes, serum creatine kinase (CK) and aspartate transaminase (AST) are elevated.
- **Muscle biopsy may need to be performed**
 - Confirm diagnosis of PSSM
 - Investigate other causes of muscle dysfunction
 - DNA testing of blood or hair root samples for certain genetically linked problems such as PSSM can be performed.

There are 2 distinct forms of ER

Sporadic : Horses that experience a single episode or infrequent episodes of muscle necrosis with exercise are categorised as having sporadic exertional rhabdomyolysis.

Chronic : Horses that have repeated episodes of exertional rhabdomyolysis accompanied by increased muscle enzyme activity, even with mild exertion, are classified as having chronic exertional rhabdomyolysis and are frequently linked to hereditary myopathies (muscle disease) : 2 forms are currently identified: recurrent exertional rhabdomyolysis RER and polysaccharide storage myopathy PSSM.

Nutrition and sporadic exertional rhabdomyolysis episode

A well-designed exercise program and a nutritionally balanced diet with appropriate caloric intake and adequate vitamins and minerals are the core elements of treating exertional rhabdomyolysis. In some cases, deficiencies of vitamins, minerals or electrolytes may cause signs of muscle pain and stiffness in horses. Suggested deficiencies include vitamin E and selenium. Adequate amounts of vitamin E and selenium prevent the detrimental interaction of peroxides with lipid membranes of the muscle cell.

Most horses with chronic rhabdomyolysis have adequate or more than adequate concentrations of vitamin E and selenium, and further supplementation has not been found to have protective effects on muscle integrity in exercising horses. Many feeds, particularly those designed for horses with rhabdomyolysis, provide adequate selenium supplementation and caution should be taken not to provide excessive selenium in the diet. Likewise, sufficient vitamin E is provided in most diets by green grasses, well-cured hay, and rice bran.

Electrolytes and Minerals

Horses performing in hot weather often develop electrolyte imbalances, particularly if exercise continues for several hours. Free-choice access to a salt block should be provided to these horses, or alternatively, 25 to 100g of NaCl (salt) supplied in an appropriate electrolyte formulation can be added to the feed daily.

Extreme climatic conditions may necessitate the use of commercial electrolyte mixtures containing a 2:1:4 ratio of sodium:potassium:chloride.

Fresh water should be available to horses at all times, especially if they are being supplemented with electrolytes. Dietary imbalances of electrolytes, particularly deficiencies of sodium, potassium, and calcium, have been implicated in exertional rhabdomyolysis. Correction of imbalances may be crucial in the management of some exertional rhabdomyolysis cases.

Nutrition and chronic exertional rhabdomyolysis

“Diet manipulation is becoming the method of choice in controlling RER, particularly in equine athletes that are closely monitored for pharmacological substances. A well-designed exercise program and a nutritionally balanced diet with appropriate caloric intake (majority via fat and fiber sources while minimising dietary soluble carbohydrate content) and adequate vitamins and minerals are the core elements of treating RER.”

Management of Recurrent Exertional Rhabdomyolysis RER

Commonly afflicts Thoroughbreds, Standardbreds and Arabians. During a racing season, 5-10 % of Thoroughbreds often exhibit signs of RER and of those 2 and 3 year-old horses with RER, up to 15% may not be able to train sufficiently to race at all that season.

A breeding trial conducted at the University of Minnesota showed:

- Nervous young (two-year-old) fillies in race training are most severely affected
- Sex predilection for females (Not obvious in older horses with RER)
- Episodes occur most often when:
 - o Restrained during exercise
 - o Level of fitness increases.

RER in Thoroughbreds appears to be due to disruption of the mechanism by which muscle contraction is regulated in conjunction with excitement and exercise. Every time a muscle contracts, calcium is released from muscle storage sites and then taken back up into storage sites for muscle relaxation. The altered contraction and relaxation of muscle suggests that abnormal intracellular calcium regulation is the cause of this form of RER. These intramuscular calcium concentrations are extremely small compared to the amount of calcium in the rest of the body and are completely independent of dietary calcium concentrations.

Effect of Modulation of Dietary Fat and Starch

Increasing dietary fat supplementation and decreasing dietary starch have resulted in beneficial effects to horses with RER, however, the mechanism for this is not clearly understood. Fat supplementation is only beneficial to RER horses when total dietary caloric intake is high. The beneficial effects of fat supplementation in RER horses may be due to the exclusion of dietary starch rather than specific protective effects of high dietary fat. Given the close relationship between nervousness and tying-up in horses with RER, assuaging anxiety and excitability by reducing dietary starch and increasing dietary fat may decrease predisposition to RER by making these horses calmer prior to exercise.

Recommended Diets for Horses with RER

- As with any horse, feeding forage at a rate of 1.5 to 2 % of body weight is a fundamental part of the diet.
- RER horses seem to benefit from fat supplementation only when they require high caloric intakes.
- Once caloric needs are assessed, a diet should be designed with an appropriate amount of fat and starch. Thoroughbred horses with frequent episodes of rhabdomyolysis are usually being fed 2 to 6 kg of concentrate feed per day.

The incidence of subclinical rhabdomyolysis is low in Thoroughbreds being fed a moderate caloric intake whether it is in the form of concentrate feed or rice bran. However, when calories are increased by the addition of more concentrate feed, the incidence of subclinical and clinical rhabdomyolysis is much greater.

One way to lower serum CK after exercise when a high caloric intake is required is to feed a low-starch, high-fat ration.

For RER horses, the recommendation is to feed:

- No greater than 20 % of daily digestible energy (DE) as non-structural carbohydrate
- Supply 20-25 % of daily DE from fat.
- The diet should contain no more than 2kg of concentrate feed, 600 ml of vegetable oil, and 2kg of rice bran per day.



All supplemental feeds should be reduced in amount on days when energy requirements are not as high, particularly if the horse is at risk of weight gain.

Other management strategies may help to decrease the intensity of the post-prandial glycemic response:

- Feeding small meals, providing at least 1.5 - 2.0 % body weight per day in forage
- Feeding a forage source either two hours before or concurrently with any grain.
- Avoid high starch supplements such as molasses is also important.

Recent studies in RER horses show that significant reductions or normalisation of post-exercise serum CK activity occurs within a week of commencing a diet providing 20 % DE as fat and 9 % DE as starch.

Potentially, the rapid response to decreasing starch and increasing fat was a result of neurohormonal changes that resulted in a calmer demeanor, lower pre-exercise heart rates, and a decreased incidence of stress-induced rhabdomyolysis. Avoiding prolonged stall rest in fit Thoroughbreds with RER is also important since post-exercise CK activity is higher following two days of rest compared to values taken later in the week when performing consecutive days of the same amount of submaximal exercise.

It is quite possible that exercise exerts beneficial effects on horses with chronic exertional rhabdomyolysis that are separate from the impact of reduction in dietary starch and/or fat supplementation. Failure to implement an appropriate exercise routine will likely lead to failure to control rhabdomyolysis.

Returning the animal to work

A horse may be returned to work after:

- It is no longer showing signs of ER, and is no longer on anti-inflammatory drugs NSAIDs (risk of hiding signs of another bout of ER). If NSAIDs are needed to keep the horse comfortable, or if the horse is reluctant to continue work, the animal is not yet ready for a return to his regular training program.
- Blood tests should reveal that the horse's CPK concentration and AST levels are normal before the horse is returned to work.

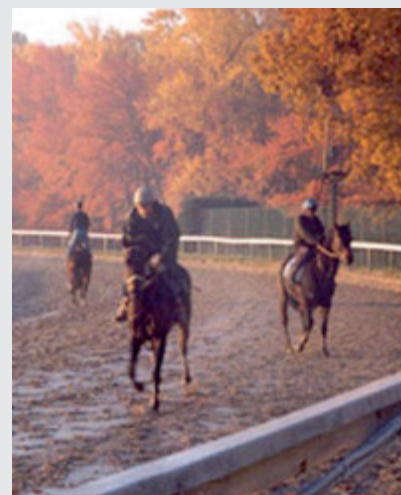
To begin bringing the horse back:

- Exercise at the walk and trot for 10–15 minutes at least once every day. This regimen will gradually be increased as the horse becomes more willing. For a moderate or severe bout of ER, it may take 4–6 weeks to return to the regular program.
- It is important not to push the horse more than he is ready or a relapse may occur. A second bout of ER is usually more severe than the first, not only taking the horse out of training for a longer time, but possibly causing permanent muscle damage.

Exercise and ER prevention

Proper conditioning is very important in preventing ER.

- Begin with a base of long, slow distance work to ensure that the horse has a foundation before proceeding on to more strenuous work.
- The horse should always have a 10-minute warm-up at the walk and trot before more strenuous work is begun, and should always have a proper cool down of 10 minutes.
- Stall confinement should be kept to less than 24 hours if possible. Since RER appears to be a stress-related disorder
- Management strategies to reduce stress and excitability are important. These include turn-out, exercising or feeding these horses before other horses, providing compatible equine company, and the judicious use of low-dose tranquilizers during training.



It is best that a horse receives exercise every day, or possibly twice a day, to prevent the recurrence of ER. If possible, avoid breaks in the horse's exercise schedule. Training, riding, driving, lunging, or turnout are all suitable.

Daily pasture turnout is ideal for horses likely to suffer from ER, as it provides exercise and adds roughage to the animal's diet.