Feed to Succeed:
Supplements to Help the Endurance Horse

BY KATHLEEN CRANDELL, Ph.D.

The endurance horse is unique among all other equine athletes. Because of the prolonged demands placed upon the endurance horse with protracted moderate intensity exertion, its performance may be influenced quickly by the quality of its diet. A simple diet of hay and oats may lack essential nutrients that allow the horse to perform as expected. Understanding how competition affects the nutrient needs of the horse will help the owner select the appropriate supplementation program for the individual endurance horse.

Improving the diet

Approximately 80 to 90% of the feed eaten by horses is used to satisfy their energy requirements. Horses, like people, utilize energy to run most of the chemical reactions within the body, particularly to fuel muscle contractions vital to the work effort. As such, any horse diet should focus on providing adequate energy (calories). The major source of that energy is dietary carbohydrates (grass, hay, grain, molasses, etc.) Because the amount of energy available from forage alone can be a limiting factor for performance, grain is often added to increase the energy density of a diet.

Dietary fat is another source of energy readily employed by the horse for calories. Fat contains roughly 2.25 as much energy as an equal weight of carbohydrate, so less is needed to fuel body processes. Dietary fat has been scientifically proven to be advantageous to the performance of horses undergoing prolonged bouts of exercise. During long duration, moderate intensity exercise, the body depends on fat stores to supply energy for work. The addition of fat to the diet has been found to increase the ability of the horse to mobilize fat stores for energy, sparing the muscle glycogen (sugar) stores for more intense bouts of exercise. In a study done at Kentucky Equine Research comparing differences in fat utilization between breeds, it was found that Arabians (the most common breed used for endurance) are much more efficient at mobilizing and burning fat as an energy source than are Thoroughbreds.

There are different dietary fat sources available to the horse, and the most common are vegetable oils. Vegetable oils can be fed safely up to 15% of the total diet. Another source of fat is rice bran, the heat-stabilized outer layer of the rice kernel which contains 20% fat. Compared to oats, rice bran can contain 120% of the digestible energy on a pound for pound basis. Therefore, this source of fat is beneficial in adding calories to the diet without increasing the amount of grain being fed.

The remaining 10 to 20% of the diet is used to satisfy the nutrient requirements that drive the cellular processes inside the body. Protein is the major nutrient the body needs to support normal body functions. Vitamins and minerals play a vital role in metabolism but are needed in relatively small amounts. A simple diet of hay and oats may lack some of these key nutrients. Grain concentrates are designed to complement the nutrient profile of forages but must be fed at the recommended level in order to obtain balanced nutrition. For many endurance horses of Arabian descent, the recommended feeding rate of commercial grain mixes provides too many calories, resulting in excess weight gain. A horse that eats

Photo by Mark Llewellyn

Supplements designed to enhance hoof health are strongly recommended for endurance horses.

less than the recommended amount may be short on the supplemental protein, vitamins, and minerals that are added to complement the deficiencies in forages. A specialized grain mixture designed for endurance horses is preferable. Failing that, a specially designed concentrate containing essential proteins, vitamins, and minerals can be used to top off a feed that is provided at a lower rate than recommended. If protein is sufficient in forage and grain, then adding a well-balanced vitamin and mineral supplement will be sufficient to fill in the shortcomings of the diet.

Supplements

Hooves: Horses often have unique requirements for certain nutrients to help improve performance. This is especially true of endurance horses. For instance, not every horse is blessed with hard, resilient hoof walls. The hooves of endurance horses often take a beating from the long hours on the trail. Research has shown that some horses with weak hooves benefit from supplementation of certain nutrients. Specific additives like biotin, methionine, iodine, and zinc, or a combination of them, can be added to the horse's diet to improve hoof quality.

Muscles: Endurance competitions can also be hard on the horse's muscles, which are in constant use during the hours of training necessary to compete successfully. During muscular exertion, free radicals (waste products of oxygen metabolism that can damage cell components) are produced and can cause muscular damage if not eliminated. Certain nutrients, specifically vitamins C and E and selenium, are key antioxidants responsible for quenching free radicals found to build up in muscle tissue. These

Kentucky Equine Research has developed many products that support the efforts of equine athletes in every field of competition. Perhaps the most challenging horse to feed is the endurance competitor that must exert tremendous energy during competitions and training, but must be fed carefully to avoid weight gain or other problems associated with high-energy feeding. These horses have benefited greatly from the following products.

- **EQUI-JEWEL** This high-fat, heat-stabilized rice bran contains 20% fat. Feeding rice bran can add calories to the diet without increasing the amount of grain. The recommended feeding rate of Equi-Jewel is one-quarter to two pounds per day.
- **EN-DURE** This product is a combination of rice bran and other dietary fats. The fat content of En-Dure is about 50%. En-Dure also contains probiotic microbials that improve overall digestibility of the diet. Further, En-Dure contains the powerful natural antioxidant vitamin E, which helps protect muscle tissue from exercise-induced damage. Carnitine is essential for proper muscle functioning. As exertion levels increase, muscle carnitine levels decrease. To offset these deficiencies, L-carnitine has been added to En-Dure. The product is very palatable and can be fed at a lower feeding rate than Equi-Jewel because of the higher energy density. The recommended feeding rate of En-Dure is around eight ounces per day.
- **MICRO-PHASE** For horses that may be receiving all the protein they require from their forage and grain concentrates but an inadequate supply of minerals, Micro-Phase can be used to ensure that all of these nutrients are provided. The feeding rate of Micro-Phase is from one to four ounces per day.
- **KER-A-FORM** This product is a specially designed biotin, methionine, iodine, and zinc supplement for horses. Ker-A-Form contains 20 mg of biotin per ounce, which is the amount proven by research to significantly impact hoof quality. These vital hoof nutrients are combined with lecithin, full-fat soybean meal, and yeast culture to provide a source of essential fatty acids and to maximize absorption. Ker-A-Form also produces a healthy, shiny hair coat.
- **MYO-GUARD** Containing the antioxidants vitamin E and selenium, as well as vitamin C and magnesium, Myo-Guard works to protect muscle tissue. It also helps to reduce muscular pain and stiffness associated with work. It is recommended as a daily supplement, particularly for horses with a history of myopathies such as tying-up. Myo-Guard can also be used when a horse is being brought to peak condition for competition. Supplementation with Myo-Guard should begin the week before the competition and be continued through the week after the competition. This supplementation will help the horse have a smoother recovery from intensive work. When fed in combination with Micro-Phase before, during, and after competition, Myo-Guard may also boost the immune system of the endurance horse.

nutrients work in concert to reduce muscular soreness and stiffness associated with exercise. Magnesium is necessary for proper nerve and muscle function and may be insufficient in the diet of some hard-working horses.

Immune function

Antioxidants are also important for support of the immune system. Human endurance athletes may have reduced immune function for about 70 hours following a bout of prolonged and intensive exercise. During this period the body may be particularly susceptible to infection, allowing viruses and bacteria to gain a foothold. Lack of sleep, severe mental stress, malnutrition, weight loss, or other stressors commonly associated with shipping and competing can also exacerbate depression of immune function. Although the research has been done in humans, it may very likely be similar for the equine endurance athlete. Whether human or equine, body cells need specific nutrients to be able to properly divide and produce necessary antibodies. Many enzymes in immune cells require the presence of micronutrients, and critical roles have been defined for zinc, iron, copper, selenium, and vitamins A, B6, C, and E.

Electrolyte losses

Electrolytes are ions (charged particles) found inside and outside of cells in the body. Electrolytes play an important role in maintaining osmotic pressure, fluid balance, and nerve and muscle activity. A horse sweats in order to get rid of excessive heat that has built up in the muscles. Horse sweat consists of water and a high concentration of electrolytes. Any level of work produces body

- **ENDURA-MAX** Endura-Max is an electrolyte formulated specifically for endurance horses. The amount of sweat produced by an endurance horse during a competition is considerable. Because electrolyte balance is critical for maximal performance, replacement of lost electrolytes is imperative. Endura-Max contains added calcium and magnesium in highly available forms to replenish those losses along with the other electrolytes such as sodium, chloride, and potassium.
- **ENDURA-MAX PLUS** This is the latest addition to the KER electrolyte family. Endura-Max Plus comes in premeasured easy-to-administer dose tubes for convenience in camp and on the trail. This product contains Endura-Max in a highly palatable base and an antacid to help soothe stomach upsets caused by the rigors of endurance competition. The buffer used is Neigh-Lox, another KER product described below.

- **SUMMER GAMES ELECTROLYTE** This product was developed for general performance horses but may be appropriate as a daily electrolyte supplement for the endurance horse. Summer Games is an electrolyte and trace mineral supplement that can be added directly to the daily grain ration.
- **NEIGH-LOX** Neigh-Lox is an equine antacid that buffers stomach acid while coating and protecting the stomach lining. For horses with signs of ulcers or sour stomachs, Neigh-Lox can be added to the grain portion of the diet on a daily basis. To use Neigh-Lox as an aid in easing the stresses of competition, horses should be started on this product prior to being loaded on the trailer and kept on it until they are returned to pasture. Neigh-Lox is available only through a veterinarian.
- **METABOLEEZE** Metaboleeze is a supplemental source of B-complex vitamins and organic trace minerals. In particular, Metaboleeze contains the micromineral chromium. For the endurance horse that has a low tolerance to large amounts of grain in the diet, Metaboleeze may be a useful supplement. It may also help horses that have experienced problems with tying-up. Metaboleeze is available only through a veterinarian.

KER continues to develop beneficial products for all performance horses. The company's equine nutritionists are also available for consultations. They work with KER Team Members, feed manufacturers across the globe, to develop nutritional programs specifically designed to meet a wide variety of equine needs.


Photo by Mark Llewellyn

The stresses of loading and trailering can cause stomach problems for horses.

heat and subsequent sweating. When an endurance horse sweats, it loses essential electrolytes (particularly sodium, chloride, and potassium) that are necessary for top performance. Other factors may cause a horse to sweat, such as the time the horse spends in or tied to a trailer during the heat of the day or the stress of an unfamiliar environment. Excessive sweating with subsequent loss of electrolytes can cause fatigue and muscular weakness. Usually, a horse can replenish lost electrolytes from its normal diet. However, under extended work or stressful circumstances, the electrolytes that are lost in sweat cannot be replaced from the daily ration of grain and forage. The amount of sweat produced by an endurance horse during a competition far exceeds that of any other sport horse. It may be difficult to realize the volume of fluid lost as the sweat may evaporate before it is even seen. Because electrolyte balance is critical for maximal performance, replacement of lost electrolytes is imperative. During long rides, calcium and magnesium may be also be lost in sweat in amounts high enough to cause metabolic disorders. Specific electrolyte supplementation can be provided to the horse during the competition phase, but it may also be necessary to provide a daily dose for horses that are in training for endurance events. Free choice water should always be available to the horse when electrolytes are used.

Stomach problems

The rigors and routines of training often interrupt the natural grazing behavior of performance horses, and consequently their stomach acid buffering mechanism. Indigestion often results. If a horse has any of the following signs it may be suffering from heartburn: drop in performance, sour attitude, poor hair coat, grinding teeth, inappetance, and weight loss. Many endurance horses enjoy the luxury of having 24-hour turnout on pasture, which is ideal for the prevention of ulcers or heartburn. However, when this lifestyle is interrupted and the horse is loaded on a trailer, put in a stressful situation, fed differently than normal, and then asked to compete for hours with limited meals, he may end up with a sour stomach that will affect performance or attitude. Medications designed to alleviate these discomforts or those specifically designed to be stomach buffers can help horses with these problems.

Chromium supplementation

Strenuous exercise and high-grain diets increase the excretion of chromium in the urine of equine athletes, thereby depleting the natural reserve of this mineral in the body. Chromium is an integral component of glucose tolerance factor, which is thought to potentiate the action of insulin in chromium-deficient tissue. In a Kentucky Equine Research trial, chromium-supplemented horses showed lower insulin levels in response to a meal, and maintained lower insulin levels throughout a standardized exercise test. This means that with chromium supplementation less insulin is required to assimilate and utilize the same amount of glucose from a meal. Another significant result was that peak levels of lactic acid were lower when the horses received supplemental chromium. Since lactic acid accumulation contributes to fatigue during exercise, this can be interpreted as being beneficial for the performance horse. For the endurance horse that has a low tolerance to additional grain in the diet, a chromium supplement may be advantageous. Chromium supplementation may also help reduce the incidence of tying-up in certain horses. One of the possible causes of tying-up is related to carbohydrate metabolism, and therefore chromium's action on glucose and insulin may be beneficial in this situation.

Keeping an endurance horse fit and healthy involves more than just putting in a large number of miles on trails. The work required of these horses is quite different than that of any other equine athlete. The challenge is to provide the correct combination of nutrients that will support the special needs of these athletes during both training and competition.