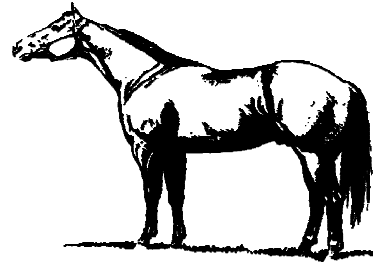


Animal Science Horse Information Series

Phone: 865-974-7294
e-mail: fharper@utk.edu
<http://animalscience.ag.utk.edu>



FEEDING YOUR HORSE'S HOOVES

**Dr. Frederick Harper
Extension Horse Specialist
Department of Animal Science
University of Tennessee**

The health of the hooves is a reflection of the overall health of the horse over the last 6-9 months. It is important that horse owners feed their horses' hooves by feeding the whole horse. Efforts to address what may be a real or a perceived nutritional hoof deficiency by supplementing one or more nutrients may result in negative effects.

The best approach to feeding the horse's hooves is to properly feed each horse a nutritionally balanced ration that meets all its nutrient needs. Feeding programs will vary from rapidly growing foals to performance horses to senior equine citizens.

In poor-quality hooves, the horn shows a loss of structural integrity. Hoof horn is a highly modified and specialized form of skin. Hooves with poor-quality horn have a slow rate of growth. A review of the basic nutrients that are important for hoof nutrition, both

from a deficiency as well as an excess point-of-view, will aid in developing an effective feeding program.

Nutritional Balance. It is critical that all horses are fed a properly balanced ration with each nutrient being supplied in the correct amount for the use category and weight of each horse. One of the serious problems in the horse industry is feeding imbalanced rations.

Dietary imbalances can affect the structure and strength of the hooves. Focusing on a single nutrient (or class of nutrients; such as, protein or vitamins) results in problems as nutrients have complex interactions.

Horse owners often take a well-balanced commercial feed (a grain mix) and add oats or another feed component to it. The result is a “new feed” that is not balanced for its intended purpose.

Another problem that horse owners cause themselves is feeding more than one supplement or more than the manufacturer’s recommended amount. There exist the idea that “if a little is good, more is better,” so the horse owner feeds 2 or 3 scoops rather than 1, which can be a dangerous assumption with some nutrients. The result can be an imbalance in nutrients or even worse, a toxic level of one or more nutrients. This situation can often occur where more than one hoof supplements is being fed.

Most nutrients, especially minerals, have interactions with several other minerals. Changing the amount of one mineral can result in another becoming deficient.

Many feed companies today develop grain mixes which are balanced to be fed with either a grass or a legume hay (or pasture). This is most helpful to the horse owner.

Energy. Energy is not a nutrient per se; however, each horse has an energy

requirement. Carbohydrates are the major energy source in feeds. Fat, also an energy nutrient, has become important in horse rations in recent years. Protein fed in excess of a horse's requirement can be converted to energy. This is not a recommended practice because of cost, and it can be negative in some situations, such as feeding excess protein to performance horses in summer.

Forages, both pasture and hay, provide energy. In some situations, such as with idle pleasure horses or those ridden only occasionally, forages can provide enough energy to meet the horse's needs. In fact, highly fermentable fiber sources; such as, beet pulp or soybean hulls, are used in feeds for top performance horses.

Body condition score (BCS) is a hands-on, visual method to evaluate the body fat content of a horse. If the BCS remains relatively the same or increases, it is a good indicator that a horse has an adequate energy intake. A decline in BCS indicates a lack of energy in the horse's ration.

If a horse is not fed adequate energy, it will lose body condition (have a lower BCS over time), and may have poorer-quality hooves. Energy is considered the first limiting nutrient and utilization of all other nutrients may be limited, if the diet is energy deficit.

Excess energy results in obesity (BCS = 8 or 9) which places extra weight, and thus stress, on the legs and hooves. High grain diets have been implicated with laminitis as are rapid feed changes to high-energy feeds. Developmental orthopedic disease (DOD) can result from feeding young, growing horses too much energy for rapid growth, particularly when they are overweight. This tends to occur when weanlings and yearlings are being prepared for halter showing and sales.

Protein. The horse's hoof wall contains a high level of protein. On a dry matter basis (with all the water removed), it may be more than 90% protein. Now, this does not indicate that one should feed excessively high levels of protein if a horse's hoof is of poor-quality. All horses should be fed their required amount of protein---not more or less.

The horse's hoof wall is composed of an insoluble protein called keratin which is a structural protein that contains sulfur containing amino acids. Methionine and cysteine form the bi-sulphurous bonds (-S-S-) between the keratin molecules. Methionine is often supplemented when horses have poor-quality hooves or laminitis. Over-supplementation of horses with methionine has resulted in sore feet, intermittent lameness, difficulty in keeping shoes on and crumbling hoof walls. When over-supplementation of methionine was stopped, and copper and zinc added to the rations, the noted problems were reversed. The hardness of the hoof is derived from keratin.

The ratio of protein-to-energy (expressed as grams of protein per Mcal of energy) is important as other ratios like calcium-to-phosphorus. For example, young, growing horses should have 50-55 grams of protein per Mcal (megacalorie) of energy; mares in late pregnancy should have 45, early lactation (0-90 days) requires 50 grams protein per Mcal and mature, idle horses need 40 grams of protein per Mcal.

Feeding too much protein or too much energy in relation to the other can be detrimental. When young horses were fed an imbalanced protein-to-calorie ratio diet, they ate less feed, gained less weight and did not grow as rapidly. Over time, it is likely that such a diet could affect the quality of their hooves.

If a horse has poor-quality hooves, feeding more protein is not the answer. A mature pleasure horse on good-quality pasture or hay does not need a 14 or 16% protein grain mix,

even if they have poor-quality hooves.

Instead of feeding more protein to the mature horse with bad hooves, one should feed a higher-quality protein. Quality protein refers to the correct amino acids in proper relation to each other. High-quality sources of protein are soybean meal, alfalfa hay, casein milk by-products and others. Linseed and cottonseed meals, whey milk by-products and some grain by-products contain low-quality protein.

Quality protein is normally not a consideration with mature horses; however, horses that are stressed in performance, housing and/or transportation may benefit from changing to a higher-quality protein if they begin having poor-quality hooves.

Minerals. Several minerals are implicated as possible factors in hoof nutrition. Calcium, zinc, copper, selenium and magnesium are often noted.

When horses did not respond to biotin (a B-vitamin) supplementation, calcium had a positive affect on the quality of the hooves. These horses were being fed a ration that was high in phosphorus and low in calcium. The calcium-to-phosphorus ratio is very important, as noted above. The diet should always contain more calcium than phosphorus. Diets that are high in grain, bran and low in forage or contain low-quality forage, often have an inverted calcium:phosphorus ratio. In other words, there is more phosphorus than calcium in the diet.

Phosphorus fed in excess ties up the calcium in the small intestine and signals the body that it is calcium deficient. Calcium has been shown to be important in the integrity of the hoof wall. Calcium is essential to bond keratin cells together. A calcium:phosphorus ratio up to 3:1 is okay in young, growing horses, while a ratio up to 6:1 works in mature horses.

Alfalfa is high in calcium and protein and can aid poor-quality hooves. Horses on a poor-quality hay, bran and oat ration had 22-25% more horn growth within 9 months when ½ the poor-quality hay was replaced with alfalfa. Performance horses stabled for long periods of time had improved hoof quality when placed on pasture in the summer. However, feeding high levels of calcium can interfere with zinc absorption.

The trace minerals zinc, copper, selenium and manganese are key elements of enzymes or co-factors that cause certain body reactions to function properly.

Sometimes having too much of one of the trace minerals can be detrimental. Zinc is necessary for healthy skin, hair and hooves, but too much zinc can be an antagonist to copper. Specifically zinc plays a role in enzymatic action in the formation of keratins and collagen.

Copper is a part of an enzyme that is required for the formation of the disulfide bonds in keratin. Another copper dependent enzyme is necessary for cross-linkage for structural integrity of collagen (found in dermis and bone).

Manganese is required for chondroitin sulfate synthesis which is important for formation, maintenance and repair of joint cartilage. Development and maintenance of the skeletal bone matrix depends on adequate magnesium.

Selenium is essential for hoof health, but deficiency and toxicity levels are within a narrow margin. When more than one selenium supplement was fed, horses developed poor-quality hooves. Excessive levels of selenium, such as, when two or more selenium containing supplements or excessive levels are fed, resulted in inflammation and bleeding at the coronary band and even laminitis. Removal of the excess selenium eliminated these problems.

Using chelated minerals appears to improve digestion of minerals. Organic selenium, specifically Se-yeast, has been shown to be more bioavailable than inorganic selenium.

Chelated minerals are minerals attached to an amino acid. Zinc-methionine is a better form than zinc-sulfate or other zinc forms. Feeding ½ the minerals in the chelated form may be advisable for good hoof health.

Vitamins. The most noted vitamin regarding hoof nutrition is biotin, a B-Vitamin. There is much emphasis on the feeding of biotin to horses today. Research in England first showed that horses with poor-quality hooves responded positively to biotin supplementation. Later research with Lippizzan horses confirmed this data.

There are two keys with the use of biotin. First, it works only with horses with poor-quality shelly hooves (brittle horn) and second, it takes months (9-12 months) for positive results to be observed. Horses that respond to biotin are usually stressed by intense performance, transportation or being stabled for long periods of time as well as young horses in poor body condition. Methionine and lysine (amino acids) are believed to increase biotin's effectiveness.

Vitamin A is also important in hoof quality. Vitamin A is important for the integrity of the skin (dermis), and the hoof is an extension of the skin.

Water. Water is a nutrient and as such is important for proper hoof development and maintenance. Poor-quality water may have a negative effect on hoof quality.

A Hoof Feeding Program. Horse owners must feed a well-balanced ration to meet the nutritional requirements of each horse for its use and weight. In this manner, the hooves will be properly fed. Such a ration will have the correct ratio of protein-to-energy, calcium-to-phosphorus, and there will be no nutrient deficiencies or excesses, some of which might be

toxic.

Horses with good-quality hooves need no special feeding program or supplements. It is only when the hooves begin to deteriorate, becoming of poor-quality, that a change in the ration or addition of a supplement is warranted.

Preventive Hoof Nutrition Program:

- 1. Keep horses on good-quality pasture that is properly limed and fertilized according to a current soil test as much of the year as possible.**
- 2. Provide a pasture mineral mix or a high-quality trace mineralized salt with half the minerals in a chelated form.**
- 3. If stabled all or part of the winter, feed a grain mix with soybean meal as a protein source and with added minerals, to compliment the type of hay. If feeding grass hay, feed a flake of alfalfa 3 times per week.**
- 4. Horses stabled most of the time (performance or boarded horses) should be fed a grain mix with soybean meal as a protein source, and ½ of the minerals should be chelated. Horses should be supplemented with 15-30 mg of biotin daily with adequate calcium from hay and/or grain.**
- 5. Feed only 1 supplement at the manufacturers' recommended levels! If you feed a general mineral/vitamin supplement, *DO NOT* feed a hoof supplement also. If you feed a hoof supplement, *DO NOT* feed a general mineral/vitamin supplement.**
- 6. Reduce as much stress as possible for the stabled and performance horse by providing adequate exercise, preferably in a pasture paddock.**
- 7. Periodically have the hooves trimmed and/or shod, usually every 5-8 weeks. If**

in doubt, ask your farrier.

Suggestions for determining the adequacy of a ration for good-quality hooves:

- 1. Is the energy adequate? BCS can indicate whether the energy level is adequate or inadequate.**
- 2. The protein-to-calorie ratio should be met with high-quality protein from such sources as soybean meal, alfalfa hay or casein milk by-product.**
- 3. Provide a mineral mix that fits the forage (pasture or hay) being fed. There should be emphasis on calcium, zinc, copper, selenium and manganese.**
- 4. Half the minerals should be in a chelated form.**
- 5. Vitamin A should be adequate at about 1.5 to 2 times the current NRC (1989) levels. Biotin can be supplemented at a level of 15-30 mg per day if needed.**
- 6. If a hoof supplement is fed, it must balance the forage and grain fed.**
- 7. For a hoof supplement to be beneficial, it must be fed for at least 6 months or more.**
- 8. Feed only one supplement from a reputable manufacturer.**
- 9. Feed only 1 supplement whether designated as a hoof supplement or a general supplement.**
- 10. Feed the supplement only at the recommended level of the manufacturer.**

###

References:

Hood, D. M., C. K. Swenson and A. B. Johnson. 2002 Building the Equine Hoof. Zinpro Corp. Eden Prairie, MN.

Jackson, S. 1996. Nutrition & The Equine Foot: Some Things to Think About. Bluegrass Laminitis Symposium. Lexington, KY.

Kempson, S. A. 1993. How Nutrition Plays a Key Role In Hoof Horn Growth and Structure. American Farriers Journal. March/April.

Kempson, S. A. 1996. Why Dietary Excesses Are Bad for Hooves. American Farriers Journal. November.

National Research Council. 1989. Nutrient Requirements of Horses. Washington, D. C.

#

R9/05