FEATURE

*Horse Care*

# Diet and Hoof Health

**by HEATHER SMITH THOMAS**

Much research has been done in the past two decades on the correlation between a horse's diet and the health of their feet, studying the link between nutrition and hoof growth, and horn strength. Healthy hoof horn cannot be created without proper nutrients. Yet, what might be adequate nutrition for one horse's hoofs might be inadequate for another.

Feet reflect each horse's individuality; hoof strength and health are influenced by genetics, nutrition, environment, basic health, activity and level of foot care. Two horses might live in the same barn, on the same diet, shod by the same farrier, have the same activity level, yet one might have tough, healthy feet and the other have weak hoof walls that won't hold a shoe.

The difference may be due to genetics and nutrition, even though their diets are the same. These otherwise similar horses may have genetic differences not only in the construction and strength of their feet, but also in ways that affect how they absorb and utilize nutrients from their diet. One may have a less efficient digestive system or even a hormone imbalance that can cause poorer hoof health. Inability to properly absorb nutrients may also be as simple as poor teeth. Other factors may include less efficient digestion due to age (older horses often do not utilize nutrients as efficiently as a younger animal) or parasite damage.

**Feeding the Feet**

The hoof needs certain basic ingredients to grow normally. Dry matter in the hoof wall is about 93 percent protein—mainly insoluble protein called keratin, which makes up the tough outer layer of hoofs and skin. Protein is made of amino acids. Hoof horn gets its strength from the cross-linking of sulfur-bearing amino acids such as methionine, cystine and cysteine.

Researchers have taken trimmings from feet during routine hoof care, analyzing the samples with electron microscopes to determine their makeup, and have done other studies to discover the effects of certain elements of diet on hoof health. Some of the major building blocks of healthy connective tissue (collagen) which includes hoof structures, are methionine, glycine, proline and glutamine. Vitamin C and copper are also necessary ingredients, serving as catalysts in formation of strong hoof horn. Essential fatty acids are needed for poper moisture balance and pliability.

Today, many commercial hoof supplement products contain methionine and claim it is essential to hoof health but, in reality, all the essential amino acids are necessary for healthy hoof growth, not just methionine. If the total protein requirements of the horse are not met, hoof growth will be adversely affected. It would be like a carpenter trying to build a house without enough nails. Even if all the other construction materials are there, he cannot continue the building without the nails. Each ingredient must be present, in proper amounts, to facilitate progress—whether building the house or growing new hoof horn.

A natural diet of green grass supplies all a horse's needs, in proper balance and mineral ratios. This is why horses on green grass experience excellent hoof growth. A horse fed poor quality hay, however, may need supplements to avoid unhealthy feet.

**Biotin**

This water soluble B-vitamin assists chemical reactions in the body, including the synthesis of protein for keratin formation. It has been shown to improve weak, thin-walled feet when fed for at least nine to 12 months, since it takes that long to grow a new hoof. However, most horses don't need biotin supplements, unless they are stressed (working hard, stabled for long periods, fed low quality feeds, etc.) since the horse creates biotin in his gut and has a very adequate amount under normal conditions.

Horses who respond best to biotin supplementation (about five percent of horses with poor quality hoof horn) are usually stressed horses or young ones in poor body condition, with poor hoof horn and large holes in the outer layer of the hoof wall when viewed under a microscope. Inner layers of the wall are generally not abnormal.

Many horse owners think that by feeding a biotin supplement they can create stronger and better hoof growth in their horses, but biotin by itself is not enough to correct poor horn quality. It is just one of many nutrients needed by the adult horse for healthy hoof horn. Even among stressed horses, a true biotin deficiency is rare and is usually accompanied by other deficiences as well. To know if a horse is truly biotin-deficient, a relatively inexpensive blood test can be done by a veterinarian.

Once poor hoof quality has been corrected by diet, high levels of biotin are no longer needed. British research found that keeping a horse on one to three milligrams of biotin daily was enough to keep hoof wall in good condition. A normal horse synthesizes biotin at that level in his gut, without the need for supplements.

An Austrian study found that even though biotin does not make hoofs grow any faster, horses fed biotin over long periods tend to have fewer micro-defects in the weight-bearing surface of the hoof wall. In that study, it took 19 months of biotin supplementation before any significant difference began to show up in the tensile strength of hoof horn, and 33 months before the difference became statistically apparent between supplemented horses and the control group. Biotin does seem to help some horses when fed long term; many horse owners and farriers report stronger feet that hold nails better, with less cracking and chipping.

**Other Factors**

Biotin may or may not be responsible for results when horses are put on hoof supplements. The reason some products seem to work well may be that they add a number of nutrients to the horse's diet that can improve keratin tissues. Some of these nutrients are other B vitamins, zinc and copper, and several amino acids. Many "hoof care" supplements include biotin, methionine and zinc, and some are elaborate blends of minerals, vitamins, amino acids and probiotics. The probiotics are included in the hope they will help the horse's digestion, enabling him to manufacture more biotin in his gut through enhanced action of the microbes that produce this vitamin during fermentation.

Many horses with brittle, poor quality hoof horn don't respond to biotin supplements but do show improvement in horn quality when diets are better balanced for calcium, as when grain in the ration is reduced. Grains are high in phosphorus and phytates, which can block absorption of calcium in the gut. Too much grain in the diet can negatively alter the calcium-phosphorus ratio that is so crucial for proper bone and hoof growth.

Alfalfa can supply the necessary calcium if a horse is on hay, but much of the calcium cannot be utilized by the horse if their diet contains too much grain. Good quality pasture grasses on fertile soils contain the ideal calcium-phosphorus balance for horses, with no grain. If a horse cannot be on pasture, a mix of grass hay and alfalfa, and a minimum of grain, can be a good substitute.

A feed that can interfere with proper hoof health is bran, which is very high in phosphorus. Whether as wheat bran (commonly used for bran mashes), rice bran, oat hulls or other grains, bran can be detrimental to horses with problem feet.

Some horses on high fat diets (vegetable oil added to feed) show improvement in hoof quality. Many farriers and veterinarians feel anything that promotes hair growth and condition will also promote hoof growth and horn health. This would include vitamin A, extra fat in the diet, etc. The nutritional supplements aimed at skin and hair tissues also seem to help unhealthy hoofs.

Other nutrients that may help poor feet are lecithin (which can add strength and pliability to connective tissues such as hair, skin and hoofs), copper sulfate, vitamin C (needed for healthy connective tissue), zinc (which can improve skin condition and hoof growth if horses are deficient in this mineral) and L-Tyrosine. The latter is an amino acid which, when combined with iodine, makes up two important thyroid hormones. A few horses with hoof problems have insufficient levels of these two hormones; their hoof defects are a symptom of a thyroid problem.

For horses in selenium-deficient regions, selenium may also be needed in a supplement since this mineral is essential for good hoof health as well as for proper muscle function. Selenium works with vitamin E (they are both powerful anti-oxidents that protect body tissues from damage during various chemical reactions in the body) to help protect the fatty phosolipids that form the "mortor" that holds the hoof wall together. The amount and quality of these fats helps determine the hardness and resilience of the hoof wall. A horse that is deficient in selenium tends to have yellow frogs—most obvious in an unpigmented hoof.

**It Takes Time To Improve a Hoof**

It can be months before a change in diet can produce visible results. If you notice in summer that a horse's hoof walls seem weak and crumbling, even if he is on good pasture, you must realize that the trouble started six to eight months earlier when that part of the hoof wall was growing. If the horse was on poor quality hay during winter, that might be the reason his feet are in bad condition.

When poor diet is corrected, hoof problems caused by nutrition should begin to show improvement in about eight to 10 weeks—with new horn emerging from the coronary band looking better than the rest of the hoof—but total replacement of the old, weak hoof wall will take about nine to 12 months, depending on rate of hoof growth.

**Disadvantages and Harmful Effects of Supplementation**

The vast array of feed supplements available can be confusing; it may be difficult to determine what a horse needs. Different horses' requirements vary, and when you add one thing to the diet you may put something else out of balance. Feed supplements usually contain trace minerals and ingredients that are sometimes lacking in a poor diet, but the horseman needs to remember that most of these ingredients are only needed in small quantities; excesses can be counterproductive or even toxic. Most nutritionists caution horsemen to never use more than one supplement, and to only use a supplement if you are very sure your horse needs it. Overuse of supplements can be hard on your pocketbook and your horse.

One example of a hoof supplement that can be counterproductive if overdone is methionine, an essential amino acid crucial to body metabolism and hoof health. Dietary supplements containing too much methionine (or overfeeding supplements that contain this amino acid) can block absorption of zinc, copper and iron in the body, resulting in hoof horn defects. Excess copper can create a

**Continued on next page**

*Horse Care Contd.*

deficiency in zinc. Overdoing any supplement may defeat your purpose or actually be harmful to the horse.

Another example is selenium. Though deficiency of this trace mineral can lead to poor hoof quality, too much selenium in diet can cause excessive and very poor quality hoof growth; the hoof grows fast but produces weak horn. Selenium excess can cause pain in the feet, cracks around the top of the hoof (due to weak horn) or even the loss of a hoof. Excessive vitamin A is another example, causing brittle feet. Excessive amounts of sulfur can block production of collagen and actually keep hoofs from growing.

A horse with healthy hoofs does not need supplements. If a horse has poor hoof horn due to poor diet, supplements can be beneficial, but the main goal should be to balance the ration and make sure the horse is getting adequate amounts of protein, calcium, trace minerals and vitamins.

If you feel a hoof problem is nutrition-related, carefully analyze the horse's feeds and try to correct any imbalances. Today, more problems are caused by overfeeding horses than by underfeeding them. Thus, you are better off to focus on the diet as a whole (to keep it adequate and balanced) than to try a shotgun approach to correct poor hooves—or you may create problems with oversupplementation.