

From Mouth to Hoof, Nutrition Plays an Important Role in Hoof Care

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The influence of modern confinement systems and demand for maximum production have been shown to negatively impact hoof horn quality in cattle and swine. In these animals, hoof quality has been reported to deteriorate to the point that animals become lame and production ultimately suffers.

Horses also experience hoof difficulties. Common problems reported include cracking or crumbling hooves, inability of the horse to “hold” shoes and, ultimately, lameness which decreases performance and hampers production. The serious economic impact of hoof problems in horses is summarized in the old adage “no hoof, no horse.”

Just like skin, the appearance and integrity of the hoof is a mirror of the health, environment and nutritional state of the horse. It is not difficult to visualize how a horse in poor health could suffer from hoof problems. Likewise, animals which are confined to a small area, such as a stall, can develop low quality hooves which may be a result of poor environmental conditions. Manure and moisture can act together to break down the intracellular cementing substances which ultimately hold the hoof together.

Biotin and zinc have been shown to be important to hoof horn health.

■ Essential Nutrients for Hoof Growth:

The importance of a balanced diet for sound hoof growth has only recently been recognized. Several nutrients are essential for proper keratinization, the process that builds hoof horn.

To date, the nutrients which are known to be essential for hoof growth include amino acids (especially sulfur-containing amino acids such as methionine), fatty acids, macrominerals including calcium, microminerals like zinc and iodine, and vitamins, most notably biotin.

■ Amino Acids:

Amino acids are the building blocks of protein, including keratin, the primary protein associated with the equine hoof. Keratin is unique in that it contains an abundance of sulfur. Sulfur to sulfur (disulfide) bonds are responsible for the cross-linking of keratin proteins within the hoof. These bonds afford the hoof much of its strength. If sulfur-containing amino acids are limited in the diet, incomplete cross-linking can occur, reducing the strength of the hoof.

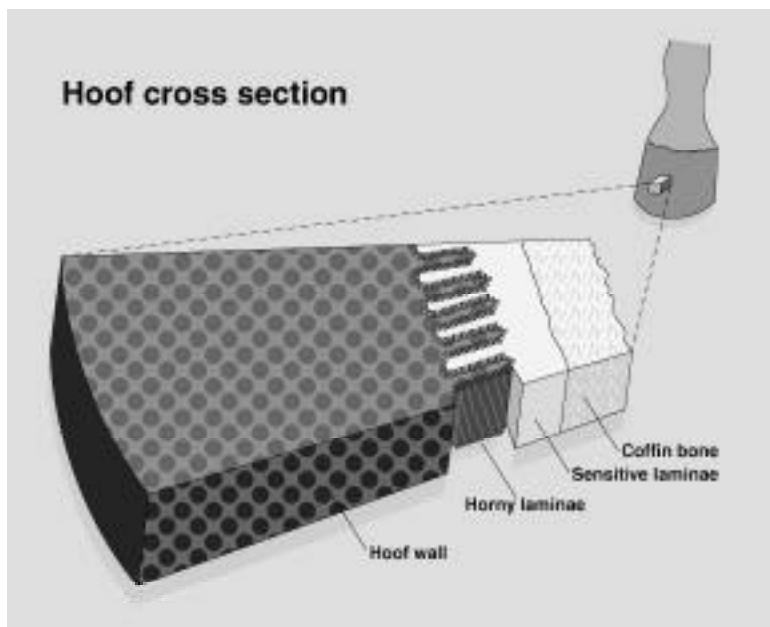
■ Fatty Acids:

Fatty acids are components of complex lipids which form the intercellular cement that binds the individual cells of the hoof. In addition, lipid material is responsible for forming the extracellular permeability barrier. This permeability barrier controls the hydration state of the hoof and, ultimately, its hardness.

■ Minerals:

Calcium is required for normal hoof growth. It is involved with a number of calcium-dependent transglutaminase enzymes. These enzymes are necessary to cross-link proteins which form the protective layer of the hoof.

A significant portion of the body's zinc is found in the epidermal tissues including skin, hair, and hoof. Zinc deficiency in farm animals has long been associated with parakeratosis. This disease is characterized by a dermatitis resulting in a rough, dry hair coat. Zinc is involved in a number of enzymatic reactions controlling protein metabolism.



All animals require iodine in their diets. Iodine functions within the body in the synthesis of thyroid hormones, which in turn control growth and development of all tissues.

■ **Biotin:** The best-known function of biotin is as a prosthetic group in enzymes controlling gluconeogenesis and lipogenesis. Biotin has also been proposed to act as a hormone in the activation of protein (keratin) synthesis.

■ **Equine Hoof Research:** Several studies have been conducted to determine the value of supplementing equine diets with specific nutrients in the hope of positively impacting hoof soundness. One such study, conducted by Linden and co-workers, supplemented d-biotin in a double-blind study to 42 Lipizzaner stallions. In this study, 26 stallions were fed 20 mg of d-biotin per horse per day for 2.5 years. A control group of 16 stallions were fed a placebo. After 14 months of supplementation, hoof condition was determined to be 30% better in the d-biotin-supplemented horses compared with the horses receiving the placebo. The beneficial effects of biotin on overall hoof condition are consistent with the results of case histories reported by three additional research groups.

Research has also been conducted with the organic (chelated) form of zinc. Ott and Johnson from the University of Florida reported that hoof growth was greater

in yearlings fed an organic form of zinc compared with those fed inorganic zinc. Further, research from Germany (Coenen and Spitzlei) found weak hoof horn contained less zinc than strong, healthy horn.

■ **KER-A-Form Hoof Supplement: Nutritional Support for the Hoof** In formulating a nutritional supplement to support sound hoof growth, the nutritionists at Kentucky Equine Research first considered the research conducted on hoof growth. Biotin and zinc were the first two ingredients put into the formula. The inclusion rate of d-biotin is 20 mg per ounce, the concentration found to significantly improve hoof condition score in the double-blind study of Linden and co-workers. Organic zinc was also included in the formula. A special chelated form of zinc was chosen for its critical sulfur-containing amino acid methionine. Fatty acids are known to be important components of the hoof and were included as a component of both lecithin and extruded ground soybeans, the carrier used in KER-A-Form. Extruded soybeans are also an excellent source of protein and other essential amino acids. Finally, any supplement is useful only if the horse can efficiently utilize its nutrients. Kentucky Equine Research has included a source of live yeast culture to aid in the assimilation of KER-A-Form. Laboratory tests have shown live yeast culture increases the digestibility of several nutrients. (N)

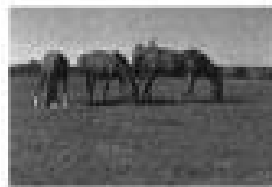


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Condition Scoring Helps Determine Optimum Weight

BY ROBIN STANBACK

Horses and humans have had a long and storied association since the first horse was captured and harnessed for use. Over the centuries man has bred horses for a variety of specific uses and the equids that have developed show the results of this breeding in their size, speed, temperament and ability. The very different types of horses from the Miniature to the Thoroughbred and Draft do have many distinctly unique needs but one they all share is the need for a sound and balanced diet to help them to maintain a healthy body structure.

Steve Caddel of Hallway Feeds has spent the last 10 years working on a unique project with Kentucky Equine Research President Dr. Joe Pagan that has involved monitoring the weight and growth of over 10,000 Thoroughbreds in central Kentucky from birth to eighteen months. Mr. Caddel has combined this experience with a life-long interest in and association with horses to become a highly regarded resource for people wanting information on their horse's nutritional health and body structure. He explained, "In 1983 researchers at Texas A&M University led by Dr. R. Henneke developed a process called condition scoring that would allow people to more accurately determine the overall health of their horses. Dr. Henneke took a system designed for the cattle industry and adapted it for horses. Many other researchers have modified Dr. Henneke's design as more information has become available. This system takes into account more than the weight of the horse as determined by scale, regression equation, or weight tape."

Measurements determined by feel and sight observation of the horse's muscle tone and fat deposits help to determine the overall score of a horse. Ranging from 1 to 9 or, in a modified version, from 0 to 5, horses are judged to be poor, very thin, moderately thin, moderate, moderately fleshy, fleshy, fat, and extremely fat. According to Mr. Caddel, however, the use of each individual animal as well as the breeding and body frame must be taken into account.

He said, "Horses have been bred for specific purposes for so many years that very distinct differences have evolved between breeds and types. For instance, many draft and pony breeds were

developed to be working animals. As such, they needed not only to be able to perform their given tasks, such as pulling coal carts in mines, but they needed to be economical animals as well. The goal was to produce an animal that could deliver the maximum amount of work for a minimum amount of cost in feed. The end result is that many draft and pony breeds are what we would consider "easy keepers" and do not require large amounts of forage or feed to be able to maintain their weight and muscle tone. Fed well and placed on lush pasture, these horses are candidates for obesity and the inherent problems that come with it such as colic and laminitis."

He continued, "Thoroughbreds have developed over years of selective breeding to travel distances at high speeds. These horses were typically bred by people who did not take the costs of maintaining the animals into consideration. The common thinking was to breed the best to the best in hopes of getting the best. It takes so many calories just to move the body forward before you can ask for speed. Breeders provided higher amounts of feed and better pastures to these horses and, over the course of centuries, these horses evolved into animals that seem to require more calories."

In the case of Thoroughbreds the body condition of choice is determined by the function of the animal. A racehorse could not run efficiently carrying an excess of weight. To perform at an optimum level, Mr. Caddel stated, "A Thoroughbred in training should have a body condition score in about the 4+ to 5 range, moderately thin to moderate." This condition score is described as a horse with a slight ridge along his back, and a faint outline of ribs discernible. Horses with a 4+ condition score also have a small amount of fat around the tailhead, and their necks, withers and shoulders do not appear noticeably thin.

Most pleasure horses, according to Mr. Caddel, are best kept in the 5+ to 6 range considered moderate to moderately fleshy. This is indicated by a flat back perhaps with a slight crease, a bit of fat over the rib cage, a fat rounded tailhead, and fat beginning to be deposited along the withers, behind the shoulders, and along the neck.

Body condition scores can also be helpful in