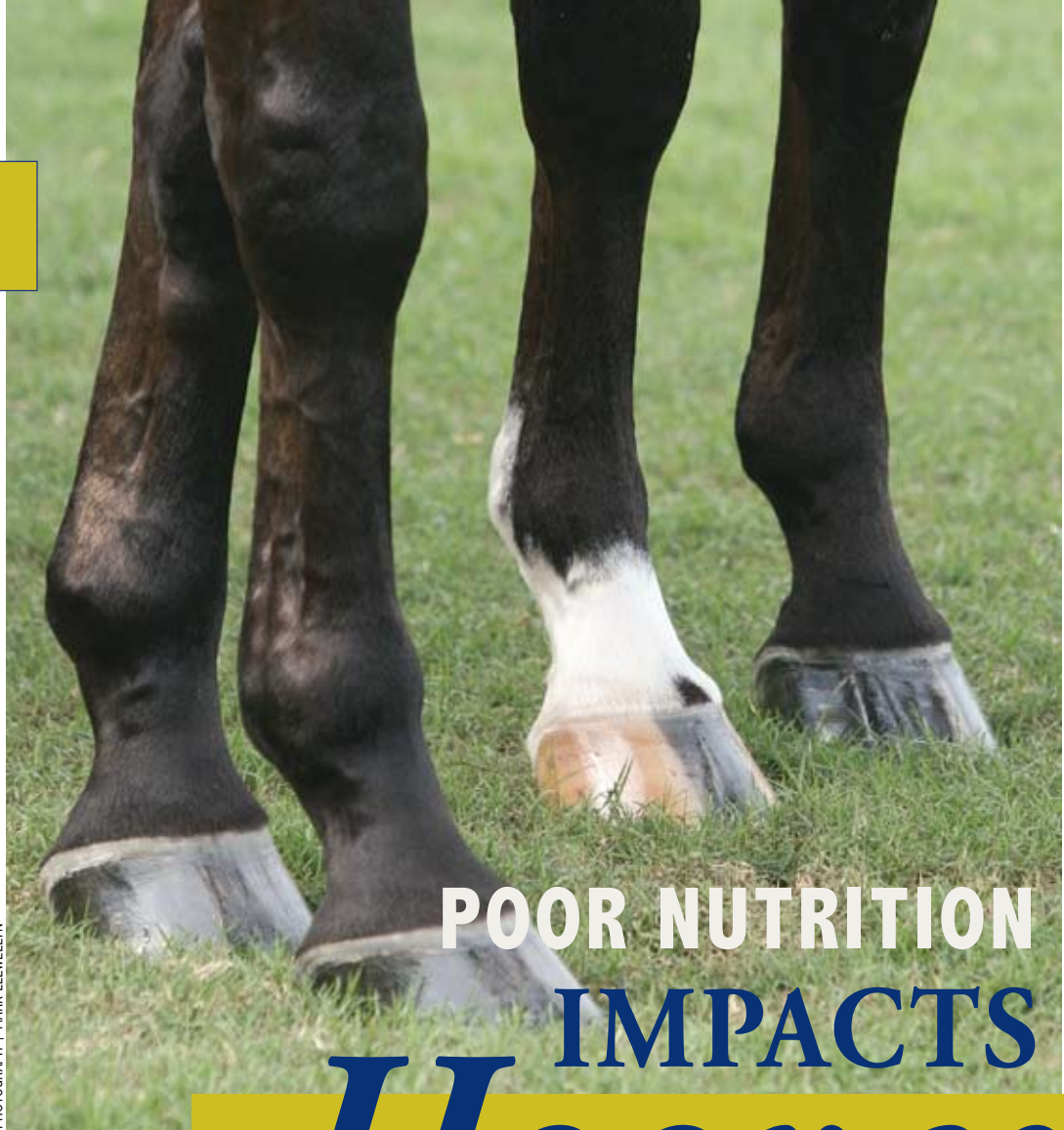


Though these feet have been prepared for show, their strength is due in large part to proper nutrition.

PHOTOGRAPH | MARK LLEWELLYN



POOR NUTRITION IMPACTS *Hooves*

The nutritionists at Kentucky Equine Research are frequently asked questions about dietary influences on hoof health. Questions have been posed by farriers, veterinarians, trainers, and owners. In recent years, more horsepeople have expressed an interest in the affects of poor nutritional status or malnutrition on hoof health.

Without question, malnourishment negatively impacts hoof growth. Inadequate dietary energy, especially to the point of emaciation, hin-


ders normal hoof development just as radically as it impedes other body processes. While hoof growth may continue at a relatively constant rate through downturns in nutrition, the quality of hoof that erupts during these periods may be severely diminished.

Like other tissues, the hooves will likely improve as a horse moves from negative energy balance (too few calories in the diet to sustain body weight) to positive energy balance (calories exceed those required for maintenance of

body weight). A malnourished horse in negative energy balance will use whatever nutrition it consumes or whatever it can leech from its internal stores to fuel survival. Hence, energy is the nutrient of primary importance. Meeting energy requirements with a well-balanced diet that contains high-quality forage and concentrates is the single most important factor when considering hoof growth and integrity of an emaciated horse. As the horse progresses in its recovery, alternative energy sources such as fermentable fiber and fat may be added to the diet. Though fat is a valuable feedstuff used to increase energy density of rations and to add shine to the coat, it does not seem to have a measurable effect on hoof growth or strength.

Aside from energy, a well-balanced diet will provide nutrients the horse requires for overall health and well-being, and these in turn will help fuel sound hoof growth. High-quality protein will supply the horse with the amino acids researchers have theorized are essential for hoof growth. Over the years, scientists have studied certain amino acids more than others, namely methionine and cystine, believing that supplementation of these will benefit hoof quality. Deficiency of one or both of these amino acids may contribute to poor hoof quality, but so may the deficiency of other amino acids or the interaction of amino acids when certain ones are missing.

Researchers have examined the amino acid content of average and poor-quality hooves. They found a correlation between cystine content and hardness in normal hooves but not in poor-quality hooves. The protein of normal hooves contained higher levels of threonine,



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phenylalanine, and proline. Certain of these amino acids are considered essential, which means they cannot be synthesized in the body in sufficient quantities to meet the body's demand for them. Thus the need for high-quality protein in all diets is critical but perhaps doubly so in extreme weight-gaining situations. Protein sources composed of a high proportion of essential amino acids are classified as high-quality. Soybean meal is the most common high-quality protein used in feed manufacture.

In addition to energy and protein, a nutritionally sound ration features a full complement of vitamins and minerals. Premium feeds will contain chelated forms of minerals. Chelation, a process that binds a mineral to an amino acid, enhances absorption of the mineral.



Regular attention by a farrier is an essential part of hoof care, especially for horses that have been neglected.

PHOTOGRAPH | MARK LLEWELLYN

POOR NUTRITION IMPACTS *Hooves*

Certain minerals have been scrutinized more closely for their connection to hoof health. Zinc has been the focus of much research, primarily because it is involved in the health of skin, hair, and hooves. Evidence suggests that low levels of zinc may cause horses to be more susceptible to hoof problems. Studies showed that 25 horses with poor-quality hooves had lower blood and hoof levels of zinc than 38 horses with normal hooves. More recently, a study in Japan revealed that horses consuming diets low in zinc and copper were more likely to have white line disease than horses supplemented with higher levels of trace minerals.


Consultation with an equine nutritionist is advised when formulating a diet for a nutritionally neglected horse. A professional will ensure that the animal's energy, protein, vitamin, and mineral needs are met through a combination of forages and a fortified concentrate.

Once the horse is nutritionally stable and is in a state of positive energy balance, attention can be turned to the physical aspect of his hooves. A thorough hoof assessment by a competent farrier provides a baseline for future hoof care. In addition to regularly scheduled visits, a professional may be able to suggest other hoof care tips. From a nutritional point of view, a farrier might recommend the use of biotin, and justifiably so, as most of the research on hoof growth and hoof wall quality has involved this B-vitamin.

Research focusing on biotin as a means of improving hoof quality in horses started in the mid-1980s. During the intervening years, various studies have found a statistically significant improvement from biotin supplementation on overall hoof condition with 20 mg per day.

Biotin only improves the growth of new hoof horn, not existing hoof, so its effectiveness depends on reliable administration at recommended levels. Because of this, several weeks may elapse before a noticeable difference exists in new hoof growth near the coronary band. More than a year may pass before an entirely new hoof is grown. It should be noted that some horses respond more positively to biotin supplementation than others. Just because biotin supplementation fails to improve one horse's hooves, doesn't mean it will not help the next horse's hooves.

As the quality of nutrition increases, so shall the quality of hooves. Well-defined ridges, known as growth rings, may appear on the hoof walls as new growth occurs. These ripples usually reflect a significant change in the health or well-being of the horse. It is commonplace for growth rings to develop on hooves of horses that have experienced shifts in their nutritional state. For instance, some horses will develop them each year in response to spring grass. The formation of high-quality hoof tissue above the growth rings is an encouraging sign.

Most well-fed horses grow serviceably sound hooves. Like other body tissues, hooves can be compromised by inadequate nutrition. When coupled with the regular care of a farrier, the provision of a diet that meets an animal's nutritional requirements will usually remedy any hoof problems caused by malnutrition. 



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