

Nutrition and developing bones

Developmental orthopedic disease proves difficult to prevent, but incidence rate can be reduced

by **Brian Nielsen, Ph.D.**

WHEN selling yearlings, one thing that is a major concern to both buyers and sellers is whether the horse has osteochondrosis.

This developmental orthopedic disease (DOD), which is the result of defective cartilage formation, is commonly detected using radiography (X-rays) to look for lesions. While certainly there are some lesions that will never affect the horse or its athletic career, enough of the lesions can result in problems, causing many buyers to pass on a horse in which osteochondrosis is detected. As a result, there is great interest in preventing the problem from occurring.

Unfortunately, preventing the development of osteochondrosis does not appear to be a simple matter. Many potential causes have been put forth—and many of these are nutritional in origin—however, none seem to be the sole cause. While it might not be possible to totally eliminate osteochondrosis, the incidence rate can be decreased by paying attention to several seemingly key factors.

Copper

One item that has received a great deal of attention as a possible cause of osteochondrosis and other DODs is a deficiency in copper.

While the 1989 National Research Council's *Nutrient Requirements of Horses* (commonly known as the 1989 Horse NRC) indicated a requirement of ten parts per million (ppm, or milligrams per kilogram) for copper in the diets of horses, some nutritionists thought this was not adequate.

The basis for suggesting a higher amount was that several studies reported a decreased incidence rate of



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BUYERS CONCERNED OVER OSTEOCHONDROSIS LESIONS

Several factors play roles in developmental orthopedic disease, including insufficient amounts of copper in the diet, insulin insensitivity, and genetics

osteochondrosis in horses fed a higher amount of copper compared with horses fed copper below the requirement of ten ppm. As a result, for at least the past decade or two, most commercial grain mixes have

supplemental copper added to them, raising the copper concentration up to the range of 25 to 60 ppm.

However, osteochondrosis is still common in certain populations of horses despite receiving copper well

above the amount recommended by the 1989 Horse NRC. As a result, when the NRC published new guidelines in 2007, the recommendations did not change substantially.

Most classes of horses have a re-

quirement of 0.2 mg of copper per kg of body weight (often working out to around ten ppm when considering how much an average horse eats). However, given that there have been reports of problems when the concentration is under ten ppm in the diets of growing horses, the copper requirement for growing horses, as well as for pregnant mares during the last three months of gestation, was set at 0.25 mg of copper per kg of body weight. That amount would guarantee a concentration of ten ppm if the animal was eating 2.5% of its body weight and a concentration of 12.5 ppm if consuming 2% of its body weight. Simply put, one should ensure that their horse is receiving at least ten ppm of copper. Having more dietary copper than that most likely will not decrease the DOD rate, but having less might increase it.

Supplemental silicon

Another mineral of interest to some equine nutritionists is silicon. Particularly in the past few years, there has been some speculation that supplemental silicon can aid in the prevention of osteochondrosis and some have suggested that it can even cause the regression of lesions.

The interest in supplemental silicon was originally generated when a large blind study using Quarter Horses in race training demonstrated a decrease in injury rates in supplemented horses. After the product (sodium zeolite A) went on the market, there were individuals who supplemented horses having radiographically evident osteochondrotic



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lesions. In some cases, these lesions regressed, and the reason for regression was chalked up to the silicon supplementation.

It also was recognized that some lesions do regress naturally, and the disappearance does not prove that supplementation was the reason that the lesion disappeared. Additionally, a controlled study using Standardbreds in race training did not show any difference in lesion regression in horses being supplemented with sodium zeolite A compared with horses supplemented with a placebo. Though the number of horses that completed the study was limited, there was nothing in that controlled study to suggest the silicon supplementation was efficacious in reducing the size of lesions. That being said, more work would need to be done to conclusively determine whether it works. As of right now, it does not appear to cause lesion reduction.

Balancing nutrients

Horse owners often like to provide nutritional supplements to aid performance or to prevent problems. Unfortunately, doing so can unintentionally cause other issues. This can be a major issue with minerals because many interactions exist between different minerals in which the absorption of one interferes with the absorption of another one.

Supplementing too much of one mineral can induce a deficiency of another.

Similarly, providing excess amounts of other nutrients such as energy or protein also can cause problems if the

diet is not balanced. In the studies that examined how much dietary copper is needed, it became somewhat apparent that if the diets were not balanced in terms of the amount of nutrients present, the incident rate of DODs increased even though the requirements for all of the nutrients appeared to have been met.

In some of those cases, the diets appeared to be balanced, but they contained excess energy relative to the amount of the other nutrients. As a result, when horses consumed enough feed to meet requirements for calories, they failed to consume enough of the other nutrients to meet those requirements. This would be like providing balanced meals to your kids but allowing them to drink soda all day long. The soda provides a lot of calories but few other nutrients. Hence, at mealtime, when they normally would be consuming the other nutrients, they are not hungry enough to eat much. Obviously this is not the ideal way to get children to grow strong and healthy, and it is not the way to get optimum and healthy growth out of your horses.

Similar issues can occur when other nutrients are added in excess.

For example, even if both calcium and phosphorus requirements are being met, if phosphorus concentrations are greater than calcium concentrations, problems can arise. If the incidence rate of osteochondrosis on a farm seems to be excessive, it would be useful to evaluate the diet

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FEED & NUTRITION

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in terms of making sure the requirements are met and that the diet is balanced. Even though a balanced ration does not guarantee that a horse

will not develop osteochondrosis, dietary mismanagement may increase the likelihood of a horse developing problems—especially if the diet is unbalanced prior to and at the time of weaning.

Growth rate

Younger horses grow faster than older horses. The greatest likelihood of having defective cartilage growth occurs when growth rate is the fastest. Therefore, feeding the young horse properly is critical to making a structurally strong athlete. While many individuals are concerned with feeding young horses for a fast rate of gain, if a balanced diet is fed, research does not clearly indicate that there is increased risk of developing osteochondrosis or other problems. But again, this is if a balanced diet is being fed.

Regardless of whether one is feeding their young horses for a fast rate of growth or a more moderate rate, most nutritionists agree that maintaining a steady growth rate is an important factor in avoiding prob-

lems. Most research studies have shown that growth rates do fluctuate throughout the year. These alterations in growth rate most likely are attributable to seasonal changes in things like the quality of pasture. Even though such fluctuations will be difficult to avoid if horses are kept on pasture, minimizing additional fluctuations in growth rate should be the goal. Methods to ensure this can include such things as limit-feeding horses (this results in a more steady growth rate compared with allowing horses to eat all they want) and creep-feeding foals so that they do not lose weight at weaning.

Some individuals recommend a fairly severe restriction in feed intake to avoid DOD problems. Unfortunately, such calorie restriction slows

down growth rate, but the growth rate often goes back up when the calorie restriction is removed. This increased growth rate also may reflect compensatory growth in which the rate of gain per unit of feed is increased. While compensatory growth provides a cheap rate of gain (less feed per pound of gain) and is desired by individuals producing cattle, compensatory gain has been linked to DODs in horses and should be avoided.

Feed restriction typically not only causes a restriction in calories, but it also causes a restriction in other nutrients as well, and this is not beneficial to the animal. The best advice is to simply try to make sure the animal is growing at a steady rate.

High-starch diets

Some researchers also believe that insulin insensitivity, brought on by the feeding of high-starch diets, plays a role in the development of DODs.

The idea is that a diet high in starch results in elevated blood glucose concentrations, thus causing insulin concentrations to become elevated to help drive glucose into cells.

In certain animals, normal amounts of insulin become insufficient to lower blood glucose, so greater amounts of insulin are released in animals that would be considered insulin resistant.

Feeding programs certainly can alter insulin responses, but it is not clear whether the altered insulin response is directly related to DODs. Due to that possible link, a substantial amount of work has been done on finding alternative energy sources for horses to replace some of the carbohydrates in equine diets. These energy sources have tended to focus on fat and fiber as alternatives to starch in the diet. While the link between high-starch diets and DODs has not been clearly established, until more is known it may help to use some of these energy sources to replace some of the starch in the diet.

Other factors

Besides nutritional factors, other items certainly can play a role in the development of osteochondrosis.

Studies have examined the link between genetics and DODs. As many would expect, certain lines of horses seem to be more prone to develop DODs than are other lines. Certainly, the problem exists more in some breeds than in others. Granted, there are factors such as how certain lines or breeds of horses are used and raised that also could factor into this. For instance, it is important to recognize the importance of exercise. Voluntary exercise appears to be beneficial to proper cartilage development. Confining a young horse to a stall without access to exercise will increase the chance for developing problems regardless of what the horse is fed. Hence, raising young horses on pasture certainly can provide some benefits in terms of stimulating proper cartilage development through voluntary exercise.

While it is unlikely the problem of osteochondrosis can be totally eliminated, proper nutrition combined with exercise and the right genetics can help keep the problem to a minimum. Given all the other factors that consignors and buyers must worry about at yearling sales, removing osteochondrosis from the list would be a major plus. ♣

Brian Nielsen, Ph.D., is an associate professor of animal science at Michigan State University.



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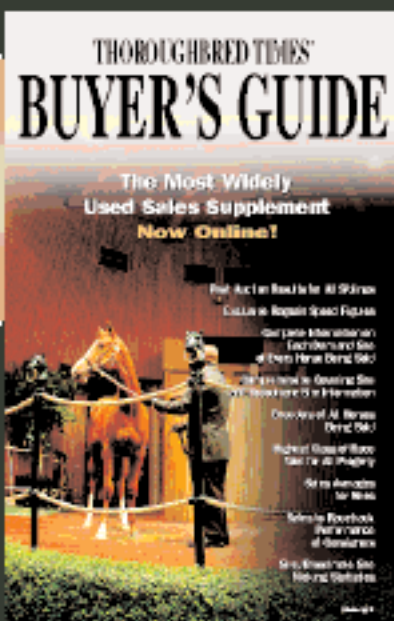
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