

Feeding for the Ages

You are what you eat. This is probably truer for young Thoroughbred racehorses than it is for many other creatures. Unfortunately, many misconceptions exist about what is and isn't good for the growing Thoroughbred. One thing is certain—paying attention to what your growing horse is ingesting will only make for a better athlete along the way and may help prevent deficiencies that can cause developmental abnormalities.

Research on equine nutrition is abundant, but one of the best places to start is with the National Research Council 2007. Now in its sixth revised edition, the NRC's *Nutrient Requirements of Horses* offers reference material for feeding various classes of horses. The NRC breaks horses into five age groups for nutritional purposes: weanling (4-to-6 months old), yearling (12 months), long yearling (18 months with classifications of sedentary, light, or moderate exercise), 2-year-olds in-training (with four variations of exercise intensity,

including light, moderate, heavy, and very heavy), and mature exercising horse (with the same four variations of exercise intensity). The NRC does not include a 3-year-old category, because it classifies horses as mature at the age of 24 months.

"Nutrient requirements definitely change as the young horse grows, gets older, and enters training," said Dr. Lori Warren, assistant professor of equine nutrition in the department of animal science at the University of Florida. "While the NRC has grouped the horse's requirements into these stages, it is more to highlight differences in the needs of the horse at these distinct stages or hallmarks of its life."

For example, she noted, most owners or managers wean a foal between 4 and 6 months, which is the time the animal is being fed its own diet; the horse has altered requirements as a yearling; and as a long yearling (18-22 months or so) the horse is likely to enter training, which changes his nutrient requirements further.

"It's not like a weanling's requirements will magically change when he hits his first birthday," she said. "Instead, it's more of a continuum. The diet of a horse, particularly for a horse that is still growing, will need to be periodically re-evaluated and adjusted for an increase in body weight (i.e., the accumulation of new tissue) and the progressive slowing of growth over time. Growth progressively declines over time, such that a nursing foal is growing much faster than a yearling, who is growing faster than a 2-year-old, etc."

Warren said that because growing horses are still laying down new bone, muscle, and other tissue, nutritionists are generally more concerned about these animals' diets than about those of adult horses. Mature horses are generally more resilient to daily fluctuations in nutrients.

"All nutrients are important in this regard, but nutritionists generally emphasize amino acids such as lysine; macrominerals such as calcium and phosphorus; and trace minerals such as zinc, copper, and selenium," she noted. "All of these nutrients play key roles in the development of bone, cartilage, muscle, and soft tissue. Provision of these nutrients, as well as others, is im-



Nutrient requirements for Thoroughbreds change as they grow and get older

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portant.” She says that the quantity of these nutrients in relation to others also is vital.

PROTEIN

Protein is probably the most often talked about ingredient among horse owners and is one of the most important for younger horses.

“Some people think that too much protein will cause developmental orthopedic problems or excess energy, but that is not correct,” according to nutrition specialist Dr. Carey A. Williams, an equine extension specialist at Rutgers University. “Young growing horses in particular need high levels of protein compared to mature

horses.” Horses need the protein for proper muscle development, she said, and excess protein will not accelerate bone growth, cause developmental orthopedic problems, or cause the horse to have too much excess energy, creating a “hot” horse as many believe.

CALCIUM AND PHOSPHORUS

Possibly the second most important part of the feeding equation is the ratio of calcium to phosphorus. Williams said the ratio of a diet needs to be no less than 1-1; in growing horses a ratio of 2-1 is more appropriate.

“You should never have calcium be less than the phosphorus, because the phosphorus will start to interfere with the ab-

sorption of calcium into bone, almost creating a calcium deficiency even though the dietary intake is sufficient,” she noted. “If a horse is on a legume-based forage such as alfalfa, they are in the clear because these forages have much higher levels of calcium than they do phosphorus. For example, alfalfa has about a 6-1 calcium-phosphorus ratio.”

Warren agrees and said the ideal calcium-phosphorus ratio is close to 2-to-1. She says as much as 3- or 4-1 is common, but she underscores that in no case should the diet have more phosphorus than calcium.

AMINO ACIDS

Amino acids are the building blocks of protein. They are the molecules that carry out the protein’s function, such as building muscle. Lysine and threonine are the two limiting amino acids in horses, which means these need to be added to the horses’ diet. Otherwise, if deficient the horse will be “limited” in his use of the other amino acids.

“That is why the NRC lists the lysine requirements for the various classes of horses, and why most feed companies fortify the diets with lysine and threonine,” said Williams.

Alfalfa and soybean meal are good-quality sources of protein, which means they’ll contain more of these limiting amino acids than other natural sources.

“This is why we usually recommend young horses, especially if they are in training, consume a legume-based forage. Straight alfalfa is fine,” Williams continued. “However, an alfalfa mixed with grass hay is also OK, as long as the grass hay is of a good quality. If the legume hays are unavailable, it is recommended to look into a protein supplement for the young growing horse that will contain pure forms of the amino acids they need to help promote healthy growth, or supplement the diet with alfalfa hay cubes or a bagged hay product.”

TRACE MINERALS

These minerals have many important functions in the body.

“The reason nutritionists focus on trace minerals such as zinc, copper, and selenium (among others) is not only because of their importance to good health, but also because they are typically low in hay and pasture forage and in unfortified grains, such as oats,” Williams said. “Because of this, feed companies add these trace minerals to fortified feed products. The quantities added will vary based on the type of horse the product is formulated for.”

The quantities added can also vary based on geographical location—this is particularly true of selenium, she noted. Some parts of the United States have high soil levels of selenium, whereas others

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have low or adequate. When soil selenium levels are high, there is a greater likelihood that forage, such as hay or pasture grown there, will be higher in selenium, as plants absorb it from the soil.

As with most nutrients, more is not always better. Horses can be over-supplemented with trace minerals such as zinc, copper, and selenium if owners are feeding several different supplements along with a commercial feed product that has also been fortified with adequate levels of these trace minerals.

"In general, if you are feeding a fortified feed according to the manufacturer's recommendations on the bag, you likely won't need an additional mineral supplement other than salt," Warren said. As far as supplements, she recommends reading and following the directions on the label. If you have questions, it is best to ask someone knowledgeable at your feed store or, better yet, consult an equine nutritionist or county extension specialist. "If you do find you need to supplement, my suggestion is to pick one product that provides a balance of minerals (macro and trace) and vitamins—in other words, a complete vitamin/mineral supplement."

ENERGY AND FAT

Young horses need enough energy to

maintain their weight while performing to the level of training asked of them. Sometimes that requires adding large amounts of grain, possibly in excess of eight to 10 pounds per day, according to Williams.

"This amount of sweet feed, if it is a carbohydrate or starch-based diet, could potentially cause developmental problems due to the growth spurts followed by slumps that are hard on the young horse's skeletal system," she said. "It is recommended to back down on the amount of sweet feed given daily but maintain the caloric intake by adding fat to the diet."

Horses can process up to 20% fat in their total diet, and much of that is used for slow breakdown into energy. Williams recommends vegetable oil products or rice bran as the best additives for increasing the fat content of the diet. Up to two cups of corn oil would be appropriate for a horse in heavy-to-very-heavy exercise, she noted.

"Rice bran is good for the finicky horse that doesn't like the oily mess; however, it also has a large amount of fiber, so you would need to add much more than the two cups of oil (one to three pounds would be more appropriate)," she said.

Any of these changes can upset the diet's balance of other nutrients, so it is advisable to check with an equine nutritionist before making these dietary adjustments.

WEANLINGS

According to Warren, the younger the horse, the faster its current rate of growth relative to that of later stages in life.

"A faster rate of growth generally means the nutrient requirements are higher," she said. "We also have to consider body size and their ability to consume a given quantity of feed. For example, a weanling has the nutrient requirements of a mature horse, but a digestive tract only one-third as big, so he can't possibly eat the same amount. This means we have to select nutrient-dense feeds—lots of nutrients per pound of feed—in order to meet the growing horse's requirements. A good example is alfalfa versus grass hay. Alfalfa has a higher density of protein, energy, calcium phosphorus, and other vitamins and minerals."

Warren said it is also important to consider the availability of the nutrients in the feeds we are providing and whether the horse can digest and absorb them.

"I generally recommend the diet of a weanling be evaluated and adjusted every four weeks until they are 12 months of age to account for gains in body weight, and then every four to eight weeks thereafter."

YEARLINGS

Yearlings are still growing, but at a slightly slower rate than weanlings. The

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nutrients they need, however, are increasing. Typically, the needs can be met by feeding the horse more, according to Williams. For example, a weanling at 6 months (that will eventually reach a mature weight of about 1,100 pounds) will need 676 grams of protein on a daily basis. However, this same horse as a yearling will need 846 grams of protein daily, amounting to 14-16% of its total diet. This is the reason legume diets are so popular, because increasing the amount of alfalfa given daily can meet this elevated protein requirement. The horse's requirement for calcium, on the other hand, will decrease from what he required as a weanling (38.6 to 37.7 grams), simply because his rate of skeletal development has also decreased. Phosphorus requirements will also decrease, keeping the calcium-phosphorus ratio around the 2-1 level.

LONG YEARLINGS

Once the horse hits 18 months there are other considerations to make besides growth alone. By this point, most Thoroughbreds are in exercise training, so the owner or manager needs to take the training intensity into account, according to Williams. As training intensity increases, long yearlings also have increased requirements for energy and protein.

"A nonexercising long yearling (similar mature weight to the horse above) will require 799 grams of protein," she noted. "However, if they are even lightly exercising, this increases to 853 grams and up to 906 grams if intensely exercising."

TWO-YEAR-OLDS IN TRAINING

According to Williams, 2-year-olds in

heavy training need approximately 969 grams of protein daily, still amounting to about 14% of their total diet. In addition, the daily calorie needs of a heavily exercised and growing 2-year-old almost triple from the time it was a weanling.

"This is why it is so important to feed energy- and nutrient-dense feeds at this age—to prevent having to feed excess grain that will not promote healthy growth," she explained.

MATURE EXERCISING HORSES

The mature, heavily exercising horse is a different machine than the growing horse. He requires only 862 grams of protein, which is about 100 grams less than what it needed as a growing 2-year-old, so it can get by with a diet containing only 10% protein, according to Williams.

"Given the weight difference between (the mature horse and) the 2-year-old in training, that is quite a bit less for the mature horse," she said.

FORAGE

"You can't not talk about forage when talking about horses' nutritional requirements," according to Williams. "It doesn't matter what the type or breed of horse, all horses should have at least half of their diet in forage (hay, pasture, and other processed forage). Good-quality grass hay is best for the mature exercising horse; however, young, growing horses, whether in training or not, should have a legume mixed hay or an addition of an alfalfa product to their meals. This will increase the amount of protein in the diet along with calcium, phosphorus, and other nutrients.

"We typically recommend horses eat 2% of their body weight in dry matter (feedstuffs minus the water content)," said Wil-

liams, who explained that a 1,000-pound horse on a strictly hay diet would need to consume about 20 pounds of hay per day. "Younger horses that are fed hay in a stall could be fed free-choice with the meals of grain making up the remaining calories. If factoring in pasture, you have to take into account the high water content, but if grazing for 24 hours a day without other feedstuffs that 1,000-pound horse would naturally consume between 2 and 3.5% of its body weight in pasture (without the water). However, if the horse needs more weight, increase the amount of forage before considering adding more grain."

NUTRITIONAL INADEQUACIES

The physical effects of nutritional deficiencies can end a horse's career before it even reaches the track. Warren said nutrient deficiencies, excesses, and imbalances usually reveal themselves as some type of growth disorder, including stunted or slow growth, but the worst-case scenario is appearance of a developmental orthopedic disease (DOD), such as physitis or osteochondrosis.

"Nutrition certainly isn't the only cause of these conditions, but it can contribute to aberrations in normal bone development if all of the building blocks are not present in sufficient quantities," Warren explained. "DODs can result from deficiencies in protein or lysine, calcium, phosphorus, and trace minerals such as copper and zinc. One must also realize it might not be a straight deficiency that causes these nutrients to be inadequate."

Warren said that on paper a weanling's diet might provide adequate calcium, but as described above, a phosphorus excess can prevent calcium absorption necessary for proper bone development. Another ex-

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ample is the nutrient-calorie ratio. A diet that appears to provide adequate protein or lysine, but contains an excess of calories (also known as “energy”) is not appropriate. The extra calories promote weight gain and might stimulate growth, but if there is not enough protein (or other critical nutrients such as calcium or phosphorus) to help support that growth, a development problem could occur.

“Research has shown providing protein above the NRC requirements does not result in clinical signs of DOD,” Warren reminded. “However, a deficiency of protein can result in DOD—so the practice of reducing the diet of a young horse with physitis or OCD is actually worsening the situation, rather than correcting it.”

Rapid growth has also been pinpointed for triggering growth problems in Thoroughbreds, and although Warren said she certainly sees more DOD issues in fast-growing horses, such as Thoroughbreds, scientific studies question whether the fast growth is really the cause.

“It is likely that the faster we push growth, the more diet imbalances will reveal themselves,” she said. “Because a fast-growing horse is laying down tissue more rapidly, it is even more critical the diet be balanced because the room for error is severely reduced. This is also the point that nutrient-calorie ratios become key. If the calories are present to promote growth, the other nutrients must be there in the correct amounts and proportions to support that rate of growth.”


In addition to growth problems, improper nutrition can lead to a lack of energy (deficient caloric intake) and tying-up (due to a lack of vitamin E), among others.

“Obvious mineral deficiencies usually are slow to develop, which is why severe diet changes should be run by an equine nutritionist,” Williams noted. “Other performance problems could be diet-related; however, the trainer also needs to look at environment, training intensity, etc.”

THE FUTURE OF FEEDING

Because horses are trained in different ways, with differing intensities, it is impossible for the authors of the NRC, or anyone else, to give a more detailed prescription of the nutrient requirements. It is always going to come down to the requirements of each individual horse. However, according to Warren, one day the NRC computer will allow the user to input the horse’s workout routine to fine-tune the results further. This type of specificity may be irrelevant because most horses are not fed in exact quantities (depending on who does the feeding that day and how they define what a “flake” of hay is). In addition, their workout probably changes from day to day.

“The bottom line is really that the NRC requirements are to be used as a guide and the quantities fed to any given horse should be adjusted based on the performance (including growth rate, body weight, body condition, etc.) of that individual horse,” Warren said. “As always, it is best to work with your veterinarian and/or locate an equine nutritionist.”

For more information on the NRC’s Nutrient Requirements of Horses or to download a free computer program that can be used to calculate nutrient requirements and compare nutrient intakes from a selection of forages, grains, and mineral sources, visit <http://nrc88.nas.edu/nrh/>. 

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TREATING UPPER RESPIRATORY TRACT DISORDERS

Abnormalities of the upper respiratory tract are second only to musculoskeletal disorders as leading causes of poor performance in athletic horses. While a small number of horses with mild upper airway issues can be managed medically, many owners elect surgery as a primary treatment option.

Abnormalities can occur at virtually every point along the upper respiratory tract, but the majority of performance-limiting abnormalities occur near the back of the throat and involve the palate, the muscular wall of the pharynx, the epiglottis, and larynx. Specifically, the “big three” conditions are dorsal displacement of the soft palate (DDSP), roaring (i.e., laryngeal hemiplegia), and epiglottic entrapment.

DDSP: Considering the number of different procedures currently available for the management of DDSP, it is rea-

sonable to suggest that a “treatment of choice” for DDSP remains to be discovered. Nonetheless, one of the more effective choices at present is the “tie-forward” surgery. The surgery is approximately 20% more effective than strap muscle resection alone (i.e., Llewellyn procedure), in that nearly 80% of horses have improved performance after surgery. A tie-forward involves placing two sutures on each side of the larynx and wrapping them around the basihyoid bone. As a result, the larynx is pulled both upward and forward to minimize displacement of the soft palate, and it is this upward movement that has been shown recently to correlate best with postoperative results.

Roaring: As with DDSP, there are various surgeries described for the management of roaring, but the current treatment of choice is a “tie-back” surgery (also referred to as a prosthetic laryngoplasty). This procedure involves using suture

material effectively to tie back the left arytenoid cartilage into a permanently abducted position.

Many surgeons also perform a ventriculocordectomy (i.e., removing both the ventricles, tissue outpouchings beside the vocal cord, and vocal cords) using a laser a day or two after the tie-back to improve the success rate of the procedure. Nonetheless, the success rate of this procedure is only estimated to be about 50-70%.

In cases of a failed tie-back surgery, a procedure is available that can resolve the persistent upper airway obstruction and return horses to their athletic endeavors within about six months post-surgery.

In a study of 73 Thoroughbred racehorses that underwent this operation, called a unilateral partial arytenoidectomy with primary mucosal closure (which involves removing the abnormally thick or immobile cartilage without removing the entire mucosal lining), 82% returned to racing, and 63% of these horses raced five or more times. Surgeons have said this is the best chance for horses with failed tie-backs to return to competition.

Epiglottic entrapment: The treatment of choice for epiglottic entrapment is called “axial division of the aryepiglottic fold.” In simpler terms, the veterinarian cuts tissue trapping the epiglottis so it is no longer capable of trapping the epiglottis. Several different approaches can be used. Veterinarians most commonly use either a laser or a curved knife under endoscopic guidance to sever the aryepiglottic fold. Success rates are good with these approaches: 80-95% of horses are considered “cured” postoperatively. However, a few horses develop problematic complications such as recurrence and permanent DDSP. Further, the aryepiglottic fold can regrow and subsequently re-trap the epiglottis. Using a laser to cut the fold of tissue surgically is reportedly associated with a lower rate of recurrence as compared to using a knife. 🐾

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