DAILY CARE

Feeding Elite Equine Athletes for Competition

by Amy M. Gill, Ph.D., Lexington KY

Balanced Nutrition Is Key to Success in the Arena

The horses that compete in the hunter and jumper arena are finely tuned athletes. Horses training at exercise levels required for these events expend great amounts of energy and sometimes have trouble consuming enough feed to meet energy (calorie) demands.

One of the most daunting tasks a trainer is often faced with is keeping a performance horse at the optimum weight level. Most horses are fed large quantities of grain (which contains a level of approximately 45-65% soluble carbohydrate or starch) in their rations because grains are traditionally more energy dense than forages (which contain structural carbohydrates, or fiber).

Because the horse is an herbivore designed to graze forages on a continuous basis, feeding large amounts of grain, which is not a natural feedstuff for horses, can lead to starch overload in the hindgut. Nonetheless, grains are very palatable and high in digestible energy and, if managed correctly, should be incorporated in reasonable amounts in the performance horse diet, as glycogen repletion and storage following maximal exertion is somewhat dependent on glucose provided in the diet. However, other ingredients like vegetable oils and soluble fibers, most notably beet pulp, soybean hulls and rice bran, do not contain high levels of starch and can be blended into the ration to help increase its digestible energy content without increasing the risk of starch overload. Fats and fibers do not cause an increase in blood glucose when consumed, a biochemical reaction which in some horses seems to intensify the "sugar high" associated with feeding high grain diets.

Ingredients in Feeds Affect Behavior

Large amounts of grain feeding are also associated with increased gut acidity. Higher frequency of stereotypic behavior is observed when horses are fed high grain diets (typically a 3:1 grain/forage diet) as compared to an all forage diet. Studies have shown that horses on high grain diets show a decreased incidence of aberrant behavior when a hind-gut buffer, which neutralizes some of the acid in the cecum and colon, is added to the diet. Some researchers believe that high grain diets cause low-level pain due to acidity in the gut which then serves as a stimulus for stereotypic behavior. Many horses with a propensity to tie-up will also benefit from the addition of fat to the diet because it helps to lower the starch content of the diet, which may in turn decrease excitability and nervousness.

Certain horses are more reactive to high levels of starch in the diet, which in turn can influence their behavior. Behavior modification for these individuals may be as simple as adding in other non-starch ingredients to the diet. Grain meal feeding is directly linked to an increase in seratonin, a brain neurotransmitter which modulates mood activity and alertness. High seratonin levels observed after eating meals high in starch has been implicated as the reason for sugar "highs" in hyper active children, and it is reasonable to assume that a similar response is seen in some horses following a grain meal. Many other factors can affect behavior in horses such as sex, genetics, breed and environment, but it is fairly safe to say that reducing starch in the diet of performance horses appears to play a role in improving mental stability.

Many horse owners also believe that grains such as oats and corn cause a horse to have too much energy or become "hot" or more excitable and difficult to handle. Molasses could also contribute to excitability because of its high sugar content, which can affect certain horses sensitive to sudden increases in blood glucose following a meal of sweet feed.

This issue may be rather confusing at times, because the term "energy" should be used to describe caloric density of a ration, and the terms "hot" or "hyper" should refer to the mental or behavioral status of the horse. The mix-up occurs because excess feeding of "energy" or calories will invariably result in a horse that is "hot" or "hyper," and the source of energy may or may not be the important factor.

In general, the performance horse that is fed super high energy feeds and then kept in confinement is almost guaranteed to become less tractable and more nervous that a horse that has access to free exercise. One possible solution is to use concentrates that are in pelleted or extruded forms, where the ingredients have been ground, mixed together and then heated and formed into small nuggets. Heating actually alters the starch molecule, making it more digestible and easier for the horse to absorb. The nice thing about pelleted or extruded products is that little or no molasses has to be added to the mix, and the shelf life of the product is also longer, due to processing.

For hunters that need to be in good flesh but quiet, pelleted high fat and fiber rations with a minimum of added grains are recommended. Low inclusion rates of grain in these diets help keep blood sugar changes after feeding to a minimum and are less likely to cause excitability. In contrast, jumpers that are required to exert maximal efforts during the course will benefit from a medium level of starch in the diet. Starches provide a quick source of glucose during performance and help keep the horse energized. For jumpers, a textured feed with some grains, fat and fiber is recommended.

Simulate Nature to Encourage Healthy Mind and Digestive Tract

Since the basis of all diets for horses are forages, performance horses should always have ample amounts of the best quality hay available at all times (other than when feed must be reduced or withheld prior to competition).

A good forage choice for performance horses is a grass and legume mixed hay. Quality of hay is determined by the stage of maturity when cut, growing conditions, amount of fertilization of the field in which it is grown, and how it is prepared and stored after being cut. Which cutting the hay is from is usually irrelevant as any cutting can turn out good or bad depending on these factors.

Concentrate feeding should be broken up into as many small feedings as possible, as research has shown the capacity to overload the hindgut with grain occurs when the horse is fed more than 0.4 % of its body weight at any on feeding. For the 1000 lb. animal, this translates to no more than 4-5 lb. of concentrate mix per feeding. According to the National Research Council, horses in heavy training may require as much as 3% of their bodyweight per day in dry matter (concentrate and forage) with proportions of 65% concentrate and 35% as forage. Therefore, the 1000 lb. horse may require 30 lb. of total feed with perhaps 19.5 lb. of concentrate and only 10.5 lb. of hay. If we abide by the rule of no more than 4-5 lb. of concentrate fed at one time, horses consuming this amount of concentrated feed should be fed a minimum of four times daily.

Variety of Ingredients Needed to Achieve Well-Balanced Ration

The ingredients fed performance horses can also make a difference in how many calories they receive.

One of the most popular feeding ingredients is **oats**, which are very palatable to horses and fairly safe to feed, due to the fiber content of the hull and the relatively easy digestion of oat starch. Unfortunately, oats contain the lowest amount of calories of all the grains fed to horses, and if a horse is having trouble keeping weight on, a straight oat and hay diet will do little to improve the situation.

Commercial concentrate mixes are usually composed of a variety of grains, fats, and the increasingly popular soluble fibers, which contain a higher digestible energy content than long stemmed forages. Also, most performance level feeds are highly fortified with amino acids, vitamins, chelated minerals, direct fed microbials, yeast, and other nutrients that oats out of the bag will be lacking. It is also important not to "cut" oats into a commercially prepared mix, as doing this unbalances the nutrient content and ratios of the feed.

Beet pulp is a soluble fiber derived from the processing of sugar beets that has become a very popular feed ingredient for the performance horse in the past decade. Because it is a fiber, it is fermented like hay into volatile fatty acids by microbes in the hind-gut, but when digested, it yields energy levels similar to that of oats.

Rice bran, a byproduct of rice milling is another soluble fiber that is gaining in popularity. Rice bran is also digested in the hind-gut in the same manner as hay, but yields a higher energy content. Furthermore, rice bran contains an anabolic plant sterol called *gamma oryzanol*, which is thought to increase lean muscle mass.

Adding **vegetable oil** to the ration is a great way to increase caloric density without asking the horse to digest and metabolize additional starch. Oils contain over twice the calories of grains, contain no starch, and are easily absorbed from the small intestine. Therefore, when high fat products are fed, less feed needs to be consumed by the horse to achieve the same caloric density of a feed containing high amounts of starch.

Besides increasing calories in the diet, high fat diets have been shown to improve performance in high intensity, short duration activities such as racing, barrel racing, reining, and show jumping when horses have been adapted to the fat. These individuals will utilize fat as an energy substrate preferentially over glycogen for

a longer period of time during exercise, allowing for a reserve of glucose when needed towards the end of the strenuous activity. Due to biochemical differences, fat adapted horses carry a lower thermal load and produce less CO_2 than horses utilizing glycogen as an energy source.

Importance of "Balanced" Rations

Feed companies are becoming increasingly aware of the importance of incorporating all three of these ingredients into their performance horse feeds to provide safe, easily digested energy-dense rations for horses requiring large amounts of feed to maintain weight. When considering a concentrate mix for hard keepers, bear in mind that several ingredients blended together usually provide the most energy and the proper amounts and proportions of other necessary nutrients. A custom blend or a commercial mix is recommended over home mixes because it's easy to unbalance the ration if too little or too much of one or several ingredients are added.

The goals for the feeding and management of performance horses should include the use of high quality forage, concentrates that contain high fat and soluble fiber and—equally important—the implementation of a routine program that minimizes digestive, metabolic and emotional disorders. Even when the best feeds are used, horses that are unhappy in their environment will not be able to perform to the best of their ability, as stress and discomfort will undoubtedly whittle away at even the greatest genetic potential.

Horse Feed Myths and Misconceptions: Science and Fact Versus Tradition

Traditions Hard to Change

This is a topic that is written about frequently, but is worth repeating from time to time as it appears to be a difficult one for some to grasp. When it comes to feeding horses, myths and old wives' tales abound. Many "traditional" methods of feeding have been passed from generation to generation of horsemen, and while some are still useful, many are outdated and may even be detrimental to the daily management of the modern horse. Most of the myths that are still in existence are commonly based on a lack of understanding of nutrition and the physiology of the horse's digestive tract and physiology.

Fortunately, modern science and research over the past twenty or so years has helped debunk many of the myths associated with feeding horses. Regardless of being proven wrong or ineffective, many of these feeding myths are still being perpetuated. There are many more myths and misconceptions about feeding horses than those that follow, but these are some of the hardest ones to get owners, managers and trainers to abandon. Wives' tales continue to circulate because, as the old adage "*It has always been done that way*" implies, change is difficult.

Hopefully, this article will help to convince the "hold outs" to phase out these useless methods permanently and replace them with those that will help horses be healthier and capable of performing to the best of their abilities.

Bran Mashes Have a Laxative Effect on the Digestive Tract

Let's start right off with this popular myth. Despite being fed with good intentions, a weekly bran mash is a dramatic alteration to the daily ration and causes a disturbance in the normal population of microorganisms that reside in the hindgut. Dumping bran (a substrate or food source that the bacteria are not used to) into the system causes a sudden kill-off of some bacteria and forces overgrowth of others. This shifting bacterial population in the gut usually results in a good case of diarrhea, leading one to believe wheat bran acted as a laxative. Remember, routine feeding of the same feeds everyday is the best way to avoid digestive upset in horses.

In addition, research has shown that bran does not have a laxative effect or cause a softening of the manure. A study conducted at Cornell University, in which 50% wheat bran was added to a diet of hay and grain found that fecal moisture was not different between horses receiving wheat bran and those on the control diet that received no wheat bran.

What bran does do is give the manure a bulkier appearance because the fiber in wheat bran is not very digestible. The horse is dumping a bigger pile because a lot of the wheat bran was not digested, not because it contains more water.

Furthermore, while wheat bran does have more fiber than corn and about the same amount of fiber as oats, it has less fiber than hay, so really, providing plenty of hay to the horse is the best way to keep the digestive tract full of fiber and subsequently well hydrated. The amount of dry hay the horse eats will directly influence the amount of water it drinks, which will in turn help to keep the horse properly hydrated.

Much concern has been raised in recent times over the level of starches and sugars (also called soluble carbohydrates) in horse rations. We now realize it is best to minimize starch and sugar in equine diets as these two ingredients have been linked to numerous exercise, growth, and metabolic disorders. Wheat bran contains a considerable amount of soluble carbohydrate (about 30%), which is another reason it should never be suddenly added to the diet in large amounts.

With all of that said, however, there is a place for wheat bran in the horse's diet. Wheat bran is very palatable to horses and provides energy and protein at levels similar to oats. Small amounts can be fed on a daily basis in the regular ration, but it should not be fed at a rate of more than 10% of the total diet (hay and concentrate). The reason for this guideline is that all brans, including wheat and rice bran, contain a high percentage of phosphorus but are low in calcium. Compounding the problem is that approximately ninety percent of the phosphorus in bran is in a form called *phytate*. Phytate interferes with calcium absorption and reduces the absorption of copper, zinc, and manganese. Feeding high levels of bran can cause severe mineral imbalances that can negatively affect bone health. Therefore, bran should be used only as an ingredient in a well balanced and fully fortified (vitamins and minerals) ration; not as a feed.

Pellets Cause Choke

This may be my all time favorite! Pellets don't cause choke; horses that eat too fast cause choke. When horses become overly hungry due to long periods with nothing to eat, are fed in close proximity to their neighbors, or feel threatened eating in a field, they tend to become very aggressive when eating. Choke is a behavioral problem, not a "form of feed" problem.

I have seen many horses choke on fresh grass, hay, sweet feeds, large cubes, pellets, apples, carrots, straw, shavings, and handfuls of mints. A horse that eats too aggressively and bolts his feed is likely to choke on any food source.

The key to preventing aggressive eating is to change the management of the horse. This can be done by increasing turnout time and/or grazing time, increasing feeding frequency, feeding smaller portions of feed, separating an aggressive horse from the herd when being fed, and making sure horses do not become overly hungry from spending long periods of time with nothing to eat. Feeding in a shallow trough or pan with large smooth stones that prevent the horse from getting a large mouthful of feed can also be helpful, along with the aforementioned techniques.

Beet Pulp Must be Soaked

Beet pulp does not need to be soaked before it is fed. As a matter of fact, most commercial textured feed mixes on the market today contain beet pulp as an ingredient and these feeds are not soaked before feeding. Feeding beet pulp un-soaked to a horse does not cause it to expand in the stomach to the point of rupture due to absorption of water and does not cause choke in a horse with normal eating behavior. Beet pulp has about the same amount of dry matter as alfalfa hay and therefore soaks up a similar amount of fluid when ingested.

In most cases, if beet pulp is fed alone instead of as part of a pre-mixed feed, it is more palatable if it has been soaked. Soaked beet pulp is also a great carrier for feeding medications and supplements to horses. But it is absolutely not true that it will cause choke or gastric rupture if fed dry to a horse that does not eat too fast.

Horses Must Have Grain in Their Diets

Horses are grazing animals, and in many cases forage (pasture and/or hay) can provide all of the nutrients they need. The equine digestive system is designed to ferment coarse, fibrous plants and—with the help of a microbial population that resides in the cecum and colon—derive all the nutrition and energy it needs from those materials. Even working, growing, gestating, and lactating horses can go without grain, so long as all their energy (calories), protein, vitamin, and mineral requirements are met.

Karen Briggs writes in her article called "7 Feeding Myths Shattered" (8-18-03 Horsechannel.com):

> "So what's the advantage of grain? It supplies concentrated energy, in the form of carbohydrates, which some horses need if they're being asked to do more

> work than what they would normally do in the wild. Show horses, racehorses and nursing broodmares can all use the extra nutritional support of grain to help fuel their higher energy expenditure. But because the equine digestive system is poorly designed to digest large quantities of carbohydrates, there's a limit to how much grain you can feed without risking dangerous conditions like colic and laminitis. As a rule of thumb, remember that every horse should consume between 1.5 and 3 percent of his body weight in total feed every day, and at least half of that should be forage, by weight."

Many people want to argue that they want to feed their horse "natural, whole grains" because they believe that is best for their horse. But grain is not natural for a horse to eat, and difficult for them to digest, especially when fed in large, infrequent meals. Where would a horse find five pounds of grain out in the wild? Grasses, leaves, twigs, bark, and dirt are natural things for a horse to eat. The problem is, in some instances we need more energy than those types of "natural" feedstuffs can provide.

Nowadays, beet pulp, soybean hulls, rice bran, and alfalfa meal (highly digestible fibers) have replaced a lot of grain in the equine diet because they provide similar levels of energy, but as fiber, not soluble carbohydrates. Feeding good quality, soluble fiber is a much healthier way to provide energy to the hard working horse.

There is hardly anything we do with our domestic horses anymore that can be considered natural. For example, confinement to a stall, low forage, high grain rations, meal feeding only twice or three times a day instead of grazing 18 hours daily, carrying a rider and running at very fast speeds for distances longer than would ever be required in the wild is not natural. Therefore, we need to embrace the new research and technology and change our ways of thinking so the horses we manage so intensively will benefit.

Protein Makes Horses Behave Badly

This myth drives us nutritionists crazy! Unfortunately, feed companies have unknowingly helped perpetuate this misconception by marketing feeds as "10, 12, or 14%" which seems to indicate the only important nutrient in horse feed is protein. That is what those numbers indicate—crude protein level—not energy or caloric density.

Overfeeding *calories*—not protein—can contribute to hyperactivity and fractious behavior in horses. Also, sugar content of the feed may play an even bigger role in creating a misbehaving horse. Ingested sugars and starches cause changes in blood sugar concentrations and (much like humans) some individual horses appear to suffer the same sensitivity to the fluctuation, while others are not bothered at all.

Every day, the horse has a minimum requirement for energy, protein, vitamins, and minerals. If you limit any of these to below the requirement, growth, milk production, and performance will subsequently also be limited. If you feed above this requirement, protein, fats, and carbohydrates simply become available as excess calories.

Therefore, if a horse is having a behavioral problem that can be linked directly to feeding (all other medical conditions must be ruled out), it is best to lower the amount of concentrate intake as a whole—not just one nutrient or another. Continue feeding as much forage as possible and add a protein, vitamin, and mineral

supplement that does not contain any extra calories from carbohydrates or fats. This way, caloric intake and sugar are limited, which are the root cause of feeding-related excitability in horses. If the horse is a fairly easy keeper and needs to eat more to maintain weight, use concentrates low in whole grains and with more fat and fiber. These feeds supply the same calories as high grain feeds, but keep blood sugar changes to a minimum.

And most importantly, if a horse is acting badly, it will benefit from more time outside the stall and in work. No feeding modifications can substitute for expending energy the good old fashioned way.

High Protein Diets Cause Development Problems in Foals

Protein is not the cause of developmental problems in growing horses.

Lori K. Warren, Ph.D., P.A.S., explains this beautifully in a paragraph taken from her paper that appears in the Proceedings of the 2002 Alberta Horse Breeders and Owners Conference.

> "Genetics, exercise and nutrition all play a role in the development of healthy bones, and as a result, the same factors are also linked to the occurrence of developmental orthopedic disease (DOD) in young horses. Most confusion regarding DOD is related to nutrition. Mineral imbalances have been well-documented as a cause of DOD. Excessive protein was blamed as a cause in the 1970's, but later studies disproved this connection. Feeding more protein than the foal needs does not increase growth rate above that achieved when the diet just meets protein requirements. Unfortunately, the diets of many young horses are kept quite low in protein for fear of causing developmental problems. Restricting protein will <u>not</u> result in improved bone growth, and can actually be harmful to the foal by decreasing feed intake, growth rate and skeletal development. On the other hand, overfeeding *energy* will result in developmental problems, particularly if protein and mineral intake are not increased at the same time. Again, the horse owner must be able to differentiate between the *energy* and the *protein* content of the diet. For growing horses, protein and minerals must be in proportion to the *energy* in the diet."

One other note, too much starch and sugar in the diets of growing horses *has* been implicated as a causative factor in the development of orthopedic problems. High starch feeding causes a disruption to the normal secretion of the hormones that are directly involved in cartilage maturation into subchondral bone, which may result in abnormalities. Here again, the best advice is to use feeds higher in fat and fiber, low in starch, and with the correct amount of protein, vitamins and minerals to help combat this problem in growing horses.

First Cutting Hay is Not as Good as Second or Third Cutting Hay

This may or may not be true, because the cutting has nothing to do with the factors that really are important to making good hay. These factors include:

- Level of fertilization of the field

- Amount of water available during growing season
- Species of plant / region being grown
- Level of maturity when harvested
- Insect infestation
- Weed control
- Sunlight

Obviously, all of these variables can change dramatically throughout the growing season. Many can be controlled and the best hay growers do just that. For example, in this country, much of the best hay comes from the dry western regions, where the sun is almost always shining and Mother Nature does not interfere with long rainy periods. Irrigation is used to control water application, fields are properly fertilized, and the right species of plants are grown for the region. High yields are easy to realize under these conditions because the level of control is so great. It is only when these factors are not controlled do you get large variation between cuttings. There are some places in California that can get 10-14 cuttings of alfalfa hay due to the long growing season and micro management of the plants in the field. Under such tight regulation, variation between cuttings is minimized.

The best way to evaluate hay is not by the cutting but by judging quality and maturity at cutting, how well the hay was processed and—most importantly—how well the hay suits the nutritional needs of the horse.

Not every horse needs the best alfalfa hay and many do well when fed medium quality hay. For example, horse owners with overweight horses should look for a medium quality, low calorie hay and then provide protein, vitamins, and minerals through the use of a supplement. This way, the horse can be fed more hay instead of being restricted to a very small amount of high calorie forage, which can ultimately lead to a crabby, hungry horse that bolts its feed. Colic is also a repercussion of inadequate fiber intake.

Feeding Free Choice Minerals Allows Horses to Seek What is Lacking in their Diets

Many horses kept in a stall or small paddock will eat anything they can find, once all other food sources run out. This includes the wood holding together the stall or paddock in which they are housed.

This theory of free choice feeding of minerals or anything else other than forages, water and salt, may only be applicable to horses that are free ranging thousands of acres and cover 25-50 miles daily to forage on enough different feedstuffs to obtain their daily nutrient requirements, but it does not hold up for domestic horses in general. Confined horses do not necessarily know what is good for them; they eat what tastes good or whatever is available if all palatable feeds are gone.

If horses are provided forage appropriate for their stage of development or level of activity along with a well-fortified balanced concentrate or supplement, white salt, and water, nothing else need be offered to them to eat. If the diet is balanced

correctly, the horse will not be lacking in any nutrients unless there is a pathological condition that exists—in which case, a veterinarian and nutritionist should be consulted.

For performance horses, it is always better to completely control intake using good quality forages and pre-mixed, balanced concentrates formulated by a reputable feed company, rather than leave the decision making to an animal that does not know any better.

It is highly unlikely horses (or people for that matter) wake up in the morning and say to themselves, "Wow, I am feeling low on manganese today so I am going to eat more of the manganese mineral mix in my stall." It just doesn't work that way!

Nutrition Tips

Use white iodized salt instead of red mineral salt. There is very little difference between the two—just a lot of iron oxide in the red salt, which gives it the red color. Horse diets are already loaded with plenty of iron, so it's a waste of money to buy any more iron. Also, iron overload may be a factor in the onset of Insulin Resistance in some horses.

Some feed companies are adding supplements such as "glucosamine" or others to their feeds. The reason this does not work is because each horse will eat a different amount of the feed, and therefore will receive varying amounts of the supplement. This can result in the horse receiving an insufficient dose of the supplement to have a therapeutic effect. Most supplements are fed in small enough amounts that they can be easily top dressed and this is the best way to feed them to ensure accurate dosing.

Contrary to popular belief, it is safe for horses to drink right after exercise. Recent research has shown that horses deprived of water directly after exercise are more likely to remain in a state of dehydration. Horses tend to have a better desire to drink and replenish fluid lost in sweat soon after exercise when their thirst drive is high, as compared to after they have cooled down.

Nothing can replace good horsemanship and skills developed through years of experience. Feeding horses is an art and a science, and we all need to be open minded enough to recognize what is working and when a change is needed. Acceptance of the fact that some long-held feeding traditions may not be the soundest methods will help horses in the long run, especially as we gain more knowledge from scientific studies.