Feeding to Perform

BY MOLLY SORGE
ANNE M. EBERHARDT PHOTOS

A high-performance horse is an athlete at the top of his game. Like an engine, his body needs fuel to run efficiently and at its optimal performance level, and digestible energy is that fuel. In addition to digestible energy—the usable portion of the total energy in the diet—an owner must balance a number of other nutrients to power the horse to compete.

A horse's activity level and body processes dictate his energy needs. A grazing horse receives a constant low-level source of energy from the forage (grasses, hay) he consumes throughout the day—enough to maintain body condition and provide energy for daily activities such as eating, drinking, walking, and breathing. So a horse with minimal work demands does quite well on a forage-heavy diet that's relatively low in digestible energy and high in fiber. Horses digest this fiber in the large intestine, in a fermenting process that breaks down the fiber sources.

"It's a very slow process because it takes so long to get these fermentable carbohydrates broken down into energy molecules," said Dr. Carey A. Williams, equine extension specialist and associate director of extension for Rutgers University's Equine Science Center. "From the time that horse eats that piece of hay, it can be a day and half later that he will fully digest it and get energy from it."

On the other end of the spectrum is a horse performing at a high level that is expending large amounts of energy and, thus, needs more digestible energy (measured in megacalories) to meet his body's needs. And while fiber remains an essential part of the diet, it's the soluble carbohydrates, such as starches, and fat in the diet that can provide that extra energy punch.

Starch Isn't a Bad Word

The horse's digestive system breaks down starches very quickly; the enzyme amylase works in the small intestine to break them down into glucose (blood sugar, the body's most important fuel molecule), which is absorbed into the bloodstream through the intestinal wall. Small amounts of glucose in the blood are readily available to the horse for energy conversion, which occurs when oxidation (the body's "burning" of fuels) converts the glucose to adenosine triphosphate (ATP) molecules—the horse's actual energy source.

When glucose is released into the bloodstream, it also triggers the body to release insulin, which carries some of the glucose across cell membranes where it is stored throughout the body as glycogen. This complex carbohydrate is stored primarily in the muscles and the liver. So, starch in the diet is converted to both an immediate energy source in the form of glucose and a stored energy reserve of glycogen.

Performance horses need high fat in their diet and a good source of soluble carbohydrates

Because the horse's digestive tract can only produce a limited amount of amylase, excessive starch can't be digested in the small intestine. If starch travels to the large intestine undigested, it's subject to a microorganism fermentation process, which is designed to break down the insoluble carbohydrates of forage. In consuming starch these microorganisms produce lactic acid, which can trigger a release of endotoxins into the bloodstream, possibly causing issues such as colic or laminitis.

So how do you provide additional digestible energy without oversupplying starch? One of the more popular equine nutrition trends is feeding low-starch formulations. And there are horses with specific nutritional needs—such as insulin-resistant horses—that require low-starch diets.

"But I don't think anybody who has a performance horse at any level should be completely excluding some of the starches and more soluble carbohydrates from the diet," Williams said. "They are a good source of energy, and they're a source of energy that high-performance horses do need.

"Some horses would need more energy than what can be had in terms of carbohydrates," she added, "which is when I think it's a great idea to add fat to the diet of intensely exercising horses."

The horse's body processes fat molecules in a much less efficient way than it does starch molecules, but it also derives much more energy from a gram of fat than from a gram of starch.

"Fat goes through many different steps to get to your ATP molecule," Williams said. "Even though there is actually three times more energy per gram of fat than you'd get from a gram of starch, the process takes so much longer to get to the endpoint of energy."

For these reasons, "I do like high-fat diets, but probably not necessarily the low-starch, high-fat diet (for high-performance horses)," she said. "There are feeds out there now that are made for the metabolic syndrome horse. Those are not for the performance horses. The performance horses need high fat, but they also need a good source of soluble carbohydrates. Otherwise, they're going to end up not having the energy to compete at a higher intensity."

Different Ways To Fuel the Body

Starches and fats provide vital energy for your horse's engine to use in peak performance, but how the horse accesses that energy varies. When a horse works moderately, at a slower pace for an extended period of time without exerting much effort, he accesses energy aerobically, which means the oxygen in the blood breaks down glucose and glycogen into energy

Feeding the "Hot" Performance Horse

Dr. Martin W. Adams - Equine Nutritionist for Southern States

Many adjectives including "hot," "excitable," and "fresh" can be used to describe the behavior that is not part of a working horse's normal behavior. While many factors can affect a horse's behavior, research has shown that nutrition can be one of them.

Southern States is a member of an international animal nutrition research organization that has done extensive equine nutrition research. One of these studies found reduced post-exercise heart rates that were attributed to calmer behavior in horses fed a concentrate formulated with a lower level of starch and sugar compared to the other feed treatments. Also, a university study observed reduced excitability with the addition of fat in the form of oil when added to the concentrate feed.

The reduction of glycemic response is the probable cause for these calming effects observed in the horse with a nutritional change. Glycemic response is the rise in blood glucose and insulin that occurs after digestion and absorption of the sugar and starch components in the horse's concentrate or grain meal. A lower glycemic response can be achieved by providing a feed formulated with lower levels of sugar and starch or by reducing the meal size. A reduced glycemic response can also be achieved by providing a feed with a higher fat content. Select a horse feed formulated with lower levels of sugar and starch and added fat if your performance horse exhibits unwanted excitability. Southern States has sugar and starch values available for all horse feeds that have been analyzed by an independent laboratory.

Southern States has products and services for all of your equine nutrition needs including horse feeds and supplements formulated with reduced sugar and starch content and elevated fat levels available in its Triple Crown, Legends, and Southern States branded lines.

Go to **www.southernstates.com** or visit a Southern States retail location for more information.

molecules. The body also can access fat molecules for energy during aerobic exercise.

When the horse's body switches into higher-intensity anaerobic work, however, it isn't able to access fat for energy. Instead, it depletes the glycogen stored in the muscles and liver.

When a horse does work that requires short bursts of explosive energy, such as racing or in a workout, he mainly uses these glucose and glycogen stores. But when his work requires sustained effort over a period of time, his body starts using fat for energy. "Three-day eventers can use both of their sources—they use their glycogen and then start using some fat," Williams said. "By the time an endurance horse hits the 40-mile mark, he's all on fat. The racehorse won't really use a whole lot of his fat stores in a two-minute race."

A balanced diet should be sufficient for most performance horses

Research has shown, however, that when a horse is able to utilize fat as an energy source during aerobic exercise, he can maintain his glycogen reserves. This is known as glycogen sparing.

"If your horse has fat available in his diet, on those slow days when he's working aerobically, he can use the dietary fat preferentially over the glycogen stores," said Dr. Brian Nielsen, professor in animal science at Michigan State University. "Then, the next day, when he's in competition and has to run fast, he will not have depleted his glycogen stores. You still have effectively a full gas tank when you really need it."

"They've actually done a lot of studies using a high-fat diet in racehorses," Williams said. "They've found that they use more of the fat stores when they're training, since their training sessions are a lot longer than a two-minute race. So they're using their fat stores during training, and then saving their glycogen that they'd have in their muscle and tissues and using that for their race. The theory is that they have more glycogen to use during the race if they're on a high-fat diet and can use fat molecules for energy during training."

Most commercial feed companies offer a high-fat product, and there are many fat supplements available, such as vegetable oil and rice bran.

So, when feeding your high-performance athlete, keep in mind his body's energy demands. If endurance and stamina are essential, make sure he has plenty of fat available in the diet to build up his slow-burning reserves. If his job demands short bursts of intense energy, soluble carbohydrates such as starches are important. A balance of the two will give your athlete the flexibility of multiple fuels.

Protein—More Isn't Better

Protein content is likely the most available piece of information on a feed tag; commercial grains are categorized by the percentage of protein they contain. However, protein shouldn't be used as an energy source, because it's very inefficient in that role, note nutritionists. Protein helps the body rebuild muscle, bone, and tissues. Increased demands on the body amplify the protein requirements, but the horse's normal forage and grain rations usually accommodate this increase.

"When they are exercising, horses aren't really breaking down muscle that often, so they really don't need to build up the muscle," Williams said. "The only time when this tends to be a problem or an issue is when you have a 2-year-old in training to be a racehorse, when they are growing and their muscles aren't completely mature yet. So they do need to lay down new muscle, which requires the amino acids that make up protein."

And unlike humans, who bulk up muscle by supplementing exercise or weight lifting with protein, horses won't utilize excess protein to develop more muscle.

"I've had a lot of people ask what's a good protein source to help build muscle," Williams said. "But a horse's muscle metabolism isn't the same as a human's. They can't look like Arnold Schwarzenegger if it's not in their genetics."

Horses will just dispose of excess protein in their urine.

While protein is commonly discussed in regard to its percentage in a feedstuff, Nielsen maintains horse owners need to start thinking about protein in a quantitative way, rather than as a percentage. Owners can calculate the protein in their horse's diet—grain and forage—with simple math, using the protein percentage and total body weight. The National Research Council's Committee on Nutrient Requirements of Horses published a calculator

that displays what a horse's diet should contain based on certain parameters; it's available online at: http://nrc88.nas.edu/nrh.

"If you look at (protein) as a percentage basis, it really doesn't change that dramatically from maintenance to exercise because what typically happens is that as a horse begins to exercise more strenuously, it has higher caloric requirements, so it eats more," Nielsen said. "If you eat more, and you keep the crude protein percentage about the same, you're effectively taking in more protein. If you're feeding a good-quality hay, especially a mixed hay that's half legume (such as alfalfa) and half grass, and you're feeding any commercial concentrate that's blended for your horse's situation, you're probably meeting and likely exceeding your horse's protein requirements."

Commercially formulated feeds use high-quality protein sources with balanced amino acids that are tailored to horses' needs.

"It's not advisable to try to feed a performance horse using straight grain like oats or corn," Nielsen said. "Those (on their own rather than part of a mix) really have a fairly poor blend of amino acids. One thing about feeding a commercial concentrate or grain is that a lot of those, especially those designed for athletic horses, use good-quality protein sources, like soybean meal, which have a good blend of amino acids. So, you're greatly increasing the likelihood of meeting the amino acid requirements of the horse."

Stick with the Basics

High-quality commercially available feeds also have tailored blends of vitamins and other nutrients that eliminate the guesswork for performance horse owners.

"You pay a little more for those types of feeds, but in reality, it's probably worth the money," Nielsen said. "There's a wide selection offered so you can try and pinpoint appropriate nutritional needs for various lifestyles."

A balanced diet with good-quality forage and a commercially mixed grain should be sufficient for most performance horses. But one supplement that is key for a horse subject to consistent physical exertion is electrolytes.

"Horses that are performing at high levels and sweating daily, enough to work up a good lather, are losing a lot of electrolytes, which need to be replenished with an electrolyte supplement," Williams said.

But make sure to read the label quite carefully.

"The electrolyte supplement needs to have salt—sodium chloride—as the first ingredient and not sugar," Williams said. "A lot of the electrolyte supplements out there are made to be more palatable, so they add a lot of glucose, and they're just diluting out the actual content of the electrolytes. It needs to be salty to be able to replenish what they're losing in the sweat."

Take-Home Message

Nutritional needs vary among high-performance horses, so it's a good idea to seek some guidance when planning an athlete's diet. It's easy to see if you're not providing your horse with enough energy—his performance suffers or he loses condition. But it's more difficult to know whether you're meeting his other nutritional needs sufficiently.

"The only way to get a good feel about whether you're meeting that horse's requirements for things other than energy is to have the diet analyzed and compare it to the standard requirements of a horse of that weight and age and activity level," according to Nielsen.

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