Feeding Strategies for Peak Performance in Horses

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A horse's athletic performance can be altered or affected by many things such as genetics, training, environment, health and nutrition. In particular, nutrition can play a large role in achieving peak athletic performance in horses by providing the necessary fuels (energy). The main fuels are fats and carbohydrates, in the forms of free fatty acids and glucose. The type, intensity and duration of exercise will determine the amount of each form of fuel used. Aerobic activities (long duration, low intensity) use more free fatty acids as fuel than anaerobic activities (short duration, high intensity), which use more glucose. However, the horse is almost always using both types to some degree, at the same time. Therefore, we need to make sure that our horse's diet contains enough energy, in the form of fat and carbohydrates, to ensure that the horse can perform like we need it to. Not only is what we feed our horses important, but how we feed our horses can be just as important. Feeding at inopportune times, or feeding too much, can be a detriment to athletic performance. We don't want to undo all of our hard work and time spent training our horses to achieve peak performance by feeding them incorrectly.

Fat Supplementation

Most performance horses' caloric needs can be met through hay and grain. However, the large amounts of grain, traditionally high in carbohydrates, needed to maintain the correct body condition score of some of our intensely worked horses (race horses, polo ponies, etc.) can be harmful to their health. Excessive carbohydrates can lead to colic, ulcers and other ailments as well as create vices in the horse. Therefore, replacing some of the carbohydrates with fat can provide several benefits. The first is that because fat is more energy dense than carbohydrates, we can provide more calories with less feed. Replacing carbohydrate calories with fat calories will also help to keep the horse cooler, which could help in the summers, particularly in the South. Microbes in the hindgut break down carbohydrates from hay, and some from grains, through fermentation. This produces a lot of internal heat and is one reason to feed extra hay in the winter – it will help keep the horse warm. Fat, however, is digested differently, and does not undergo microbial fermentation; therefore, it does not produce as much heat and will help keep the horse cooler in the summer.

Fat supplementation also may help the horse's performance. An increase in dietary fat (up to 10% of the diet) may potentially increase the amount of muscle glycogen storage in the horse. Glycogen is the storage form of carbohydrates, and is a primary fuel for energy during anaerobic work, which consists of short bouts of intense exercise such as sprinting or jumping. Therefore, the more muscle glycogen, the longer the horse can exercise. Once the glycogen is depleted, the horse becomes fatigued. So, adding fat can improve performance, particularly that of high-intensity, short-term, anaerobic work, such as cutting or jumping. In addition, aerobic work such as trail and pleasure riding can be improved as added fat can cause muscle glycogen sparing. Instead of using muscle glycogen for exercise, the horse will use fat instead, thus delaying time to fatigue. Fat supplementation is well received by horses and can be added up to 10% of the concentrate without any palatability or digestibility issues. As with any dietary change, it must be added slowly to allow time for adjustment. Although effects may be seen in as little as four weeks, it may take two to three months for complete adaption to a fat-supplemented diet, so don't expect results immediately.

Feeding Prior to Performance

An often-asked question is, "When should I feed my horse before exercise or a competition?" The answer depends on what the horse will eat and how it will

be exercised. Research has shown that a grain meal, either with or without hay, fed two hours prior to an exercise bout similar to the endurance and speed phase of a three-day event decreased free fatty acid availability and plasma glucose concentration (Pagan and Harris, 1999). Moreover, grain meals fed three hours prior to exercise also decreased plasma glucose and free fatty acid concentrations, which serve as fuels for the horse (Lawrence et al., 1993). Limiting two necessary fuels for energy is a detriment to performance, particularly higher intensity performance such as eventing, fox hunting or racing. Additionally, feeding a grain meal two hours prior to exercise, and ad libitum hay, resulted in decreased plasma volume and elevated body weights, making the blood thicker and the horses heavier (Pagan and Harris, 1999). This also could be a detriment to peak performance. Feeding hay alone did not decrease free fatty acid and glucose availability; therefore, performance will not be limited by the decreased fuels as seen with grain meals prior to exercise. The hay alone may produce a decrease in plasma volume and elevated body weights, similar to the grain meals. However, feeding hay in small amounts may reduce the effects, and the consequences of withholding hay to stalled horses (ulcers, vices) may outweigh the effects.

Not only does a grain meal affect fuel availability, but it also may affect heart rate. Higher heart rates during the first five minutes of exercise were found in ponies that had consumed grain meals at 0.7% of their body weight prior to exercise (Duren et al., 1992). Similar results were seen in horses that consumed grain meals two hours prior to exercise. However, horses that were fed less than 0.5% of their body weight in grain did not have higher heart rates during an exercise bout (Lawrence et al., 1995). Higher heart rates at a given speed could have an undesirable effect on performance, as the heart would be working at a faster rate than it should. In essence, the conditioning put into a horse to decrease his heart rate at a given speed would be undone. Even though research results are inconclusive, the potential for increased heart rate should be avoided by giving the horse forage only (ad libitum or up to 1% of body weight) prior to competition.

Most of the research has focused on feeding horses a grain meal two to three hours prior to exercise, but a definitive "cut-off" time has not been established. Therefore, if a competition starts early in the morning, it is best to give the horse a last grain meal the previous evening. If competition starts later in the day, the last grain meal should be given early in the morning. Forage may be provided throughout the day in small amounts; however, if a grain meal is missed during the day, do not attempt to "make it up" during the next feeding by offering twice the amount. Offer the normal amount at the scheduled time.

Most of these recommendations are applicable for intense exercise of longer duration, such as racing, polo, fox hunting and endurance racing. Most of the drawbacks to a grain meal prior to exercise, such as decreased fuel availability or increased heart rates, should not adversely affect horses in low intensity or short duration exercise, such as pleasure, equitation, or even short, timed events such as barrel racing.

Feeding After Performance

So now that we know a little bit about feeding our horses prior to performance, what about feeding them after exercise? If the horse is exercising at high intensities, or for long durations, it is imperative that it receives forage and grain (if needed) after a bout of exercise, particularly if it is competing for multiple days. Concentrates should be fed two hours after intense exercise. Feeding forage and grain following an intense or long duration bout of exercise is essential to restoring glycogen (stored carbohydrate) pools in the liver and muscle. Glycogen is a primary fuel for exercise, and is comparable to gasoline for automobiles. Once the gasoline runs out, the car stalls. Once glycogen is depleted during exercise, the horse fatigues and can no longer continue. Thus, it is very important for horses that compete over multiple days, such as eventers, endurance racers or competitive trail horses, to replenish their depleted glycogen stores so that they have enough "gasoline" to perform the following day. However, it takes several days of rest, relaxation and adequate carbohydrates to completely refill the "gas tank."

Body Condition Score

Another feeding strategy for peak performance is the maintenance (or achievement) of the optimal body condition score. What body condition score is best for peak performance? To answer this, use the Henneke body condition scale, which runs from 1 to 9, with a score of 1 assigned to a very thin horse and a score of 9 assigned to a very obese horse (Henneke et al., 1983; Figure 1). A score of 5 would represent a horse whose

ribs are not seen, but easily felt. A score of 5 is optimal for most disciplines, as a thin horse (less than 3) will not have enough energy reserves to sustain performance, and overweight horses (greater than 6.5) could overload their joints and have a difficult time in hotter weather due to increased fat cover. Excess weight can cause a loss of performance due to overheating or joint pain. However, in events such as endurance racing or flat racing, a body condition score as low as 4 is acceptable since a decrease in weight results in a lighter load to carry, thus faster times.

Ideally, adjust the horse's ration so that it achieves and maintains a body condition score of approximately 5. One way to reach a desired body condition score is to adjust the concentrate amount by 20% for each score away from the target score. For example, if a horse is a score of 6, and we would like it to be at a 5, we would lower its concentrate intake by 20%. On the other hand, if it was a 3, and we would like it to be at a 5, we would increase his concentrate by 40%. This is assuming its exercise regime stays the same. Increasing exercise intensity, frequency or duration also will help the horse shed a few pounds. It is also important to remember that ration changes need to be made gradually. Slowly increase or decrease the ration over three to 10 days until reaching the desired amount. The longer time frame is appropriate for drastic increases/decreases. It does take some time to lose or gain the pounds needed to change a whole body condition score, so be patient, and re-evaluate the horse a month after increasing or decreasing its ration.

General Feeding Management

As with all horses, it is important to feed a balanced ration to a performance horse. Improperly balanced rations can lead to a decrease in performance, metabolic stress and digestive upsets. Be sure to either purchase commercial feed designed for performance horses or formulate specialized feeds with the assistance of an equine nutritionist.

Assuming a horse is healthy, sound and disorder-free, and is consuming a balanced ration, most supplements are not needed and are simply a waste of money; they could also potentially cause problems such as detrimental mineral interactions and toxicities. Possible exceptions to this may include joint and ulcer medications/supplements. If the horse is unwell, it is best to work under a veterinarian's direction.

Another exception to supplements is electrolytes. Horses working under hot and humid conditions for long periods of time and sweating excessively may need some form of electrolytes. Horses lose a lot of minerals through sweat, and those need to be replaced. Horses that sweat heavily during exercise may not be able to recoup the lost minerals through their normal diet, and may require a dose of electrolytes. Electrolytes come in various application forms, such as a paste or granules to be added to feed or water. It is not recommended to put the electrolytes in the water, as this will make the water rather salty and the horse may not want to drink it. Providing electrolytes in a paste will ensure the horse receives the proper dose in a timely fashion, and won't affect water intake, which can be difficult to control. Furthermore, electrolytes should only be provided when the horse is sweating excessively, as horses cannot store the electrolytes and excess electrolytes will be excreted. Horses that are not sweating heavily usually can replace their electrolyte loss through their normal diet.

Summary

Nutrition can play a key role in achieving peak performance. Fat supplementation may increase the time to fatigue, reduce the amount of carbohydrates needed and help horses get a beautiful, shiny coat that sparkles under arena lights! Timing of feeding is also crucial to performance since grain meals fed too close to performance can lower necessary fuels and possibly increase heart rates. We must always strive to keep our horses in prime condition. Perfecting our feeding strategies will help us maximize our training and conditioning programs and keep our horses in peak physical condition.

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Figure 1. Henneke Body Condition Scoring Scale

Condition	Neck	Withers	Shoulder	Ribs	Loin	Tailhead
1 Poor	Bone structure easily noticeable	Bone structure easily noticeable	Bone structure easily noticeable	Ribs protruding prominently	Spinous processes projecting prominently	Tailhead, pinbones and hook bones projecting prominently
2 Very Thin	Bone structure faintly discernable	Bone structure faintly discernable	Bone structure faintly discernable	Ribs prominent	Slight fat covering over base of spinous processes. Transverse processes of lumbar vertebrae feel rounded. Spinous processes are prominent.	Tailhead prominent
3 Thin	Neck accentuated	Withers accentuated	Shoulder accentuated	Slight fat over ribs. Ribs easily discernible.	Fat buildup halfway on spinous processes, but easily discernible. Traverse processes cannot be felt.	Tailhead prominent but individual vertebrae cannot be visually identified. Hook bones appear rounded, but are still easily discernible. Pin bones are not distinguishable.
4 Moderately Thin	Neck not obviously thin	Withers not obviously thin	Shoulder not obviously thin	Faint outline of ribs discernible	Negative crease (peaked appearance) along back	Prominence depends on conformation. Fat can be felt. Hook bones not discernible.
5 Moderate (Ideal)	Neck blends smoothly into body	Withers rounded over spinous processes	Shoulder blends smoothly into body	Ribs cannot be visually distinguished, but can be easily felt.	Back is level	Fat around tailhead beginning to feel soft
6 Moderately fleshy	Fat beginning to be deposited	Fat beginning to be deposited	Fat beginning to be deposited	Fat over ribs feels spongy	May have a slight positive crease (a groove down back)	Fat around tailhead soft
7 Fleshy	Fat deposited along neck	Fat deposited along withers	Fat deposited behind shoulder	Individual ribs can be felt with pressure, but noticeable fat filling between ribs.	May have a positive crease down the back	Fat around tailhead soft
8 Fat	Noticeable thickening of neck	Area along withers filled with fat	Area behind shoulder filled in flush with body	Difficult to feel ribs	Positive crease down back	Fat around tailhead soft
9 Extremely Fat	Bulging fat	Bulging fat	Bulging fat	Patchy fat appearing over ribs	Obvious crease down the back	Bulging fat around tailhead

Source: Henneke, 1983.

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