

## Alfalfa for Distance Horses

Whenever you hear the comment, "Well, that's what we've been feeding for forty years and all our horses have done just fine on it", the odds are they're talking about alfalfa. In most parts of the country, it's cheap, is the most common hay available and it just *looks* like great feed---bright green, leafy and the horses just gobble it like candy. If it looks that good, and the horses like it that much, it must be the best available feed...right?

There's no denying that good-quality alfalfa is a highly nutritious forage---higher in protein, energy and many minerals than any other roughage feed. However, rather than making this an optimum feed for distance horses, this nutritional density puts alfalfa into the category of "too much of a good thing." This article will discuss some of the specific reason of how and why alfalfa should best be used in a distance horse's nutritional program.

One of the primary drawbacks to alfalfa is its high protein content. Even relatively poor quality alfalfa usually contains 15% protein and "dairy quality" alfalfa can contain protein levels well over 20%---far higher than a distance horse either requires or should be eating.

Why is excess protein bad? Won't it help put weight onto a thin horse? Yes and no. For the horse to increase his body fat, he must be in a "positive energy balance", meaning he's eating more energy (read "calories") than he's using up in maintenance, growth, work, or reproductive needs. Excess protein in the diet *can* be utilized to meet energy needs, although this is an inefficient method of providing energy---sort of like using bundles of dollar bills to start a barbecue. It'll get the job done, but there are much cheaper, easier and more efficient ways of doing it.

When the body utilizes excess protein for energy, it snips off the nitrogen end of the protein strand and breaks up the remaining amino acids for participation in several energy-producing metabolic pathways. In terrestrial animals, excess nitrogen goes through several chemical reactions to form urea, a waste product which is primarily removed from the bloodstream by the kidneys and excreted by the body in the urine. A certain amount will also be excreted in the sweat, and is in part why horses on a high-protein diet often have thick, patchy, lathery sweat which is less effective in cooling than is a thin, clear, watery sweat.

In order to excrete large amounts of excess urea, the horse must drink more water and produce more urine, which in turn has a higher ammonia content. In a stall-bound horse, more bedding and labor be required to control the increased urine out put. In addition, the increased ammonia fumes can irritate the upper respiratory tissues, as well as simply creating an unpleasant environment for both horse and owner. Even in horses not kept in a stall, the urine output may create a greater degree of dehydration during endurance events. These disadvantages alone more than outweigh the minimal energy benefits obtained from feeding high levels of alfalfa.

And just how good a source of energy is alfalfa, anyway? Even though alfalfa is higher in energy than any other forage, it is still classified as a roughage and is a relatively poor source of energy. For example, let's take a 900 pound horse being conditioned for endurance, not yet competing, whose owner is feeding free-choice alfalfa in an attempt to maintain or put on weight---a common practice in many performance barns. A horse eating even 30 pounds of alfalfa per day

would be just barely meeting his energy needs, probably would not be gaining significant weight, and would be getting protein 228% in excess of his requirements. A more appropriate ration would be good-quality grass hay (with typical protein contents of between 7-10%) and supplementation with more energy-dense feeds, such as beet pulp, grains and fat.

Does excess protein directly affect performance? Almost certainly. Although there are no scientific studies which specifically examine the effects of an all-alfalfa diet, there is significant evidence that protein levels above around 10% are a detriment to endurance-type exercise. Dr. Sarah Ralston, PhD, DVM, DACVN has observed in both endurance and three-day event horses that as protein content of the ration increased, so did metabolic failure. Michael Glade, PhD, in observing feeding practices and racing performance in Australian Thoroughbreds, observed that racing times increased (in other words, the horses slowed down) as protein content of the ration increased over requirements. And finally, many horse owners report that grouchy, temperamental, "hot" horses become calmer, steadier and more consistent performers when excessive alfalfa is removed from the ration.

Another disadvantage to alfalfa is the mineral content---specifically, magnesium and calcium. The alfalfa plant seems to have the ability to concentrate magnesium, with the result that Southwest grown alfalfa can have magnesium contents up to seven times higher than that found in other parts of the country. Alfalfa grown in less alkaline regions do not seem to have these excessive magnesium levels. Magnesium, ammonium (from the excess nitrogen as discussed above) and phosphorus are the three primary components of enteroliths (intestinal stones). A ration high in Southwest-grown alfalfa is unavoidably going to be high in two out of the three primary components of enteroliths. What about the third component, phosphorus? High levels of phosphorus are most commonly found in grain products, the two highest being rice and wheat bran, at 1.57% and 1.15%, respectively---both commonly found in athletic horse rations. It's no surprise that colic due to enteroliths is more common here in the Southwest than it is anywhere else in the country, although other factors also seem to be contributory causes. As yet there has been no clear empirical relationship proven between alfalfa and enterolith formation. Although feeding alfalfa does not guarantee the formation of intestinal stones, this potential problem is yet another argument against feeding a ration high in alfalfa.

Why is alfalfa's calcium content a disadvantage? Endurance horses need lots of calcium, right? Yes, they do---calcium is required for muscle contractions (as well countless other functions in the body) and insufficient plasma levels of calcium during exercise can lead to metabolic problems and failure, including synchronous diaphragmatic flutter ("thumps"). However, alfalfa's high calcium content may actually increase the odds of thumps during an endurance event. Because calcium is such a vital mineral, it is also one of the most highly regulated substances in the body. Several protein hormones, specifically calcitonin, calcitriol and parathyroid hormone, are responsible for maintaining plasma levels, and either storing away or mobilizing calcium from its storage depots in the bone as needed. The concentration of these hormones rise and fall in response to whether more calcium is being stored away, or being mobilized---for example, if dietary and plasma levels of calcium are consistently low, then concentrations of parathyroid hormone (PTH), the hormone responsible for mobilizing calcium from storage, would increase to adequately supply needed calcium. Likewise, if there is little need for mobilizing calcium from the bone, than levels of parathyroid hormone would decrease accordingly.

When horses are fed high-alfalfa rations, calcium is supplied well in excess of their daily requirements---for example, twelve pounds of alfalfa supplies 70 grams of calcium, more than twice the daily requirements of a 900 pound horse at hard work. In response to this large and continuous supply of calcium in the diet, the body will adjust its calcium-regulating hormone levels accordingly---calcitonin responsible for storing calcium away will increase, and levels of parathyroid hormone will decrease. From the body's point of view, there is no need to maintain high levels of a calcium-mobilizing hormone when so much excess calcium is consistently being provided in the diet.

This supply-and-demand concept becomes a problem during a strenuous endurance event. Since calcium is required in large amounts for muscular contractions, plasma calcium levels gradually fall as duration and intensity of exercise increases. In response to falling plasma calcium levels, the body calls upon parathyroid hormones to mobilize more calcium from its storage depots in the bone. However, because the body has become accustomed to having excess calcium available from the diet, it may be that the concentration of parathyroid hormones is too low to adequately supply stored calcium quickly enough to meet the sudden high demand. In other words, it's simply a case of not enough workers being available at a moment's notice to move calcium from storage into circulation. As a result, plasma calcium levels may continue to fall, increasing the likelihood of metabolic problems such as thumps.

This possibility is much more unlikely when a horse is fed a ration which is **adequate** in its calcium content without being **excessive**. Most grass hays, rations that contain beet pulp or just a few pounds of alfalfa (as in two or three, not eight or ten), will supply sufficient calcium even for a hard-working endurance horse. At these levels, the body will regulate hormone levels to levels to readily mobilize sufficient calcium from storage when further demands are placed on the system. If the horse is accustomed to eating small amounts of alfalfa in his daily ration, then alfalfa provided judiciously during endurance events may help provide additional plasma calcium without adversely affecting calcium-regulating hormones.

In summary, alfalfa shouldn't be seen as a totally unsuitable feed for distance horses, but should be viewed for what it is---a rich, high-protein, fairly low energy feed that is more appropriately used as a supplement rather than as a mainstay of the diet. Although alfalfa may be more suitable for horses at other production levels, such as lactating or growing, large amounts of alfalfa shouldn't be fed to an equine athlete any more than prime rib should be provided to a human marathon athlete on a daily basis. It's just "too much of a good thing".

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