

Don't Guess. Test your hay

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In our effort to 'cover all the bases', many of us feel we have to supplement with fortified grains in an effort to feel secure that we are providing enough vitamins, minerals and protein in our horses diet. Grain may present an unnecessary amount of sugar and starch that may even be dangerous to those horses suffering from laminitis or other forms carbohydrate intolerance. Is the use of broad-spectrum supplements creating an expensive sense of false security? Are we still just guessing about the specific nutritional needs of our horses? Are you wasting money on supplements you may not need, or even making your mineral imbalances worse? Are you assuming that because you feed your foundered pony only grass hay that you have minimized the sugar in his diet? Does your hay provide enough protein for your horse's stage of growth and activity level? If you are not having your hay analyzed, you cannot answer any of these questions. A hay test can.

As our knowledge of equine nutrition continues to advance, more attention is being focused on individual components of the diet. As pasture or hay is the cornerstone of the equine diet, knowing its composition is vital to assuring our horse's needs are being met. Nutrient deficiencies and imbalances in hay are common, even in hay that looks to be of high quality. Too many of us learned how important hay testing is *after* our horse's health deteriorated. More informed horse owners are taking proactive measures in hopes of addressing the need for a balanced diet, and as a result the equine supplement industry is booming. Major mineral imbalances contribute to bone disorders such as Developmental Orthopedic Disease. Trace mineral deficiency is implicated in a broad spectrum of horse health issues including metabolic disorders, bone and muscle disease, hoof and hair quality, immune system dysfunction, poor athletic performance and infertility. Protein content of hay varies widely, and may be deficient or excessive in a ration based totally on forage.

Equine researchers are finding links to disease and excessive amounts of specific carbohydrate fractions in the diet. Orthopedic Developmental Disease, phytitis (Glade, 1984), laminitis (Longland, 2006), Insulin Resistance (Treiber, 2006), Exertional rhabdomyolysis and Equine Polysaccharide Storage Myopathy all require minimizing sugar and starch in the diet. With the advent of new testing methods we are finding that sometimes even some hay can be too high in sugar for horses with these carbohydrate intolerant conditions. The source of carbohydrate, rather than caloric estimates of Digestible Energy have a marked affect on glucose metabolism in ponies (Argenzio 1972). Yet the system of basing equine rations on Digestible Energy persists, because equine nutritionists haven't come up with a better system. A more useful method is now available with direct testing for sugar and starch.

It is impossible to determine what is needed to balance a horse's diet without a complete analysis of the forage being fed. If any ration balancing system, regardless of the level of sophistication, uses tables or averages for determining nutrient content of forage, its validity should be questioned. The nutrient content of forage is comprised of a complex interaction of factors, which include: soil fertility, texture and pH, environmental conditions during growth and hay curing, stage of growth when cut, species and variety of the forage. Mineral content of forage varies enormously from one geographic area to another. It can even vary widely on the same farm, particularly if soil types differ. A river bottom soil may have an entirely different mineral profile from a field on a sandy ridge a half mile away. The hay from the low spot in the field may be very different from the hay grown on the higher ground. One year's crop may fall short in some nutrients if the farmer could not afford to lime or fertilize that year. Too much manure can cause toxic levels of nitrate in forage. Minerals that may be lacking in the desert

SW of the United States may be found in very high levels on the east coast and vice versa. Equine nutritionists from supplement companies admit privately that their products are based on average needs nationwide, and may not adequately address needs in a specific geographic region. Custom blends of equine supplements directed at targeting mineral needs in a specific region are not as profitable, due to extra expense of duplicating processes, storage and packaging. While some horses may be fortunate enough to live in an area where average mineral supplements meet their needs, those living in areas where minerals vary widely from the average of the whole nation may still fall short, or may be getting additional minerals that are already too high in that region.

How to sample your hay

Because the fertility of soil is so variable from one spot to another, the nutritional content of one bale of hay will also vary from another. This is why it's so important to sample many bales of hay from all around your stack, so that the resulting analysis is representative of the whole stack; not just that particular bale. Forage researchers have found that hay cut in the morning is lower in sugar than hay cut in the afternoon, which is another reason why numerous, random samples will better show you an average of what your horses are eating. More is better, but usually around 15 bales are considered minimum. The best tool to use is a hay corer, which is a tube with a cutting tip that can either be turned by a hand brace, or attached to a heavy duty electric drill. These can often be



borrowed from a hay broker, a county extension agent, or agricultural professional. They can be purchased for about \$100. Grabbing handfuls of hay from the center of bales will not produce accurate test results. Mix the cored samples in a clean container, and take a representative sub-sample of at least a dry quart and place in a properly labeled, ziplock bag. Never let your sample come in contact with any rusty implements, or the metallic trace mineral results will not be believable.

Yes, you can sample fresh grass

For minerals and protein, randomly select a composite sample from throughout your paddock, and dry it well before shipping to the lab. If you want to test for sugar or starch, you'll have to freeze it immediately and ship it frozen to preserve the carbohydrates. Yes, it's a bother to ship with dry ice in an insulated container, and overnight shipping is expensive, but unless you do it correctly the results for sugar are worthless. When shipping fresh grass get about a pound, because over half will be water.

Where to send it?

Many labs cater to the cattle industry, therefore the specific tests offered, and calculations for Digestible Energy and Total Digestible Nutrients are based on the requirements for cattle. More useful information will be gained from using a lab that offers tests geared specifically for horses. Just like any other business, some analytical labs are better than others. Using a lab that has passed the Forage Testing Council certification process will improve your chances of getting an accurate test. Here is a listing:

http://www.foragetesting.org/index.php?page=certified_labs

Some labs only do a very fast, minimal kind of test based on a method called NIR, which stands for Near Infrared Reflectance. This will not give you information about trace minerals, and may

not be accurate for sugar or starch. You get what you pay for. A good professional lab should have your test completed within a few days of their receipt, or a week at most. Many offer to email results, so add your email address when submitting samples. Most labs keep your sample for up to a month after they do the requested tests; so if something looks odd and needs to be retested, or you decide you want additional testing done, that is usually an option.

What tests to ask for?

A lot of the information provided by a standard hay test are artifacts from cattle nutrition and have little practical value to a horse owner. These are the tests that will be most useful to horse owners.

Crude Protein (CP) This really isn't a test for protein, but a test for nitrogen content. Because nitrogen has a set ratio in forage protein, they multiply the N content by 6.25 to get the % 'crude' protein. This is accurate most of the time, except when the hay might have high levels of nitrate, such as when the hay was grown under drought conditions, subjected to frost, or over-fertilized. If CP looks too good to be true, it probably isn't! In these cases, call the lab and request a nitrate test. This is usually around \$8, and well worth the investment.

Sugar + starch

This is relatively new to the forage testing industry, and only a few labs offer it. Many horses can get along just fine eating large amounts of sugar, but if you have an equine with laminitis, obesity, too rapid growth or problems with excess energy, this could be the most important part of your hay test. Water Soluble Carbs will include sugar and all the fructan. Ethanol Soluble Carbs include sugars and the shorter chain fructans. The average of Non Structural Carbohydrate (WSC + starch) content in straight grass hay is 11-15 % of dry matter. There is very wide range in NSC content of grass hay, from 2% to over 30% of dry matter. High levels of NSC may occur in hay grown under cold or drought stress, or without adequate fertilizer. Anything that slows growth can increase NSC concentration. Starch content of grass hay is generally 1-3%, while Ethanol soluble sugar content normally runs from 4-11% of dry matter. Again, under unusual weather conditions, sugar may be higher than these averages. If cost effectiveness is a concern, test just for sugar content and skip starch, (unless it is Bermuda or another tropical grass hay, in which case the starch can be high). For a horse with glucose intolerance, keeping the level of NSC (WSC + starch) in hay <10 dm, can often alleviate symptoms. Dairy One, www.dairyone.com is an innovator in sugar and starch testing of feeds, and their online searchable Feed Composition Library contains a wealth of information on the sugar and starch levels in various kinds of forage and feed. Dairy One has a new branch that targets the needs of horse people: www.equi-analytical.com

Major Minerals

Calcium (Ca), phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na) These are all needed in large amounts, like grams per day, and are usually reported as %. Nearly all hay tests include major minerals.

Trace Minerals

Iron (Fe), Zinc (Zn), Copper (Cu), Manganese (Mn) Molybdenum (Mo) Sulfur (S) are minerals needed in mg per day, and are usually reported as PPM, or Parts Per Million. These are not always included in cheaper tests, but are necessary to be proactive in maintaining optimum health. Trace minerals are commonly deficient and very important to many systems in the body. Copper and zinc deficiency manifest as a rough, dry hair coat, or poor hoof texture. Selenium



deficiency can affect hormone and immune function.

Other important mineral tests

If you live in an area known for acid soils, requesting a test for aluminum, which can be found in toxic amounts, might be a good idea, especially if your iron and manganese tests high. Cobalt, an essential component of vitamin B-12 may be lacking in some areas. Often local cattle nutritionists have a good grasp of what may be toxic or deficient in your area, and their advice can be valuable when fine tuning a mineral supplement for your horses.

www.servitechlabs.com offers aluminum or cobalt for \$11 each

www.equi-analytical.com includes cobalt with trace minerals, sulfur for \$3,

Selenium is another essential nutrient that is often lacking, but because it is also sometimes found in toxic amounts, supplementing without knowing actual need may be risky. Selenium tests are not offered by many forage testing labs. South Dakota State University developed an accurate test for selenium in forage for about \$30 and many labs subcontract this test to them.

<http://anserv.sdstate.edu/>

Blood tests for selenium concentration are reliable and may be more cost effective than testing hay. Cornell Veterinary Diagnostic Lab does whole blood selenium for \$12.

Using test results

www.equi-analytical.com has set up explanations and tables for interpreting their hay test results and comparing to NRC Nutrient Guidelines for the Horse. The calculations are really not that hard. You essentially figure out what your horse is eating, compare to what your horse needs, and the difference is what you need to supplement. You can also hire an equine nutritionist to do these calculations for you.

With some more math, you can check the concentration on your supplement, multiply by how much you are feeding, and see if your supplement is meeting your horses nutritional needs. If not; then do smarter shopping to get his hair coat shiny, his metabolic rate up to normal, and increase both quality and quantity of life by addressing nutritional deficiency and imbalances.

Further reading:

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