



April 2007

Previous VET NOTES

- April 2007 - Bandaging
- February 2007 - Single screw compression V. Screws and wire (Transphyseal bridging)
- January 2007 - The dental health of young performance horses
- December 2006 - Neonatal Isoerythrolysis in foals
- November 2006 - Upper respiratory infections of young Thoroughbreds in training
- October 2006 - Eastern equine encephalitis—time to vaccinate!!
- September 2006 - Gastroscopy
- August 2006 - Rhodococcal pneumonia
- July 2006 - Managing limb deformities in foal with dynasplints
- June 2006 - Disaster preparedness
- May 2006 - Mare reproductive loss syndrome (MRLS)
- April 2006 - Exercise-induced pulmonary hemorrhage
- March 2006 - The use of high speed treadmill to diagnose upper respiratory tract disorders
- February 2006 - Common medications used to assist breeding, cycle regulation and pregnancy maintenance of the mare

THE ADVANTAGES OF HIGH FAT / LOW CARB DIETS

High fat / Low Carbohydrate diets are the most important advancement in equine nutrition since the advent of commercial diets. Steadily, since the mid 1980's, a growing body of research is proving the many benefits this type of diet can provide. These notes will provide: (1) an overview of carbohydrates found in horse feed and (2) why there are so many positive health / performance effects associated with reducing the amounts of these carbohydrates and replacing those calories with fat and fiber.

Carbohydrates

There are two main types of carbohydrates in horse diets: hydrolysable (soluble) and fermentable. Hydrolysable carbohydrates (CHO-H) mainly come from cereal grains (like oats, corn, and barley) or are sugars (like molasses). They can be thought of as the “dangerous” carbohydrates. Fermentable carbohydrates can be further broken down into dietary fiber (the structural part of the cell wall of plants) which is slowly fermented by bacteria in the hindgut and readily fermentable carbohydrates (CHO-RF) which are sugars inside the cell wall such as fructosans and pectins. A common example of a readily fermentable carbohydrate is beet pulp.

Hydrolysable (soluble) carbohydrates are easily hydrolyzed (digested) by intestinal enzymes and do not have to undergo fermentation by bacteria. Therefore, they become immediate sources of glucose. “Sweet feeds”, which are often mixes of corn, barley, oats, and molasses, cause rapid rises in blood glucose within 15 minutes. This elevated blood sugar level causes a proportionally elevated amount of insulin to be released so that the sugar can be stored in the muscles and removed from the blood. Continued exposure to high blood sugar can cause high insulin levels which become less effective at resolving the high blood sugar. This state of elevated insulin levels and blood sugar is termed insulin resistance.

The glycemic index of a food is its ability to cause this raise in blood sugar levels. The higher the glycemic index, the faster and higher the blood sugar raises and the more soluble (dangerous) carbohydrates are present. Feed that has a lower glycemic index is preferable because it causes a slower, longer rise in blood sugar levels. Feeding two-grain meals a day (with a typical sweet feed) sets up a feeding-fasting roller coaster of glucose and insulin rises which lead to other fluctuations in hormones such as growth hormone. It is for this reason that developmental orthopedic diseases (like OCD) may be less likely to occur on a high fat and fiber, low sugar and starches type diet.

CHO-H can easily overload the small intestine where they are supposed to be digested and rapidly ferment in the cecum or large colon. This rapid fermentation by lactate producing bacteria produces excessive lactate, gas, and hindgut acidosis (which kills many beneficial bacteria and allows some bad ones to overgrow). Diarrhea, Colic, and Laminitis are examples of conditions that can result from overloading the hindgut with rapidly fermenting carbohydrates.

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Fats

Working horses require more than just good pasture and it is from this need that the cereal grains were introduced to the horse's diet, i.e. to give more calories for work. High fat diets replace the calories that were reduced by removing soluble carbohydrates. Fats replace these calories very efficiently because they possess twice as many calories as the same weight of carbohydrates (9 kcal/g vs 4 kcal/g). Because horses have no gallbladder, they continuously secrete bile and digest fats efficiently with excellent absorption. Many studies have proven that adult horses will eat a diet up to 20% fat calories by weight and the fat does not disrupt the uptake of other nutrients. However, concentrates containing >10% fat can adversely affect calcium absorption and bone mineralization in young horses. Therefore, it is recommended that young horses receive ≤10% fat.

Athletic performance can be improved by fat adaptation, i.e., adapting a horse to a high fat diet. These changes usually occur within 3 weeks to 6 months. Fat adapted horses have less production of heat and acid during digestion. A glycogen-sparing effect and decreased lactate production will also occur. Studies have shown faster times on the race-track mainly due to faster time during the first furlong and longer times to fatigue on treadmill studies.

Another advantage of a high fat diet is a tendency for calmer behavior. Studies have shown decreased spontaneous activity and reactivity to stimuli. This may be one of the reasons high fat diets reduce the incidence of "tying-up" in nervous fillies.

High fat diets are usually combined with increased fiber content which can lower the glycemic index and maintain the health of the microbes living in the hindgut for better fermentation. It is preferable to use a commercial high fat/fiber feed rather than just adding oil to an existing concentrate diet which can cause nutrient imbalances.

Health Benefits

Almost every body system benefits from a high fat and fiber, lower soluble carbohydrate feed. Here are some benefits that have been proven by multiple studies:

Reduction in Developmental Orthopedic Disease – Osteochondrosis (OCD)	Reduction in Laminitis
Reduced risk of Diarrhea, Colic and grain intolerance	Less risk of Gastric Ulcers
Less risk of Metabolic Syndrome (Laminitis/Obesity Syndrome)	Reduced incidence of Myositis (Tying Up)
Enhanced Exercise Performance	Behavior Benefits
Enhanced hair coat	

References

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- January 2006 - Managing high risk pregnancies
- December 2005 - Affording the unhealthy horse
- November 2005 - Strangles
- October 2005 - The "dummy" foal
- September 2005 - New medications
- August 2005 - Extracorporeal shockwave therapy (ESWT)
- July 2005 - Vaccination recommendations
- June 2005 - The advantages of high fat/low carbohydrate diets for horses
- May 2005 - The Hoof: Form and function
- March 2005 - Liquid gold
- February 2005 - Breeding the problem mare



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