



# VET NOTES

JUNE 2005

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- March 2005 - Liquid gold
- February 2005 - Breeding the problem mare
- January 2005 - Condylar fractures
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- December 2003 - Internal parasites - the hidden battle

## THE ADVANTAGES OF HIGH FAT / LOW CARBOHYDRATE DIETS FOR HORSES

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. This lecture 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: hydrolyzable (soluble) and fermentable. Hydrolyzable 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.

Hydrolyzable (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.

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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.

## 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 5-10% 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 racetrack 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)
- Reduced risk of Diarrhea, Colic and grain intolerance
- Less risk of Metabolic Syndrome (Laminitis/Obesity Syndrome)
- Enhanced Exercise Performance Enhanced hair coat
- Reduction in Laminitis
- Less risk of Gastric Ulcers
- Reduced incidence of Myositis (Tying up)
- Behavior Benefits

### **References**

1. Harris PA, Kronfeld DS: Influence of dietary energy sources on health and performance, in Robison NE (ed): *Current Therapy in Equine Medicine*. Philadelphia, WB Saunders, 2003, pp 698-704.
2. Kronfeld DS, Harris PA: Equine grain-associated disorders. *Comp Cont Ed Prac Vet.* 25: 974-982, 2003.
3. Ralston SL: Impact of feeds on glucose and insulin metabolism in young horses. *Proc 22<sup>nd</sup> ACVIM*: 2003, pp 188-189.
4. Van Saun RJ: Fat supplements for horses: a healthier diet? *Proc 22<sup>nd</sup> ACVIM*: 2003, pp 195-197.
5. Geor, RJ: Dietary energy substrates for horses: health and performance effects *Proc 22<sup>nd</sup> ACVIM*: 2003, pp 190-192.

# Announcements

Our office expansion has now been completed. We hope you enjoy our new lobby on your next visit.



- November 2003 - Equine tapeworms - The forgotten parasite
- October 2003 - Blister beetle poisoning
- September 2003 - The horse owners' role in wound care
- August 2003 - West Nile update: Broodmare vaccinations
- July 2003 - Stifle radiographs
- June 2003 - A newly emerging cause of diarrhea in weanling foals
- May 2003 - Vaccination recommendation
- April 2003 - Flexural deformity of the distal interphalangeal joint or "clubfoot" and the distal check desmotomy
- January 2003 - Poor performance and clinical sports medicine
- October 2002 - Endoscopic examinations

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