

## ***Starch: The Great Evil of Horse Diets??***

Commercial horse feeds can be subject to the latest “fad” diet as much as many human diets. A few year’s ago the fad was that high protein caused OCDs in foal which has subsequently “gone away”. Many commercial feed manufacturers are touting their low Carbohydrate low starch diets in a fervor somewhat akin to the “Atkins’ Diet for horses”

How much is reality and how much is sales pitch? Probably a little of both, by nature horses would not consume grains and the concentrated horse feeds used. They also would not consume the fats currently in-fashion. That does not mean the either of these feed is inappropriate.

### **Are there times when one should limit the amount of starch available to horses?**

**Yes.** One should limit the amount of starch, sugars, and fructanes available to horses that have a history of laminitis, Cushing’s, glycogen storage disease (genetic tying-up), and obese horses that have become insulin resistant, essentially diabetic horses. Fortunately the number of horses in these categories is relatively small. Horses in these situations deserve specifically designed diet program. In addition to restricting the typical grains, i.e. oats, corn, barley, they should also be restricted to grazing only in the mornings and hays selected to have more fiber and less starches and sugars. Fructans are indigestible sugars that can make up to 50% of the dry matter of some cool season grasses and can result in faster cecal fermentation that seen with corn.

We recommend using our “Prince Regency Draft Formula” as a way to provide critical vitamins and minerals without adding starch feeds in the diet. We will gladly work with you to provide a program for horses needing special care.

### **What about growing foals?**

Spikes, sudden increases in insulin concentration, have been associated with some developmental problems in foals. Typically problems occur in fast growing foals and those that have had an uneven growth pattern, periods of slow growth interspersed with periods of rapid growth. Growth and weight (obese) gain at too great a rate does not allow the bone time to develop both the proper matrix, collagen protein framework, and the bone mineralization to provide the strength needed. If the young horse is returned to better feeding regime and little stress is put on it during its late yearling and 2-year-old year, many of these imperfections will either disappear or not interfere with performance. However the best management is to avoid any possibility through feeding and management programs.

Most premium horse brands, including PRINCE REGENCY feeds, have a formula specifically designed for mares and foals. It is important to have carbohydrates, starch, as part of this ration. It is normal for mare in late gestation to have high insulin and glucose concentration. The fetus absorbs glucose “along a concentration gradient”, in other words if glucose is not high in the mares blood then the foal will not get enough glucose. This glucose is critical for foal development and to have a storage of glycogen that will allow the foal to be vigorous and to stand and nurse.

Additionally, once the foal is born we need to insure that the mare can produce milk to support the foal's growth. Mare's milk differs from cow's milk. The major source of energy in cow's milk is fat and the CHO (lactose) concentration is relatively low. In mare's milk it is the opposite. Rather than 1% lactose, mare's milk has 8 to 9% lactose. All animals lack the ability to convert fat to carbohydrates. If a mare does not have enough carbohydrate in the diet it will limit her ability to produce lactose and will reduce the amount of milk she produces. This is particularly important in foal born early in the year when less pasture is available. Therefore it is important to have a source of carbohydrates for the mare.

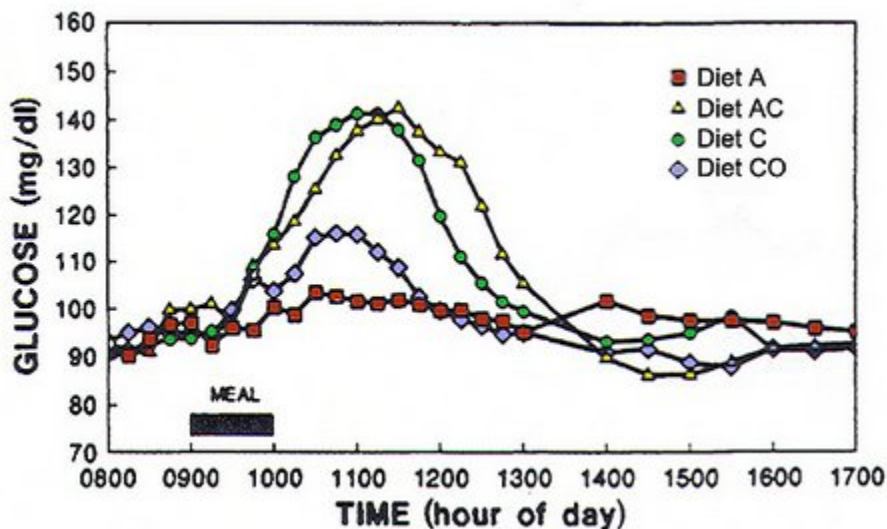
Foals will begin to sample a mare's feed at roughly 2 weeks of age. As the foal ages it will consume more and more feed, the rate of this intake is often dependent upon the mare's behavior. The simplest way to avoid insulin spikes in foals is to increase the number of feedings. If the feed is spread from twice (2X) a day feeding to 3X or 4X a day feeding the potential amount of grain will not be sufficient to cause concern. The other factor that can limit the insulin spike is the addition of fat to the diet. (See figures 1 and 2 below.) PRINCE REGENCY MARE & FOAL feed has added vegetable fats to provide omega-3 fatty acids in addition to energy.

### **Advantages of added fat**

Fat does not invoke a response in plasma insulin concentrations and is a good supplement to provide to horses with certain nutritionally related diseases mentioned above. With implications for all horses, additional fats modify the amount of insulin released when dietary starch is provided. Stulls and Rodiek (J.Nutr, 1988; 206-213) demonstrated that adding oil (corn) dramatically reduced both the glucose and insulin response to horses provided corn grain. In their study horses were fed a diet from one of 4 treatments: Diet A, 100% alfalfa hay; Diet AC, 50% alfalfa hay and 50% corn; Diet C, 100% corn; and Diet CO, 90% corn and 10% corn oil.

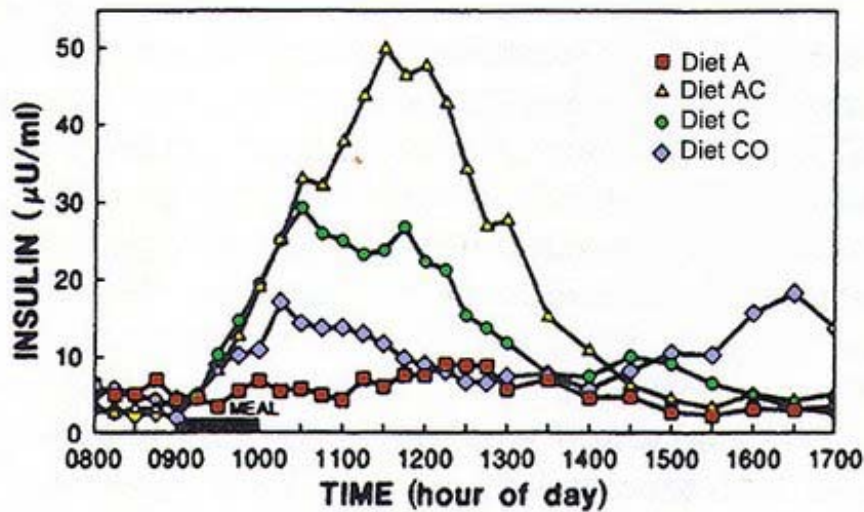
What they and other researchers have found is that the addition of oils or fats decreases the spike in glucose concentration and reduces the increase in plasma insulin concentration.

Figure 1.



Stulls and Rodiek, 1988

Figure 2.



Stulls and Rodiek, 1988

The added fat effect has strong implications in developing diets that not only meet the energy needs of the horse but also do it in a safe and economical manner. Using the data from Stulls and Rodiek and the fact that corn is approximately 60 percent starch, the ratio of starch to oil in the CO treatment is 6:1. Lets consider a commercial feed such as PRINCE REGENCY MARE & FOAL (M&F) that has both starch containing components and oil. In the case of the texturized form of M&F the ratio of starch to oil is only 2.6:1 or less than half of the sited experiment and a strong indicator that the starches in the Mare and Foal product do not represent a to a foal's development.

### What about starch overload resulting in high lower gut fermentation?

There is no doubt that a large amount of fermentable starches reaching the lower gut can be a life-threatening problem. A horse getting unrestricted access to a grain or concentrate feed can face acidosis, colic and laminitis. How much starch is too much? Work at Texas A&M (Potter, 1988) suggests feeding corn starch at 0.35 to 0.4% of body weight in one feeding may cause an overload situation. Work by Radicke (1991) and Kienzle (1992) suggest levels as low as 0.2% of body weight in a feeding, depending upon the source of starch.

We recommend feeding PRINCE REGENCY feeds to maintain proper body condition, with feed consumption generally kept to 1% of body weight or less per day. With 2X a day feeding that is a recommendation of 0.5% of body weight per feeding. The highest starch content of any REGENCY feed is 30% (Maintenance, texturized). Feeding a 30% starch product at 0.5% of body weight provides on 0.15% starch in one meal, well below the level at which trouble might begin. Feeding Regency feeds according to label and practical recommendations does not represent a threat of starch overload.

The University of Kentucky Extension Service has published a recommended formulation for performance horses that in fact calculates to a starch concentration of 31.4%, again adding to the credibility that the formulations in PRINCE REGENCY products do not pose any risk in feeding.

The following charts (Figures 3 and 4) show the calculated starch and NSC content of various PRINCE REGENCY formulations. Also included is the University of Kentucky's performance horse recommendation.

Figure 3.

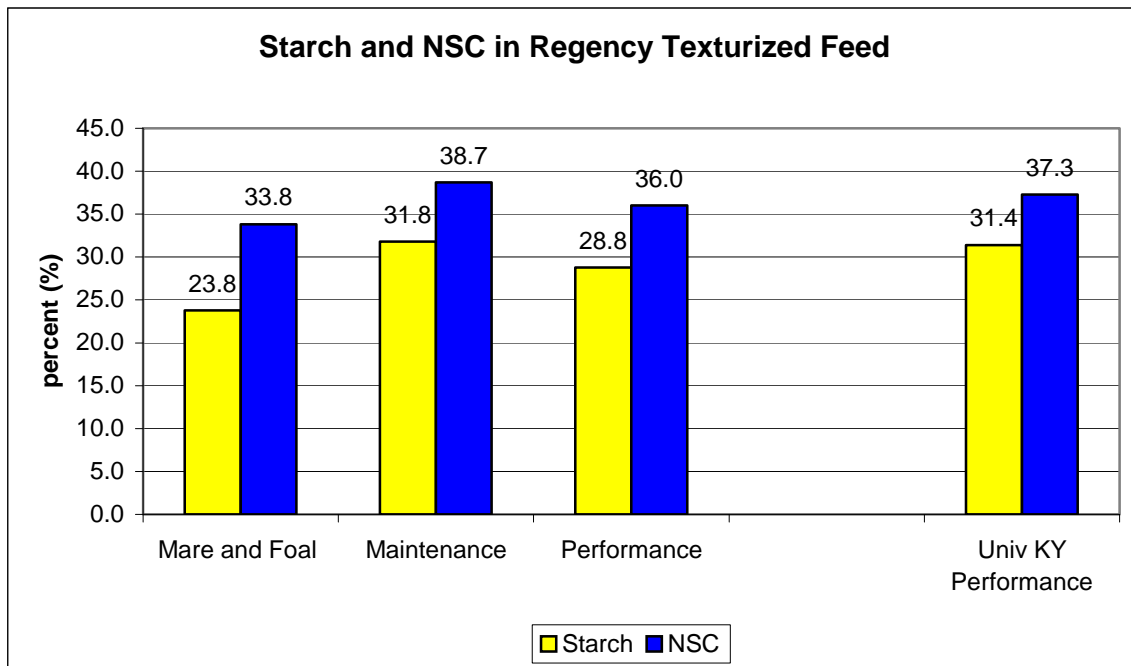
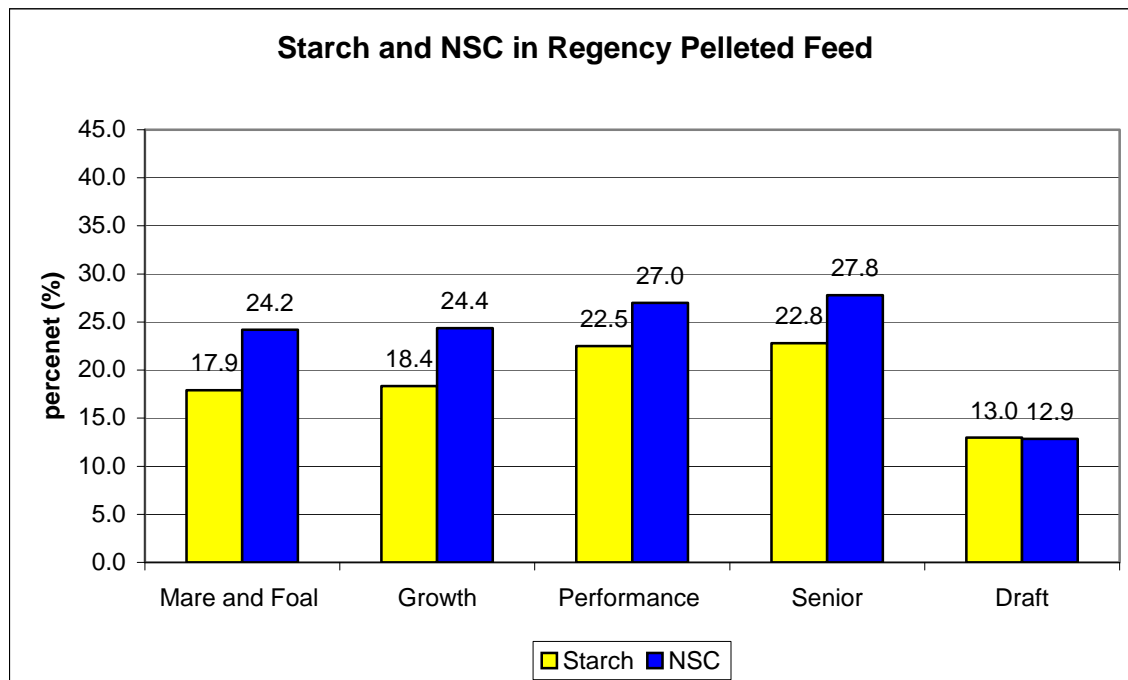


Figure 4.



For those customers looking for lower starch diets, we recommend using pelleted rather than texturized feed. Slight variation in ingredient inclusion rates along with the lack of molasses for the final product results in lower starch and NSC values for pelleted feeds vs. texturized feeds.

## **Even if REGENCY feeds have moderate starch levels that don't present a risk, why shouldn't I still choose a very low starch diet?**

Carbohydrates and starches have a particular value in equine diets. Dr. Hoffman recently wrote and presented to the 2007 Tennessee Nutrition conference a good summary of the importance of carbohydrates to the equine athlete:

“While low starch grain concentrates provide an alternative energy source that is critical for horses with a history of digestive and metabolic disorders that are sensitive to starch, these concentrates are not a “one fits all” solution. Specifically, exercising horses require some dietary starch in order to appropriately fuel performance. Horses have an opportunity for small intestinal metabolism of starch and simple carbohydrates to glucose, which is more metabolically efficient than hindgut fermentation of fibers to volatile fatty acids. Compared to fatty acids, glucose (or its stored form, glycogen) is aerobically metabolized twice as fast to generate ATP for muscle contraction. As speed and exertion increases to the point of anaerobic work, glycogen is metabolically favored over fatty acids.”

## **Can I read a tag to compare starches in different products?**

**No**, is the unfortunate answer. Starch content is traditionally lumped into the category of Non-structural carbohydrates (NSC). This is calculated by taking all the known nutrient contents and subtracting from 100% to estimate the amount of NSC. Obviously, any errors in other measurements will result in errors in estimating NSC. In addition NSC also includes in other CHO or sugars, both digestible and indigestible.

Even if you have a good estimate of the amount of NSC or starch you may not have a good estimate of how or where that starch or NSC will be digested. For example the starch found in oats is more digestible than the starch found in corn. However if you process the corn by steam flaking, pelleting, or extruding you can increase the digestibility to that of oats or even greater.

Good horse feeds will use ingredients or processes that allow for starches to be digested and absorbed in the small intestine rather than having large amounts of undigested starch reach the cecum and large intestine.

Given that adding oil to the diet avoids much of the insulin spike that concerns some horse owners and the difficulty of evaluating the starch content, the best course of action is to use the existing nutritional research in conjunction with a feed producer using quality ingredients and good manufacturing practices.

Although starch is an important nutrient in a horse feed it should not be the single item with which a product is evaluated.

## *KEY FACTOR TO REMEMBER WHEN EVALUATING STARCH CONTENT*

- Not all starches are the same.
  - Oat starch is more digestible than corn.
  - Processed corn digestibility can be equal or greater than oats.
  - Feed tag information will not help in evaluating starch.
- Feeding additional Oils or fats mitigates the insulin effect.
  - PRINCE REGENCY feeds contain ratios of oil to starch equal to or above those needed to reduce glucose and insulin.
  - The oils in PRINCE REGENCY feeds (flax seed and soybean oil) are good sources of Omega 3 fatty acids.
- Starch is an important and valuable component of the equine diet.
  - Mares need carbohydrates to help produce healthy foals.
  - Mares need carbohydrates for milk production.
  - Equine athletes need carbohydrates for efficient energy use.
- The levels of starch found in PRINCE REGENCY feeds are moderate.
  - PRINCE REGENCY feed starch concentrations are below those levels shown to have an impact in Carbohydrate overload.
  - Because of the quality ingredients used, most horse owners will feed less PRINCE REGENCY feed than they do other feeds.

