

Review of “Role of diet and feeding in normal and stereotypic behaviors in horses”

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Why was this paper written?

Most horses eat grass. They may also eat hay, and straight grains, and mixed feeds, and supplements, and fats, and herbal preparations, and various types of treats. They graze all the time, or only days, or only nights, or every so often. They get one grain meal a day, or possibly two, or three, or even more. They are fed grain before they exercise, or after they exercise, or at both times, or maybe not at all. These same horses may be either calm or agitated when handled; can have too much or too little energy when ridden; can stand quietly in their stalls or else chew, kick, or pace constantly.

In many cases, feeding practices for today's horses are quite different from the eating patterns found among wild horses. The effects of feed types and feed management practices have been studied. This paper reviews the existing evidence regarding the role of diet in equine digestion and behavior.

What information is presented?

A natural pattern of unlimited grazing provides horses with exercise, social contact, hours of chewing, high saliva production, a relatively steady supply of ingested material entering the stomach, and only moderate fluctuations in blood glucose and insulin. Stalled horses eating large grain meals may meet their caloric requirement, but their other physiologic needs may be thrown into turmoil. Studies show that behaviors such as coprophagy (eating manure), stall-chewing, and eating of straw bedding are less common in stalled horses that are given large amounts of hay and more common in stalled horses given an all-concentrate diet.

Research has pointed out that horses eating large grain meals have significant fluctuations in plasma glucose and insulin, possibly causing peaks and troughs in energy that may be seen as nervous, unpredictable behavior. They may also be subject to digestive and metabolic disorders like hindgut acidosis, colic, and gastric ulceration.

While an all-forage diet might be the most natural, many heavily exercised horses are not able to consume enough calories from hay or grass to fuel the demands of training and performance. Replacement of some dietary carbohydrates with fiber and fat is helpful in avoiding glycemic and insulinemic fluctuations, thereby leveling out peaks and slumps in energy. The addition of oil leads to slower gastric emptying so horses may feel full longer, reducing stress caused by the urge to graze.

Various studies have shown a tendency toward a decline in aggressive behavior, less reactivity to sudden visual stimulation (such as opening an umbrella), and less moving around and startled reaction to loud noises or invasion of space (pressure) in horses eating diets with more fat, more hay, and/or lower levels of carbohydrates.

Weaning is a stressful time for young horses, and the same trends (less stress, lower levels of cortisol, reduced reactivity to novel visual stimuli) were seen in weanlings fed a diet higher in fat and fiber. These weanlings also spent more time investigating novel objects and completed a handling test more quickly than foals fed traditional diets high in starch and sugar.

A recent study on insulin resistance suggested that over long periods of time, fat and fiber diets may facilitate better patterns of glucose regulation resulting in an effect on brain function, specifically more efficient produc-

tion of the mood regulator serotonin. This effect was seen in foals fed a fat and fiber diet. There is also some evidence that pregnant mare diets may influence insulin sensitivity in their offspring. Up to 80 days of age, foals born to mares fed starch and sugar diets tended to have higher levels of glucose and insulin than those whose dams ate a fat and fiber diet during late pregnancy. Foals of mares fed the starch and sugar diet also tended to have lower insulin sensitivity at 160 days of age, even though all mares were fed the fat and fiber diet after the foals were born.

Supplementation with tryptophan has been shown to increase alertness and attention in humans, and tryptophan depletion causes anxious behavior in rats. Tryptophan supplements are marketed as calming aids for horses in spite of the fact that there is no evidence that a calming effect is seen in equines. There is some evidence that various herbal preparations may calm excitable horses, but the authors caution, "Unlike synthetic drugs, the active ingredients of herbs are affected by unpredictable parameters. Given the chemical evidence for their pharmacologic properties...this creates difficulties in predicting their effects and assessing their safety."

Oral stereotypies such as cribbing and locomotor stereotypies such as weaving may be related to feeding practices and/or digestive function. Some studies have shown that cribbing, which is not seen in populations of wild or feral horses, rises in intensity during the hour before feeding of stalled horses, and peaks four to eight hours after feeding. Research has shown that weaving is most common right before food delivery. Dividing the daily ration into multiple feedings reduced the overall incidence of cribbing but increased the incidence of weaving. Any factor that reduces the stress of barn confinement, especially providing increased visual access to other horses, tends to reduce the incidence of weaving. Environmental enrichment has little or no effect on cribbing; this behavior seems to be increased by a low-forage or high-grain diet and decreased somewhat when horses are bedded on straw, possibly because straw provides another edible fiber source.

The precise relationship between cribbing and gastrointestinal discomfort has not been established. Large grain meals increase the risk of colic and have been shown to alter the pH of the gastrointestinal tract. Foals that crib show significantly greater evidence of gastric inflammation and early ulceration than those of normal foals. Feeding an antacid reduces inflammation and ulceration and tends to result in a reduction in cribbing behavior. Also, cribbing leads to the production of small amounts of saliva, a buffer of acid in the stomach.

The stress of weaning is both psychological and physical. The weanling is deprived of milk which has been a component of its daily diet, and few foals make an immediate and smooth transfer to eating grain. Even brief periods of not eating can lead to acidity, ulceration, and an increased risk for some types of colic. However, not all foals develop digestive problems or stereotypies. In one study, 42 of 186 foals—slightly fewer than one in four—began to show wood-chewing, cribbing, or both after weaning.

What does this information tell us about the influence of feed management and dietary components on equine comfort and behavior?

The authors state, "There is a need for a greater understanding of the mechanisms whereby diet may influence the development of abnormal oral behavior. Understanding causality is important, and further longitudinal studies are needed to fill in current gaps in knowledge." In general, the best practice for avoiding or minimizing problems involves keeping a horse's environment and feed management practices as close as possible to those of horses living in natural conditions.

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