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Advances in Equine Nutrition

Volume III

Edited by

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AN OUNCE OF PREVENTION: FEEDING MANAGEMENT TO MINIMIZE COLIC

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The threat of colic lurks in the subconscious of all present-day equine caretakers. Even the hobbyist makes calculated decisions to avoid this dreaded condition – cooling the horse thoroughly before allowing it to drink, gradually switching from one feed to another, and periodic dosing with proven deworming agents. By definition, colic means any abdominal pain. However, the term has evolved to define a condition rather than a clinical sign.

In recent decades, great advances have been made in understanding the etiology and pathogenesis of abdominal disease in horses, including those factors directly related to feeding management. Accompanying these advances have been noteworthy strides in the prevention and treatment of colic.

The Equine Digestive Tract

Horses are classified as hindgut fermenters, meaning bacteria aid in the digestion of feedstuffs in the latter part of the gastrointestinal tract (the cecum and large intestine). The gastrointestinal system of a horse measures, on average, 100 feet long and holds approximately 48 gallons of water and ingesta. The gastrointestinal tract begins with the stomach, which holds approximately 2-4.5 gallons of fluid or food. Acid production and enzyme secretion are the primary functions of this organ.

Food is passed from the stomach to the small intestine, which consists of the duodenum, jejunum, and ileum. The duodenum is the site of bile and pancreatic enzyme secretion, fluids which help digest fats, proteins, and carbohydrates. The jejunum is the site of absorption of amino acids, mono- and diglycerides, fatty acids, glucose, vitamins, minerals, electrolytes, and a small amount of water. The jejunum is suspended by a sheet of mesentery, which is anchored via a stalk to the dorsal roof of the abdomen. This allows the jejunum to be mobile, but this mobility can lead to torsion, or twisting on itself, which can be a cause of colic. The ileum is the last section of the small intestine. It is short and has a muscular wall. The ileum acts as a one-way valve for ingesta to pass into the cecum.

The large intestine begins with the cecum. This is actually a fermentation vat where roughage undergoes microbial digestion. The cecum is 3.5 feet long and

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holds 7 to 8 gallons of fluid and up to 15 gallons of ingesta. B vitamins and volatile fatty acids are also produced here as a result of microbial fermentation. The ingesta leaves the cecum and passes to the large colon, which is approximately 11 feet long with an 18-gallon capacity. The large colon accounts for 40% of the total capacity of the equine gut. Water and volatile fatty acids are absorbed here. The fermentation process produces gas, which can be a cause of colic if it is allowed to build up within the large intestine. Pain is caused by gastrointestinal tract wall distention, displacement of the large colon, or torsion caused by the gas distention. Increased gas production can be caused by an increase in carbohydrate load, bowel obstruction, or altered motility of the bowel.

The small colon is approximately ten feet long. This segment of the gastrointestinal tract does not have any absorptive functions. This is where the ingesta is formed into fecal balls. The terminal section of the gastrointestinal tract is the rectum, which is approximately one foot long.

The incidence of colic per section of gastrointestinal tract is as follows: stomach 12%, small intestine 33%, cecum 6%, large colon 49%, small colon 7%, and rectum <1%.

Types of Colic

Many factors may cause the pain associated with colic. The most common are:

1. Spasms caused by contractions of the bowel wall.
2. Distention from a buildup of gas, fluid, or ingesta that causes expansion of the bowel.
3. Traction, a result of pulling on the bowel.
4. Ischemia (decreased blood flow) of the gastrointestinal tract because of dehydration, blockage of a blood vessel by a clot, or compression of a blood vessel.
5. Inflammation caused by stress, parasites, nonsteroidal anti-inflammatory drugs, sand, infectious colitis, or ingested toxins.

In a study that reviewed colic cases examined by veterinarians on the farm, 46% were spasmodic or gas colics, 29% were large colon impactions, 6% were strangulating obstructions, 8% were the result of enteritis, and 11% were from undiagnosed causes.

Colic risk factors can be divided into intrinsic factors and management practices, including environmental control. The intrinsic factors play a small role in the overall risk of colic. There does not appear to be any breed or gender predilection for colic. Mares may show more signs of colic late in pregnancy due to fetal movement. One study showed the incidence of colic is greatest among horses 2 to 10 years old. Further examination of this group revealed colic was

related more to the stressful occupations (racing, three-day eventing, etc.) of the horses in this age group rather than age.

Management appears to play the greatest role in decreasing the risk of colic. Pasture turnout with a fresh water source appears to carry the lowest colic risk because horses are able to continually ingest small amounts of food throughout the day. Inclusion of concentrates in the diet tends to increase the likelihood of colic, and the risk escalates as the amount of concentrates fed increases. Feeding horses up to 5.5 pounds of concentrates slightly increased the risk of colic compared to feeding only roughage. Feeding 5.5 to 11 pounds of concentrate was five times more likely to cause colic than feeding only roughage. Horses eating more than 11 pounds of concentrate were six times more likely to colic.

Processed feeds are more easily digested than whole grains. Large amounts of pelleted feed or grain cannot be digested efficiently by the small intestine. The concentrate is passed into the cecum and large intestine where it is fermented by microbial flora, causing gas production and increasing acidity within the bowel. Fermentation causes water to be transferred from the bloodstream into the bowel lumen, which causes mild, transient dehydration. This dehydration persists for approximately eight hours after eating a high carbohydrate meal. Feeding a large amount of grain daily in multiple meals does not appear to decrease the risk of colic because the large intestine has very little time to restore its normal balance before the next feeding.

The horse's gastrointestinal system is designed to process roughage diets. Fresh grass in early spring is considered a readily digestible carbohydrate. Therefore, there may be an increased risk of spasmodic colic in horses grazing pasture if they have not previously been kept on pasture.

High-quality hay is important in decreasing the risk of colic. Abruptly changing from a high-quality hay to a poorer quality hay may predispose the horse to impaction due to decreased digestibility.

Alfalfa has been associated with enterolith formation. The problem with alfalfa may lie in its high protein content rather than its mineral content. A by-product of protein digestion is ammonium ion production. In an alkaline environment, such as that possible in the colon, these ions can form a complex with available magnesium and phosphorus. Over time these complexes may enlarge and become "stones." These stones can become so large they may block narrow portions of the large intestine, such as the pelvic flexure or the transverse colon. Enteroliths are found in horses in any part of the country but seem to be more predominant in the western United States, presumably because alfalfa is the primary source of roughage.

Parasites

Internal parasites were a significant cause of colic prior to the development of anthelmintics effective against the larval stages of strongyles. Today, this type of

colic is rare if the horse is dewormed with ivermectin or ivermectin-type products. After large strongyle (bloodworm) larvae are ingested, they penetrate the bowel lining and migrate along the blood vessels. Many tend to lodge within the cranial mesenteric artery, the primary vessel that supplies blood to the gastrointestinal tract. Blockage of this vessel can cause damage to the bowel by decreasing its blood supply.

Small strongyle (cyathostome) larvae are ingested and then burrow into the lining of the large intestine, where they may remain dormant for up to two years. In this hypobiotic state, they are resistant to most anthelmintics and may cause weight loss, poor coat condition, delayed growth, colic, and/or diarrhea. It is suspected that warming environmental temperatures may stimulate the emergence of these larvae. Only three products have been shown to be effective in decreasing the number of cyathostome larvae. Strongid C is a daily dewormer that kills the larvae before they reach the hypobiotic state. Moxidectin (Quest) is in the same family as ivermectin. A double dose of fenbendazole (Panacur Power Pack) can be given for five days to penetrate cyathostome larvae in their hypobiotic state. Worming with a double dose of fenbendazole is recommended in the fall for cooler climates and in July for the southwestern and south-central states. For the deep South, it is recommended in May and November due to year-round grazing.

Summary

The strategy for preventing colic is multifactorial. The following management principles can help reduce the risk of colic in horses.

1. *Match the horse's normal diet.* Feed a high-quality roughage diet with very few soluble carbohydrates. The bulk of the diet should be roughage (hay or pasture), which should average 1-2% of the body weight per day. If grain must be fed to meet energy requirements, at least 50% of the total diet should be roughage. Fat may be added to the diet to increase the caloric density of the grain without causing the digestive problems associated with overfeeding carbohydrates. Horses can eat two cups of corn oil per day with no digestive upset. Fat can be added in the form of corn oil, vegetable oil, or rice bran.
2. *Mimic the horse's natural feeding schedule.* Allowing free choice hay to horses kept in stalls or paddocks will mimic the horse's grazing behavior. Overweight horses should be fed 1% of their body weight, and this can be divided into two or three feedings. Horses are creatures of habit, so feeding at approximately the same times every day will help decrease the risk of colic. Feeding grain without access to roughage between the feedings has been shown to increase the concentration of gastric acid and bile, which can cause severe gastric or duodenal ulceration within 14 hours of fasting.

Feeding small amounts of grain throughout the day will help decrease the carbohydrate load on the large intestine as long as the grain is kept to three pounds or less per meal.

3. *Afford the horse daily or near-daily exercise.* Colic risk is lower for horses on pasture. If full pasture turnout is not an option, the horse should be turned out daily for as long as possible. If no turnout is available, the horse should be ridden, walked, or otherwise exercised daily.

4. *Make diet alterations gradually.* Make dietary changes over a period of one to two weeks. Concentrate can be increased by ½ pound per day. When changing hay, mix the old hay with the new to allow the gastrointestinal tract to adapt. If the horse is to be confined to a stall due to an injury, decreasing the grain will help prevent colic.

5. *Provide good-quality feedstuffs*. All feeds offered to horses and ponies should be the highest quality. Avoid feeding any concentrate that is spoiled or contaminated. Horses will not often eat feed that is spoiled, but all suspected rancid feed should be discarded even if horses will consume it. Do not assume that feed is free of contamination simply because horses will eat it. The remains of rodents or other animals (mice, snakes, etc.) should deem any feed unsuitable for consumption.

   Hay should be leafy and soft with fine stems. Grass and legume hays harvested before maturity are more readily digested by horses and ponies and are therefore less likely to cause colic. Some owners are under the erroneous assumption that obese or laminitic horses should be given mediocre or poor-quality hay because overfeeding has been destructive to their well-being in the past. Instead, such horses should be fed the best quality grass hay possible doled in judicious portions.

   Alfalfa hay should be thoroughly inspected for blister beetles. As few as two or three beetles can induce colic or colitis in an otherwise healthy horse. Purchasing alfalfa hay from a reputable dealer is one way to avoid blister beetle poisoning, but because beetles usually swarm and infestation is hit-and-miss, inspection of every bale is worthwhile.

6. *Use only feeds formulated for horses.* Cattle, pig, and chicken feeds are not suited for consumption by horses. The nutritional requirements of horses are completely different than those for other species. A far more important reason for avoiding feeds formulated for other species exists. Certain additives in these feeds are poisonous to horses. For example, monensin, a common ingredient in cattle and poultry feeds, is highly toxic to horses and may predispose a horse to colic, general weakness, and death.

7. *Allow free access to fresh water*. Horses should have clean water available to them at all times. The only exception to this hard-and-fast rule is the

restriction of water immediately following intense exercise that has resulted in elevated body temperature and increased respiration rate. However, a horse can be offered two or three sips periodically during the cooling out period to help lower core body temperature. Particular attention should be paid to water consumption in the winter. Some horses drink less as water temperatures fall to near freezing. If this is the case, warm water should be offered to the horse at least twice a day during periods of persistent cold temperatures. Allowing the horse the opportunity to drink during transport and long-term exercise may also prevent an episode of colic.

8. *Put the horse on a regular deworming program*. The cost of deworming is minimal, especially when compared to the benefits. Consult a veterinarian when devising a deworming program as this individual is most likely aware of the primary parasitic threats in the region. Regular deworming may also save on out-of-pocket feed expenses because the feed will be utilized for sustaining the body processes of the horse and not the life cycles of internal parasites.

9. *Schedule regular dental care*. Annual dental examinations will ensure that feed is chewed properly and maximal nutrients are delivered to the gastrointestinal tract for absorption. Dental abnormalities can severely hamper the mechanical breakdown of grains, particularly unprocessed cereal grains such as whole oats. If teeth are left unchecked, sharp points may develop on the molars, and these may cause extreme discomfort to the horse. Some horses may eventually refuse to eat due to the pain caused by dental abnormalities.

10. *Manage the environment*. Keep the horse's environment free of debris. Ingested foreign materials such as rubber or baling twine can cause colic by blocking the digestive tract. Minerals and other material may surround an object and form a stone that can lead to blockage. Although most horses will not eat toxic plants if other food is available, owners should monitor the pasture and hay bales for suspect plants.

Colic has plagued horses for centuries, even prior to domestication. Unfortunately, eliminating colic completely from the inventory of equine health concerns is unrealistic despite continued research efforts of scientists worldwide. However, reducing the occurrence of colic is possible when sound management practices are followed punctiliously.