

## Control Colic Through Management

*Peter Huntington BVSc, Clarissa Brown –Douglas PhD, Bryan Waldrige DVM & Joe Pagan PhD  
Kentucky Equine Research, Brighton, Vic Australia & Versailles, KY, USA [www.ker.com](http://www.ker.com)*

Colic is one of the most dangerous and costly equine medical problems, estimated to occur in 1 of every 10 horses each year. In recent years, several studies have been published identifying potential causes and risk factors associated with colic in horses. As any equine veterinarian would attest, there seem to be countless situations, which can precipitate colic.

Factors which are difficult for horse owners to control, include breed and age of horse along with geographic region of the country where the horse is kept. Other factors including internal parasite control, the quality and quantity of fibre in the diet, and grain feeding can be managed to reduce the risk of colic. The following is a discussion of several nutritional and management aspects of colic which can be influenced, thereby reducing the incidence of colic.

### Risk factors for Colic

- Change in diet
- Change in feed type and intake
- Poor quality indigestible hay
- Grain intake greater than 2.5 kg per day
- Eating sand
- Spoiled Feed
- Restricted water access or intake
- Electrolyte abnormalities
- Change in activity/management
- Teeth problems
- Transport
- More time in stable
- Parasites
- Administration of dewormer
- Previous history of colic
- Breed - arabs
- Age – new born foals and older horses
- Cribbing
- Medications inc NSAID
- Gastric ulcers
- Hind gut acidosis
- Cribbing and windsucking

### Signs of Colic

The signs of colic are quite variable – remember colic is the term given to any horse showing abdominal pain. Signs depend upon the cause of the colic and are listed in the table below along with the frequency at which particular signs are shown by horses with colic

### Signs shown by horses with Colic

Rolling	44%
Pawing	43%
Lying down	29%
Getting up and Down	21%
Flank watching	14%
Lip curling	13%
Backing into Corner	10%
Kicking at Belly	7%

#### Internal Parasite Control

Parasitic load has long been considered as a potential cause of colic. There are several mechanisms by which internal parasites could cause colic symptoms in horses. Two of the most obvious mechanisms include damage to the blood supply and decreased motility of the digestive system. Research has reported the benefits of routine administration of oral anthelmintics to reduce the incidence of colic. Therefore, it is recommended that horses be maintained on a regular internal parasite control program tailored to their individual parasite load. In recent years, the development of very effective dewormers in the 'mectin' group has reduced the severity of parasite infestation and damage in many horses, so the risk of parasite related colic has gone down. But resistance is emerging quickly so watch out for more parasite related colic in the future.

#### Quantity of Fibre

Anatomically, horses have developed a specialized digestive system, which allows them not only to survive, but also to thrive on high fibre diets (Figure 1). The caecum (C) and colon (D) collectively hold approximately 80 to 100 litres of liquid, and house billions of bacteria and protozoa, which produce enzymes that ferment plant fibre. The horse's small, one-compartment stomach (A) stresses the need for a continual intake of feedstuffs. Taken together, a small stomach coupled with the large capacity of the fibre fermenting hindgut, make the horse ideally suited to graze.

Horses on pasture graze for up to 17 hours/day and nearly continuously with distinct breaks in grazing activity occurring only between 3:30 a.m. and 4:30 a.m. Researchers have established a link between access to pasture and the incidence of colic in horses. They reported that there was a significant decrease in the odds of a horse with colic if the animal had access to pasture. These studies point to the need for horses to graze continuously and a decreased likelihood of a colic problem if horses are allowed to graze. It is the experience of these authors and our field experience that lush, high-moisture spring pasture can also be a colic risk in horses. Colic problems in horses consuming large amounts of high-moisture, low-fibre grass virtually disappeared when horses were offered dry hay while grazing these pastures. Therefore it is recommended that horses have access to pasture whenever possible, and be provided with additional dry hay when pastures contain a high-moisture and a low-fibre content (lush spring pasture).

Horses confined to stables have an increased likelihood of colic. Many mechanisms could account for this increased risk. First, stabled horses have the desire to consume forage in a continuous manner; however, they are routinely fed their forage in two distinct meals (morning and evening). Secondly, stabled horses may not be receiving adequate forage to maintain proper gastrointestinal function. This may be the case with horses being fed restricted amounts

of hay and chaff hay to maintain or reduce bodyweight. Alfalfa hay typically contains more calories per kg than grass hay or oaten/wheaten chaff. Therefore, horses fed alfalfa are often fed fewer kg of hay per day than horses consuming grass or oaten hay. Not only are horses fed alfalfa receiving fewer kg per day, reducing the amount of time spent eating, but alfalfa hay also contains less fermentable fibre than grass or oaten hay. Thirdly, exercise and movement around a paddock seems to play a big role in reducing the risk for horses that are kept outside rather than in stables.

Since horses seem to have an absolute requirement for forage in the diet to prevent colic, it is recommended that a minimum of one kg of dry forage (hay/pasture) per 100 kg of body weight per day be provided. For horses confined to stables, the selection of lower calorie hays or chaff (grass-type) will provide the horse with more forage and mimic the continuous feeding behavior during grazing.

When horses are fed green alfalfa rather than chaff or hay there is often a reduction in the quantity of fibre fed, as there is 75-85% water in the green alfalfa. The same applies to cut green grass. Don't overestimate the amount of fibre the horse is getting as the water content is very high. Feeding something green, that has just been growing is recommended rather than feeding all forage as aged dry hay but remember horses fed greens also need hay or pasture. Another consideration is fibre length. In cattle there is a requirement for some long stem fibre in the diet and our experience is that there is a higher risk of colic in horses fed all their fibre as short cut chaff. For that reason do not be concerned if you are feeding rougher cut chaff with longer fibre length and in fact it is probably a digestive benefit for your horse. For one thing, chewing time and saliva production will be increased with larger fibre particle length

#### Quality of Fibre

The quality of fibre fed can also influence the potential for colic to occur. Mycotoxins, which are toxic compounds produced by moulds, have been linked to colic in horses. Do not feed mouldy feeds to horses and store feed to reduce the risk of it going mouldy. Other toxic substances occasionally ingested with forage can also cause colic symptoms. Another indicator of fibre quality is fibre digestibility. Wheat or oat straw, a relatively indigestible fibre source, has been implicated as causing impaction colic in horses. The high lignin and silica content help the plant hold the grain up and the silica gives it the shiny appearance. Rice straw and rice hulls are even less digestible as they have an even higher lignin and silica content. Impaction may result from a lack of fermentation of the indigestible material in the hindgut. Horses cannot digest or utilise these poor quality forages as effectively as cattle and there is an increased risk of impaction colic when they are fed. Some types of hay with a high indigestible fibre content is also a greater impaction colic risk. Data on the precise amount of poorly digested fibre that can safely be included in the diets of horses are not available. However, the poor physical appearance and performance of horses fed this type of diet should set practical limitations. Be careful feeding tropical forages as these hays can also be very indigestible.

Enhanced fibre digestibility has been reported with the addition yeast culture to the diet of mature horses. The addition of live yeast culture may provide a mechanism whereby horses can more efficiently utilize forage of marginal quality. Yeast culture may stimulate activity of beneficial microbes in the large intestine, particularly bacteria that digest cellulose. This can lead to an increase in the fermentation of cellulose and other fibre fractions. There are

anecdotal reports of a reduction in the incidence of colic when yeast culture is added to the diet.

## **Mycotoxins**

Mycotoxins are produced by more than a hundred types of fungi. Some fungi produce a single mycotoxin, while others generate multiple toxins. Animal poisonings by [mycotoxins](#), called mycotoxicosis, have been recorded for centuries. Thousands of horses have died from mouldy corn poisoning after consuming corn infected with fumonisins and high mycotoxin levels in grains and forages have been linked with an increased incidence of colic.

India's climate and feed storage conditions, predisposes horses to mycotoxin exposure. Moulds may be visible on feeds such as hay and grain but mycotoxins are not visible, although they can be measured in lab tests. Certain feeds are predisposed to mycotoxin contamination including corn, ground nuts and straw but all feeds are susceptible to contamination. Key to proliferation is heat and moisture, and the mycotoxins seems to reproduce rapidly during wet conditions, especially in late summer and early autumn. Grain stored in high-moisture environments seems particularly susceptible.

No specific remedy is available for mycotoxin toxicity, and symptomatic treatment is usually warranted. Mycotoxin binders are available, but haven't been proven effective in horses, and none is currently approved by the FDA. Getting better quality feed is the best option, but consider use of a mycotoxin binder in a 'can't hurt, may help' approach. Horse owners that [purchase](#) high-quality feed from reputable feed manufacturers have less worry about mycotoxin contamination, as these mills buy premium grains for use in feeds and often add mycotoxin binders.

## **Grain Feeding**

Since horses are anatomically designed to digest fibre, the addition of grain concentrates to the diet is a potential risk factor for colic. US researchers reported that daily feeding of grain concentrate from 2.5 to 5 kg/day and above 5 kg/day increased the risk of colic 4.8 and 6.3 times, respectively, compared to horses fed no grain. The exact mechanism for this increased risk for colic was not determined; however, several studies on the site of grain digestibility offer at least a partial explanation.

Normally, grain concentrates contain large amounts of starch that are enzymatically digested with their end products (simple sugars) absorbed in the small intestine. Several factors are known to influence the rate and extent of grain digestion in the small intestine. One factor is the source of starch. Various sources of starch (i.e. oats and corn) differ in the architecture of their starch granule, which has a large impact on how well they are digested in the horse's small intestine. The pre-caecal (small intestine) digestibility of these two starch sources averaged 84% and 29% for oats and corn, respectively. Starch, which is not digested in the small intestine spills into the large intestine where it is fermented by bacteria. Unfortunately, one of the end products of microbial starch fermentation is gas and another lactic acid, which irritates the gut lining and decreases intestinal pH. The increase in acidity causes other bacteria to die and release potentially fatal endotoxins. All of these situations can potentially cause the horse to

colic. Processing the starch in grain (crimping, rolling, grinding etc.) can also influence small intestine digestibility. Grain starts being fermented in the stomach and too much grain in a single feed can lead to excess fermentation, acid production and impaction of the stomach. Finally, the amount of starch fed in a single meal and its rate of intake will influence pre-caecal digestibility and safety of the feed and the water content of hindgut. Large meals of grain don't stimulate drinking like a meal of hay does and can reduce the water content of the large intestine, increasing the risk of impaction colic.

As acidosis develops the downward shift in pH provides an unfavourable environment for many of the fibre-fermenting microorganisms that inhabit the hindgut. In particular, bacteria such as *Ruminococcus albus* and *Fibrobacter succinogenes* are sensitive to precipitous decreases in pH. For optimal performance, these bacteria favour an environment with a pH between 6.5 and 7.0. When pH drops below 6.0, fibre-digesting bacteria become less efficient and begin to die off so the digestive process is less efficient. In contrast to fibre-digesting bacteria, lactate-producing and lactate-utilising bacteria thrive in an environment with a low pH. Changes in the pH of the hindgut due to alterations in the microbial populations and acid profiles may result in hindgut acidosis. Because the hindgut is overwhelmed with lactic acid when a horse is experiencing acidosis, the intestinal lining becomes inflamed and irritated, causing the horse discomfort and this may result in irritable or unsettled behaviour. Horses often show loose droppings and trainers know how common this is in horses during training and on raceday. Horses suffering from hindgut acidosis may also be at risk of colic or display stereotypical behaviours such as wood chewing and stall weaving. Furthermore, long-term exposure to pH below 5.8 will begin to have deleterious effects on the epithelial lining of the colonic and caecal walls that may affect absorptive capacity for nutrients.

Rumen acidosis is a common problem in dairy cattle fed high-grain diets. A buffer such as sodium bicarbonate is often added to a cow's ration to attenuate the drop in rumen pH that decrease feed intake and milk production. Sodium bicarbonate has also been shown to be effective in treating hindgut acidosis in horses when it is infused directly into the caecum via a caecal fistula, which of course is impossible outside of a research environment. Unfortunately, feeding raw sodium bicarbonate to horses is ineffective because of the anatomy of the gastrointestinal tract. Ideally, the sodium bicarbonate should be protected so that it is delivered to the hindgut intact. Kentucky Equine Research (KER) has recently investigated a protected sodium bicarbonate (PSB) that survives transit through the stomach and small intestine of the horse.

KER conducted a series of studies to evaluate the effect of encapsulated sodium bicarbonate (PSB) on HGA in horses fed high levels of starch or fructans. In one study, six Thoroughbreds in training were fed a diet of unfortified sweet feed, grass hay and 50 g of loose salt per day. Grain intakes ranged from 4 to 6 kg per day. Horses were split into two groups and assigned to one of two treatments. The treatments were 168 g per day of PSB or the basal diet (control group). Horses switched treatments for period 2. Both the hay and grain portion of the diet were split into two equal feedings. One-half of the PSB (84 g) was added to each grain meal. Faecal samples were taken at two-hour intervals for an eight-hour period on day 15 of each period and were analysed for VFAs, pH and L- and D-lactate concentration. Faecal pH in the control group decreased significantly from the baseline by six hours post-feeding. Faecal pH in the PSB group did not exhibit any significant fluctuations during the eight-hour sampling period. Faecal L-

lactate and D-lactate were significantly higher ( $P < 0.05$ ) post-feeding in the control group compared to the PSB group. Faecal VFAs were significantly higher ( $P < 0.05$ ) in the PSB supplemented group, suggesting a more favourable environment for fibre-fermenting bacteria and digestion. The PSB was effective in attenuating HGA that resulted from high-grain intakes in exercised Thoroughbreds. This research has now led to the successful use of the product KERx Equi-Shure in thousands of horses in many countries. It is fed in each grain meal to horses on high grain diets or those prone to colic.

This knowledge regarding starch digestibility would lend several recommendations to grain feeding in horses to decrease the risk of colic. First, processing of the grain will increase digestibility in the small intestine and decrease dangerous changes in hindgut gas and acidity. Steam flaking/rolling, pelleting, micronisation and extrusion are efficient methods for processing grains intended for horses. Second, limit the amount of grain provided to no more than 2.5 kg in a single meal. When high intakes of grain are required by the horse, a number of small meals are preferable to one or two large meals. The use of dietary fat eg oil, sunflower seeds, stabilized rice bran or digestible fibre eg lupins, beet pulp, soy hulls as an energy source is also a valid method to reduce the amount of grain needed in the diet. Don't forget that high quality forage can contribute a lot of the energy and protein needed by the horse for the horse that is spelling or in light/intermittent work.

### Sand Colic

Sand colic is a particular problem in horses kept in sandy areas, even if they are not grazing. Horses often eat dirt or eat their feed on the ground this taking in sand in the process. Some of the sand then accumulates in the lower parts of the large intestine and can lead to a blockage or impaction. If you suspect your horse to have a sand buildup you can add water to the manure, mix it up and then see if the sand settles to the bottom of the mix. Although not all horses affected by intestinal sand shed sand in the faeces, faecal sand sedimentation is a recognized screening tool for horses suspected to have some degree of intestinal sand.

If you are in a risky area, try to prevent your horse eating sand by making sure all feed is fed in bins and racks or hay nets off the ground and the horse can't tip the feed bin over. Rubber mats are also useful under the feed bin. Feeding enough hay is the biggest aid to help keep the sand moving through the gut and reduce the accumulation. Psyllium husks are also used for the same purpose, and some horses are given regular paraffin oil drenches to try and move the sand on, although this is not always successful.

Psyllium is commonly recommended as a bulk laxative to prevent sand accumulation, although its effectiveness in horses may be no better than ad lib hay consumption. has not been completely confirmed by research. Psyllium, a vegetable fibre derived from the ripe seeds of the Plantago plant, is believed to stimulate peristaltic contractions in the intestine, pushing ingesta through the tract.

Although the mechanism of sand clearance from the gastrointestinal tract is not well understood, the researchers feel that psyllium increases gut motility (rather than trapping the sand). Psyllium has also been shown to be a valuable supplement in obese horses with Insulin resistance ( Equine Metabolic Syndrome)

## Water Intake

Water is the most vital nutrient of all and dehydration from sweat loss or reduced water intake will lead to an increased risk of colic. This is sometimes associated with electrolyte abnormalities that lead to changes in gut motility but more commonly, it causes the contents of the hind gut to dry out and can lead to 'tight balled' droppings or to impaction colic. If water is too hot or cold, or tastes differently it can lead to a reduce intake and an increased likelihood of colic. It should be pretty simple to supply a horse with free choice palatable water but it doesn't always happen

## Action if your horse has Colic

**Colic is a veterinary emergency as horses are often in serious pain, early treatment gives better outcomes and the horse can hurt itself when reacting to the pain of the colic. So you need to call your veterinarian, take away feed and water and prevent the horse from hurting itself. Walking a horse with colic may prevent it rolling, but many horses prefer to lie quietly rather than being marched around on the end of a lead rope.**