

PREVENTING AND REDUCING COLIC

By Dr. Jennifer Stewart



WHAT IS COLIC

'Colic' describes signs of abdominal pain or discomfort and is a symptom rather than a disease. With over 70 causes – most of which are intestinal - colic can be caused by anything in the abdomen including stress, trauma, parasites or problems with the liver, reproductive, urinary or gastrointestinal systems. With such a wide range of potential causes, the challenge of recognising and diagnosing colic becomes a race against time.

Colic is the top equine emergency, with around 4% of horses having an episode annually and a fatality rate of over 6%, so as well as being able to recognise and diagnose the cause of colic, there is much information available on prevention.

Understanding the risk factors helps identify horses at increased risk and underpins management strategies to reduce or prevent colic. In 2019, a North Carolina equine surgeon wrote on the surgeon's perspective of colic prevention. The results of his and other international studies involving all breeds and disciplines of horses, have found that colic is - in a large part - a disease

Risk factors were grouped into three broad areas:

- HORSE FACTORS: (age, breed, reproductive status),
- ENVIRONMENT FACTORS (season, weather – a decrease in atmospheric pressure increases the odds of colic by 2.5),
- MANAGEMENT FACTORS: number of carers, housing, pasture access, sandy soils, feed, water, exercise, parasites, transport, hospitalisation and level of dental care.

The risk factor identified most frequently was change in management. While there is little we can do re horse and environment factors, management factors are the most important colic risk – and give us an opportunity for change. A recurring finding was that a change in diet within the two weeks prior increased the risk of a colic episode by 5-fold (see Table page 52). Other risk factors identified were: coastal grass (Bermuda), high acid detergent fibre (ADF) and very fine hay; round bales; crib-biting/windsucking (increased risk of epiploic foramen entrapment, simple obstructions and distension colic); eating hay compared to haylage; no access or reduced access to pasture or water and a change in housing or stabling. Other nutritional factors included

type and amount of feed, concentrate intake (grains and muesli-style feeds), soil type (access to sand), feeding management (frequency and number of feedings per day), water and salt intake.

GRAINS, CONCENTRATES AND MEALS

A diet high in concentrates (>2.5kg/day) is a major colic risk factor and this risk increases with meal feeding. A Swedish study found that for each 1 kg increase/100 kg BW in the amount of muesli, the risk of colic increased over four times. There are several reasons for this – all of which we may be able to manage.

Firstly, because there is a limit to the amount of starch/sugar/protein that can be digested by the enzymes in the small intestine, when concentrate is fed as a meal, semi- and un-digested feed passes into the large intestine. Here it is 'fermented' (there are no digestive enzymes, only micro-organisms in the large intestine) producing ammonia, acid and gas that disturb the stability and balance of the biome. For 35 hours feed ferments in the large intestine – which is 7 metres long and has a volume of 150 litres containing 100 million micro-organisms per ml. Like a compost pile, micro-organisms in the large intestine slowly break down and ferment roughage/fibre – and like a swimming pool the pH must be kept in a narrow range or the contents turn green, nasty and toxic.



oats per 100 kg body weight (BW) per meal = 2kg for a 500kg horse. High starch grains such as barley and corn should be fed in smaller amounts and any changes to the diet must be introduced gradually over a 14-day period to allow the micro-organisms time to adapt.

The number of daily feedings with concentrates is associated with the presence of colic. Horses fed three concentrate meals a day were over twice as likely to suffer colic compared to horses not receiving any concentrate. These horses were also the ones fed the highest amount of starch-rich concentrate (oats, processed grains and muesli) per day. The recommendations for high starch feeds is to divide feed into 4-6 smaller meals – however, with very high intakes it may not be enough to just divide the ration into smaller portions throughout the day, and oils and beet pulp should replace some of the concentrate.

Ulceration risk increases with active training, limited turnout, changes in diet or routine, introduction of grain-based feed, limited forage, intermittent feeding, travel and competition. The gut disturbances resulting from grain-based feeds lead to production of toxins that can damage the gut lining, reducing digestion and absorption. Bleeding ulcers in the colon reduce the blood supply to the end of the small intestine and the hindgut, harming the ability to move digested feed along the gut. For many reasons, implementing recommended management changes is not always possible with competition horses, but increasing pasture time (important for reducing the risk of recurrent colic) and roughage, reducing stress and the amount of starch and sugar, and substituting non-molassed beet pulp and oil for a portion of the grain are possible.

Second, large volumes of fluid (150 litres for a 450 kg horse) move in and out of the intestine every day during digestion. Maximum activation of fluid shifts occurs during meals. These shifts (which facilitate digestion) can cause distensions as the fluid flows into the bowel, and impactions when the fluid is reabsorbed into the body. In addition, massive sudden fluid movements can alter the ability of the gut to absorb nutrients and the order, pattern and sequence of normal gut contractions. Fermentation of starch/sugar/protein from concentrate/grain feeds triggers fluid absorption from the large colon, increasing the risk of impactions. Intestinal fluid fluxes may be reduced with frequent small feedings (dividing the daily feed into up to 6 equal portions).

Continued.

Concentrate meals entering the large intestine, trigger massive shifts in the microbiome and overgrowth of ‘bad’ micro-organisms that produce ammonia, acid and gas. These changes can trigger initial gas distension, leading to twists and displacement of the colon and increase the risk of endotoxemia, laminitis, gastric pain, colonic distension and impaction. Differences have been found in the manure micro-organisms (flora) of pregnant and foaling mares in the three weeks before they developed colic. However, manure pH and flora are not reliable measures of what is happening in the large intestine where feed is retained for 35 hours and changes happen very quickly.

High-starch diets and abrupt diet changes are probably the most important risk factors for diet-associated colic in the horse - due to their disruption of the stability of microbial populations and fluid shifts in the equine intestine.

Even small changes can have significant risks and the common practice of feeding a few daily cereal-based meals, interspersed by long periods of roughage (or no roughage!) with very different nutrients to concentrates, represents marked dietary change occurring on one day and probably daily variation in hindgut pH and bacterial populations, and promotion of colic risk.

Oat and sorghum starch are more digestible than barley, corn or wheat starch and therefore the latter have a greater impact on the digestive tract. The small intestine has the ability to digest around to 0.4 kg



RECOGNISING COLIC SYMPTOMS Table 1

Different in every case (ponies and donkeys are more stoic and less likely to show obvious signs)

- Change in manure amount, type or frequency
- Quiet or dull behaviour
- Box walking
- Weight shifting
- Pawing
- Extended or multiple rolling
- Restlessness
- Lying down and getting up multiple times
- Kicking at the abdomen
- Flank-watching
- Rolling for less than 5 minutes
- Lying down quietly
- Loss of or reduced appetite
- Abdominal distension
- Increased heart rate (normal 28-44 bpm)
- Increased respiratory rate (normal 8-16/min)
- Increased temperature (normal 36.5-39°C)
- Belly kicking
- Sweating
- Trembling
- Repeated stretching
- Teeth grinding
- Flehman (curling lip)
- Flatulence
- Frequent posturing as if to urinate
- Girthiness
- Reluctance to flex through the body, extend or collect

DONKEYS are DIFFERENT Lack of ear movement, low head carriage, dullness, isolation, reduced appetite (flank-watching, abdominal kicking and rolling are rare). Normal heart rate 36-52 beats per minute, respiratory rate 12-28 per minute, temperature 36.5-37.8°C



ROUGHAGE

A lower daily roughage intake has been found consistently in colic horses, i.e. feeding more roughage promotes good gut health and reduces the risk of colic. Every 1 kg increase in the amount of roughage per 100 kg body weight (BW) reduced the risk of colic by 20% and this is because of the biological effect of forage on the horse's digestive tract – less acid production, stable pH and reduced emergence of harmful bacteria. In addition, the fibre in roughage has a high water-holding capacity - reducing the risk of impactions. However, horses fed

small amounts of roughage throughout the day have more colic than those with free access, so dividing the daily roughage into many small portions is not equivalent to free access. If free access exceeds the horse's energy requirement (i.e. it becomes too fat) replacing some of the forage with straw is commonly used to provide a continuous intake of fibre. Recommendations for total daily roughage intake are at least 1 kg roughage/100 kg BW as a minimum, but preferably around 1.5-2 kg/100 kg BW/day. Feeding roughage before a concentrate meal further reduces colic risk.



WATER AND SALT

Horses without a continuous supply of water are more than twice as likely to develop colic - limited access to water increases risk of colic 3-fold, and a change in water source by 5-fold. If a horse becomes dehydrated it moves fluid out of the gut and into the body tissues. This reduces the water content of the intestines and can lead to impactions. If roughage is changed from haylage to hay, water intake decreases. Paddocked horses require daily around 5 litres of water/100 kg BW and stabled horses, 3 times this. Automatic waterers need a flow of 8 litres/minute to meet the horse's needs. Restricting water can result in reduced appetite and metabolic disturbances such as colic. Reduced salt intake (less than 25 grams – one tablespoon a day) is linked to higher risk of colic – especially impactions. It is recommended that horses also have access to a salt lick and those with a mineral/salt block have a 70% reduction in risk of epiploic foramen entrapment – a disease of the small intestine.

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WORMS

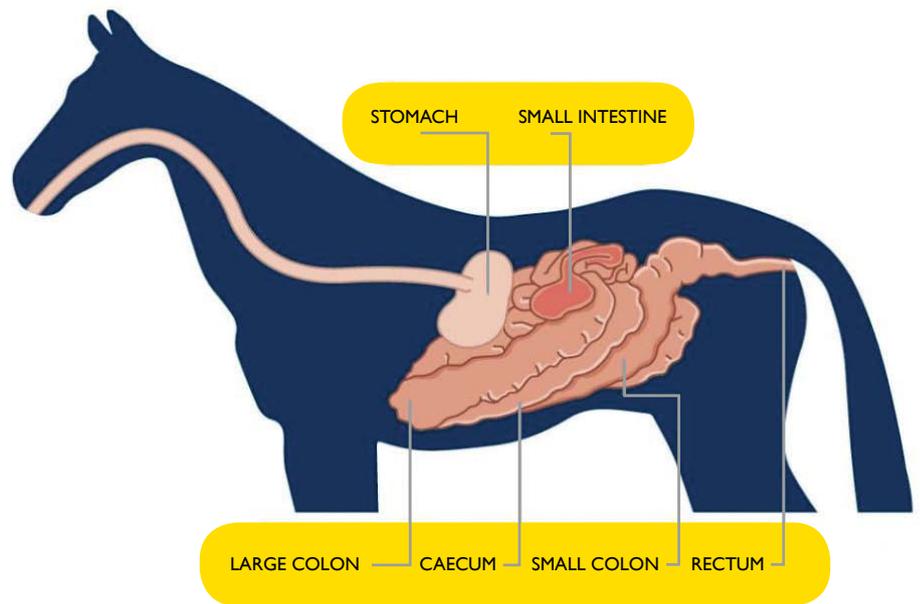
The emergence of resistant worms and resurgence of large strongyles means discussing with your veterinarian the inclusion of manure egg counts and strategic worming programs is increasingly important. Round worm accumulations can occur in weanlings that have not been routinely, strategically wormed and are

then given a wormer when they already have a heavy infestation. Tapeworms accumulate at the junction of the small and large intestine – disturbing gut function. Careful assessment of deworming programs continues to be a critical component of management to reduce the incidence of colic. There is resistance developing to ivermectin and, to reduce parasite burden while avoiding resistance, deworming programs require veterinary advice re which horses need worming, what anthelmintic to use and when.

IMPACTIONS

Hay high in lignin and ADF (acid-detergent fibre) are also risk factors for ileal impactions (a condition in which the terminal end of the small intestine becomes blocked by a bolus of feed, resulting in progressive distension of the small intestine and onset of colic). Soft/coarse hays are often not ‘chewed’ sufficiently – especially if dental care is not ideal. The poorly chewed fibres become caught at the junction of the small and large intestine where they ultimately block the flow of food. Careful, slow changes to hay and using good quality, well-digested hays can help prevent blockages and colic.

Risk factors for ileal impaction include sudden changes in feed, a diet consisting



of high amounts of ADF, round and tapeworm infestation, foreign body ingestion, decreased water intake or weather changes. Hay with a high ADF and flax fibre bedding may predispose to ileal impaction by stimulating intestinal motility. Studies looking at bedding type didn't find any differences in risk whether stable bedding was shavings, sawdust, dirt and clay, sand, straw, shavings and dirt or shavings and sand.

OBESSE HORSES

Obese horses and those over 15 years of age have increased abdominal fat and are most at risk of strangulating lipomas. Routine monitoring of body weight and condition and veterinary management of equine metabolic syndrome may reduce the prevalence of strangulating lipomas. A lipoma is a fatty tumor that forms in a horse's abdominal cavity. *Continued.*

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Colic caused by a strangulating lipoma will not resolve with medication.

Early recognition of colic symptoms reduces the risks. Owners, carers and trainers are essential in the recognition of colic. Typical symptoms of colic can be mild or severe signs (see Table 1). Subtle behaviour changes may not be recognised as impending colic. Knowing the 'normal' for your horse in terms of heart and respiratory rates and body temperature is important and will assist your veterinarian with their initial assessment. A recent survey of 1600 horse owners found while more than half believed they knew the normal range for heart rate (28-44 beats/minute), their answers ranged from 6 to 250 beats per minute. The range for respiratory rate (normal 8-16 per minute) was between 2 and 300 breaths per minute, and for temperature (normal 36.5-39°C) answers were 16-80°C. Significant differences exist in the clinical presentation and diagnostic approach recommended in donkeys with clinical signs of colic (see Table 1).

Colic is in large part a disease syndrome associated with management - both nutritional and non-nutritional.

The majority of surveys and studies concluded that nutrition management is the primary and most modifiable risk factor.

Avoiding changes, or introducing changes gradually, are key to reducing the risk of colic. Perhaps to compare the intestinal tract to a flowing river with its own special and delicate ecosystem, can help us respect it and avoid polluting it. In the end, the effect of nutrition/management change depends on whether the ecosystem in the intestine has adapted to its new, changed environment - or not.

MANAGEMENT RISK FACTORS FOR COLIC

ACTION	RISK
Change of water source	> x 2
Concentrate meal 3 times a day compared to no concentrate	> x 2
Change in concentrate type	> x 3
Increase in muesli concentrate by 1kg per 100kg body weight	> x 4
2.5 to 5kg of concentrate/day	> x 5
Over 5kg of concentrate/day	> x 6
Every 1kg/100kg bodyweight increase in roughage	< x 3
Flax bedding vs straw	> x 3
More than 1.8kg concentrate/day vs <1.8kg concentrate/day	> x 2*
Grain + roughage vs roughage only diet	> x 3
Corn 0.7kg/day vs corn 1.3kg/day	> x 3
Sweet feed vs no sweet feed	> x 4
Recent diet change vs no change	> x 5
Change in concentrate feeding vs no change or no concentrate	> x 7
Change in amount of concentrate 1-7 days before colic	> x 12
Change in amount of concentrate 8-14 days before colic	> x 3
Change in amount of hay	> x 2

> indicates increased risk | < indicates decreased risk | * for simple colonic obstruction and distention



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Dr Jen Stewart has been an equine veterinarian for more than 40 years and an equine nutritionist for more than 10 years. Jen has been developing premium formulas for studs, trainers and feed companies in Australia and around the world and regularly consults to leading international studs and trainers in various countries.

Jen has spent a fair bit of time researching and being involved in nutritional management of developmental orthopaedic diseases, colic, tying-up, laminitis, performance problems, post-surgery and other conditions. She is currently the only practicing equine veterinarian and clinical nutritionist in Australia. Jen's promise is to continue to BRING SCIENCE TO YOUR FEED BIN.

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