

To fully understand the causes of **colic**, it is helpful to have a basic understanding of the internal anatomy of the horse and its workings, which will now be discussed in this section. However some readers may find such graphic information beyond what they care to know. If you prefer not to see or know about your horse's insides, the problem can simply be described this way. The causes of **colic** are in many ways like those that occur with an unruly garden hose. Food flows through the **bowel** in the same way that water flows through a hose. Like hoses, the horse's **bowel** can become blocked, kinked or twisted. The horse's **bowel** is extremely long, delicate and not firmly held in place. So the **bowel** can be thought of as a forty metre long garden hose floating free in a large space with plenty of opportunity to either become stuck, blocked or knotted up. However unlike garden hoses, the horse's **bowel** is also extremely delicate and depends on a constant supply of fresh blood and complicated regulation by the nervous system to work properly. Good **bowel motility** is vital, not only to ensure good digestion but also to keep the whole digestive tract in place. **Parasites, ulcers** due to excess acid, bacterial diseases, damage to the nerve supply, damage to the blood supply and excessive gas accumulation can all disrupt the proper function of the **bowel** and cause **colic**.

Once you appreciate how complex and fragile the horse's internal workings are, the wonder is not that they get **colic** but how they ever manage to survive from day to day without getting **colic**. Readers of a more sensitive disposition should now skip ahead.

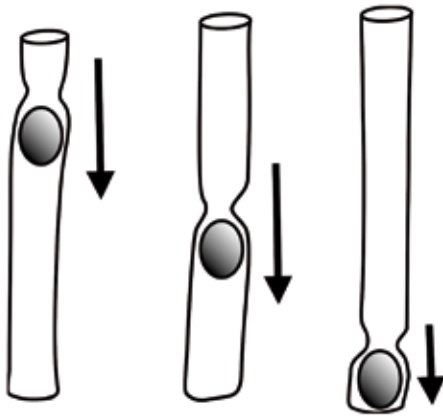
### **Anatomy and physiology of a horse's digestive tract**

---

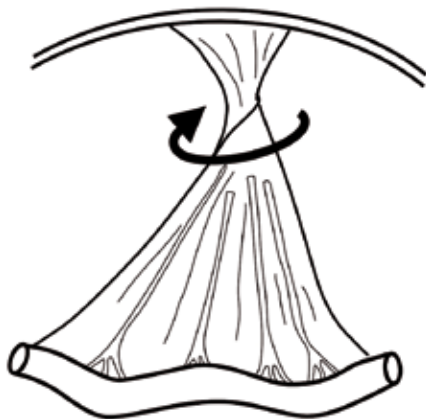
The digestive tract of a horse is roughly similar to that of a human. Food is swallowed and reaches the stomach via the **oesophagus**. In the stomach food is dissolved in an acidic substance. It then passes into the **small intestine** where it is further broken down by digestive enzymes and starts to be absorbed. Remaining food passes into the **large intestine** where water is absorbed before waste is eliminated as droppings. Horses differ from humans a little since the **large intestine**, as well as absorbing water, also produces more nutrients for the body by a process of fermentation. Horses also differ from man in that nearly every part of the digestive system has serious built-in design flaws.

For food to be properly digested it must be properly chewed. A horse's adult teeth continue to grow longer throughout life. Proper wear keeps the teeth level and the horse is able to chew effectively. However, due to the shape of the horse's head, the top rows of teeth are usually slightly wider apart than the bottom rows. This can lead to sharp edges developing on the outside of the upper teeth or the inside of the lower teeth. Most horses are also slightly 'parrot mouthed', the top teeth being set slightly in front of the bottom teeth. This can lead to the development of large hooks on the first premolar tooth on the top row and the last molar tooth on the bottom row. If a tooth is lost or extracted, the tooth opposite it will not be worn down and can over grow causing considerable pain. It is very common

## SECTION 2 | what causes colic?



Food is moved through the intestine as muscle contracts behind the bolus and relaxes in front of it. This is called peristalsis.



The 10-30 metres of **small intestine** is suspended from the roof of the **abdomen** at the root of the **mesentery**. As is shown it is easy for the **bowel** to twist on this axis.

for older horses and ponies to have dental problems. These lead to food not being chewed or digested properly and can make them prone to **colic**. Horses should have their teeth examined by a vet or qualified equine dentist every year or, if they have had a tooth extracted, every six months.

One of the most serious problems for horses is that they cannot be physically sick. At the top of the stomach is a very strong muscular one-way valve (the **cardia**) that stops the horse bringing up any toxic or excess food or fluid. Horses only have a normal capacity for about nine litres of fluid in their stomach. If more than about eighteen litres accumulate in the stomach, it can cause the stomach to rupture, which is always fatal.

The horse's **small intestine** is a thin walled, sausage like tube measuring from 10 to 30 metres. The whole tube hangs freely on a paper-thin sheet of tissue called **mesentery**, which is suspended from one point on the roof of the horse's **abdomen**. Imagine hanging up an unruly, extremely long garden hose suspended from a sheet in the middle of a barn and you can imagine the many and various ways that this tube can tangle and twist itself. Particularly, as unlike a garden hose, this tube is constantly moving as it pushes food along. Regular waves of muscular movement are crucial to keep this structure in place. If **motility** is slowed down or stopped in one section, the **bowel** behind will gradually fill up, stretch and stop moving too. If fast moving **bowel** crashes into non-moving **bowel** the **bowel** can twist or sometimes even telescope into the piece in front (this is called an **intussusception**). The **small intestine** uses a lot of oxygen, as it is very active in digestion. For the **small intestine** to survive it needs a constant supply of blood, which arrives

## SECTION 2 | what causes colic?

via the **mesentery**. Any kink or twist in the **mesentery** cuts off the blood supply and rapidly kills the **bowel**. If the vessels that supply blood to the **bowel** are damaged (which certain **worms** can do) the part of **bowel** they supply can die from lack of oxygen. This is called an **infarction**.

At the junction of the small and **large intestine** is a blind-ended sac called the **caecum**. In humans this is called the appendix and it is a small structure with little use which is easily removed. In the horse the **caecum** is around one metre in length with a capacity of thirty litres, is tightly attached at the base and is impossible to remove completely. Horses differ from humans in that they ferment food in the large **bowel**. Bacteria break down insoluble carbohydrates such as cellulose (found in grass) to form fatty acids that the horse can use as an energy source. A by-product of this process is gas. Having a healthy balance of bacteria in the **caecum** is vital to health. If the types of bacteria in the **caecum** become unbalanced then massive amounts of gas can be generated causing severe pain to the horse. This is called **caecal tympany**. Even worse, if this gas passes on to the next part of the intestine (the large **bowel**) then the gas can cause this to float out of position and even twist.

Even if the horse does have the correct proportions of the correct bacteria in its **bowel**, there is still a potentially fatal complication of relying on digestive bacteria. Some of the healthy digestive bacteria (Gram negative bacteria) contain a deadly toxin contained in them called **endotoxin**. Horses are highly sensitive to **endotoxin**. If even one gram gets into their blood stream they will start to go into a state of shock. Yet paradoxically horses naturally have gallons of **endotoxin** in the



Checking the colour of your horse's gums can show if your horse is dehydrated or in a state of shock. Gums should be moist and pale pink. A dark purple colour like this can be a sign of **endotoxaemia**.



The long delicate blood vessels shown here are essential to the survival of the gut but are easily damaged by twists or **parasites**.

## SECTION 2 | what causes colic?



Example of a small intestinal twist. The **jejunum** has wrapped around itself, the **bowel** is darker than normal but might recover after the twist is released.

large **bowel** separated from the blood stream only by a thin wall. **Endotoxin** gets into blood if the **bowel** wall is damaged or loses its blood supply. This can happen when the **bowel** is distended, displaced or twisted (which, given its structure, is not unlikely). **Endotoxin** is responsible for many of the clinical signs seen in severe **colic** such as pain, sweating and high heart rates.

The final part of the digestive tract includes the **large colon** and the **small colon**. In horses the **large colon** is about 3-4 metres long and 20-30cm in diameter. It loops through three hairpin turns – the sternal flexure, the **pelvic flexure** and the diaphragmatic flexure before emptying into the **small colon**. The way the **bowel** twists it ends up sitting on itself in two horseshoe-shaped sections that are bound together by a short **mesentery**. Apart from this connection and the connection to



Another small intestinal twist this time around an abdominal scar or adhesion (top of picture). The **bowel** is obviously dead and will have to be taken out.

the **caecum** and **small colon**, this massive structure is free to flip around or twist. If the contents become gassy or dried out and heavy the colon can completely twist round on its axis and cut off its own blood supply. The **large colon** is prone to becoming backed up and blocked by dry droppings. The part of the colon where these blockages are felt on rectal exam is the **pelvic flexure**, so they are usually called **pelvic flexure impactions**, but actually they often involve the whole length of the colon.

All of the intestines as well as other digestive organs such as the liver and pancreas are contained within the **abdomen** in a space called the peritoneal cavity. The peritoneal cavity is separated from the chest by a thick muscular wall called the **diaphragm**. **Bowel** should always be within this space, however if a hole or weakness develops in the muscle surrounding the **abdomen**