

FACTSHEET

THE EQUINE GASTROINTESTINAL TRACT

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LEARN ABOUT KEY ANATOMIC FEATURES OF THE EQUINE DIGESTIVE TRACT

At first glance, the equine digestive system looks similar to that of other animals, including humans. Horses have all the same major structures, such as the mouth, esophagus, stomach, and small and large intestines. As you will see, however, important differences in structure and function of most elements of the gastrointestinal tract exist between humans and horses, the major ones being the cecum and large intestine. Because horses are herbivorous, nonruminant hindgut fermenters, their cecum and large intestine are far more voluminous and intricate, playing a much more prominent and integral role in processing feeds compared to a human's large intestine.¹

THE FOREGUT

Oral Cavity and Esophagus

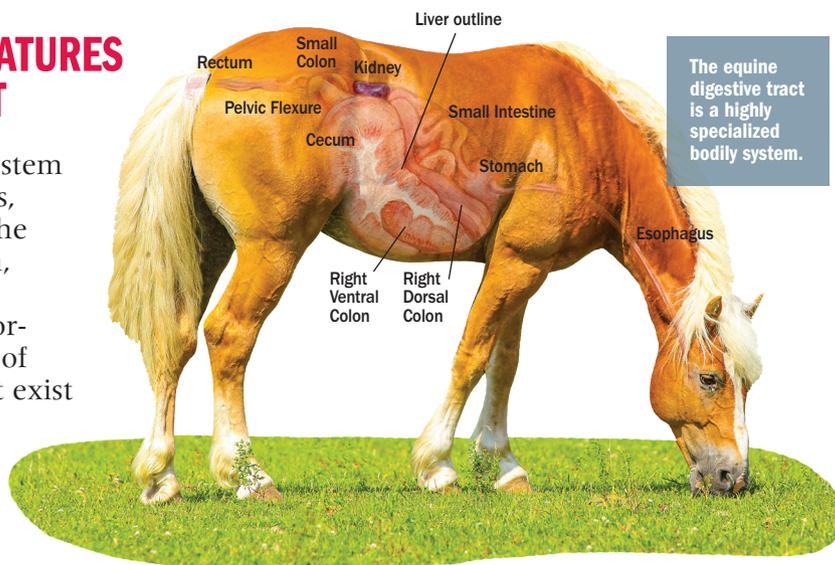
A horse's lips and incisors are key to prehending food. Once inside the mouth, salivary glands release mucus and digestive enzymes to provide lubrication and begin breaking down food so it passes seamlessly from the mouth to the stomach via the 60ish-inch-long esophagus. Horses grind their food with their premolars and molars, necessitating healthy dentition. This is why horses benefit from biannual oral cavity examinations.² Dental disease, degenerative joint disease of the jaw (temporomandibular joint osteoarthritis), and oral tumors can all affect the amount and type of feed a horse can procure, pulverize, and propel "down the hatch."

Dental issues certainly affect voluntary feed intake, but even nonanatomic factors can drive a horse's appetite. Studies show horses have taste preferences and that these preferences might be individualized (i.e., not all horses prefer apple-flavored feed). One research group also stated that, "interest in a feed should not be taken as a proof of its tastiness."^{3,4} Olfaction might play a role in a horse's eagerness to eat, as well.

Stomach

Once in the stomach, feedstuffs really begin to break down (remember salivary gland secretions started the process in the oral cavity). The muscular contractions of the stomach mix the feed with hydrochloric acid and other secretions such as digestive enzymes. Pepsin, for example, breaks down proteins, preparing the constituent amino acids for absorption in the small intestines (very little absorption of nutrients occurs in the stomach).

The stomach has a very small capacity—only 2-4 gallons—and is, in fact, the smallest stomach relative to body size of all domestic animals. Due to this small volume, food gets shuttled fairly rapidly into the small intestines. The rapid emptying of the stomach explains why



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horses can graze almost continuously throughout the day.

Like many things equine, the stomach is a delicate organ. Ulcers, which are erosions in the surface/inner lining of the stomach, form easily in either the upper (squamous) or lower (glandular) regions. Together, the condition is referred to as equine gastric ulcer syndrome (EGUS).⁵ Inappetence/anorexia, poor body condition/weight loss, diarrhea, behavior changes, and poor performance might suggest the presence of one or more ulcers, warranting a call to your veterinarian. Multiple factors can contribute to the development of EGUS, and a variety of management strategies might help prevent or reduce its occurrence. These include minimizing stress by decreasing exercise intensity and increasing turnout; ensuring the diet is high in forage, with dry matter intake $\geq 1.5\%$ body weight; and feeding horses small, frequent meals low in concentrates but with ad libitum forage and water.

Small Intestines

After churning and mixing with gastric juices, digesta moves into the small intestines. Similar to humans, this is where the bulk of digestion and absorption occur. Digestion refers to the breakdown of food into smaller molecules such as sugars, fats, and amino acids. Those nutrients then cross the surface of the small intestine into circulation where they shuttle through the body to power the internal organs.

With approximately 60-70 feet of small intestine, a lot can go wrong.^{6,7} The leading causes of colic (a general term used to describe abdominal pain) include intestinal dysfunction, accidents, inflammation, and ulceration. Gas colic occurs when gases accumulate and distend the small intestine, causing pain. Similarly, feed can become impacted in the small intestine, distending the intestines and blocking the flow of ingesta. Spasmodic colic occurs when the muscles in the wall of the intestine contract or spasm rather than producing their normal, mild, rhythmic contractions that help propel digesta down the length of the intestinal tract. Intestinal incidents—twisting or telescoping of the intestines upon themselves and strangulations from other organs or abdominal fatty lumps (lipomas), for example—also cause colic.

THE HINDGUT

After the proteins, soluble carbohydrates, and fats have been digested and absorbed in the small intestines, the remaining fibrous portion of the feed passes through a very tiny orifice into the cecum, the beginning of the equine hindgut. The undigestible fibrous ingesta remains in the huge 8-gallon, 4-foot-long muscular fermentation vat for about seven hours. Rhythmic, muscular contractions of the cecum swirl food around, mixing it with millions of microbes (bacteria, yeast, protozoa) responsible for fermentation. This fiber fermentation results in the production of volatile fatty acids that are rapidly absorbed into the bloodstream and subsequently used by various organs for energy production, fueling such activities as muscle contraction. Fermentation, rather than digestion, produces the bulk of a horse's energy, which is why horses rely on forage rather than concentrates (the latter of which are largely digested).

From the cecum, the remaining fibrous slurry flows through yet another orifice

into the large intestine. The feed continues fermenting along its pathway from the right ventral (lower) colon to the left ventral colon before doubling back on itself in the left, then right dorsal (upper) colon. This latter part then turns into the transverse colon and rectum, where digestive waste is released. Of importance, the diameter of the left dorsal colon is markedly smaller than that of the ventral colon, which means feed can easily become lodged/impacted in that region, called the pelvic flexure, causing colic. Feed can also become impacted at the tiny orifices leading in and out of the cecum.

While large intestinal colic is certainly concerning, intestinal tract health relies heavily on the population of microbes that make up the intestinal microbiome.⁸ Marcio Carvalho Costa, DVM, PhD, and J. Scott Weese, DVM, DVSc, Dipl. ACVIM, two experts in this field, wrote, "A properly functioning intestinal tract and intestinal microbiota are critical for maintenance of health and performance, but minor stressing factors can lead to imbalances that can have catastrophic consequences."

Such stresses include administration of medications, changes in feed, inappropriate feeding (e.g., type, amount, and frequency),

performance, transport, and other management factors (e.g., access to pasture and conspecifics). Consequences of an altered intestinal microbiome include colitis (diarrhea), colic, and laminitis. Finding ways to manipulate the microbiota is currently a major research focus in the industry to improve the overall health and performance of horses.

TAKE-HOME MESSAGE

The equine intestinal tract is a highly specialized body system that varies markedly in size, shape, and function along its length. The large intestine and cecum house millions of microbes that perform vast and varied tasks, from fiber fermentation to improving health and performance.

Resources

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