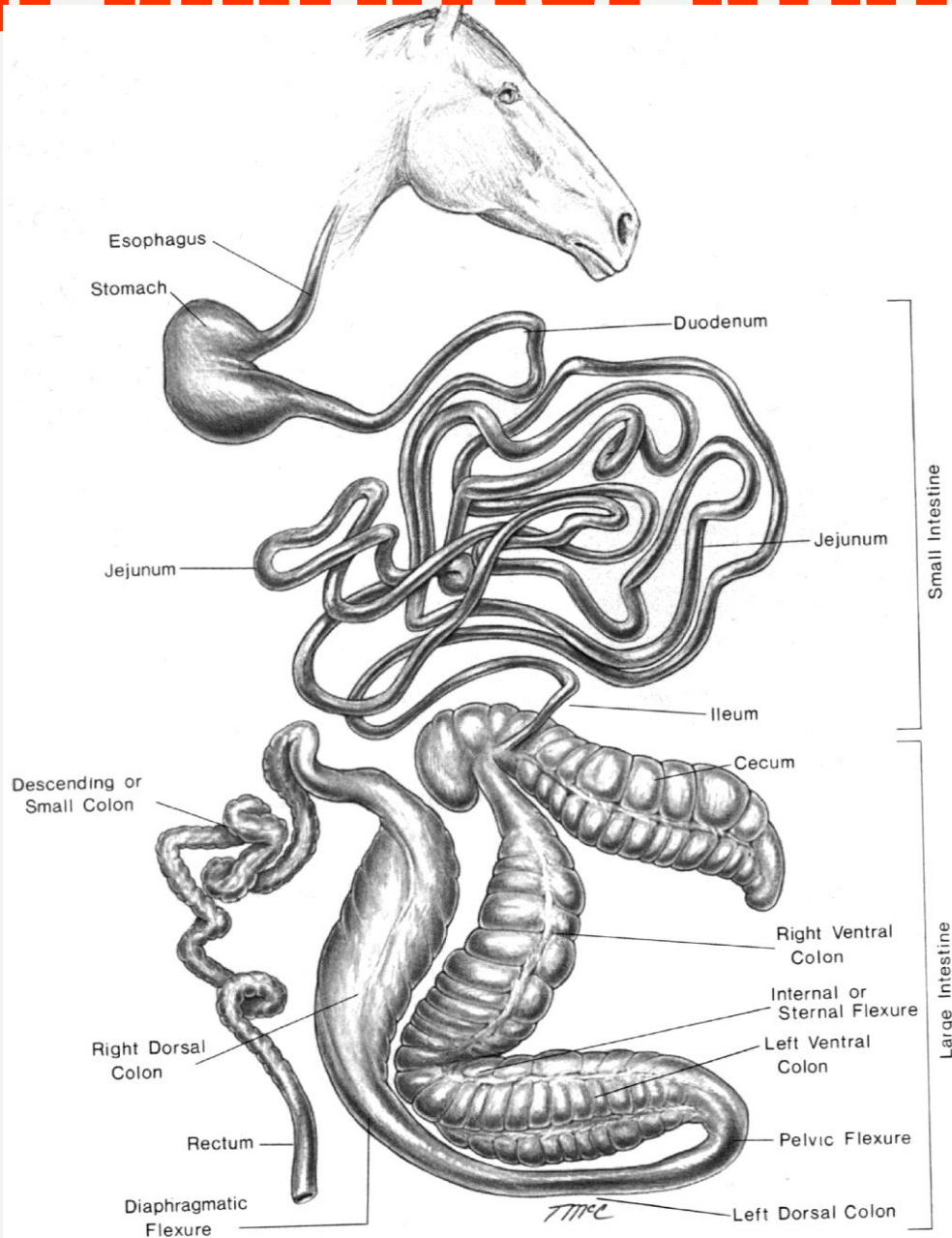


EQUINE NUTRITION

**ANATOMY AND PHYSIOLOGY OF THE
DIGESTIVE TRACT**

EQUINE DIGESTIVE SYSTEM



Esophagus

Stomach

Duodenum

Jejunum

Jejunum

Small Intestine

Ileum

Cecum

Descending or
Small Colon

Large Intestine

Right Dorsal
Colon

Right Ventral
Colon

Internal or
Sternal Flexure

Left Ventral
Colon

Rectum

Pelvic Flexure

Diaphragmatic
Flexure

Left Dorsal Colon

T.M.C.

MOUTH

- **First part of the alimentary canal**
- **Long and cylindrical**
- **Teeth – 24 molars and 12 incisors (adult horse)**
- **3 Pairs of Salivary glands**
- **Upper lip**
 - **Strong, mobile and sensitive**
 - **Used to place forage between teeth**
- **Tongue used to**
 - **Move ingested material to cheek teeth**
- **Upper and lower incisors present**
 - **Unlike ruminants**
 - **Allows close shearing of forage**

MOUTH

- **Ingestion of forage is**
 - **Slower than cattle and sheep**
- **Number of chews per minute is similar**
 - **73-92 horses**
 - **73-115 sheep**
- **DMI per bite ~ half than sheep**
 - **Horses need longer daily periods to graze**

MOUTH

- **How many chewing movements does it take for roughly 2lbs concentrate to be digested?**
 - 800 to 1200
- **How many chewing movements does it take to for roughly 2 pound concentrate of long stem hay?**
 - 3000 to 3500

MOUTH

- **Abnormal or diseased teeth can cause**
 - **Digestive disturbances and colic**
 - **Older horses with worn teeth are at higher risk**
- **Horses have two sets of teeth**
 - **Deciduous teeth (average 24) (baby teeth)**
 - **Permanent teeth (Average 36-40)**
 - **Never stop growing and maintenance is required**

MOUTH

- **Saliva**
 - **Feed stimulates secretion**
 - **Copious amounts produced (average 85lbs)**
 - **Enzyme *Amylase* (breaks down starch into maltose)**
 - **Bicarbonate and Sodium Chloride present**
 - **Provides buffering capacity**
 - **Provides lubrication to prevent choking**
 - **Also allows for some microbial fermentation in proximal region of stomach**

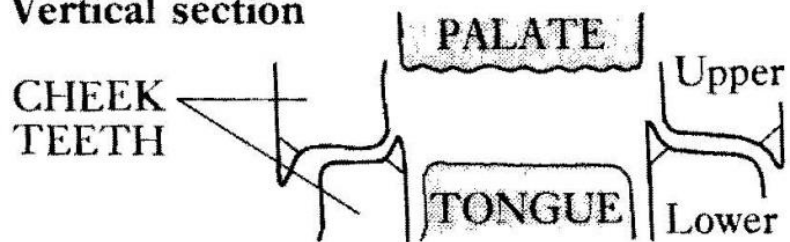
HORSES VS RUMINANT

- Ruminant – cow, sheep or goat
- 1. Horses have upper incisor teeth
 - Ruminants do not
- 2. Horses masticates feed with the teeth
 - Ruminants cud chew
- 3. The horse secretes a larger volume of saliva
- 4. Horse saliva contains Amylase
 - Ruminants are enzyme free

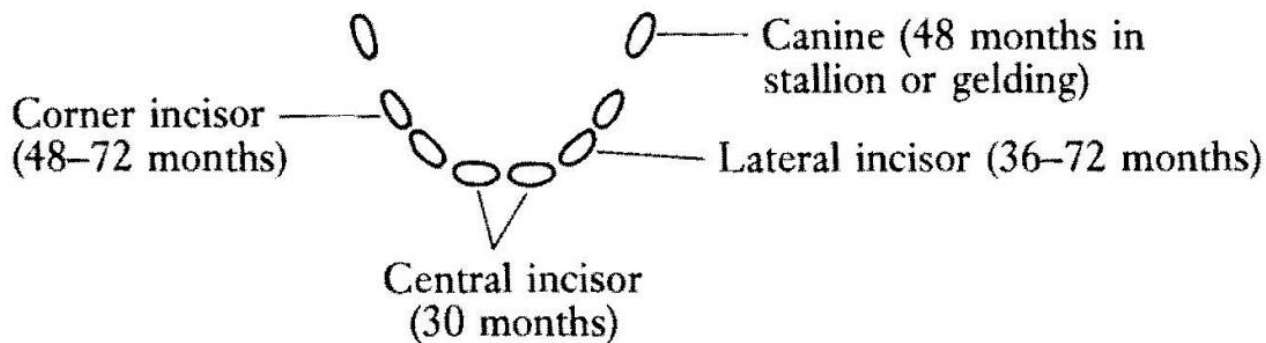
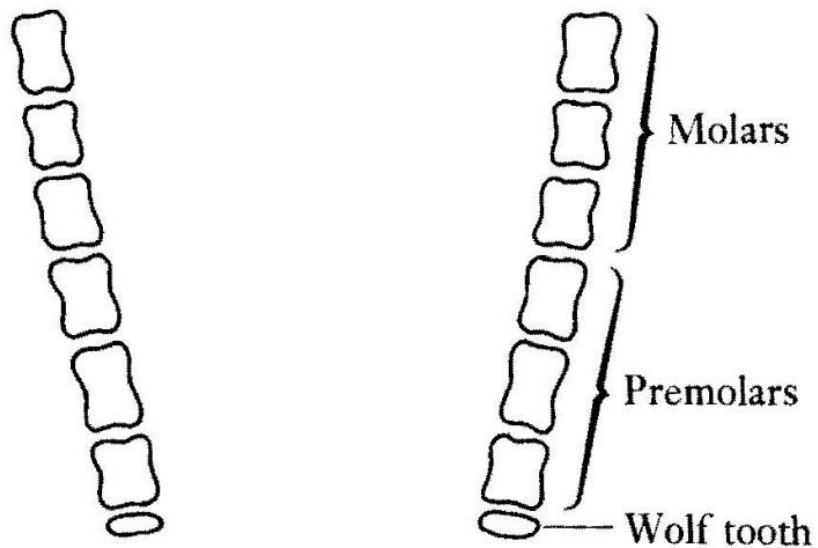
ESOPHAGUS

- 50 – 60 inch tube
- Provides passage of feed from the pharynx to the stomach

Vertical section

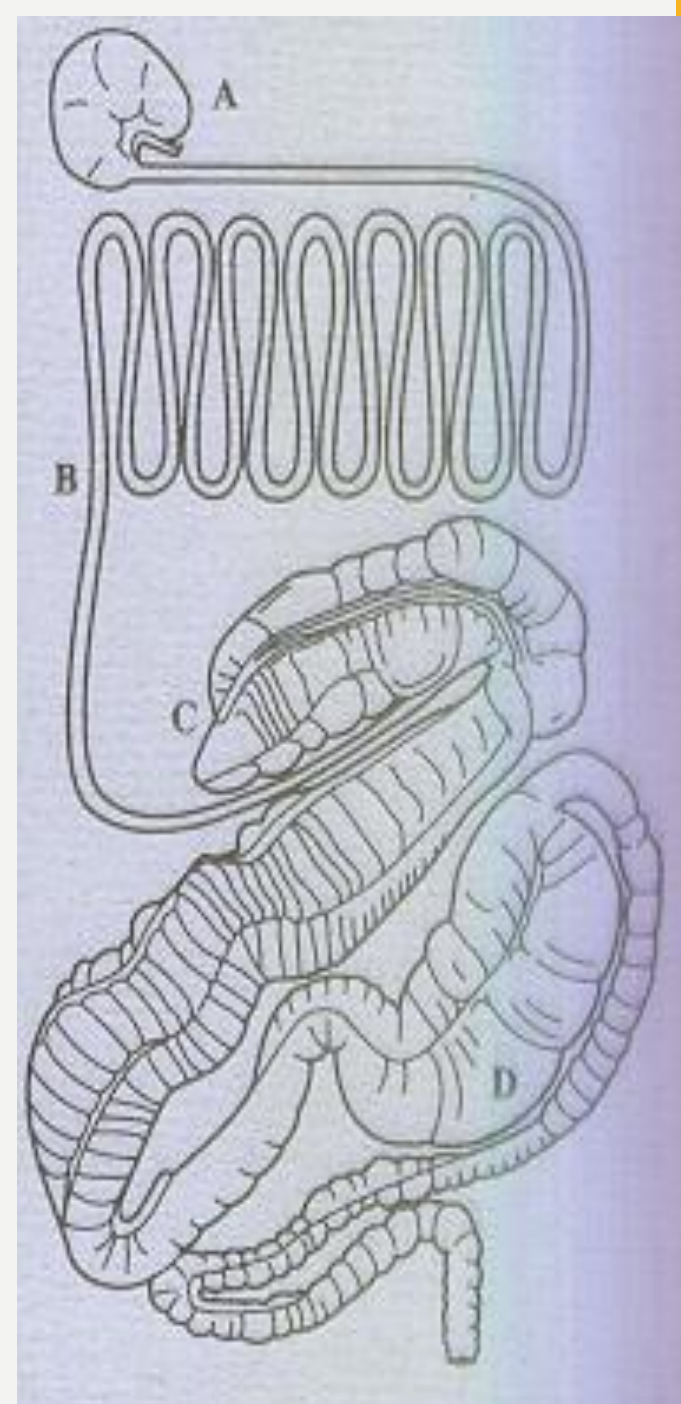


View from above



STOMACH

- Represents ~ 10% of GI tract
- How many gallons can the stomach of an 1100 lb horse capacitate?
 - 2 to 5
- Why is there no need for a large compartment?
 - Constant grazers
- pH ranges from 1.5 to 5.5



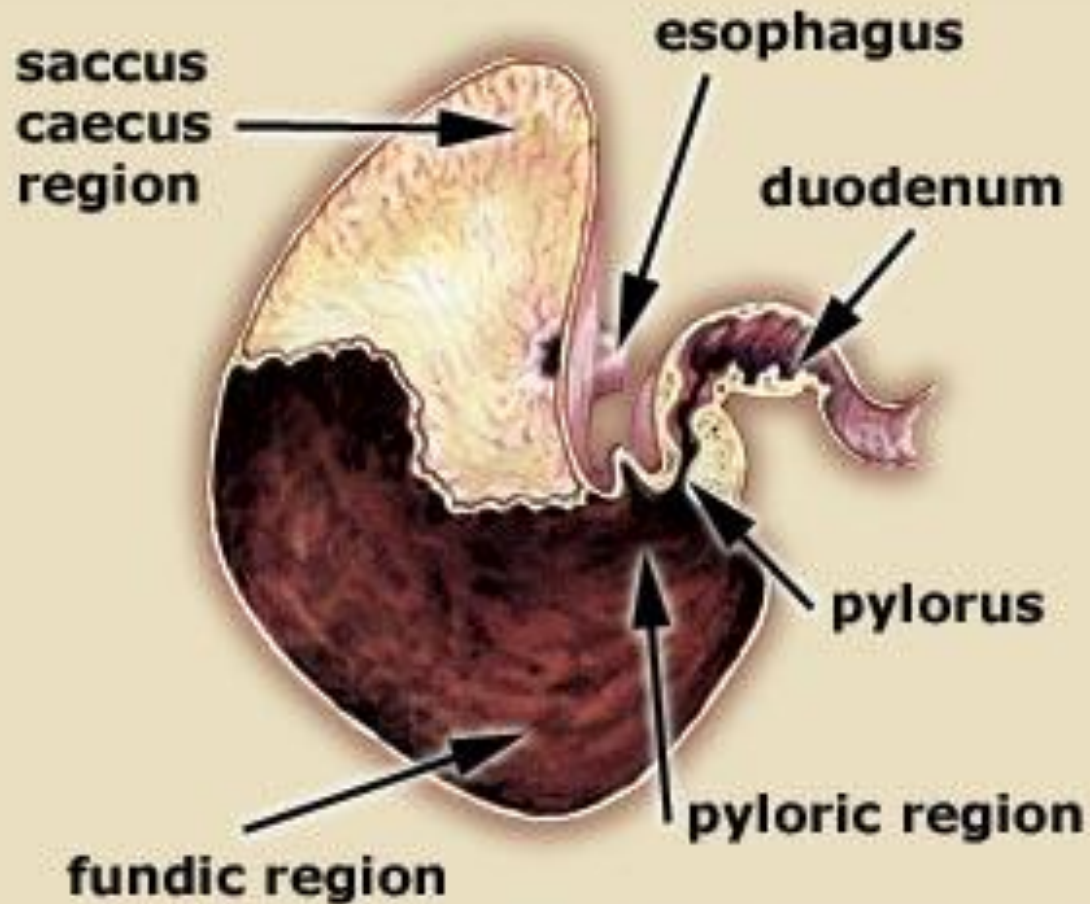
STOMACH

- Most digesta is held in the stomach for short periods of time
 - Two to six hours
 - How fast do liquids pass through the stomach?
 - 75 % gone within 30 minutes
- Entrance of stomach is guarded by cardiac sphincter
 - Function of valve generally does not allow horse to vomit

STOMACH

- Holds 8 – 16 quarts
- Functions best at $2/3$ capacity
- Multiple small meals is much better than 1 big meal
- Food moves through very rapidly
- 3 Main Areas:
 - Saccus Caecus
 - Fundic Region
 - Pyloric region

THE EQUINE STOMACH



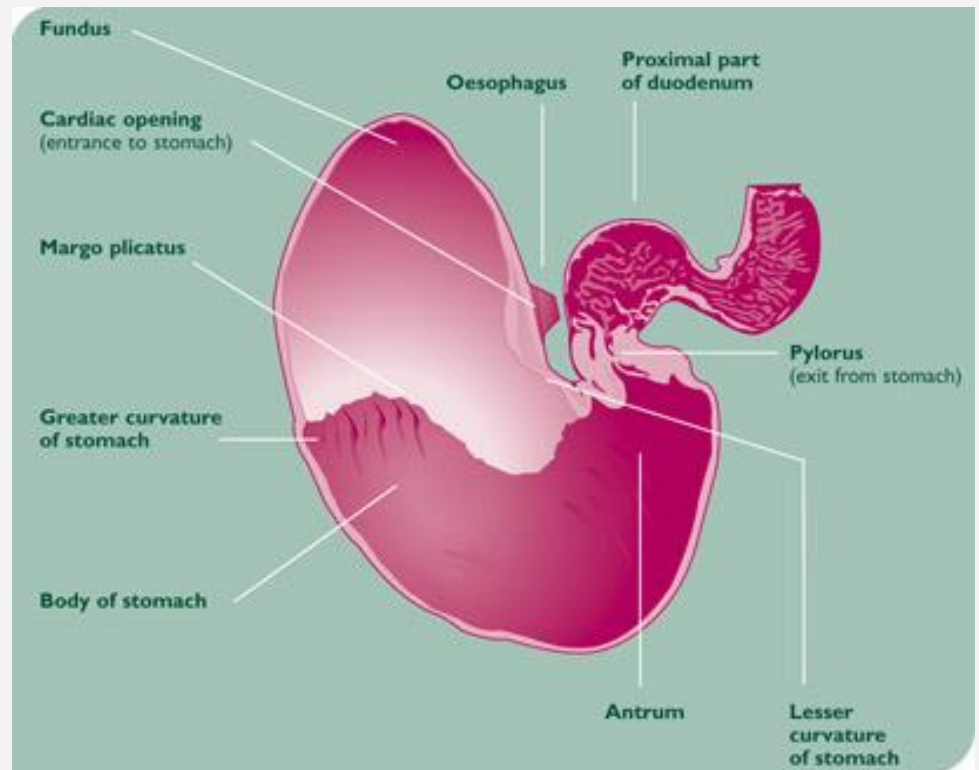
© DR. ROBIN PETERSON/THE HORSE

GASTRIC ULCERATION

- **Two General Types:**
 - *Squamous Ulceration*
 - *Glandular Ulceration*
- **One research study indicated:**
 - TB's in training = 80%
 - TB's off one month = 52%
- **Clinical signs generally include colic and pronounced teeth grinding**
- **In general, ↑ grain = ↑ ulceration**

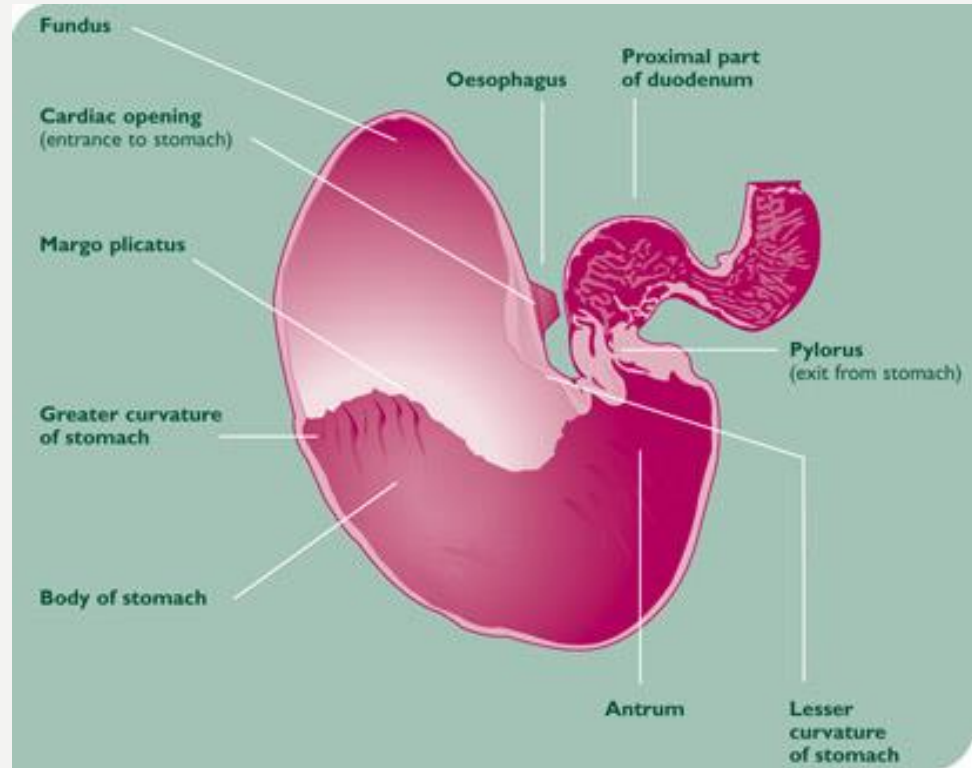
SQUAMOUS ULCERATION

The dorsal region is covered by squamous epithelium and ulcers occur here as a direct result of extended exposure to acid secretions. Many equine stomach ulcers occur in the area near to the esophagus. In foals the developing cell lining is thinner than in adults, making foals especially prone to gastric ulceration



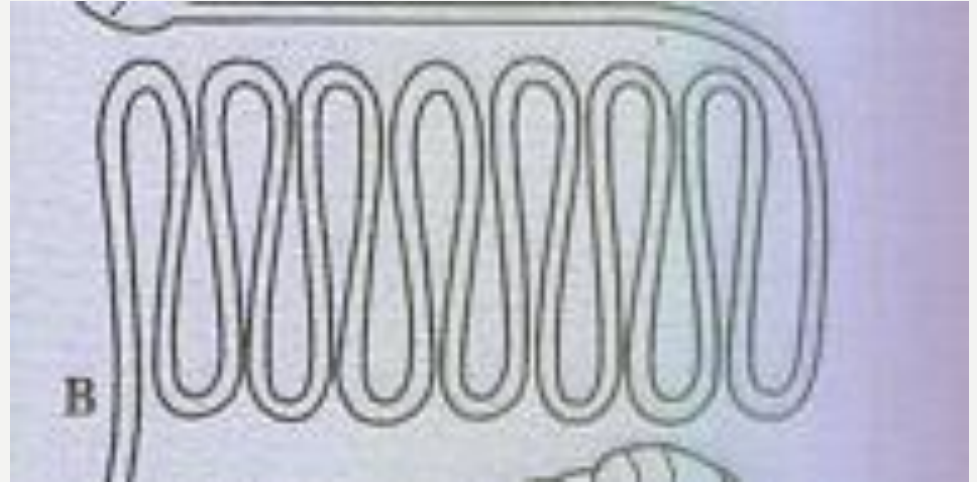
GLANDULAR ULCERATION

The ventral region is covered in glandular epithelium and ulcers occur here when the protective mucus layer is compromised e.g. due a side-effect of certain medications, enabling acid erosion of the stomach wall.

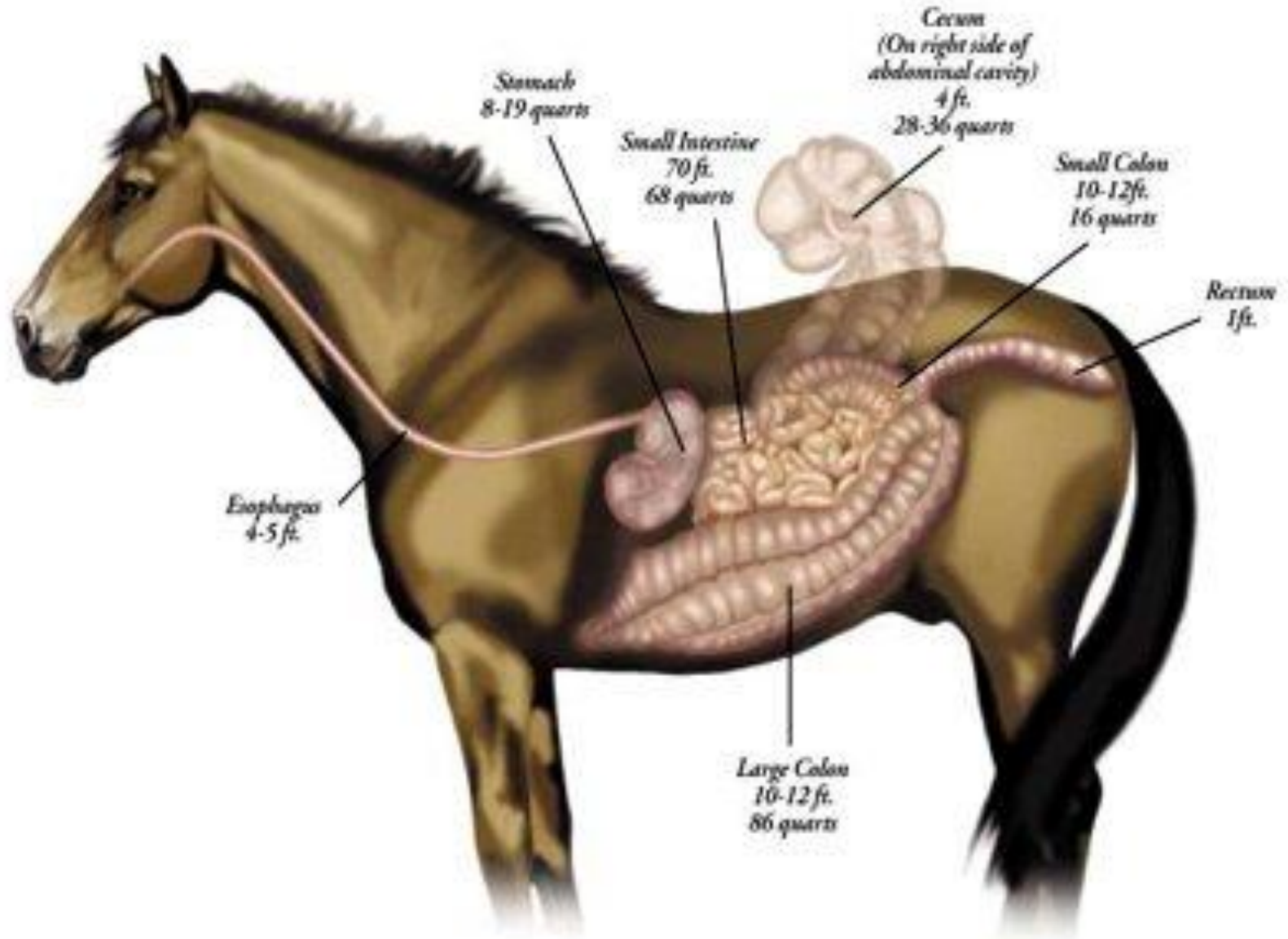


SMALL INTESTINE

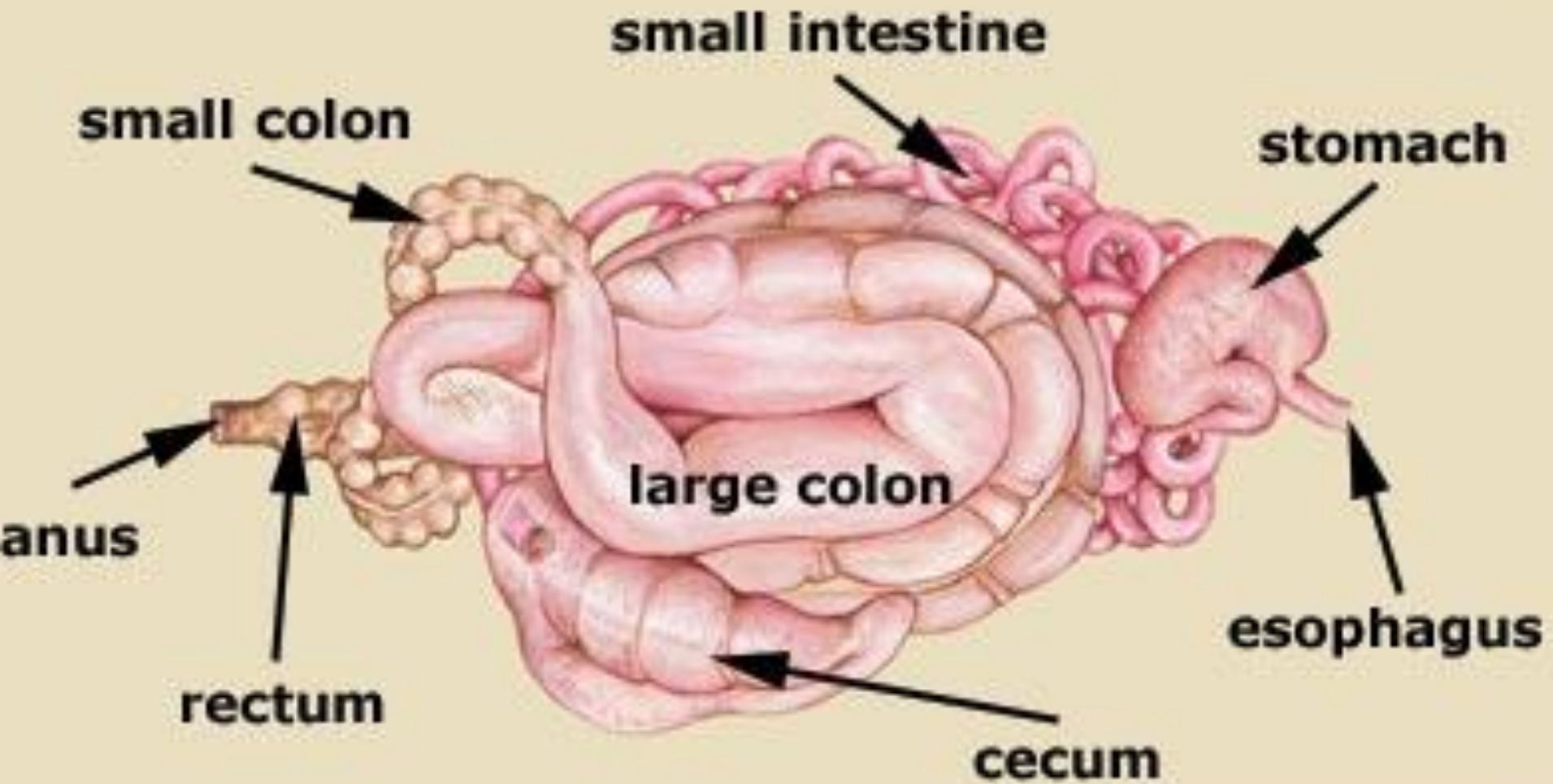
- Divided into three parts:
 - Duodenum
 - Jejunum
 - Ileum
- How long?
 - 60 - 80 feet long
 - 3 – 4 “ diameter
- May hold up to 10 to 12 gallons
- Some food passes
 - In as little as 15 minutes
 - Most takes 10 hrs



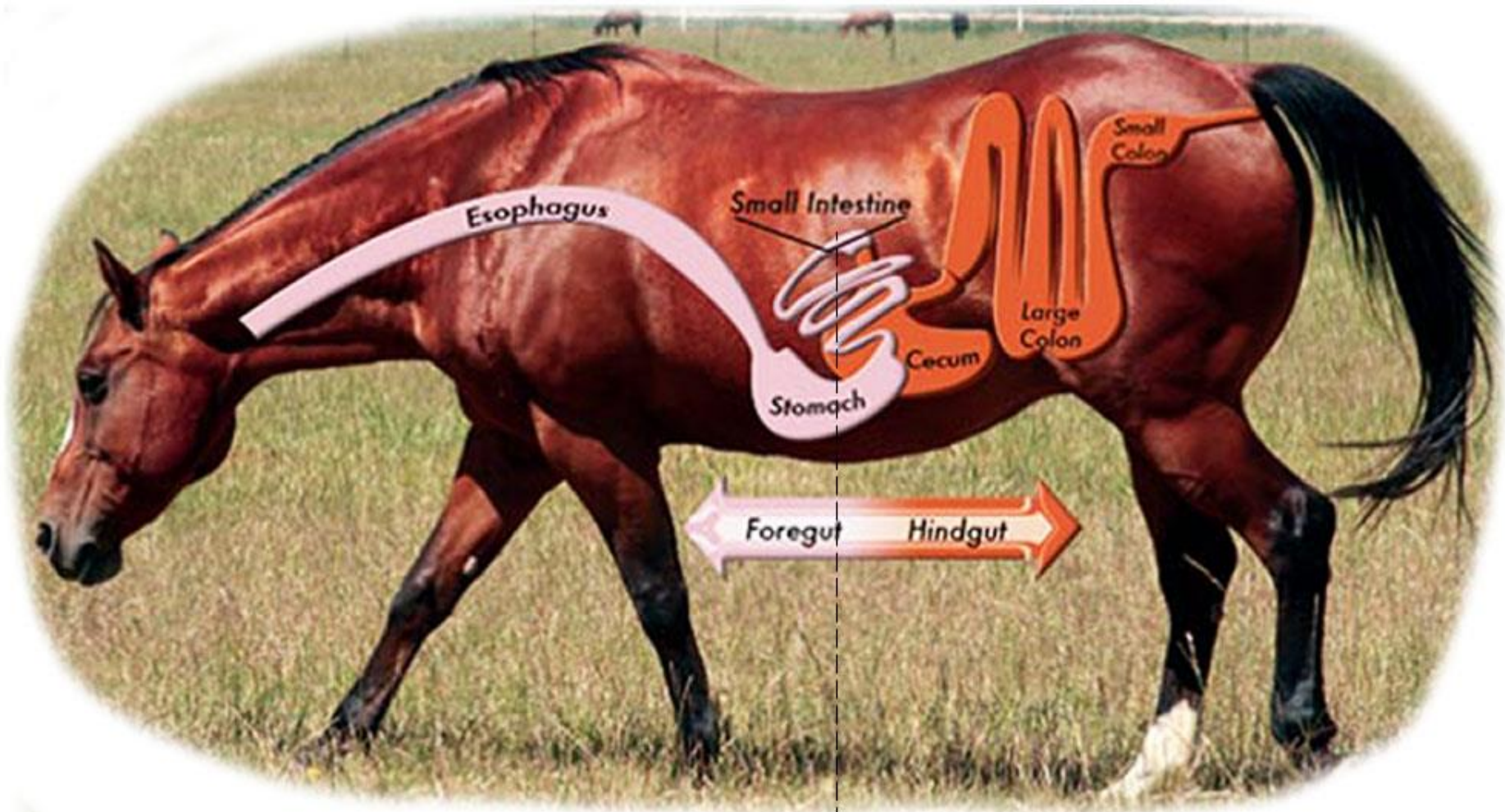
GASTRO-INTESTINAL TRACT

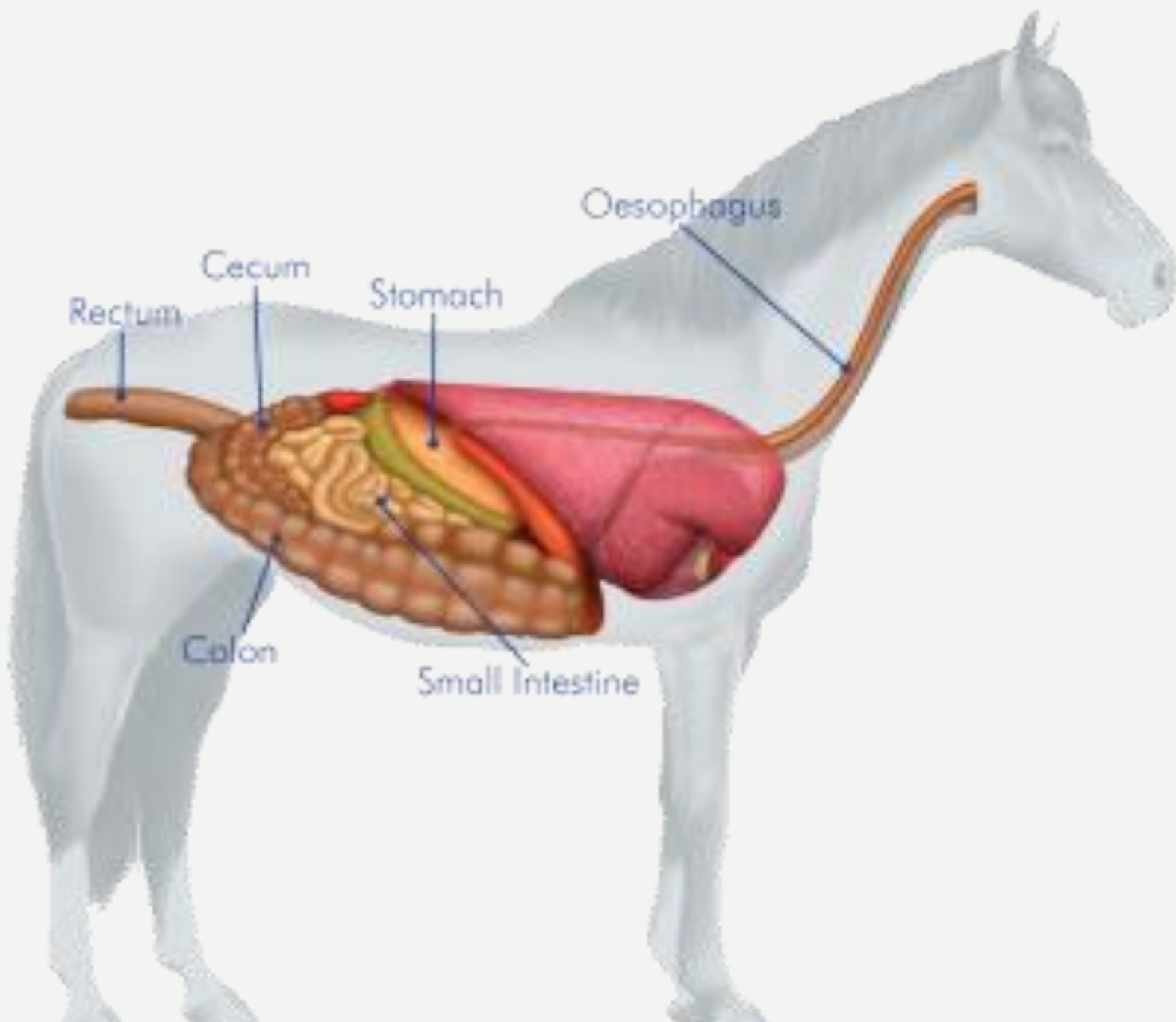


EQUINE GASTROINTESTINAL TRACT



COLIC





SMALL INTESTINE

- **What leaves the small intestine?**
 - **Fibrous Feed residues**
 - **Undigested feed starch**
 - **Protein**
 - **Microorganisms**
 - **Intestinal Secretions**
 - **Cell debris**

LARGE INTESTINE

- **Also called the Hindgut**
- **About 65% of the digestive system**
- **4 Parts:**
 - **Cecum**
 - **The Large Colon**
 - **The Small Colon**
 - **The rectum**

CECUM

- 3 to 4 feet in length
- Holds 7 to 8 gallons
- Contains fluid
- What is digested?
 - Large amounts of fiber
 - ~ 1/2 of the soluble CHO's ingested
- Absorption can also occur
- Bacterial protein
 - Produced, digested, and absorbed

LARGE COLON

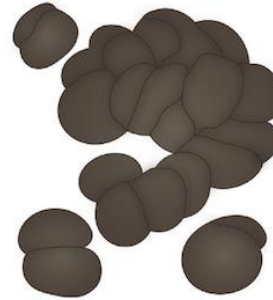
- 10 to 12' long
- Diameter of 8 to 10"
- Holds 14 to 16 gallons
- Four Portions:
 - Right ventral colon
 - Sternal flexure or left ventral colon
 - Pelvic Flexure to the left dorsal colon
 - Diaphragmatic flexure to the right dorsal colon (connects to small colon)

SMALL COLON

- Contents become solid
- Fecal balls are formed (Poopy)

A Guide to Horse Poop

Normal



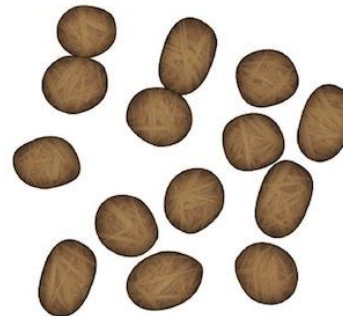
Normal horse poop has individual balls larger than a golf ball, clumped together. It is wet enough that it squishes, rather than crumbling and falling apart.

Diarrhea



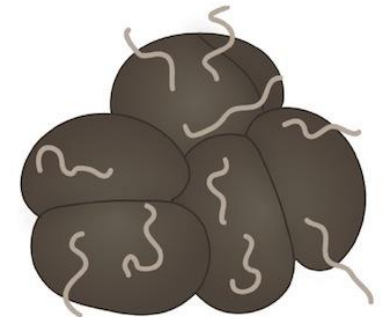
Loose, wet stools can be caused by several things, including too much sand in the gut, stress, diet change, parasites or disease, and a vet should be consulted.

Constipated



A horse with an impaction or an impending impaction may pass small, dry poop balls. This is because the gut has sent all excess moisture to the impaction.

Wormy



It's not common to see adult worms in horse poop, but it's an easy way to determine which parasite the horse has and what type of dewormer it needs.



RECTUM

- Poop comes out