

AGA 2110

THE DIGESTIVE SYSTEM OF FARM ANIMALS 2

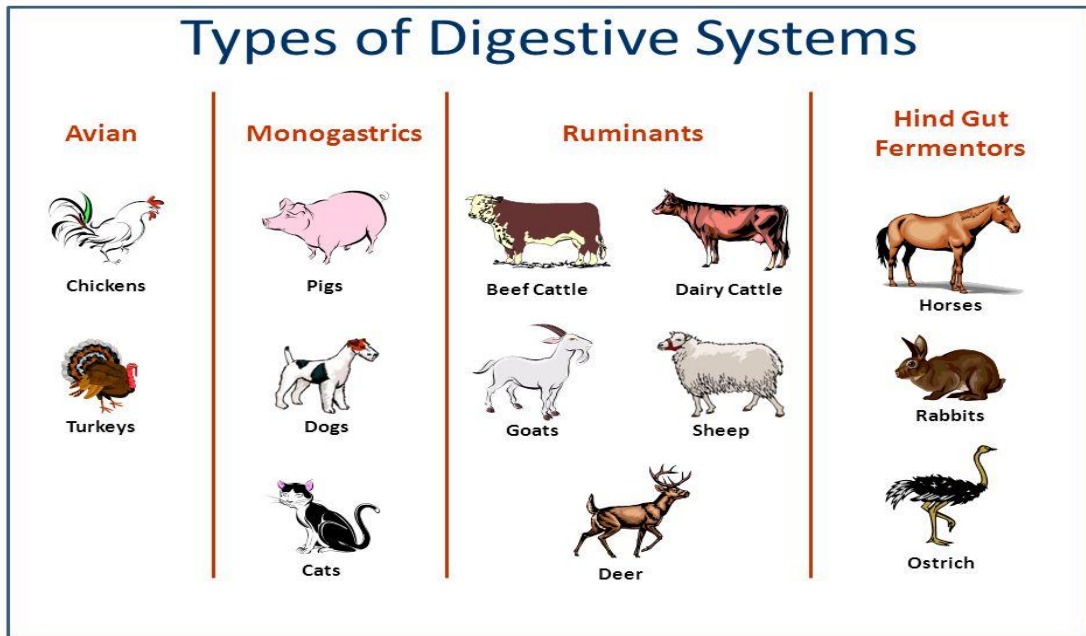
DEPARTMENT OF ANIMAL SCIENCE

UNZA

CLASSIFICATION OF FARM ANIMALS ACCORDING TO THE ANATOMY OF THE DIGESTIVE SYSTEM

Farm animals are classified into four (04) groups based on the anatomy of their digestive systems

1. **Monogastric animals** – simple stomach
2. **Modified Monogastric animals (Avian)** – has "two stomachs"
3. **Ruminant herbivores (Foregut fermenters)** – stomach with 4 compartments
4. **Non- ruminant herbivores (Hindgut-fermenters)** – simple stomach but large & complex large intestine



1. MONOGASTRIC DIGESTIVE SYSTEM

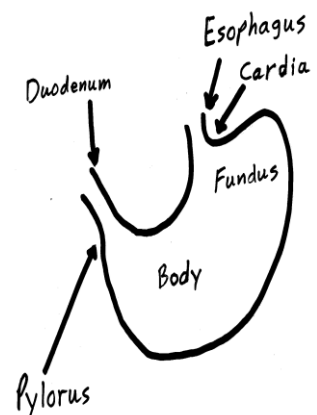
- Have one simple stomach
- The stomach secretes acid, resulting in a low pH of 1.5 to 2.5. The low pH destroys most bacteria & begins to break down the feed materials.
- Monogastric animals are better adapted to eat rations high in concentrates.
- Concentrates are highly digestible feedstuffs that are high in energy & low in fiber. They are typically 80- 90% digestible.
- Common concentrates are cereal grains & oil meals. Cereal grains include corn, wheat, barley, and oats.
- Oil meals include soybean meal, linseed meal, and cottonseed meal.

PHYSIOLOGY

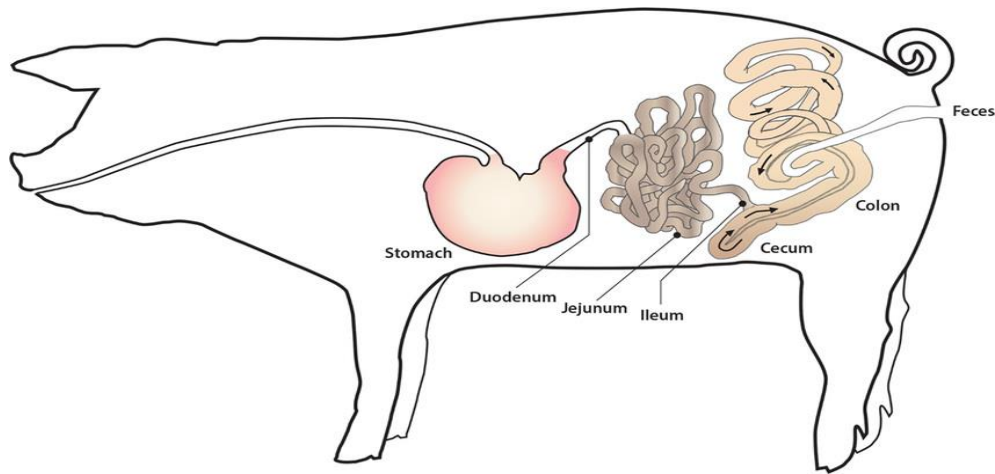
- Stomach releases gastric juice
- Gastric juice contains water, hydrochloric acid, mucus, intrinsic factor, pepsinogen
- The pH of gastric juice in mammals can be 2 or less
- Pepsinogen (an inactive form of the enzyme pepsin and a component of gastric juice) is activated by the low pH.
- Acid in the stomach changes pepsinogen to pepsin, which breaks down proteins in food during digestion.
- A layer of mucus protects the epithelial lining of the stomach

MONOGASTRIC ANIMALS

- Swine is a monogastric animal (single stomach).
- Basically glandular
- Secretions produced; mucus, Hcl & enzymes
- Swine have a digestive system that is anatomically & physiologically similar to the human digestive system



PIG DIGESTIVE SYSTEM



MONOGASTRIC DIGESTION steps

- Enzymes help breakdown large molecules
- Mouth** - **amylase** in saliva of pigs breaks down starch to disaccharides and dextrin
- Stomach** - HCl - creates acidic environment & breaks proteins down polypeptides.
- gall bladder** – Releases bile produced in the liver, bile emulsifies fats
- Bile is alkaline to neutralize stomach contents that are acidic
- Small intestine** – Enzymes are released which help to digest feed to break it down to smaller particles ie amino acids, fatty acids & monosaccharides are available for absorption

PANCREATIC ENZYMES & ROLE IN DIGESTION

SECRETION	SITE OF ACTION	ACTIVE ENZYME	SUBSTRATE & PRODUCT
Pancreatic juice	Duodenum	Pancreatic amylase	Starch- disaccharides & dextrins
		Trypsin	Protein - polypeptides
		Chymotrypsin	Peptides – amino acids & peptides
		pancreatic lipase	Fats- fatty acids & glycerol

MONOGASTRIC DIGESTION steps

Caecum - essentially non functioning in many monogastrics. Rabbits and horses have an enlarged caecum that acts like a rumen and is involved with microbial digestion (fermentation)

Large Intestine

- bacterial activity (very little activity)
- water absorption
- waste storage

AVIAN DIGESTIVE SYSTEM – KEY FEATURES

- Found in poultry
- No teeth, no lips, no chewing
- Have a beak for gathering food/ breakdown of feed
- Mechanical digestion of feed is done by beak & gizzard
- Salivary glands are present & well developed in species which consume dry food.
- The crop** is a dilation of the esophagus
- The crop is for **storage** of food. Food here is also soaked

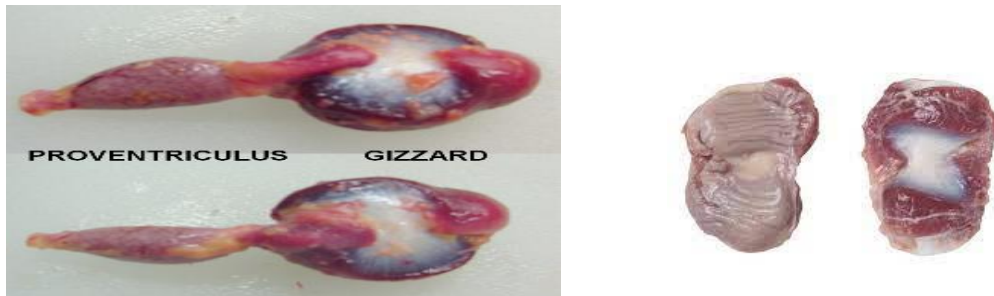
AVIAN DIGESTIVE SYSTEM – KEY FEATURES

- Proventriculus** is located between the crop & gizzard
- Proventriculus** secretes gastric secretions HCl and pepsinogen as well as mucus.
- Glandular stomach – add digestive juices



AVIAN DIGESTIVE SYSTEM – KEY FEATURES

- ❑ The gizzard is a very muscular organ, which normally contains grit or stones that function like teeth to grind the food



AVIAN DIGESTIVE SYSTEM – KEY FEATURES

- ❑ Food moves from the gizzard to the s/intestine & then to the large intestine.
- ❑ The non-digestible food components then travel into the cloaca
- ❑ Urine is also emptied into the cloaca.
- ❑ Undigested material is then passed out of the body through the vent
- ❑ Digestion in avian system is very rapid

AVIAN DIGESTIVE SYSTEM – KEY FEATURE

- ❑ **Ceca** are paired structures, are located at the junction of the small & large intestine. Here microbial digestion of cellulose occurs
- ❑ **Cloaca** – Last part of the GIT. It is a common opening to the digestive, urinary & reproductive tracts in birds
- ❑ **Vent** - common exit for GI & urinary tracts

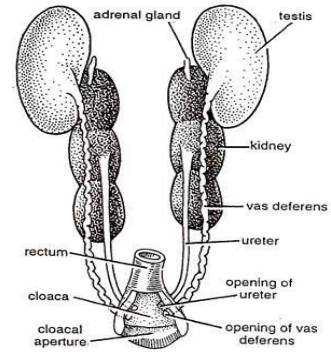
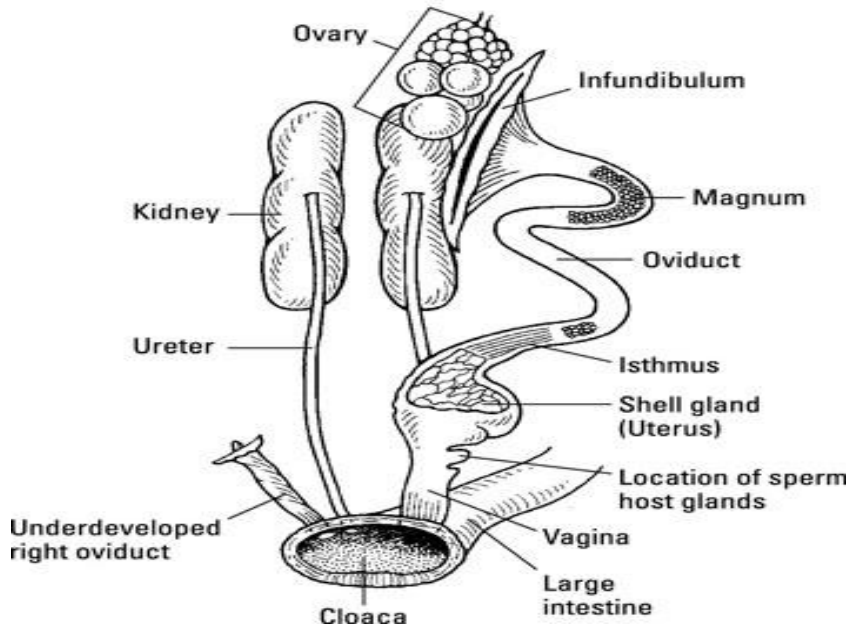
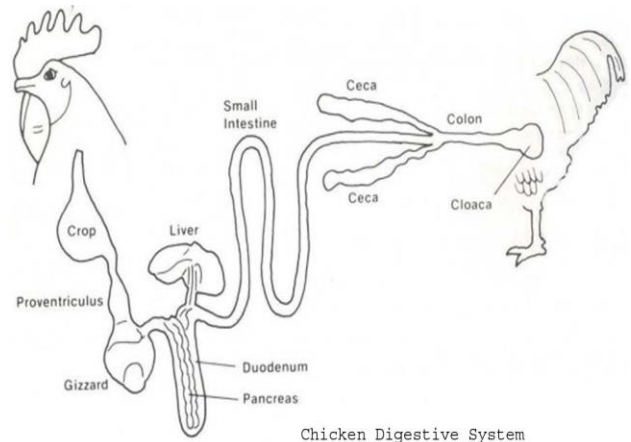


Fig. 11. Male urinogenital system of pigeon.



AVIAN DIGESTIVE SYSTEM

- The beak
- The oesophagus
- Crop
- Proventriculus
- Gizzard
- Small intestine
- Large intestine
- The caeca are a pair of tubes that allow fermentation of undigested food to take place



RUMINANT DIGESTIVE SYSTEM

- Mouth, oesophagus, liver, pancreas, small & large intestine have similar function to monogastrics

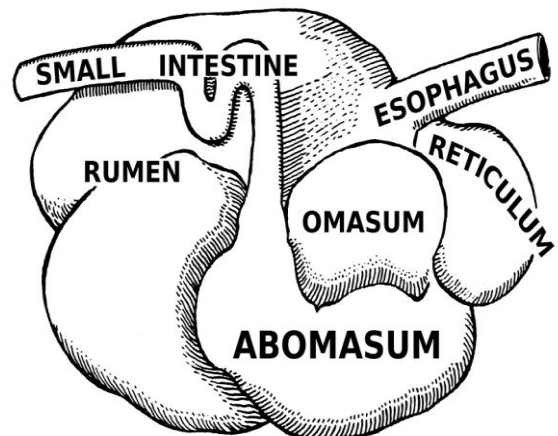
RUMINANT HERBIVORES

- Ruminants are also called **foregut fermenters**
- Cattle, Sheep, Goats, Deer
- Animals with complex digestive systems
- Capable of digesting material with a high fiber concentration
- Uses microbial fermentation
- Ruminants are mammals that are able to acquire nutrients from plant-based food by fermenting it in a specialized stomach prior to digestion, principally through microbial actions.

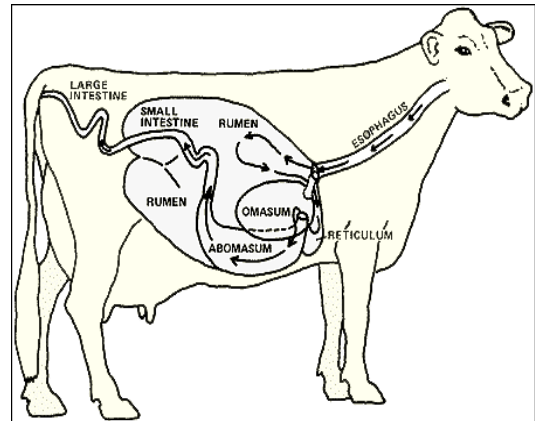
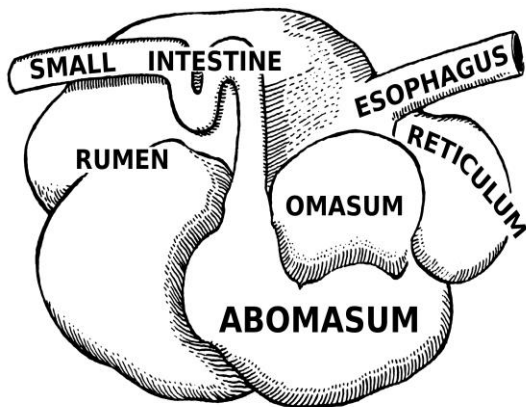
COMPARTMENTS OF RUMINANT STOMACH

Ruminant stomach

1. Rumen
 2. Reticulum
 3. Omasum
 4. Abomasum
- Rumen, reticulum & omasum are called **forestomach**
 - Forestomach** - Lined with non-glandular epithelium



THE RUMINANT (FOREGUT FERMENTERS)



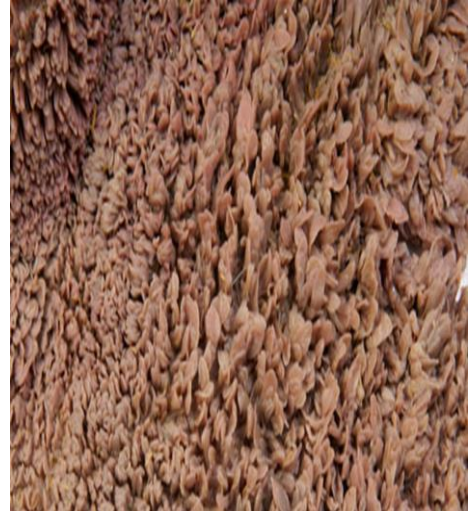
2. RETICULUM

- Most cranial part
- Found in front of the rumen
- 16L capacity
- Inside mucosa is thrown into ridges giving it a honey-combed appearance
- Muscular wall continuous with rumen

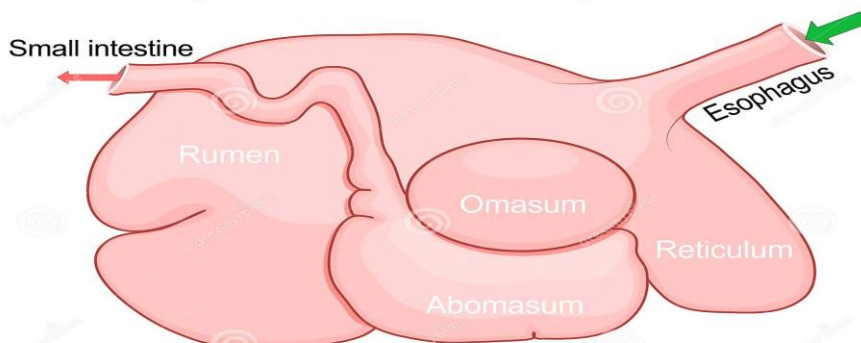


1. RUMEN

- ❑ Largest of the 4 parts
- ❑ 184 L
- ❑ Reticulum & the rumen are separated by the **ruminoreticular** fold
- ❑ Rumen almost entirely filled the left abdominal cavity
- ❑ Lined with papillae

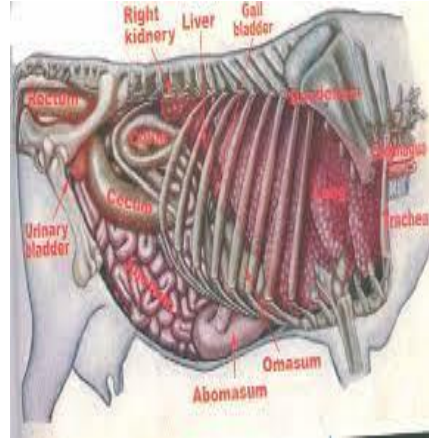
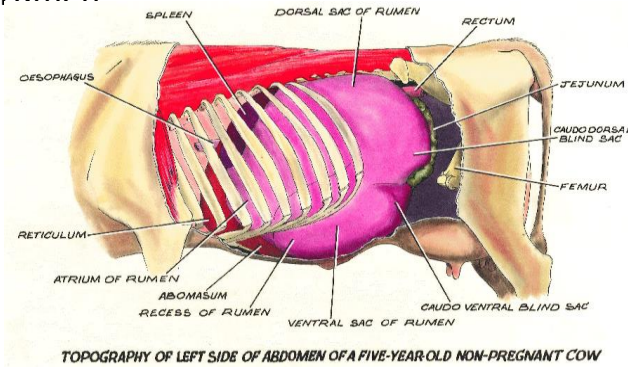


Ruminant digestive system

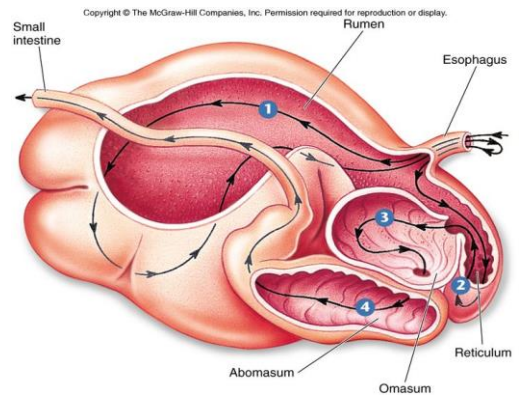
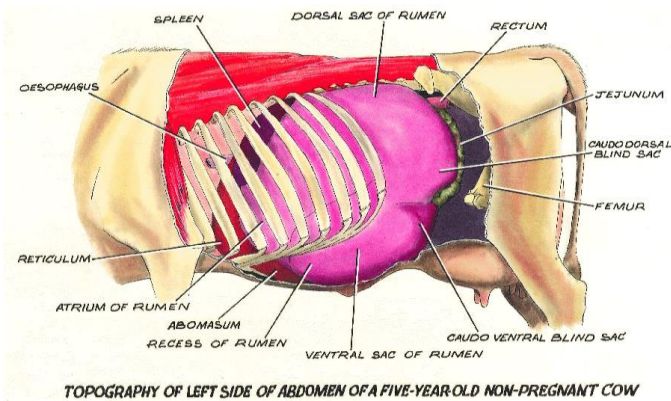


1. RUMEN

☐ Left abdominal cavity filled the rumen

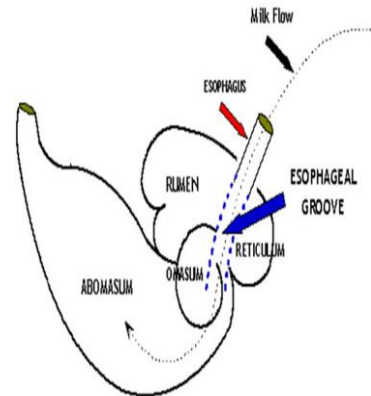


POSITION OF RUMEN IN LIVE ANIMAL



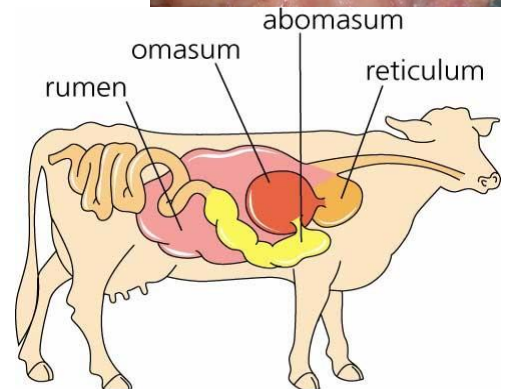
SUCKLING RUMINANTS

- ❑ Rumen & reticulum are relatively undeveloped
- ❑ Milk is channelled by the oesophageal or reticular groove to the omasum and abomasum
- ❑ Solid food stimulates enlargement of rumen & reticulum



4. ABOMASUM (TRUE STOMACH)

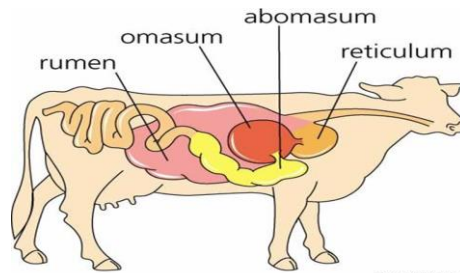
- ❑ also called the true stomach
- ❑ a glandular lining
- ❑ 27 L
- ❑ Secretes HCl & digestive Enzymes



Elizabeth Morales

3. OMASUM

- ❑ 3rd compartment
- ❑ 8L capacity
- ❑ Spherical in shape
- ❑ Inside thrown into broad longitudinal folds or leaves similar of the pages in a book (Bible)

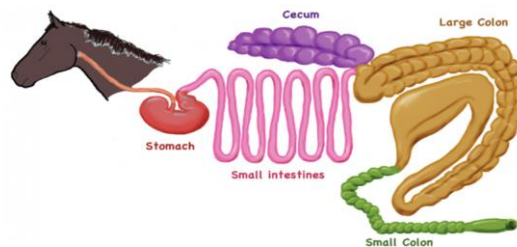


Elizabeth Morales



NON-RUMINANT HERBOVORES (HINDGUT FERMENTERS)

Hindgut fermenters generally have a cecum and large intestine that are much larger and more complex than those of a foregut or midgut fermenter.

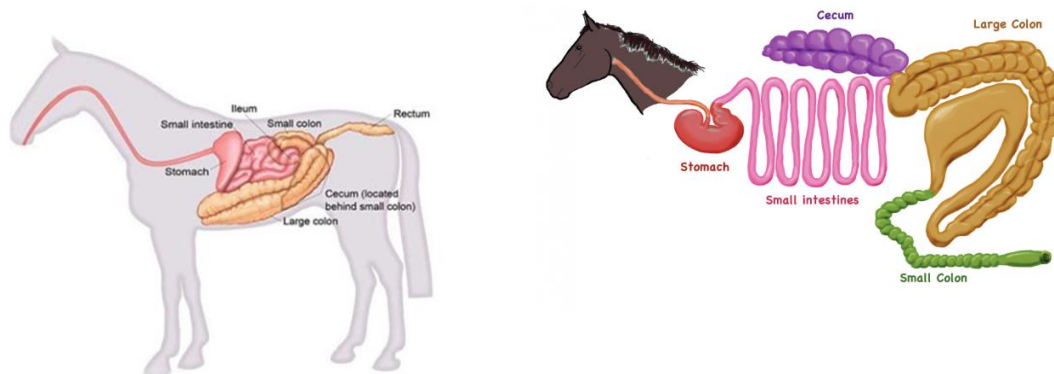


NON-RUMINANT HERBOVORES (HINDGUT FERMENTERS)

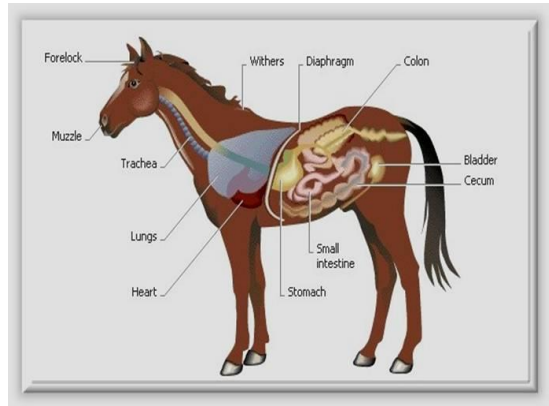
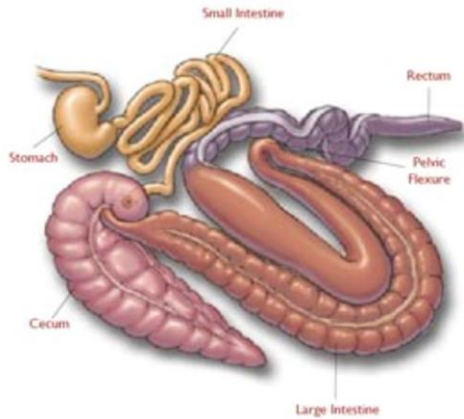
- ❑ Hindgut fermenters generally have a cecum and large intestine that are much larger and more complex than those of a foregut or midgut fermenter.
- ❑ Horses are classified as non-ruminant herbivores.
- ❑ This means they have the capacity to break down the cellulose and hemi-cellulose components in forages without the four-chambered stomach that cattle have.
- ❑ Horse's large intestine occupies 60 of the abdominal cavity

HORSE DIGESTIVE SYSTEM

Has Enlarged cecum & large colon



HORSE DIGESTIVE SYSTEM



THE GASTROINTESTINAL TRACT OF A RABBIT

