

The Ruminant Digestive System

Functions of the digestive system of animals include:

- Ingestion (eating)
- Chewing (mastication)
- Swallowing (deglutition)
- Absorption of nutrients
- Elimination of solid wastes (defecation)

The digestive system changes food nutrients into compounds that are easily absorbed into the bloodstream.

- Species like cattle, deer, sheep, horses, and rabbits that depend entirely on plants for food are classified as herbivores.
- Animals like dogs and cats that depend almost entirely on the flesh of other animals for food are classified as carnivores.
- Still others, like swine, birds, and humans that consume both flesh and plants are classified as omnivores.
 - Different species of animals have digestive systems adapted to the most efficient use of the food they consume.
 - The anatomy and physiology of the digestive systems of herbivores, carnivores, and omnivores all differ.
- Ruminants are those animals that contain a multi-chambered digestive system (polygastric) that allows the animal to gain the majority of their nutritional needs from forages and other roughages.
- Forage refers to grasses, roughages refers to other high-fiber food sources.
 - The digestive tract extends from the lips to the anus. It includes the mouth, pharynx, esophagus, stomach, and the small and large intestines.
 - Accessory glands include the salivary glands, the liver, and the pancreas.
 - The length and complexity of the digestive system depends on the species.
 - In herbivores, it is very long and complex.

The digestive system of ruminant animals includes the :

- Mouth - grasps the food
- Teeth - grind the food
- Ruminants have only one set of teeth in the front of the mouth (incisors), and two sets in the back (molars).
- Tongue - covered with finger-like projections (papillae) that contain taste buds.
- Salivary glands - secrete saliva, that moistens food and is mixed with the food material to aid in swallowing.
- Pharynx - funnels food into the esophagus, preventing food material from entering the lungs.
- Esophagus - food tube that leads from the mouth to the stomach.
- At this point, ruminant animals have a multi-chambered “stomach”
- Reticulum - honeycomb-like interior surface, this part helps to remove foreign matter from the food material.
- Ruminant animals grasp mouthfuls of food and swallow it before it is chewed.
- They wrap their tongue around a mouthful of grass, clamp down their teeth, and pull to break the grass at its weakest point, and swallow.
- Ruminants will “chew their cud” (regurgitate) their food material and then grind it with their molars at a time when the animal is resting.
- This is done until the food particles are small enough to pass through the reticulum into the rumen.
- Since ruminant animals do not “chew” their food when it is taken in, at times foreign material like rocks, nails, small pieces of wire, can be swallowed.
- While the animal is “chewing its cud” foreign particles that are heavy are allowed to “sink” in the reticulum, preventing many foreign particles from entering the rest of the digestive system.
- Once foreign material enters the reticulum, it stays there for the life of the animal.
- If enough of this foreign material remains in the reticulum, it may cause damage and infection of the reticulum (hardware disease).

- Rumen - the organ that allows for bacterial and chemical breakdown of fiber.
- The rumen has a very thick, muscular wall.
- It fills most of the left-side of the abdomen
- The walls of the rumen contain papillae (that can be up to 1 cm. in length), where the bacteria that are used to breakdown fiber live.
- In some ruminants (dairy cattle) the rumen can have a capacity of 55-65 gallons!
- Omasum - section that is round and muscular.
- “Grinds” the food material and prepares the food material for chemical breakdown.
- Abomasum - very similar to the stomach of non-ruminants.
- this is where the majority of chemical breakdown of food material occurs.
- mixes in digestive enzymes (pepsin, rennin, bile, etc.).
- Small Intestine - where most of the food material is absorbed into the bloodstream
- Contains three sections:
 - duodenum
 - jejunum
 - ileum
- The food material is continually squeezed as it is moved through the small intestine, becoming more solid.
- The majority of the food material absorption occurs in the duodenum and the jejunum.
- Large Intestine - begins to prepare unused food material for removal from the body
- a portion of the large intestine in some animals contain pouches that may contain enzymes for further species-specific digestion (horses and rabbits (cecum)).
- Colon - collects the unused food material that is to be removed from the body
- Rectum - “poop chute”

- Anus - opening through which the waste is removed.
- Controlled by sphincter muscles, that also help protect the opening.
- In conclusion, the rumen allows for bacteria to breakdown fiber, enabling ruminants to gain the proteins and energy from plant sources.
- Non-ruminant animals cannot obtain the nutritional value from most plant sources unless the food has been modified (ground, mashed, etc.)