

Lesson Two - Goat Digestive Tract

LEARN: Goat Digestive Tract Overview

30 minutes

Purpose: Gain an understanding on the parts and functions of the goat digestive tract.

Materials:

- *Goat Digestive Tract* slide presentation
- *Goat Digestive Tract Student Notes*
- *Goat Digestive Tract Student Notes – Answer Key*

Facilitation Steps:

1. Look over the *Goat Digestive Tract* slide presentation before class.
2. Print and hand out the *Goat Digestive Tract Student Notes* to the class so they can take notes during the presentation.
3. Prepare to present the *Goat Digestive Tract* slide presentation to the participants. Review and discuss the following information on each slide.

Slide 1: Goat Digestive Tract introduction slide.

Slide 2: Monogastric vs. Polygastric Digestive Systems - There are two types of digestive systems. The goat is a member of a class of animals called ruminants. These animals ruminate (chew their cud). They differ from us. They have special four-compartment stomachs, which digest roughage such as hay, grass or silage, which are foods high in fiber.

Slide 3: Digestive Tract of the Goat - The digestive tract starts in the mouth and ends in the anus of the goat. As food passes through, it is broken down into smaller and smaller parts. There are 3 goals of the digestive system:

1. Break down food for nutrients
2. Absorb food as nutrients
3. Pass non-absorbable material through the body as urine or feces

Slide 4: Upper Gastrointestinal Tract – Parts include the mouth (salivary glands, mucosa, teeth and tongue), pharynx, esophagus (gullet) and stomach.

Slide 5: Mouth - Goats have no upper incisor or canine teeth. They depend on the rigid dental pad in front of their hard palate, their lower incisor teeth, their lips and their tongue to take food into their mouths. Chewing is the first step in processing the food. This is impressive, as the goat makes 40,000 to 60,000 jaw movements per day as it chews, and re-chews regurgitated feed. As this roughage is eaten by adult goats, it is chewed, soaked with saliva and then swallowed. This small rounded mass of food is called the “cud”.

Slide 6: Pharynx and Esophagus – The pharynx is in the back of the mouth, where both food and air pass the way to the esophagus. This is a tube-like structure that carries food from the mouth to the stomach. Swallowing is the first muscle contraction that pushes food from mouth to stomach. Muscle contractions push the food (cud) and gases through the esophagus to the stomach.

Slide 7: Stomach - The goat’s stomach has four chambers: the rumen, the honey-combed reticulum, the omasum and the abomasum (or true stomach).

Slide 8: Rumen – This is the largest of the four stomach compartments of ruminant animals. The capacity of the rumen of a goat ranges from 3 to 6 gallons. The rumen acts as a big fermentation vat where bacteria and protozoa supply enzymes to break down the fiber in the goat’s feed. Rumen fermentation results in large quantities of gas, principally methane and carbon dioxide. Because of this, ruminant animals are frequent belchers and if this doesn’t occur, the animal will bloat. Gas is allowed to enter the esophagus by the relaxation of its lower sphincter diaphragm. The esophagus fills with the gas, the lower sphincter closes and the upper pharyngo-esophageal sphincter relaxes. This results in the gas expelling.

Slide 9: Reticulum - This second stomach compartment, also known as the honeycomb or hardware stomach, is located just below the entrance of the esophagus into the stomach. When the food particles of cud become small enough, they pass into

this area. The reticulum will hold the heavier substances from the rumen. If there are any non-food items like nails, rocks or wire that the goat has swallowed, it will end up in the reticulum. If a goat swallows a foreign object, it could become stuck, potentially causing serious injury. The reticulum is part of the rumen, separated only by an overflow connection, the rumino-reticular fold. Therefore, microbial action also takes place here. The capacity of a goat's reticulum ranges from 1/4 to 1/2 gallon. The function is to act as a pump that causes liquid to flow in and out of the rumen. Foods freely flow from the rumen to the reticulum and back. The reticulum is the smallest of the four compartments of the goat's 4-hambered stomach.

Slide 10: Omasum - Known as the manyplies, it consists of many folds or layers of tissue where excess moisture is removed from the ingested feed and finer grinding occurs as well, even after rumen-reticular fermentation. It also absorbs more nutrients called volatile fatty acids, which help supply the goat with energy. The capacity of the omasum is approximately 1/4 gallon. The omasum is not involved in the rumination process.

Slide 11: Abomasum - This compartment is considered the 'true stomach' of ruminant animals. The capacity is about one gallon. Feed passes into the abomasum and glandular secretions of gastric enzymes and hydrochloric acid are produced. The abomasum consists of three regions: the fundic, body and pyloric regions. The fundic glands are the most important for digestion. A unique secretion from the fundus combines with vitamin B12 to produce red blood cells. This protects the walls of the abomasum from protein-degrading enzymes and hydrochloric acid. The pyloric region joins the small intestine, separated by the pyloric sphincter muscle.

Slide 12: Lower Gastrointestinal Tract – the small intestine has 3 parts: duodenum, jejunum and ileum. This is where digestion and absorption occur. The duodenum is the first part of the small intestine, where enzymes are produced and secreted and further break down nutrients into simple compounds occurs. These are absorbed into the blood stream or lymph in the jejunum and ileum.

Slide 13: Small intestine - The small intestine is a 100-foot-long, 1-inch-wide tube with a 2 ½ gallon

capacity. The remaining feed particles are passed on to the small intestine, where most of the nutrients are absorbed by the body and made available to the goat. In the small intestine, feed mixes with secretions from the pancreas and liver. Enzymes reduce any remaining proteins to amino acids, starch to glucose, and complex fats into fatty acids. Small, fingerlike projections called villi, which increase the absorption area of the small intestine, line the small intestine walls.

Slide 14: Large intestine - The large intestine has three parts: cecum, colon and rectum. Its primary function is to absorb water from the intestine's contents, thus making it more solid. It is 6 ½ feet long and takes approximately 18 hours for contents to move through it. The cecum is a tube-shaped organ, also known as the blind gut, and is located at the junction of the small and large intestines. Feed materials entering this compartment are digested by the microorganisms found in it. The capacity of the cecum of goats is approximately 1/4 gallon. The colon is where fecal pellets are formed. The rectum, the last foot of the large intestine, is a storage place for this fecal material. The anus is where the elimination of fecal matter happens.

Slide 15: Accessory glands - The salivary glands, liver and pancreas contribute to digestion. The saliva secreted by the salivary glands is important in the chewing of the cud. Bile produced by the liver, and stored and secreted by the gall bladder, helps emulsify fat in preparation for digestion. Enzymes secreted by the pancreas are important in the small intestinal digestion of carbohydrates, proteins and fats.

Slide 16: Rumination - is the regurgitation, rechewing and re-swallowing of rumen contents. The regurgitated cud is chewed thoroughly for about one minute, then swallowed again. Ruminant animals may spend up to 8 hours per day in rumination, depending on the type of feed. The ruminant digestive system of the goat works non-stop in an adult goat. The goat must continually create digestive juices and enzymes 24 hours a day every day of its life.

4. Answer any questions using the *Goat Digestive Tract Student Notes* – Answer Key.