NEW YORK STATE 4-H DAIRY GOAT PROJECT
FACT SHEET #13

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DIGESTIVE SYSTEM OF THE GOAT

The goat is a member of a class of animals called ruminants. These animals ruminate (chew their cud). Unlike us, they have special four-compartment stomachs especially designed to digest roughage (food high in fiber) such as grass, hay and silage.

The goat's stomach has four chambers: 1) the rumen, 2) the honeycombed reticulum, 3) the omasum, and 4) the abomasum or true stomach. The size relationship of the four chambers changes as the animal grows up. The abomasum gets proportionally smaller. To understand why this happens, let's consider the function of each compartment and then review the goat's diet.

1) The rumen acts as a big fermentation vat. Bacteria and protozoa in the rumen supply enzymes to break down the fiber in the goat's feed. This is similar to how bacteria can ferment the sugars in grape juice to make wine in big wine barrels. The tiny organisms in the rumen also help to build proteins from the feed and manufacture all of the B vitamins needed by the goat. Many nutrients that help provide the goat with energy are also absorbed here. The fermentation process produces heat that helps to keep the goat warm.

When roughage is eaten by the adult goat, it is chewed on, soaked with saliva, and then swallowed. This bolus of food is called "the cud". It goes down into the rumen to be attacked and broken down or digested by the microorganisms. At regular intervals the cud is brought back up to the goat's mouth to be chewed on some more and then swallowed again. This entire process is called rumination. If you watch the goat's neck carefully, you can see her swallow and later regurgitate her cud. The goat will often burp to get rid of the gas produced by all the fermentation going on in her rumen. You can really smell the fermentation process on her breath. If something causes the goat to stop being able to burp up the gases, the gas will build up and bloat or swell up her rumen and she may become very sick with "bloat".

2) Once the food particles of cud become small enough, they pass to the second compartment or reticulum. Here any foreign objects that may have been accidentally swallowed with the feed settle out in the honeycomb structure of the reticulum's walls. Another name for the reticulum is the "hardware stomach".

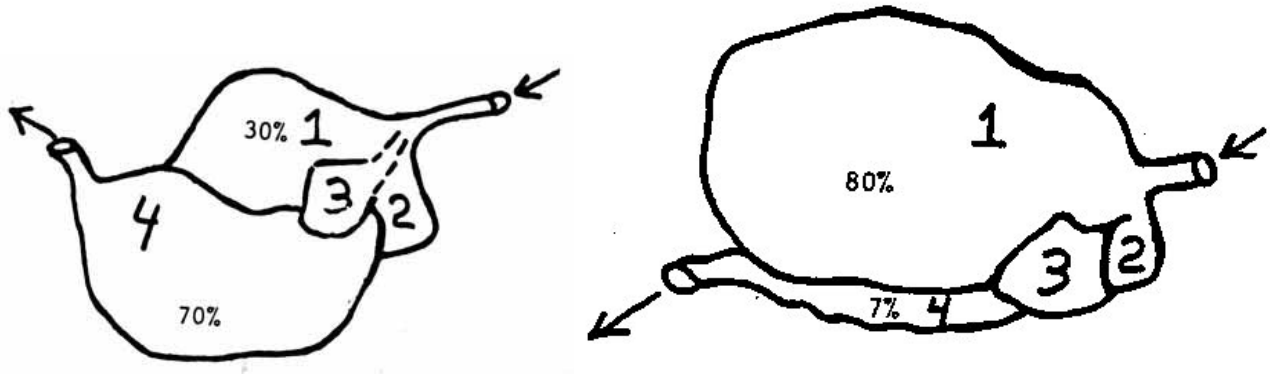
3) The fermenting particles then pass on to the omasum. The omasum removes the water from them and also absorbs more nutrients called volatile fatty acids that help supply the goat with energy.

4) The particles are then forced into the abomasum or true stomach. Here, the particles are digested by the stomach acid, hydrochloric acid (HCl). This form of digestion is the same as what occurs in our stomachs.
The remaining particles are then passed on to the small intestine where most of the nutrients are absorbed by the body and made available to the goat.

When a goat kid is born, its rumen, reticulum and omasum are very tiny and not useful. The goat kid depends on a liquid, milk, not roughage for its feed source. When the kid swallows milk, the milk goes directly to the

abomasum through the esophageal groove. Every time the kid swallows, a flap of skin at the entrance to the rumen folds over to form a grove that bypasses the rumen and sends the milk straight to the abomasum to be digested by stomach acid. As the kid gets older, she starts trying to consume roughage. The rumen becomes active and starts to enlarge. Its population of microorganisms increases. The reticulum and omasum also respond to the changes in diet by getting bigger. By the time the kid is an adult goat, roughage is her main source of food and her rumen is far larger than his abomasum.

KID **ADULT**



1- rumen, 2 - reticulum, 3 - omasum, 4 - abomasum

Suggested Activities

1) Get some human foods (for example, baby food, yogurt, rice krispies, shredded wheat, celery, spinach). Put a 1/4-cup of each in a separate unstarched cotton spice bag or square of cotton cloth. Boil them covered in a solution of 1 tablespoon of neutral detergent soap (i.e., baby shampoo) per cup of water in a saucepan for one hour. This will digest all the nutrients but the fiber from them. After boiling, rinse the bags in cold water, gently squeeze dry, and open. Which foods had more fiber? Which would be easiest for a kid to digest? *

Do the same experiment using milk replacer, a complete pelleted calf or lamb ration, various grains, hays, and straws. Which ones have more fiber? For more advanced 4 - H er's, weigh out 100 grams each of the feed samples rather than a 1/4 cup. After boiling, oven dry them at 500 F and reweigh them to compare fiber content.

2) Watch a goat chew her cud. * Try to count how many times a goat brings up her cud in 15 minutes.

3) Invite a veterinarian to come talk to your 4 - H group about bloat and other metabolic diseases that can occur when something goes wrong with your goat's digestion. *

4) A rumen fistula is an artificial opening that allows scientists to look inside the rumen of an animal. Contact an agricultural college that has a fistulated cow, sheep or goat and take turns examining the animal's rumen.

5) Obtain a clean and rinsed out digestive tract of a sheep or goat from a slaughter house and lay it out on a lawn to examine and identify the different parts. Measure the length of the different parts including the small intestine.

* Activity is suitable for Cloverbuds.