

## The Ruminant

- ❖ Regurgitate and remasticate food
- ❖ Two suborders of ruminants
  - ❖ Ruminantia: includes deer, moose, elk, reindeer, caribou, antelope, giraffe, musk, ox, bison, cow, sheep and goat
  - ❖ Tylopoda: camel, llama, alpaca, vicuna (do not have an omasum)

NOTE: the fact that camels store water in the rumen is a MYTH; there is no evidence to support the stored water idea

The rumen houses bacteria and protozoa which ferment food and enables the animal to obtain energy that would not otherwise be made available

### Four Compartments

- Rumen (paunch)
  - Reticulum (honeycomb)
  - 3. Omasum (many plies)
  - 4. Abomasum (true stomach)
- } Forestomach (proventriculus)

Tripe: rumen and reticulum

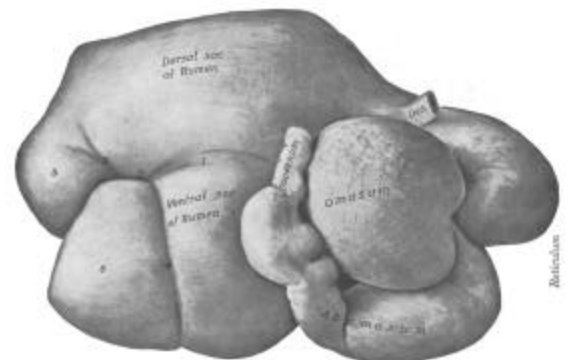


Fig. 10-9. Stomach of cow, right view. Oes, Esophagus; 1, right longitudinal groove of rumen; 2, caudal groove of rumen; 3, 4, coronary grooves; 5, 6, caudal blind sacs of rumen; 7, pylorus. From Sisson and Grossman: The Anatomy of the Domestic Animals. Philadelphia, W.B. Saunders.

## Reticulum

- Most cranial compartment
- serves as pump that causes liquid to flow into and out of the rumen; the flow of liquid directs ingesta into the rumen, regulates its passage from the rumen to omasum, supplies moisture to rumen contents, and flood the cardia before regurgitation

### Hardware disease

Pointed objects, such as wire, enter reticulum and penetrate thoracic viscera causing inflammation or pericarditis (can actually pierce heart)  
can try to remove object using a strong magnet

## Rumen

Large, muscular sac that extends from diaphragm to pelvis;

- almost entirely fills the left abdominal cavity
- subdivided into sacs; smooth muscle in walls
- allows for soaking and fermentation of bulk fibrous food and, because of motility, the contents are continually mixed

Reticular Groove

- also called the esophageal groove
- nursing stimulates groove closure preventing milk from entering rumen/reticulum
- as animal ages, reflex goes away
- young calves that are bucket fed without a nipple, often have big bellies due to the milk going into rumen

## Omasum

- filled with muscular laminae that are covered by mucous membrane studded with short, blunt papillae
- provides for continued fermentation and absorption, and regulation of onward propulsion between the reticulum and abomasum
- usually found packed tightly with rather dry roughage that are ground by papillae

## Abomasum

- provides true stomach functions
- first glandular portion of ruminant digestive system
- terminal portion is the pylorus, a sphincter, that joins with the junction at the small intestine
- peristaltic contractions
- activity depends to some extent on the contents of the duodenum

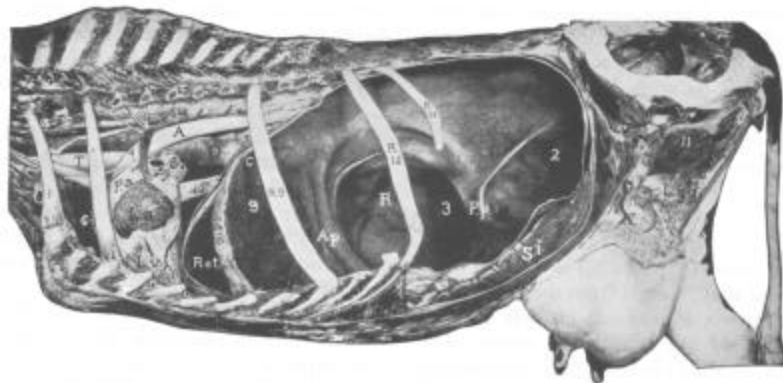


Fig. 18-10. Deep dissection of Holstein cow; left side. Ribs 9, 12, and 13 (rib thirteen had no costal cartilage) retained for landmarks on rumen.

A, Aorta; A.p., cranial pillar of rumen; C, cardia; L.a., left auricle; L.g., caudal mediastinal lymph gland; L.v., left ventricle; O, esophagus; P.a., pulmonary artery; P.p., caudal pillar of rumen; R, rumen; Ret., reticulum; R.9, R.12, R.13, ribs, 9, 12, and 13; S.i., small intestine; T, trachea; U, left bronchus (opening of pulmonary artery to left of U); 1, first rib (brachial vessels to left of 1); 2, 3, caudal blind sacs of rumen; 4, vagus nerve (recurrent branching off and passing over the ligamentum arteriosum below 4); 5, thoracic duct; 6, right auricle; 7, pulmonary veins; 8, lateral attachment of rumino-reticular fold; 9, rumino-reticular opening; 10, posterior vena cava; 11, subpelvic tendon.

## **Rumination**

Process that permits an animal to forage and ingest food rapidly then complete the chewing at a later time

- Reflex initiated by mechanical stimulation of receptors in the mucosa of the reticulum and rumen in the areas of the cardia

### 1. Regurgitation

- Preceded by contraction of the reticulum
- Cardiac sphincter at the junction of esophagus and stomach relaxes as the bolus of food reaches it
- Parasympathetic stimulation tends to cause sphincters to relax and other parts of the digestive tracts to increase activity
- This is followed immediately by an inspiratory movement with the glottis closed
- Negative pressure produced in the thorax by the movement is transmitted to esophagus causing the thoracic esophagus and cardia to dilate
- The lower pressure in the esophagus as compared to the rumen coupled with reverse peristalsis causes a quantity of material (semi-fluid ingesta) to pass through the cardia → esophagus → mouth

### 2. Remastication

- More leisurely than initial chewing
- Cattle ruminate about 8 hours/day
- One rumination cycle per min

### 3. Resalivation

- Mixes bolus with more saliva

### 4. Redeglutition

- Swallowing of bolus

Eventually, bolus that has soaked enough and been finely divided enters omasum through the reticulo-omasal orifice

OR

Bolus may skip directly into abomasum via omasal groove

This process is not well understood

- Because of the bacteria in rumen, bolus is fermented
- By-product of fermentation is carbon dioxide and methane gas
- Eructation: process by which gas from the forestomach is removed by way of esophagus to the pharynx
- Bloat:
  - failure of eructation mechanism
  - can use detergents to increase surface tension to eliminate
  - bubble formation