

Veterinary Bioscience:

Digestive System



LECTURE 6

THE COMPOUND STOMACH OF RUMINANTS

LECTURER

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INTENDED LEARNING OUTCOMES

At the end of this lecture, you should be able to:

- Apply an understanding of the position of the forestomachs within the abdominal cavity, in order to integrate the structural features of the different chambers with their function.
- Utilise your knowledge of the anatomy of the ruminant forestomachs in order to determine the nature of displacements or obstructions when they occur.
- Apply an understanding of the relationship of the forestomachs with other abdominal organs and structures, in order to relate this to the potential for the development of disease in neighbouring structures.

KEY WORDS

Stomach; reticulum; rumen; omasum; abomasum; digestion.

LECTURE OVERVIEW

The compound stomach functions to act as a fermentation chamber where fodder (composed of complex carbohydrates) is broken down into useable metabolites by symbiotic micro-organisms. It has four compartments, the relative sizes of which vary with age, in correlation with the nature of the food ingested. It occupies almost three quarters of the abdominal cavity and fills almost the entire left half of the abdominal cavity in the adult animal, extending from diaphragm to pelvic inlet and extending considerably over the median plane into the right half.

It has four compartments which are grouped into the fore-stomach (or proventriculus) which is non-glandular, and consists of the **rumen**, **reticulum** and **omasum**; and the **abomasum** which is glandular.

At birth, the abomasum is the largest compartment, but in the adult, the rumen is the largest. In cattle, the reticulum is the smallest compartment and lies on the left side cranial to the rumen. The omasum lies on the right side of the rumen and reticulum, and in sheep, this is the smallest compartment. The abomasum is somewhat elongated and lies on the abdominal floor.

Reticulum

The reticulum (or 'honeycomb') is the most cranial compartment and lies on the left side. It serves as a sieve for coarse material, also absorbs fatty acids, water, salts, etc. It passes coarse material back to the rumen and fine material to the omasum by very forceful contractions.

Rumen

The rumen fills the left half of the abdominal cavity and contributes ~80% of total stomach capacity. It is divided into several compartments (sacs) by thickened pillars, corresponding to grooves on the outside. Ruminal contractions mix the ingesta and furthers the process of microbial fermentation releasing volatile fatty acids and gases. The lining of the rumen is also adapted to absorb volatile fatty acids, sodium and water. Papillae increase the surface area for absorption and assist mixing of ingesta.

Omasum

The omasum (the 'butcher's bible') contributes ~ 7-8% of total stomach capacity in the cow (smallest compartment in the sheep and goat), and lies mainly on the right of the midline. It lies between the rumen and reticulum on its left and the liver and body wall on its right. It is spherical to ellipsoidal in shape, but somewhat compressed, having greater and lesser curvatures. The omasum serves as a two-stage pump for transfer of ingesta from the reticulum to the abomasum and as a sieve for quality control separation. It also absorbs fatty acids, water, salts.

Abomasum

The abomasum is the 'true stomach', equivalent to the simple stomach of carnivores. It is rich in glands that produce digestive enzymes and HCl for digestion and mucus for protection. It is a somewhat elongated sac which chiefly lies on the abdominal floor - insinuated between the ventral sac of the rumen and the reticulum; the caudal end is flexed around the lower pole of the omasum. The abomasum also contributes ~ 7-8 % of total stomach capacity in the cow.

FURTHER READING

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