

## DIGESTIVE SYSTEM OF RUMINANT ANIMALS

Ruminant animals like cattle, sheep and goat feed mainly on grasses and they can ruminate or chew the cud because of the complex nature of their stomach which is divided into four compartments-**rumen**, **reticulum**, **omasum** and **abomasum**. **All ruminants are herbivores** e.g. cattle, sheep, goat, horse, donkey, deer, **but not all herbivores are ruminants**. The digestion in ruminant can be summarized as follows:

- **Mouth:** This consists of the teeth, tongue, salivary gland. The ruminant gathers grass with its tongue, holds it tightly with the teeth and pulls off a small quantity, which is hurriedly chewed before swallowing. Digestive enzymes in the mouth have no time to act at this stage.
- **Oesophagus:** The food (grass) passes from the mouth into the rumen through the oesophagus.
- **Rumen (pouch):** This is the first and the largest stomach. It has several tongue-like projections called “papillae” and a soft towel-like appearance. These are the features which adapt it to the digestion of roughages. The rumen contains billions of bacteria and over 1 million protozoa.



Its functions include:

- ✓ Fermentation, which is brought about by microorganisms
  - ✓ Temporary storage of food before regurgitation
  - ✓ Production of volatile fatty acids (VFA) and other gases as a result of fermentation
  - ✓ Absorption of the VFA through its walls
  - ✓ Production of some vitamins e.g. vit. B
  - ✓ Breakdown of cellulose
  - ✓ Detoxification of toxic compounds
- **Reticulum:** This is the second stomach which is lined with a mucosal layer. The mucosal layer is formed into hexagonal chamber which looks like honey comb. The food stays here for a very short time, from where the food then moves by a process of **regurgitation** or by anti-peristaltic movement to the mouth through the oesophagus. At this stage, the ruminant is said to be **chewing its cud**. The food is then chewed into a semi liquid form which is now swallowed in bits and moves into the omasum.

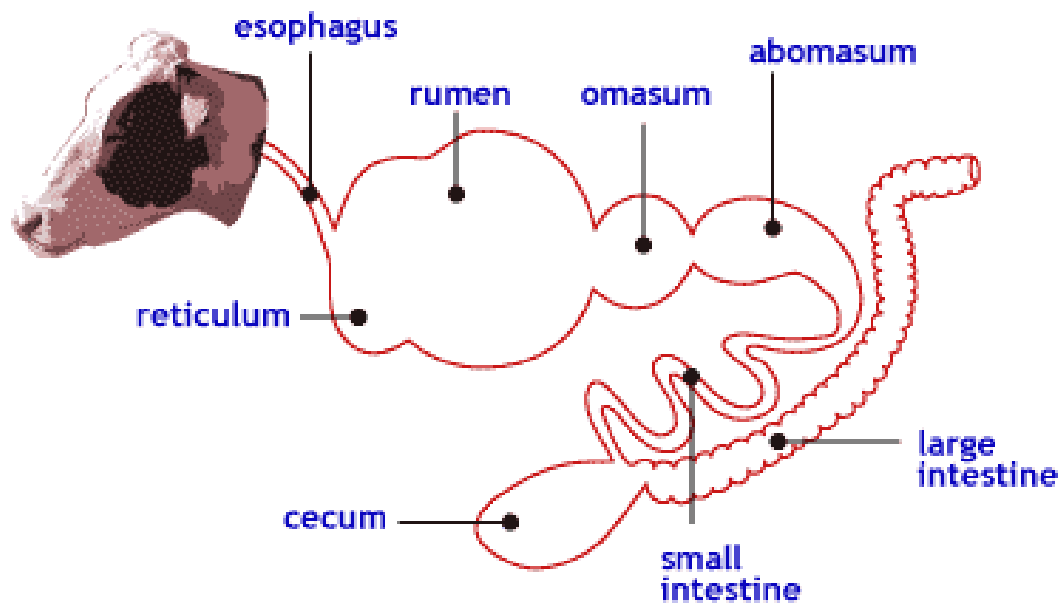
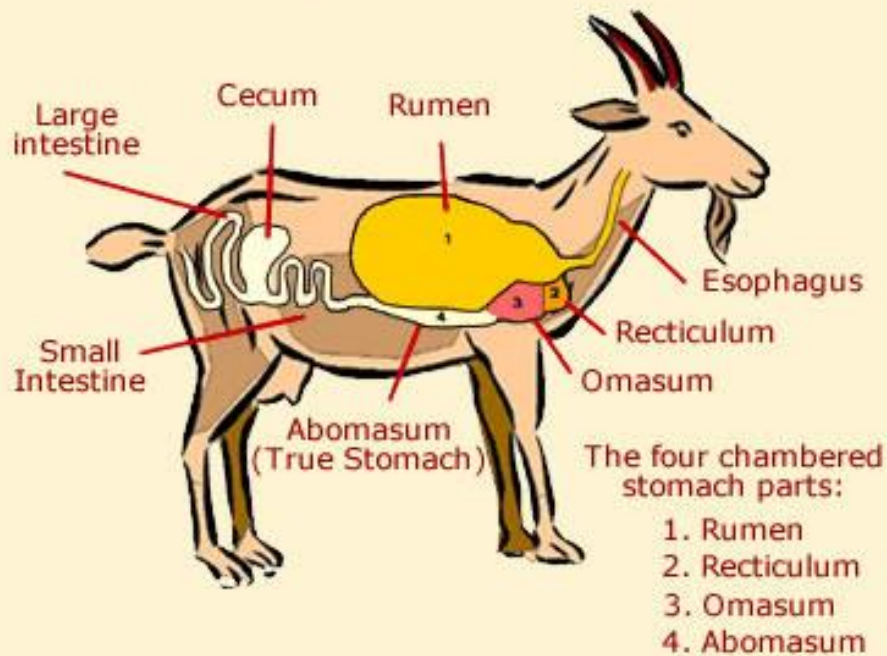


- **Omasum:** This is also known as **manyplies** or **psalterium**. It is the third and the smallest stomach, where the food stays for some time and later moves into the fourth stomach called abomasum. The many folds of the omasum serve to squeeze out the water from the feed, so that majority of the water doesn't 'escape' into the rest of the digestive tract but remains in the rumen.



- **Abomasum:** This is the fourth stomach and the last compartment. It is **the only true (glandular) stomach**. Its functions are similar to what obtains in the monogastric or simple stomach animals. Gastric juice is secreted which contains pepsin and renin. Pepsin acts on protein and converts it to peptone while renin curdles milk protein by converting casein into caseinogen. The solid paste now goes into the duodenum as chyme.
- **Intestines:** These comprise the duodenum, ileum and colon. These perform the same functions as in monogastric animals.
- **Caecum:** This area houses symbiotic bacteria called cellulase which help in the digestion of cellulose. Part of the digested cellulose is utilized by the bacteria and the remaining is reabsorbed into the blood stream of the ruminant.
- **Anus:** The undigested food is now passed out as dungs through the anus. Animal dung serves as good source of manure for enriching the soil.

## Goat digestive system



## DIFFERENCES BETWEEN MONOGASTRIC AND RUMINANT DIGESTIVE SYSTEMS



<b>MONOGASTRIC</b>	<b>RUMINANT</b>
❖ Have simple, one chambered stomach	❖ Have complex, four chambered stomach
❖ They cannot digest cellulose because the necessary microbes are absent	❖ They can digest cellulose due to the presence of the necessary microbes
❖ They feed mostly on concentrates	❖ They consume mostly roughages like grasses and legumes.
❖ They cannot synthesize their protein. Supplementary feeding is required.	❖ They can synthesize their protein.
❖ The cost of feeding (buying concentrates) is too high.	❖ The cost of feeding is very low.
❖ Digestion is not aided by bacteria	❖ Digestion is aided by bacteria.
❖ They do not regurgitate	❖ They regurgitate
❖ They have incisors and canines	❖ No incisors

#### **DIFFERENCES BETWEEN RUMINANT AND POULTRY DIGESTIVE SYSTEMS**

<b>RUMINANTS</b>	<b>POULTRY</b>
❖ Possess complex stomach	❖ Possess simple stomach
❖ Feed on high fibres (grasses)	❖ Feed on low fibres e.g. maize
❖ Have teeth	❖ Have no teeth

❖ Have no crop	❖ Have crop
❖ No gizzard	❖ Have gizzard
❖ Can regurgitate	❖ Cannot regurgitate food.

### CIRCULATORY SYSTEM IN FARM ANIMALS

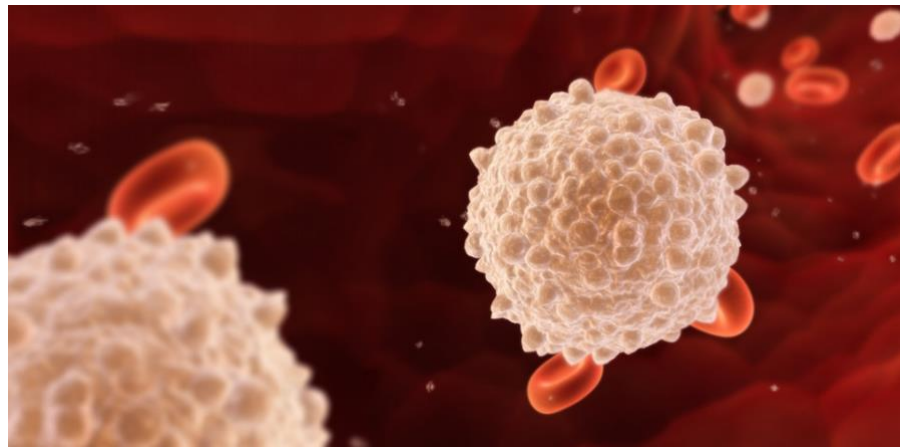
Circulatory system is concerned with the transportation of certain blood substances round the body of the animal. It consists of the heart, the blood vessels (arteries, capillaries and veins) and the blood itself.

**THE BLOOD:** This is the only circulatory tissue and it consists of the liquid part called **PLASMA** and the cells or particle-like part called **CORPUSCLES** also known as **blood cells**. There are three types of blood cells:

1. **Red blood cells (Erythrocytes):** These are biconcave in shape. They are responsible for the absorption and transportation of oxygen round the body and also carrying CO<sub>2</sub> from the body to the lungs for excretion. They have no nucleus and are manufactured at the marrows of long bones. They contain haemoglobin. Their life span is 3-4 months (i.e. 90-120 days)



2. **White blood cells (Leucocytes):** They have no shape and are manufactured at the lymph, spleen and bone marrows. They have a nucleus and their main function is to prevent foreign bodies from contaminating the animal's body. They also help to build immunity against disease attack.



3. **Blood platelets (Thrombocytes):** They are also manufactured at the marrows of long bones and ribs. They are spherical in shape and have no nucleus. Their major function is clotting of blood.



N.B: A sex-linked disease in which there is difficulty in clotting of blood is called HAEMOPHYLIA.

**Blood Plasma:** This consists of substances like protein (e.g. fibrinogen), prothrombin, food substances, hormones, water, waste products etc. Plasma is colourless and it carries the RBC, WBC and the blood platelets.

### **FUNCTIONS OF THE BLOOD**

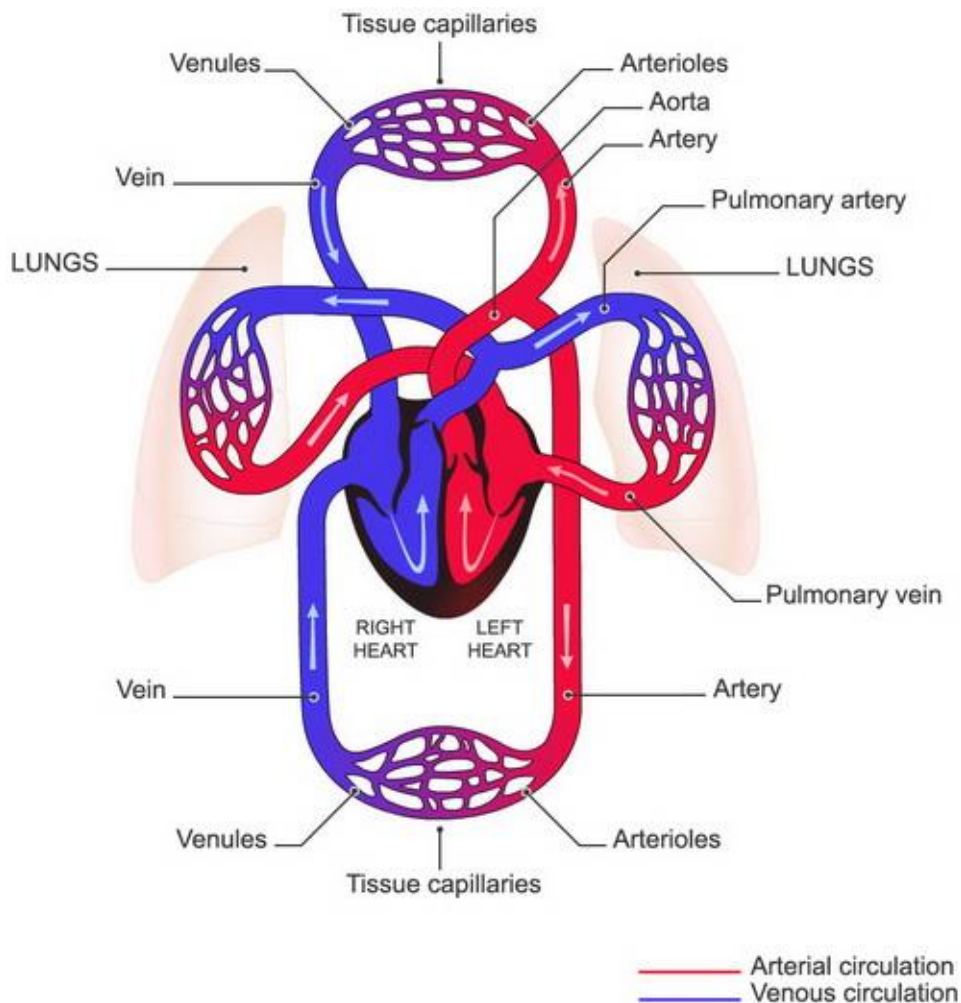
- ♣ Transport of O<sub>2</sub> with the help of haemoglobin.
- ♣ Distribution of heat around the body.
- ♣ Transport of waste products of metabolism e.g. CO<sub>2</sub>, urea, to where they are removed.
- ♣ Carries digested food substances from the alimentary canal to their areas of absorption in the body.
- ♣ Helps to fight against germs with the help of WBC.
- ♣ Maintains the water content of the body.
- ♣ Helps in blood clotting with the help of platelets.

### **The Blood Vessels**

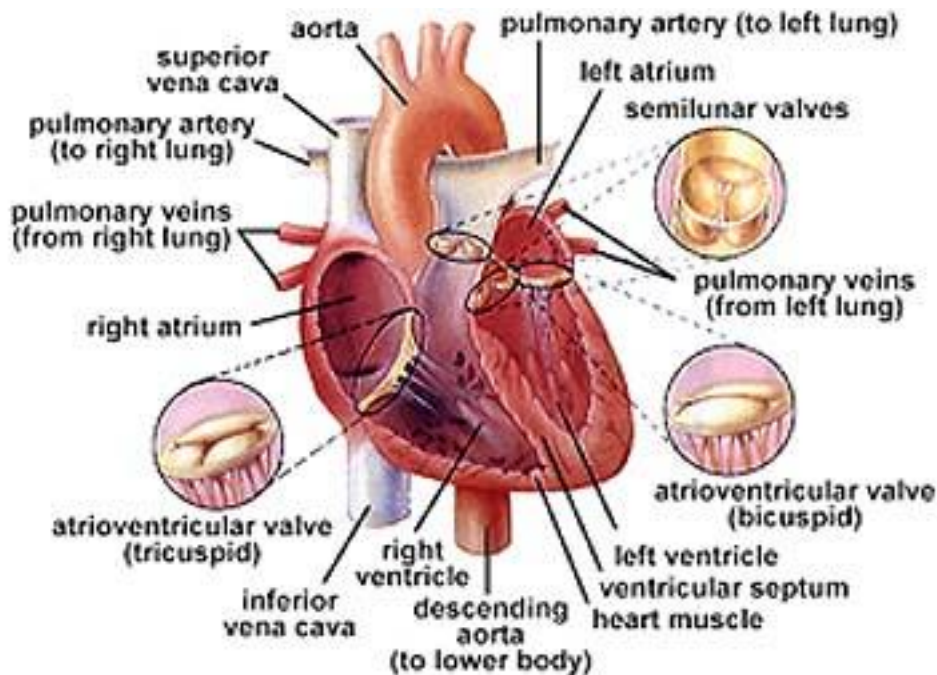
There are three major blood vessels:

1. **Arteries:** They carry blood away from the heart to the body. The largest artery is called AORTA. Arteries are further divided into ARTERIOLES. Arteries have thick, muscular and elastic walls which enable them to withstand the high pressure of the blood they carry.
2. **Veins:** They carry blood back to the heart. The blood in them is at a low pressure. Hence, their walls are not as thick, muscular and elastic as those of the arteries. Veins are subdivided into VEINULES. The largest veins are the ANTERIOR AND POSTERIOR VENA CAVAE which enter the right auricle of the heart.
3. **Capillaries:** They are microscopic blood vessels which form a network that link the arterioles and the veinules. The blood in the capillaries is at a higher pressure at the arteriole end than at the veinule end.

**ASSIGNMENT:** State five differences between arteries and veins (in a tabular form)



**THE HEART:** This is located at the pericardia region of the thoracic cavity. The heart muscles are known as the CARDIAC muscles. The working system of the heart is known as the HEART BEAT. The heart of mammals is divided into four chambers namely: **Right Auricle, Right Ventricle, Left Auricle, Left Ventricle**. Blood flows in one direction in the heart.



The Pathway of Blood Flow Through the Heart Animated Tutorial..mp4

Farm animals possess a **closed circulatory system**. This means that there is no mixing of oxygenated blood and deoxygenated blood in the heart. Farm animals also display a pattern of **double circulation**. This means that for one complete circulation, blood has to pass through the heart twice, each time going through a separate pathway. The two pathways are:

1. Pulmonary circulation: whereby blood moves from the heart to the lungs and back to the heart.

2. Systemic circulation: whereby blood flows from the heart to all other parts of the body and back to the heart.