

ANATOMY AND PHYSIOLOGY OF FARM ANIMALS

Anatomy is the part of agricultural biology that deals with the study of the structure and form of the body while **Physiology** is another branch that studies or deals with the study of the functions of various parts of the body. This is important for the farmer because it will enable him to know more about the nutrition, reproduction and management of his animals.

The body of farm animals is divided into four major groups:

1. **Head:** It is found at the upper part of the body. The brain, the eyes, the ears, the tongue, the nose etc. are some of the major organs found in this region.
2. **Thoracic cavity:** This refers to the chest region. The heart, the lungs, the trachea are some of the organs found in this region.
3. **Abdominal cavity:** This refers to the stomach/abdominal region. The organs found here include liver, uterus, stomach, oviduct or fallopian tube, kidney, spleen, gall bladder, intestine, pancreas etc.
4. **The limbs:** This includes the fore limbs and the hind limbs.

ANIMAL BODY SYSTEMS

These include:

- a) Digestive System
- b) Circulatory System
- c) Respiratory System
- d) Nervous System
- e) Reproductive System
- f) Excretory System

DIGESTIVE SYSTEM

Digestion is the process by which insoluble food substances are broken down into simple soluble and absorbable compounds. It occurs within the alimentary canal which consists of the mouth (enclosing the tongue, teeth and salivary gland), the oesophagus, duodenum, stomach, the intestines etc.

Farm animals show variation in the structure and functions of the stomach. Cattle, sheep, goat have stomach with four chambers. Such animals chew the curd and are called **Ruminants**. Domestic fowls, pigs and rabbits have simple stomach. No compartments and the oesophagus leads straight to a single stomach. Such animals are called **Monogastric** or **Non-Ruminant Animals**.

Importance of the Digestive System

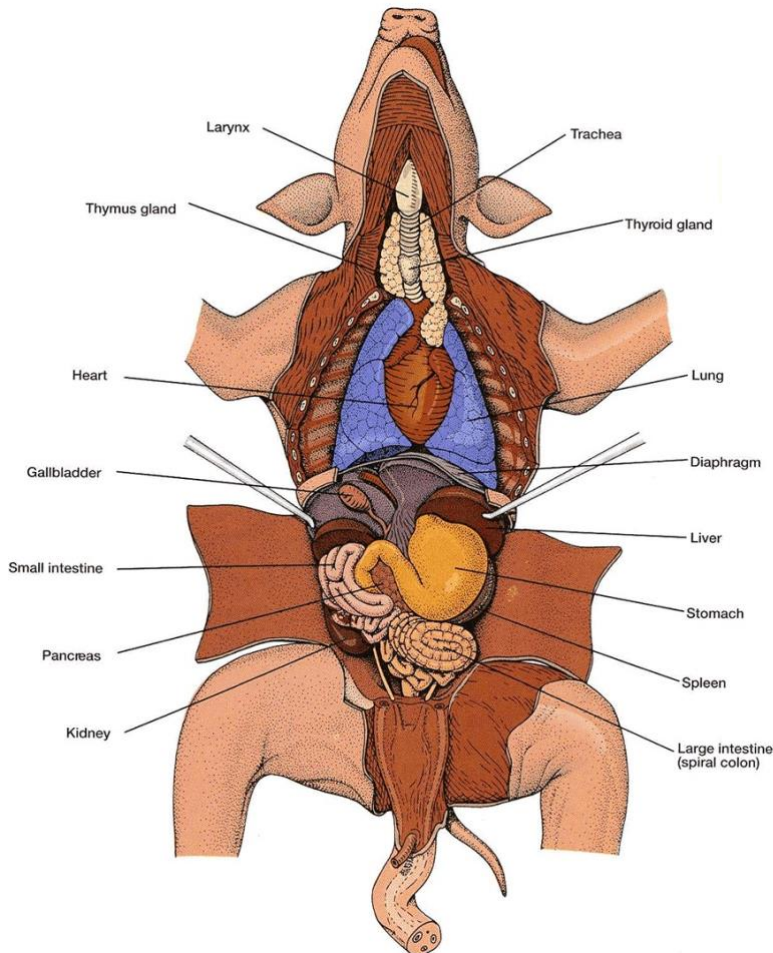
- ✓ It aids ingestion of feed.
- ✓ It promotes the digestion of feed.
- ✓ It ensures the absorption of digested feed.
- ✓ It helps in the egestion of undigested feed.
- ✓ It helps in the secretion of reproductive hormones and digestive enzymes.

MONOGASTRIC DIGESTIVE SYSTEM

The digestive system of monogastric animals include:

1. **Mouth:** Food is ingested through the mouth and masticated into smaller pieces with the teeth. The tongue mixes the food with saliva, rolls into a ball form or **bolus** before swallowing into the oesophagus. The salivary glands in the mouth secrete saliva. The saliva contains the enzyme **ptyalin** or **salivary amylase** which converts starch into maltose.
2. **Oesophagus/gullet:** This is a straight tube which connects the mouth to the stomach. When food enters the oesophagus, its muscular walls contract and force the bolus into the stomach by the means of a wave-like motion called **PERISTALSIS**.
3. **Stomach:** The stomach is a muscular sac which stores food so that it passes on gradually in small quantities into the small intestine for digestion. The stomach secretes the following:
 - a. **Gastric juice:** This is secreted by the gastric hormone. The gastric juice contains hydrochloric acid (HCl). This acid stops the action or the effect of ptyalin and kills numerous bacteria in the food.
 - b. **The enzyme pepsin:** This enzyme begins the digestion of protein, it converts protein to peptides.

- c. **The enzyme Renin:** This curdles milk in infants. It converts casein (milk protein) into caseinogen.
- d. **Mucus:** This prevents the destruction of the stomach walls by the acid and enzyme secretion. Food is churned and mixed in the stomach in the form of watery paste called **CHYME**. The pyloric sphincter at the base of the stomach controls the passage of food into the small intestine.



4. **Small Intestine:** The small intestine is the longest part of the alimentary canal. The first region of the small intestine is called **duodenum** while the remaining section constitute the **ileum**.
 - a. **Duodenum:** As food enters the duodenum, the walls of the duodenum secrete **ENTEROGASTRONE** which is the hormone that stimulates the secretion of digestive juices, from the liver and pancreas.
 - i. **The liver:** The liver secretes **bile** which is a green liquid containing alkaline salt. It neutralizes the effect of the hydrochloric acid of the gastric juice. Bile

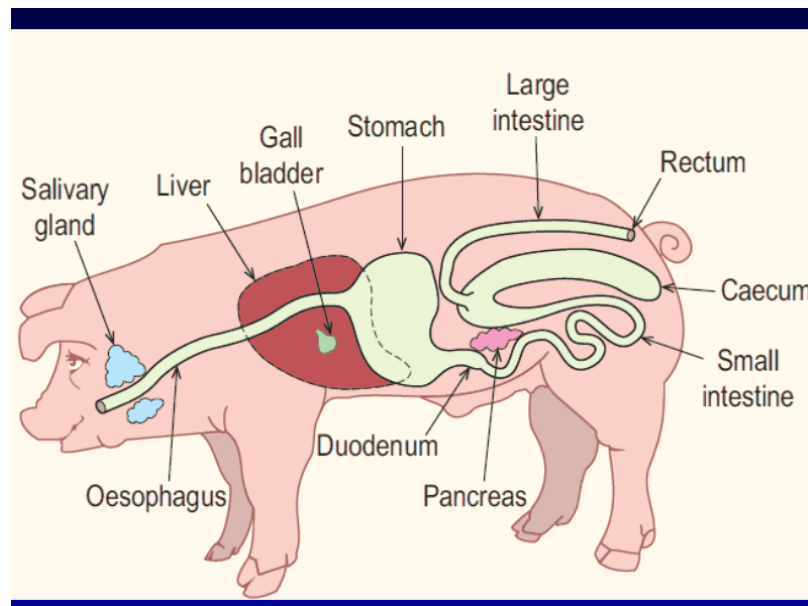
also emulsifies fats and lipids. A gall bladder connected to the duodenum by the bile duct stores the bile which is secreted by the liver.

- ii. **The pancreas:** The pancreas secretes the pancreatic juice and it consists of the following enzymes e.g. **Amylase** which converts starch to simple sugars; **Lipase** this completes the digestion of fats by emulsifying fats into fatty acids and glycerol; **Trypsin** converts peptones into short polypeptides and **amino acids**. All the reactions in the duodenum occur in the alkaline medium.

- b. **Ileum:** The walls of the ileum secrete intestinal juice which is alkaline in nature and it contains the following enzymes:

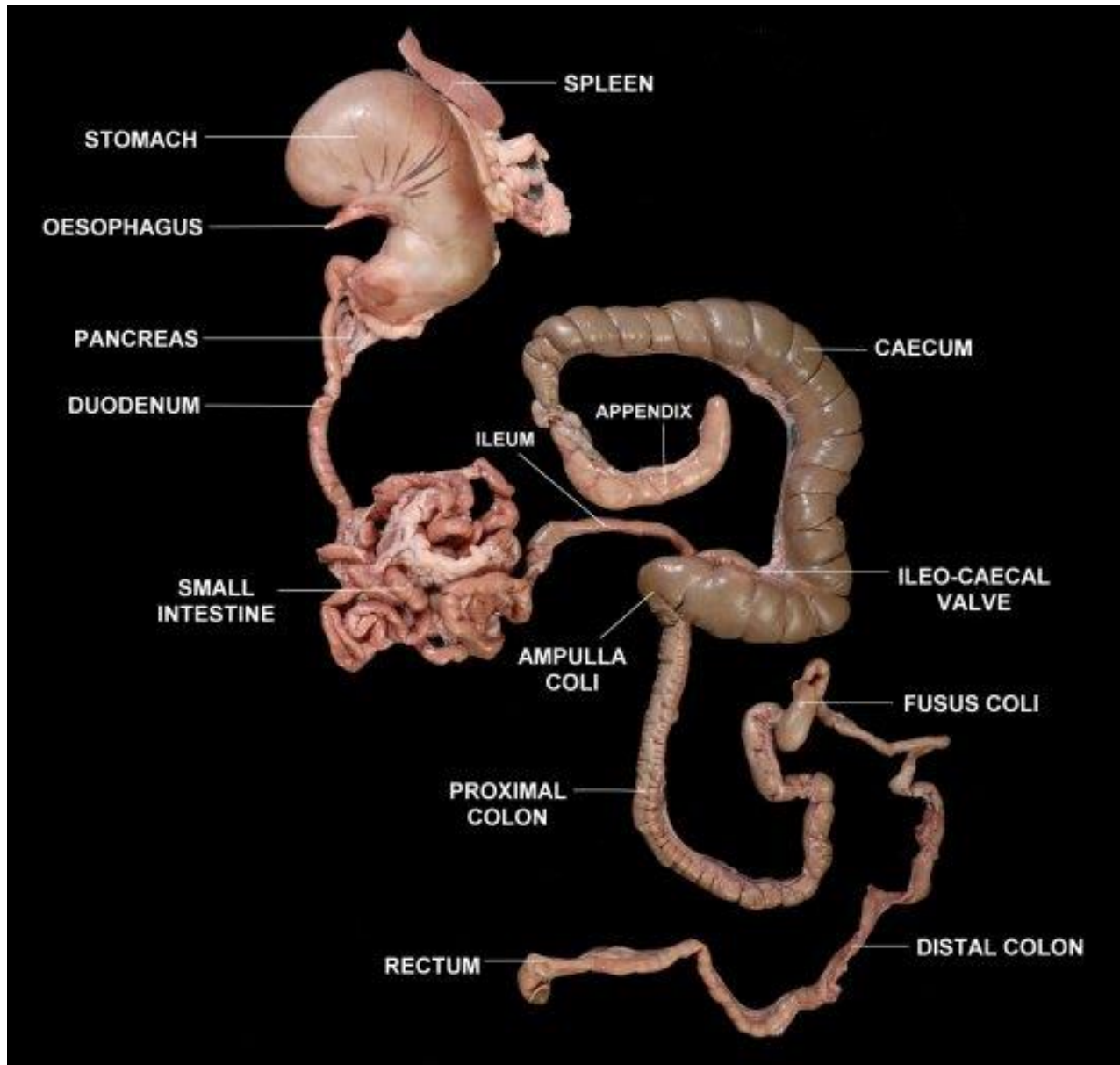
- i. **Maltase:** which converts maltose into glucose
- ii. **Sucrase:** this converts sucrose into fructose and glucose
- iii. **Erepsin:** convert peptides into amino acids
- iv. **Peptidase:** which converts polypeptides into amino acids.
- v. **Lactase:** converts lactose into glucose and galactose.

All other undigested food is carried down into the **large intestine** or **colon**



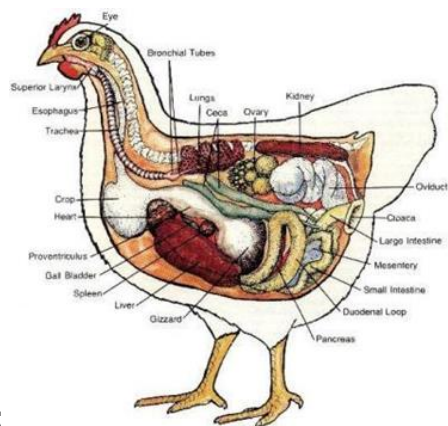
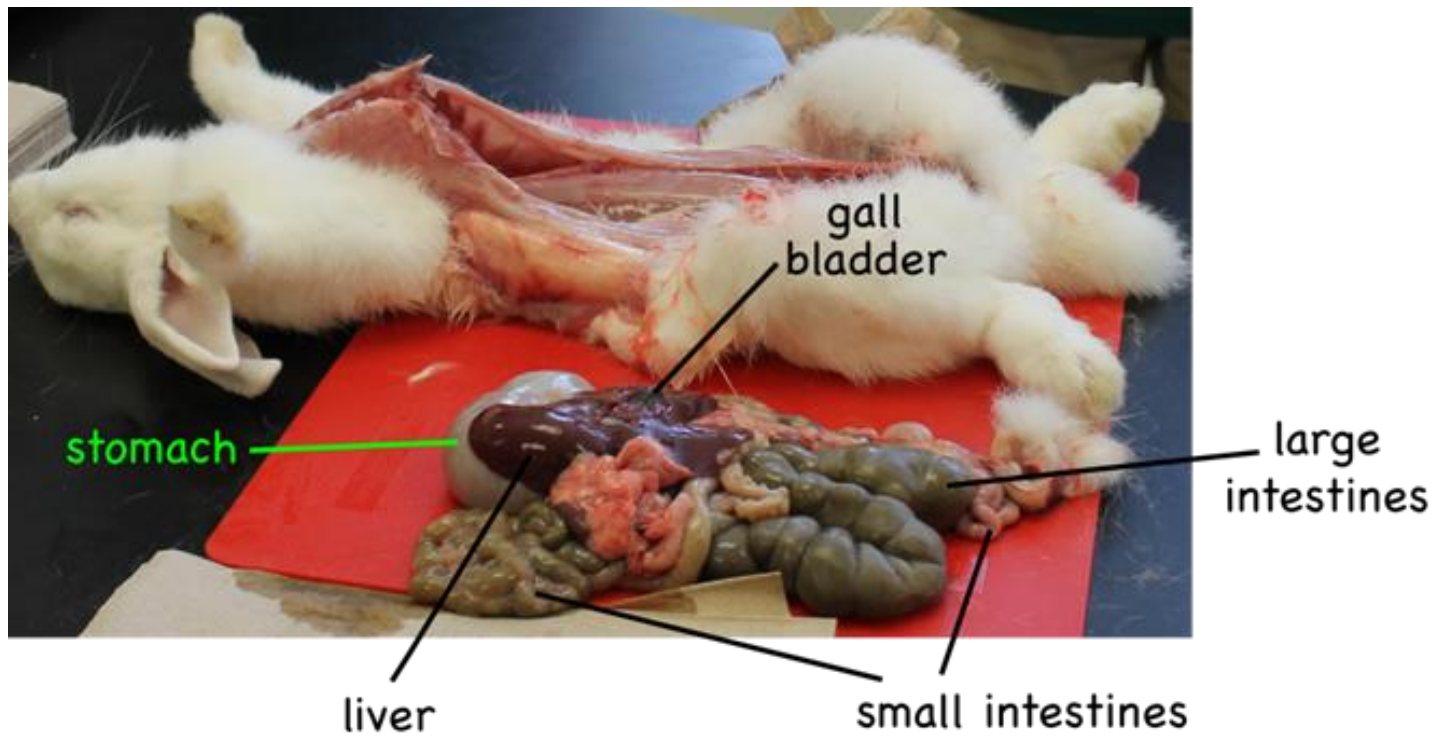
5. Large Intestine: The ileum opens to the large intestine at the **caecum**. In rabbit, (a monogastric herbivore), the caecum is highly enlarged and contains a population of microorganisms (bacteria and protozoa). The microbial population in the caecum secretes the enzyme *cellulase* which digests cellulose (a process called **post-gastric fermentation**). The

microbes also synthesize vitamins and proteins from non-protein nitrogen. This results in soft faeces which is rich in vitamins and protein. The faeces is later consumed by rabbits (a habit called *Coprophagy*).



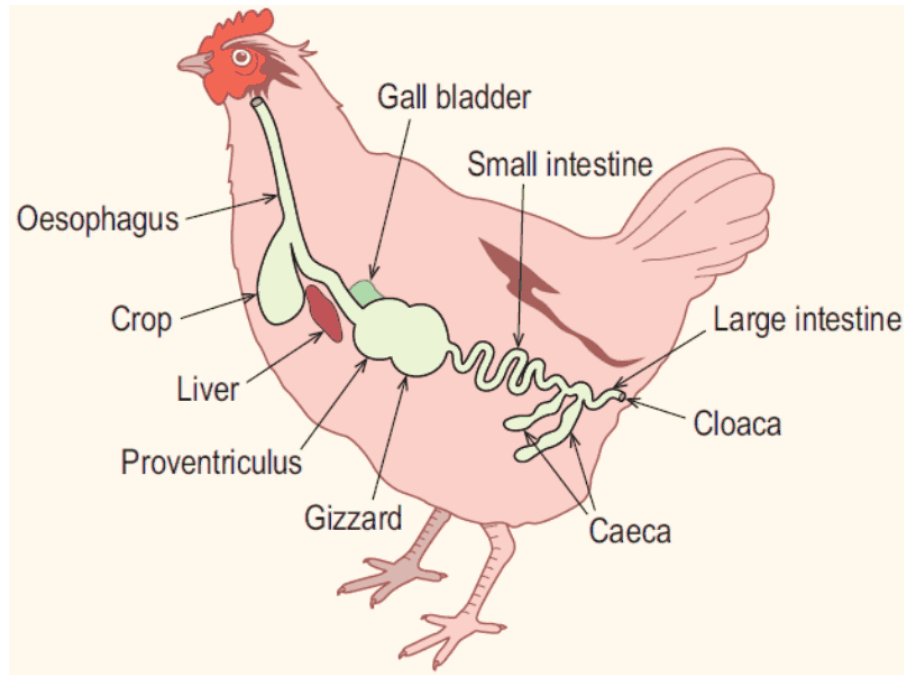
No digestion takes place in the large intestine. It only consists of undigested food, dead cells, surplus bile and other secretions. The undigested food is stored in the rectum and is passed out as faeces through the anus. The large intestine is also concerned with the reabsorption of moisture into the animal's body.

Absorption of digested food takes place in the VILLI.

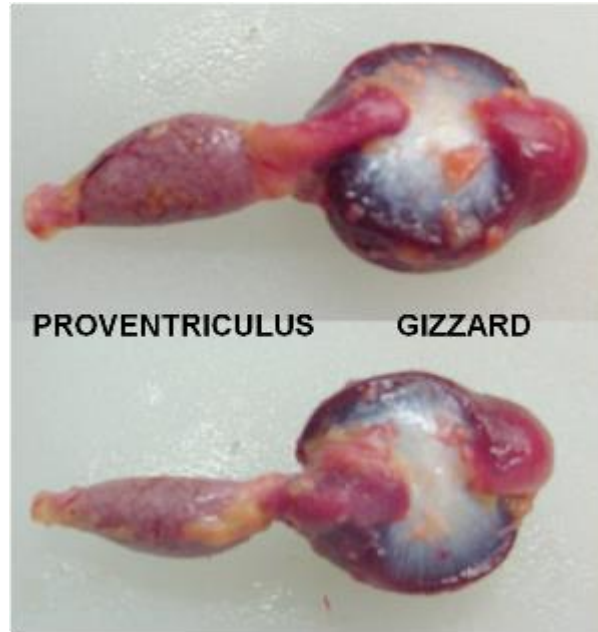


DIGESTION IN BIRDS

Birds are also monogastric animals. Digestion in birds is slightly different from that observed in rabbit and pigs. The alimentary canal consists of the mouth, oesophagus, crop, proventriculus, gizzard, duodenum, ileum, colon, caecum and the cloaca.



- ❖ **THE MOUTH:** There are no teeth, but a pair of beaks which are used to pick up grains (marsh) one after the other. The tongue aids in swallowing food into the oesophagus.
- ❖ **CROP:** This is a sac-like structure which is used for temporary storage of food. Certain bacteria present here help in fermenting the food. The food is then passed through the oesophagus into the proventriculus.
- ❖ **THE PROVENTRICULUS:** This is the first part of the stomach. There is gastric juice which is acidic due to the presence of dilute hydrochloric acid containing an enzyme called **pepsin** which acts on protein and converts it into peptones. The food then moves into the gizzard.
- ❖ **GIZZARD:** This acts as the “teeth” of birds; and helps in the mastication and churning up of food substances. The gizzard is a tough, thick and muscular organ which aids the grinding of food.



From here, food enters into the duodenum, ileum (i.e. small intestine) and later the colon (large intestine). The activities and reactions that take place here are similar to the ones described in pigs and rabbits.

- ❖ **CAECUM** (pl. CAECA): This is two in poultry. The two caeca harbour microorganisms which aid the breakdown of some cellulose into glucose.
- ❖ **CLOACA**: This is the common part of reproduction and ejection of waste product. Birds do not urinate, therefore, their waste products are passed with urine through the vent.

