

Q 7. Give a comparative account of gastrointestinal tract (= alimentary canal) of frog and rabbit.

Ans.

Gastrointestinal tract (= digestive tract) is a tube which runs from mouth to anus. Generally it is a coiled tube which functions in ingestion, digestion, absorption of food and in elimination of undigested wastes. Major subdivisions of the tract are the oral cavity, pharynx, oesophagus, stomach and small and large intestine. Associated with the tract are accessory organs, such as the tongue, teeth, oral glands, pancreas, liver and gall bladder.

Difference in the anatomy of digestive tracts posterior to the pharynx are not so much related with whether the animal lives on land or in the water.

The difference in the digestive tract is due to the nature and availability of food. As for example, in case of herbivores the grass is always available as the mouth is opened. Such a food is to be stored. In carnivores, extensive enzymatic activity and mastication are required. In case of vampire bat, it is readily absorbed after ingestion. This is the reason that the shape of the animal's body is long in Cyclostomes or snake, the tract is relatively straight. On the other hand, if the trunk is short, as in frog and turtles, the absorbed surface of intestine is increased by making it coiled. Some fishes have a spiral valve that increases the absorption area without the need of the coil. In some fishes the tract is ciliated while in birds caeca are developed.

I. Gastrointestinal tract of Amphibia e.g., Frog (*Rana tigrina*) :

1. Alimentary canal of frog is a long and coiled tube.
2. Mouth is a wide aperture which is bounded by upper and lower lips.
3. Mouth opens into buccal cavity. The columnar epithelium lining consists of mucous glands are not found in it. Lower jaw is devoid of teeth, but in upper jaw teeth are found on premaxillae and maxillae bones.
4. The dentition is homodont (= all teeth are similar) and acrodont (= not in socket). polyphiodont (= teeth are replaced several times) conditions are found.
5. A bifid, muscular tongue is found in the mouth cavity.
6. Posteriorly the buccal cavity passes without demarcation into a short pharynx. Various apertures like, glottis, Eustachian aperture, opening of vocal sacs etc. open into pharynx.
7. Oesophagus is a short, wide and muscular tube. It enlarges to merge with stomach in the peritoneal cavity.
8. The stomach is a large (about 4 cm long), broad and slightly curved bag-like structure. Its large broader anterior part is called cardiac stomach, while the short narrow posterior part is known as pyloric stomach. Its mucous epithelium contains several gastric glands. The posterior end of stomach is slightly constricted and its opening into small intestine is guarded by a circular ring-like sphincter muscle, called pyloric valve.
9. Small intestine is a long, coiled and narrow tube, about 30 cm long. It is attached mid-ventrally to body wall by mesenteries. Its anterior part is called duodenum and the posterior part is known as ileum. Duodenum receives a common hepato-pancreatic duct from liver and pancreas. Ileum is the longest part of alimentary canal and makes several loops before joining the rectum. The internal mucous lining forms many longitudinal folds, but there are no villi and definite glands and crypts.
10. Large intestine is a short, wide tube of about 4 cm length. It runs straight behind to open into cloaca by anus. Anus is guarded by an anal sphincter. Cloaca opens outside by the cloacal aperture.

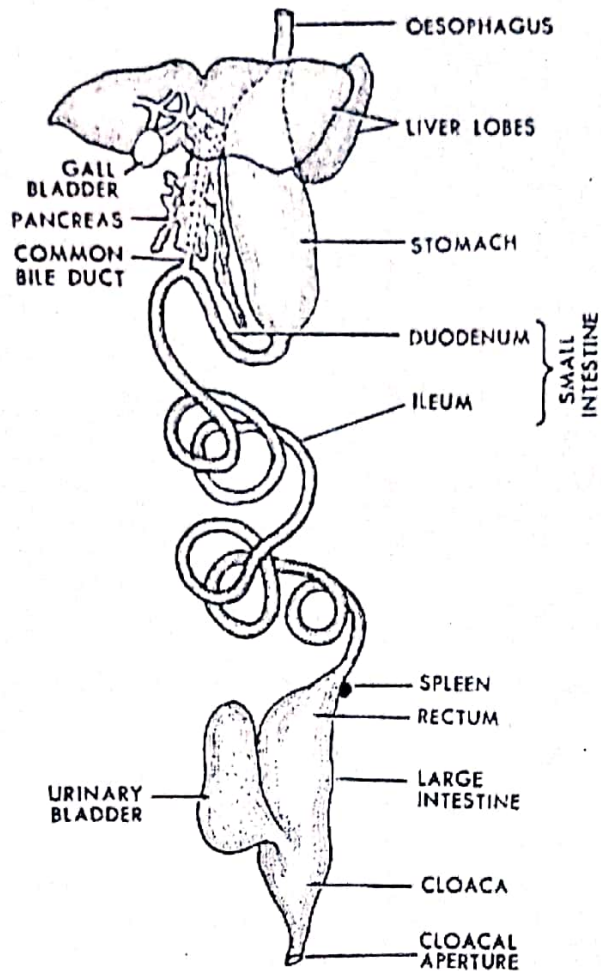


Fig. Alimentary canal of frog.

11. Liver and pancreas are the most important gastric glands besides the gastric and intestinal glands. Liver of frog consists of 3 lobes- left, right and median. It is a reddish-brown in colour and located closed to the heart and lungs. Pancreas of frog is a much branched, irregular, flattened and yellow-colored gland lying between stomach and duodenum.

II. Gastrointestinal tract of Rabbit (*Oryctolagus cuniculus*) :

1. The mouth is relatively small. It is bordered by two soft, fleshy and movable lips. The upper lip is divided by a median vertical cleft, running up to the nostril. The mouth opens into a narrow, vertical, slit-like space, called vestibule.

2. The vestibule leads behind into the oral buccal cavity. It is lined with mucous membrane. The roof of the buccal cavity is formed by the palate. Its anterior part is called the hard palate and the posterior one is known as soft palate. The hard palate divides the original buccal cavity into an upper nasal passage and a lower food passage. Most of the floor of the buccal cavity is occupied by a large, mobile and muscular tongue. Teeth are present on both the jaws. Teeth are thecodont, i.e., firmly embedded in cup-like socket of the jaw bones. Teeth of rabbit are diphyodont (= two sets are present throughout life). Teeth are also heterodont (= different types).

3. Posterior part of buccal cavity is called pharynx. The soft palate divides the pharynx into nasopharynx, oropharynx and laryngopharynx. The floor of laryngopharynx

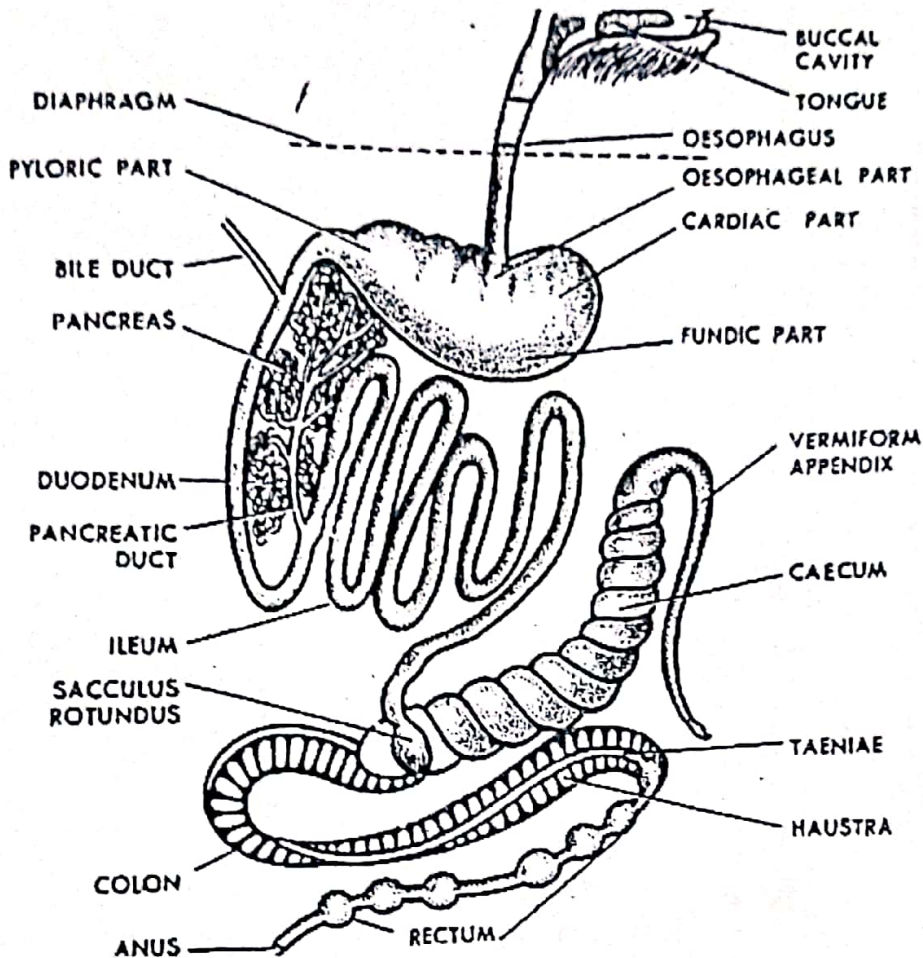


Fig. Alimentary canal of Rabbit.

carries a median vertical slit (= opening), called glottis. The laryngopharynx leads posteriorly into the oesophagus through a wide aperture, called gullet.

4. The oesophagus is a long, narrow elastic and muscular tube. It runs straight down through the neck dorsal and parallel to the trachea. After piercing the diaphragm, it enters the abdomen and joins the stomach. The inner wall of oesophagus consists of several longitudinal folds.

5. The stomach of rabbit is bean-shaped. It is situated on the left side in the anterior part of the abdominal cavity. The smaller inner concave surface is known as lesser curvature, while the larger outer surface is called greater curvature. The larger anterior part of stomach is known as the cardiac stomach and the smaller posterior part as the pyloric stomach. The pyloric stomach posteriorly meets the duodenum.

6. The small intestine is a long, narrow and much convoluted tube. It can be differentiated into anterior duodenum, middle jejunum and posterior ileum. Duodenum is the smallest part. It forms the typical U-shaped loop containing the pancreas. The wall of duodenum contains crypts of Lieberkuhn and Brunner's gland. There is no clear morphological demarcation between jejunum and ileum. Both are more than 2 meters long and greatly coiled. Their internal lining is provided with villi. The distal end of ileum is expanded to form a small spherical sac, called sacculus rotundus. It opens into the caecum through an ilio-caecal valve.

7. A wide, about 50 cm long, thin-walled tube is present at the junction of ileum and colon. It is called caecum. It terminates into a small, about 15 cm long blind tube, known as vermiform appendix.

8. The large intestine is more than one meter long and consists of two regions- anterior colon and posterior rectum. Rectum opens to the outside through anus, situated at the base of the tail.

9. The glands associated with the digestive tract are mucous, salivary, gastric glands, liver, pancreas and intestinal glands. Mucous glands occur throughout the mucous lining of the alimentary canal. There are four pairs of salivary glands. Parotids glands are situated at the base of external ears, Infra-orbital glands lie below the orbits, sub-mandibular near the angles of mandible and sub-lingual below the tongue. Gastric glands are found in the mucous membranes of stomach.

10. The liver is relatively large. It is partially divided into 5 lobes. Three lobes are on the left side. These are small spigelian, left lateral and left central. The two lobes on the right side are caudate and right central. An elongated dark green thin-walled gall bladder is embedded on the posterior face of right central lobe.

11. The pancreas is an irregularly branched pinkish gland held in the U-shaped duodenal loop. Its single duct opens into the distal limb of duodenum.

12. Numerous, microscopic, simple and tubular intestinal glands are found in the mucous lining of the small intestine. They open at the base of the villi.

Comparison :

1. The internal mucous lining in frog forms many longitudinal folds, but there are no villi and definite glands and crypts.

2. The tongue of frog is bifid, while in rabbit it is straight.

3. The teeth of rabbit differ from those of frog in several aspects. Teeth are thecodont, i.e., firmly embedded in cup-like socket of the jaw bones. Teeth of rabbit are diphyodont (= two sets are present throughout life). Teeth are also heterodont (= different types). But in frog teeth are acrodont, homodont and polyphyodont.

4. The stomach of frog is without fundus and caecum.

5. The liver of frog has 3 lobes, but in rabbit it has 5 lobes.
