Topic: Feeding mechanism and digestion in Amphioxus

FEEDING MECHANISM AND DIGESTION IN AMPHIOXUS

Mechanism of Feeding and Digestion in Amphioxus (Branchiostoma):

Food:

Amphioxus is a microphagous animal. The food or 'sea soup' consists of protozoans, algae, diatoms and other organic particles.

Feeding:

Amphioxus (Branchiostoma) obtains food by filtering the stream of waters that enters the pharyngeal cavity. The wheel organ produces a vortex. The buccal cirri become curved to form a sieve to prevent the entry of large particles. The sensory papillae in the buccal cirri and velar tentacles act as chemoreceptors and taste the nature of the food particles and also estimate the size of food particles.

If food particles are large in size or liable to cause toxicity, these are expelled by the forceful expulsion of the water from the pharyngeal cavity. The ingress of water into the pharyngeal cavity through the mouth is controlled by the velum.

The pharynx plays the most important role in food collection. The major portion of the water passes out into the atrium through the gill-slits. The cilia present on the gill-bars beat to drive the water out into the atrium and, thus, facilitate the inflow of fresh water current through the mouth.

The food particles, due to their own weight, begin to fall on the floor of the pharyngeal cavity and are entangled by the sticky secretion of the mucus-secreting cells of the endostyle.

The cilia in the endostyle and gill-bars beat to produce an upward current to push the mucus-entangled food particles towards the epipharyngeal groove. The cilia of the endostyle also beat to drive the food along the peripharyngeal-ciliated tracts to the epipharyngeal groove.

The food is pushed backwards by the backward beating of the cilia of the epipharyngeal groove. The secretion of the glandular cells of the endostyle transforms the boluses of mucus- entangled food particles into a cord-like structure, known as food cord.

The food cord from the pharynx passes through the oesophagus into the hepatic diverticulum and midgut where this food cord is subjected to the action of digestive enzymes secreted by the hepatic diverticulum. The food cord from the hepatic diverticulum is pushed backwards by the cilia present in its cavity. The mucus-entangled food cord is rotated by the ciliary action in the ileocolon ring.

Digestion in Branchiostoma is both intracellular as well as extracellular. The intracellular digestion takes place inside the hepatic diverticulum while the extracellular digestion occurs inside the midgut. The secretory cells of the hepatic diverticulum contain zymogen granules and they show phagocytosis, i.e., the cells are able to engulf the food particles from the food cord and digest the food as seen in Amoeba and Hydra.

The phenomenon of phagocytosis is attested by the fact that carmine particles, after ingestion into the diverticulum, are taken inside the cells. The digestive

enzymes in Branchiostoma are amylase, lipase and protease. The digested food is absorbed in the hindgut and the undigested particles are expelled through the anus.

The controlling mechanism of the ciliary mode of feeding in Branchiostoma is not clearly known. The afferent and efferent nerve fibres in the atrium presumably play the important role in feeding. The rate of water current is largely controlled by the intensity of beating of cilia and also the degree of contraction or dilatation of the Inhalant and exhalant apertures.

The different receptors present on the velum and the atrium taste the nature of water current. If the water current contains any toxic substance, the atriopore closes and the water is regurgitated by sudden contraction of the pterygial muscles which form the floor of the atrium. Bone (1979) has shown that after ingestion of sufficient food, the food collection is stopped until the food that has been taken in is digested.

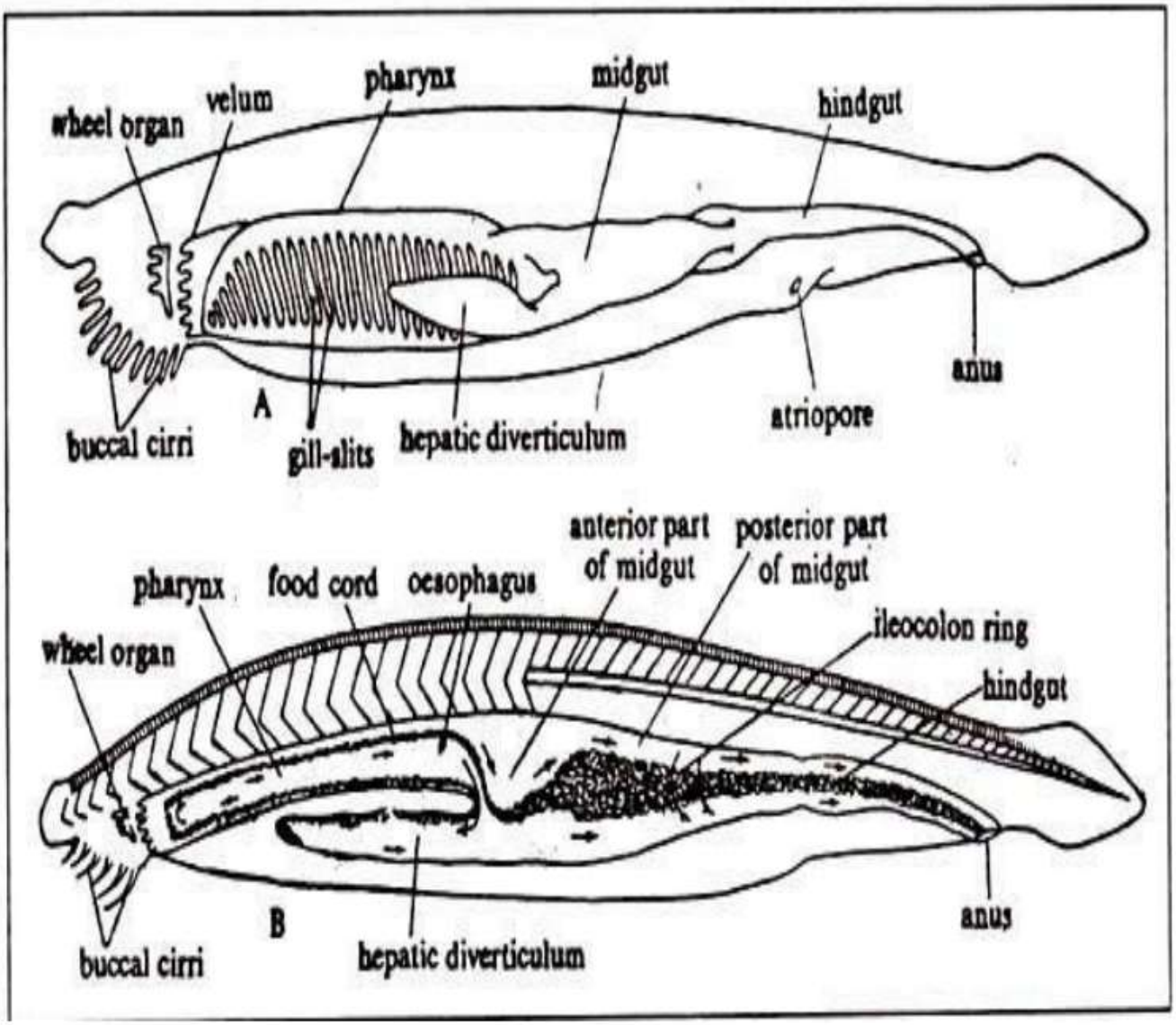

Fig: - A.Digestive system of Branchiostoma

B. Showing the schematic representation of the feeding current through the gut.