TOPIC: AND GENERAL CHARATERISTICS AND CLASSIFICATION OF CEPHALOCHORDATA

LECTURE NO:07

BSC PART 1-PAPER II-GROUP A

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Digestive system

As mentioned above, Amphioxus have oral *cirri*, which are thin tentacle-like strands that hang in front of the mouth and act as sensory devices and as a filter for the water passing into the body.

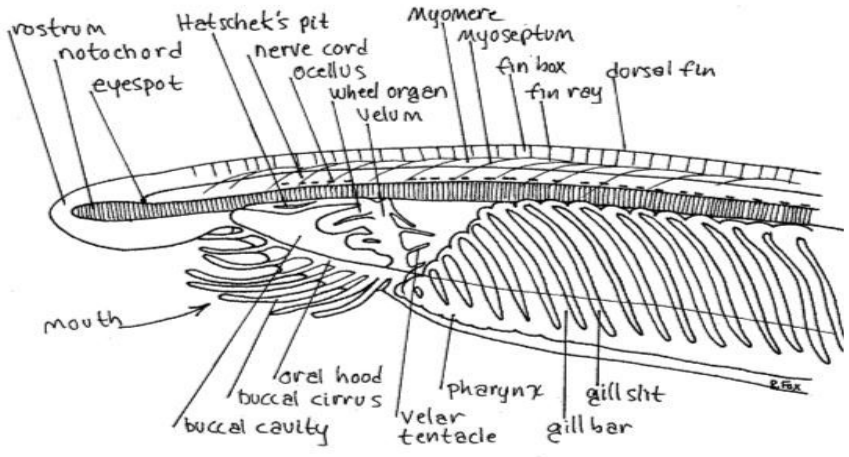

Fig 4.4 Anterior end of Amphioxus body

Water passes from the mouth into the large pharynx, which is lined by numerous gill-slits. The ventral surface of the pharynx contains a groove; called the endostyle.Which is connected to a structure known as

Hatschek's pit, produces a film of mucus. Ciliary action pushes the mucus in a film over the surface of the gill slits, trapping suspended food particles as it does so. The mucus is collected in a second, dorsal, groove, and passed back to the rest of the digestive tract. Having passed through the gill slits, the water enters an atrium surrounding the pharynx, and then exits the body via the *atriopore*.

Both adults and larvae exhibit a "cough" reflex to clear the mouth or throat of debris or items too large to swallow. In larvae the action is mediated by the pharyngial muscles while in the adult animal it is accomplished by atrial contraction.

The remainder of the digestive system consists of a simple tube running from the pharynx to the anus. The hepatic caecum, a single blind-ending caecum, branches off from the underside of the gut, with a lining able to phagocytize the food particles, a feature not found in vertebrates. Although it performs many functions of a liver, it is not considered a true liver but a homolog of the vertebrate liver.

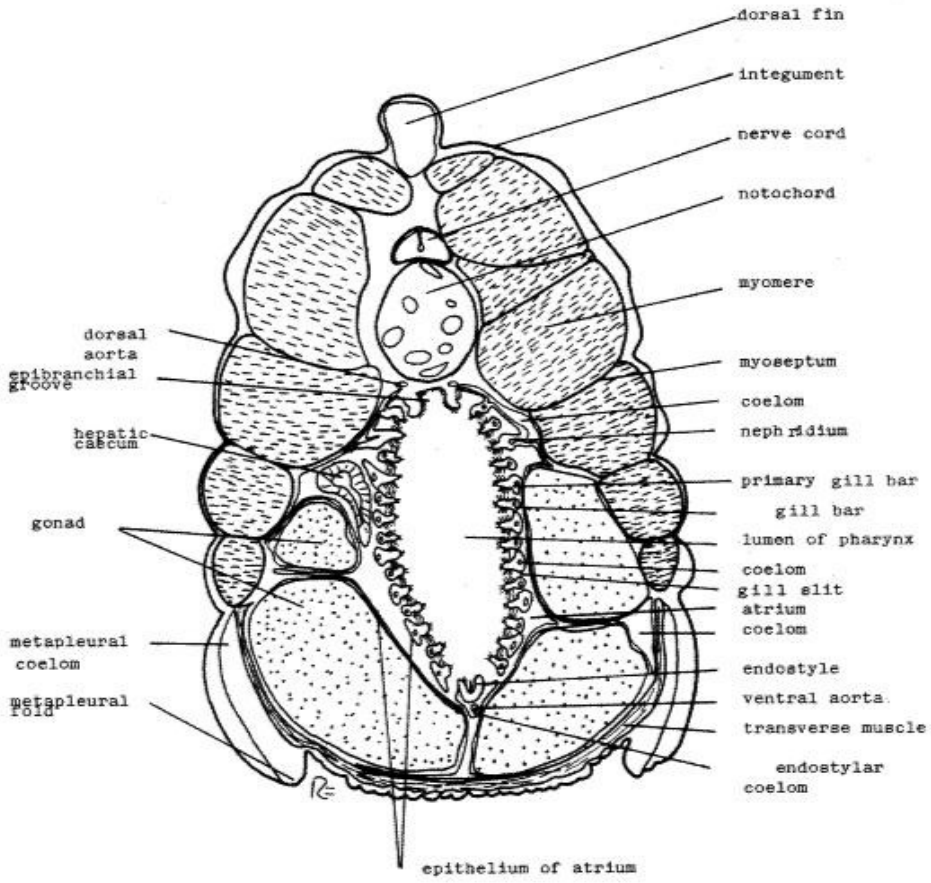

Fig 4.5 T.S of Amphioxus through Pharynx

Nervous system

Amphioxus possesses a hollow nerve cord running along the anterio-posterior end of the body.

Unlike vertebrates, the dorsal nerve cord is not protected by bone but by a simple notochord made up of a cylinder of cells that are closely packed to form a toughened rod. The lancelet notochord, unlike the vertebrate spine, extends into the head. This gives the subphylum its name (*cephalo-* meaning 'relating to the head'). The nerve cord is only slightly larger in the head region than in the rest of the body.

Respiratory System

Spacial respiratory organs are lacking.The pharyngeal wall of Amphioxus is richly vascular and water current enters the pharyngeal cavity. The blood flows so close to the surface that some exchange between CO_2 of blood and O_2 of water can easily occur .But there is no capillary network in gill bars. Further the blood lacks a respiratory pigment .It is probable that most gaseous exchange occurs through superficial areas such as fins, metapleural folds and atrial wall containing lymph spaces.

REPRODUCTION IN AMPHIOXUS

Amphioxus is a unisexual animal. But sexual dimorphism is absent. *Amphioxus* shows 26 pairs of Gonads. They are present from 25th myotomal segments to 51. Gonads have no ducts.

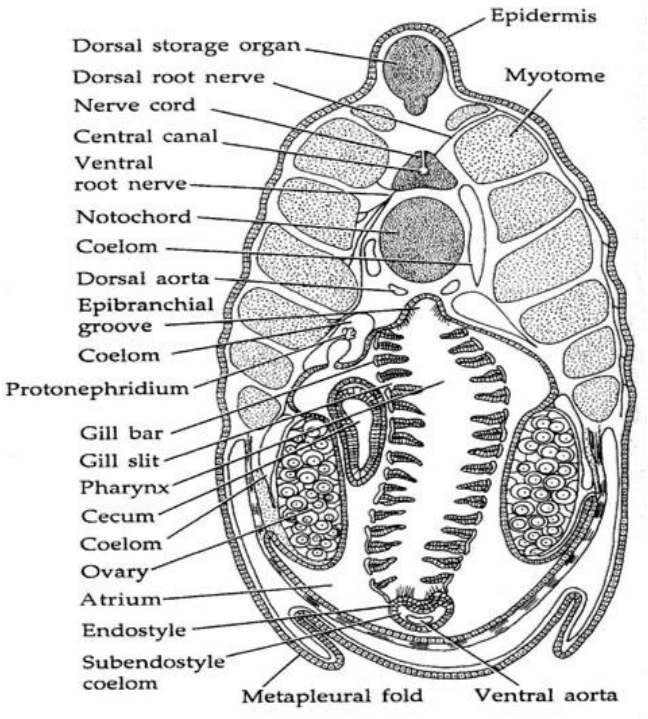

Fig 4.6 T.S Amphioxus through Gonads

When mature the overlapping tissue of the gonad will rupture and the gametes are Iibreted into atrium of Amphioxus. -They will come out into the water through the atriopore.

Gametes of *Amphioxus*:

The mature male sex cell called sermatozoan. It is 15 to 20 cm in length and shows three regions namely head, middle piece and tail.

On the head acrosome is present. Head shows a big nucleus. Around the nucleus thin sheet of cytoplasm is present.The middle piece is small with mitochondrial matrix called nebenkeron. The tail is long and helps in movement.

The mature female sex cell is ovum. It is small and 0.12 mm in diameter. It is a **microlecithal egg**. The cytoplasm around the nucleus will show yolk. In the peripheral cytoplasm yolk is absent. It is granular and is called carticoplasm. The plasma membrane surrounds the cytoplasm. Around this is a mucopolysaccharide membrane is present. It is called vettaline membrance. In between these two layers perivitelline space is present. The nucleus is present towards the animal pole, where as the opposite pole is called vegetal pole. The vegetal pole becomes posterio dorsal side of the embryo. The Animal pole becomes antero-ventral side of the embryo. Hence a gradient polarity is established in the egg.

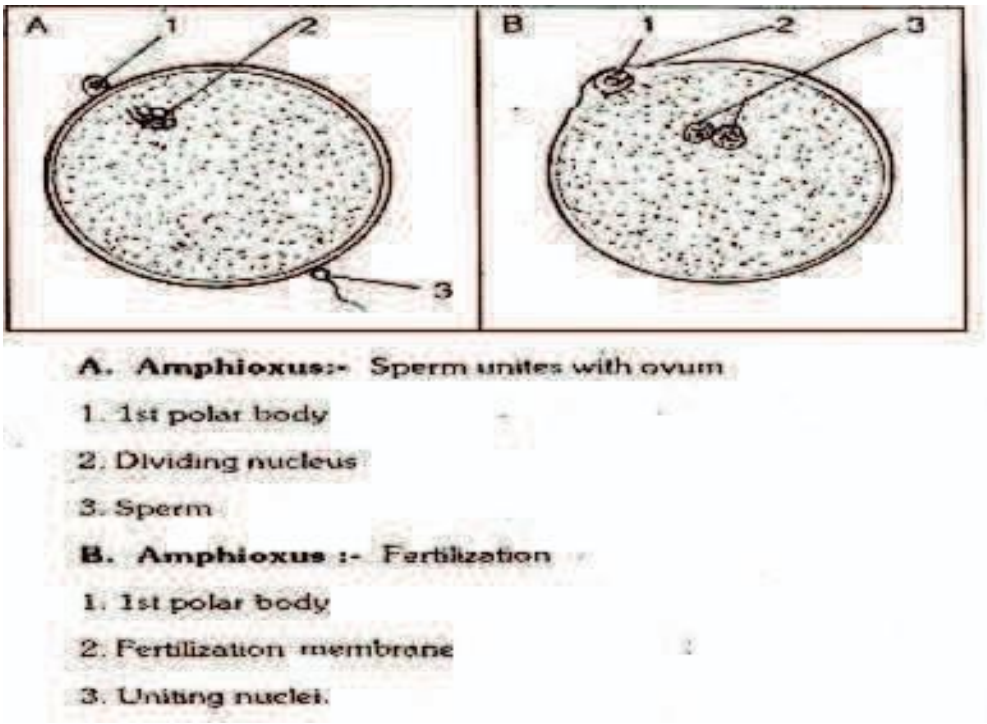

Fig 4.7 Egg or Ovum in Amphioxus

FERTILISATION: As soon as the egg comes in contact with the water the vitelline membrane wilI separates from the plasma membrane.

A number of sperms surround the egg, but only one makes entry through the contents of the egg from the vegetal pole. At this time a number of changes take place in the corticoplasm. Now membranes are formed which unite with vitelline membrane. This is called fertilisation.

4.7 SUMMARY

Cephalochordata (or lancelets, traditionally known as amphioxus, plural amphioxi) is a subphylum of marine invertebrates of the phylum Chordata. They are usually found in shallow parts of temperate or tropical seas. As with all chordates—a group that includes tunicates (subphylum Urochordata), hagfish (class Agnatha), and all vertebrates (class Vertebrata)—cephalochordates have a notochord, a hollow dorsal nerve cord, and pharyngeal slits (or pharyngeal pouches). Cephalochordates retain the notochord throughout their lives, unlike tunicates and vertebrates that have the notochord only during early (embryonic, larval) stages. Unlike vertebrates, cephalochordates and tunicates lack a backbone or vertebral column.

The notochord of cephalochordata, unlike the vertebrate spine, extends into the head. This gives the subphylum its name (cephalo- meaning "relating to the head"). Lancelets are blade-shaped (tapered at both ends), yielding the name amphioxus, which comes from the Greek for "both (ends) pointed."

With only about 30 species, it would be easy to overlook this subphylum and its importance. Yet, in Asia, lancelets are harvested commercially for food that is eaten by both humans and domesticated animals, and they are an important object of study in zoology as they provide evidence about the origins of the vertebrates. Cephalochordates also play a key role in food chains, sometimes they are found in thousands per square meter of sand.

There are only two genera of cephalochordates recognized—Branchiostoma (originally Amphioxus, about 23 species) and Asymmetron (about six species). The common name lancelet, or amphioxus, is generally used for all cephalochordates.