



Nervous system of *Branchiostoma* (=Amphioxus)

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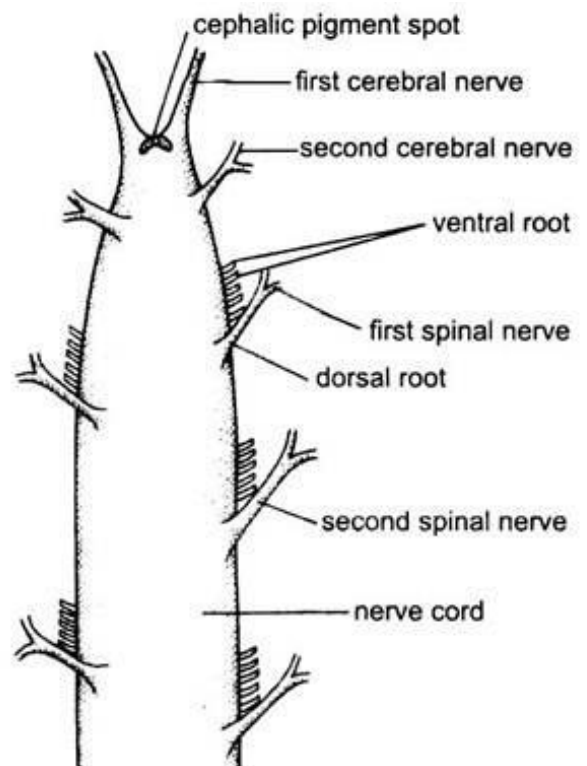
Branchiostoma, commonly known as lancelets or amphioxus, are small, fish-like marine organisms belonging to the phylum Chordata. They represent a basal chordate form and are considered to be a living link between invertebrates and vertebrates. While they lack a well-developed brain and complex sense organs found in higher vertebrates, they possess a primitive nervous system and simple sensory structures suited to their ecological niche.

The nervous system of *Branchiostoma* is relatively simple compared to vertebrates. It consists of a dorsal nerve cord and a nerve net.

The dorsal nerve cord runs along the length of the body, situated above the notochord. This nerve cord is considered homologous to the spinal cord of vertebrates. It is the primary center for coordinating responses to sensory stimuli and controlling motor activities. The nerve net consists of a diffuse network of nerve cells (neurons) spread throughout the body. It serves primarily to transmit signals and coordinate basic physiological functions.

1. Nerve cord. The central nervous system of *Branchiostoma* includes a hollow dorsal neural

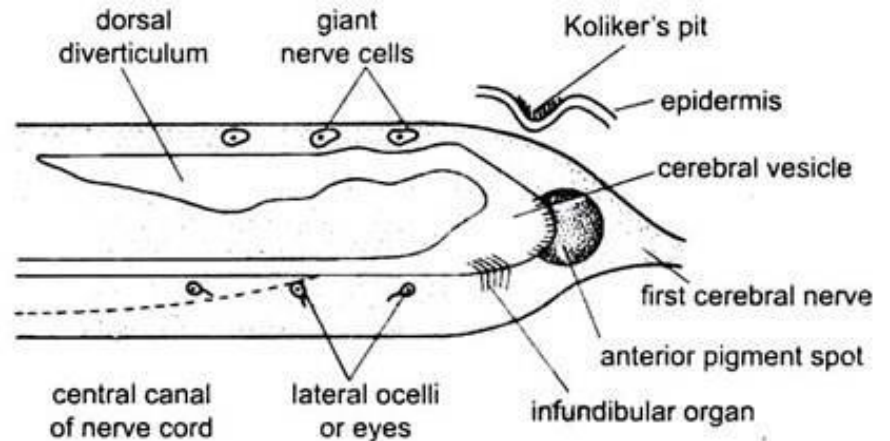
tube or nerve cord lying mid-dorsally just above the notochord. It has no ganglia. Its anterior end



Branchiostoma. Anterior part of nerve cord in dorsal view.

terminates abruptly in the rostrum just behind the anterior end of notochord. It shows a slight enlargement, the so-called brain or cerebral vesicle. The posterior part, called the spinal cord, gradually tapers to end, just before the posterior end of notochord. A narrow central canal, called neurocoel, runs throughout the length of neural tube and filled with a cerebrospinal fluid. It

dilates within the cerebral vesicle forming its ventricle. From its roof, arises a pouch-like blind dorsal diverticulum the extends behind over the central canal for a short distance. The cerebral vesicle contains two important receptor organs, a pigment spot in



Branchiostoma. V.L.S. of anterior part of nerve cord.

its anterior wall and an infundibular organ on its floor. Histologically, the nerve cord resembles that of other vertebrates. It consists of inner grey matter of nerve cells surrounding the central canal, and outer white matter of nerve fibres. As in annelid worms, some giant neurons with longitudinal giant nerve fibres are present in its dorsal wall. These enable the animal to contract suddenly and violently in case of danger.

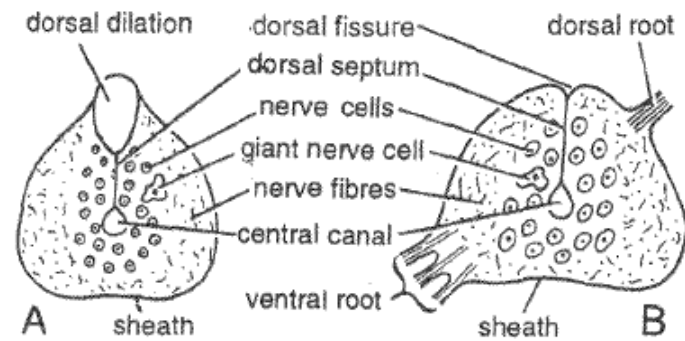
2. Nerves. The peripheral nervous system includes paired nerves arising from nerve cord. The first two pairs arising from cephalic vesicle are called cerebral nerves. They lack ventral roots. These are purely sensory in nature and convey impulses from receptors of snout, oral hood and buccal cirri to the nerve cord. Nerves arising from nerve cord behind the cerebral vesicle are called spinal nerves. One pair of these arises on either side in each segment. Each pair of spinal nerves actually includes separate dorsal and ventral nerve roots which do not unite to form a

single mixed spinal nerve as in vertebrates. Dorsal nerve root is both sensory and motor (mixed) and passes out to skin between myotomes. The ventral nerve root is motor and arises opposite to the myotome which it supplies. Thus, the dorsal and ventral roots of pair do not originate at the same level, but the dorsal root of one side lies opposite the ventral root of the other side. While the dorsal root is single, the ventral root is made of several branches. Nerves of amphioxus are primitive and non-myelinated, i.e., not covered by a sheath of myelin as seen in the nerves of vertebrates.

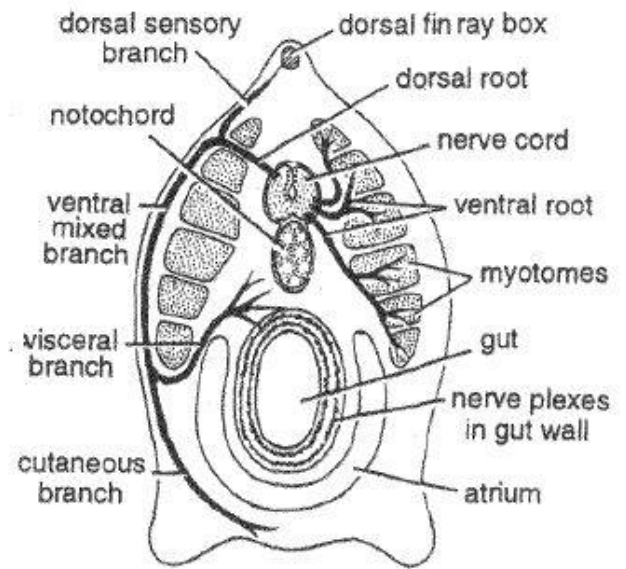
3. Autonomic nervous system. It consists of two nerve plexes in the gut wall connected to

There is an autonomic nervous system having two nerve plexuses in the smooth muscles of the wall of the intestine. These are connected to the neural tube by visceral nerves (preganglionic) through the dorsal roots. The autonomic nervous system controls the involuntary muscles of the

gut wall.



Branchiostoma. T.S. nerve cord. A – through cerebral vesicle. B – Through nerve roots.



Branchiostoma. Distribution of dorsal and ventral nerve roots.