

Nervous System of Leech (Hirudinaria)

The well-developed nervous system has three components—the central, the peripheral and the sympathetic nervous system

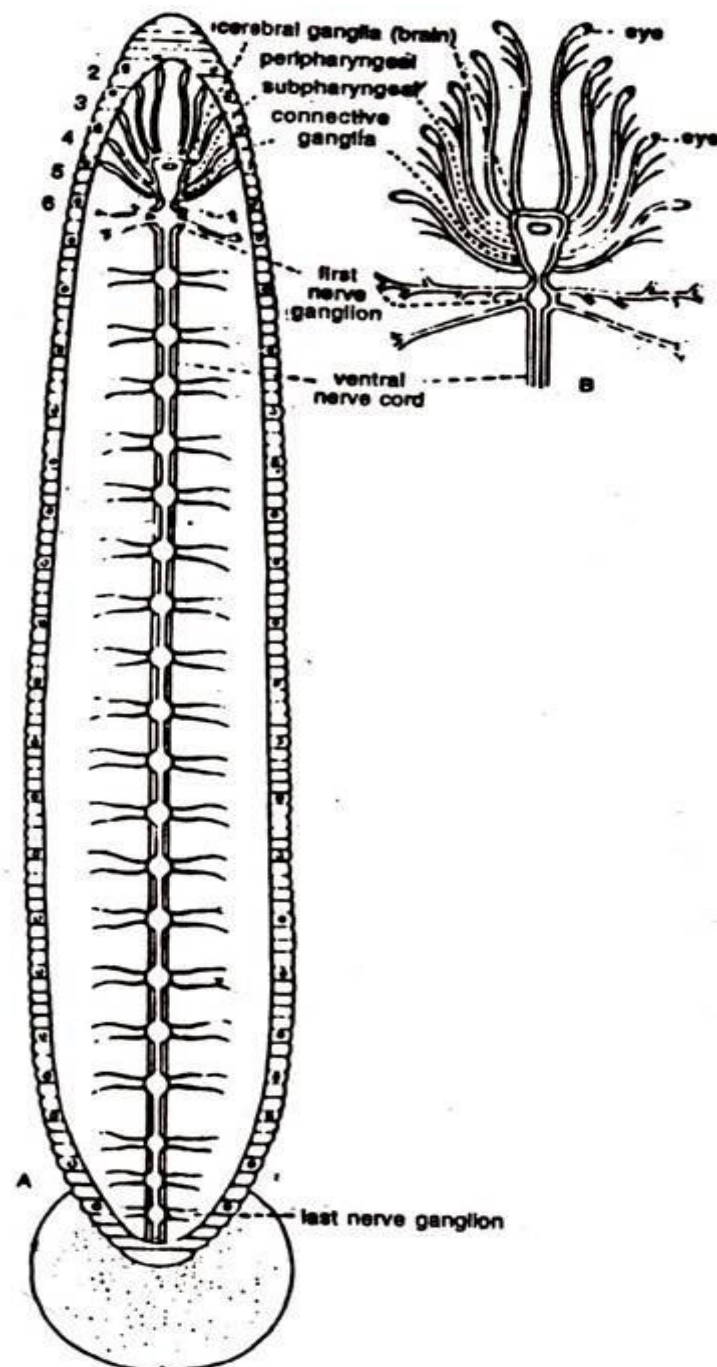


Fig. 24.34. *Hirudinaria* sp. Nervous system.
A. Entire nervous system, B. Anterior portion, magnified

Central Nervous System of Hirudinaria: The central nervous system is enclosed within the ventral hoemocoelomic channel and lies ventral to the gut. The cerebral ganglia or the brain, peripharyngeal connectives, sub-pharyngeal ganglia and ventral nerve cord constitute central nervous system.

1. Nerve ring:

Situated in the fifth segment, the nerve ring is small, somewhat elongated and oriented vertically. The pharynx passes through it.

a. Cerebral ganglia or brain:

The two ganglia are fused to form the dorsal part of the ring or the brain.

b. Peripharyngeal connectives:

Two, constitutes the lateral sides of the ring around the pharynx and connect the brain with the sub-pharyngeal ganglia.

c. Sub-pharyngeal ganglia:

Large, triangular in shape/formed by the fusion of four pairs of embryonic ganglia and form the ventral part of the nerve ring.

2. Ventral nerve cord:

It is solid, consists of two nerves, right and left, enclosed in a sheath. It runs backward from the sub-pharyngeal ganglia ventral to the gut, being enclosed in the ventral sinus.

A ganglion in the ventral nerve cord is formed by the fusion of two ganglia and twenty-one such ganglia are situated, one in each, from 6 to 26 segments, in the first, annulus. The terminal ganglionic mass is large and formed by the fusion of seven pairs of embryonic ganglia.

Peripheral Nervous System of Leech (Hirudinaria):

Nerves emanating directly from the brain and ventral nerve cord are included in the peripheral nervous system:

1. Nerves from the brain innervate the first pair of eyes, prostomium and walls of the buccal chamber.

2. The sub-pharyngeal ganglia send four pairs of nerves to 2 to 5 pairs of eyes and innervate buccal floor, body wall and segmental receptors of the first five segments.

3. Two pairs of nerves, anterodorsal and posterolateral, arise from each ganglion of the ventral nerve cord:

a. The anterolaterals supply the body wall, nephridia, reproductive organs and receptors.

b. The posterodorsals innervate body wall, viscera, muscles and testis sacs.

Sympathetic Nervous System:

Nerve plexus below the epidermis, in muscle layers of the body wall and in the gut wall, connected with the peripharyngeal nerve ring, constitute the sympathetic nervous system.

Receptors and Sense Organs in Hirudinaria:

These are of four types

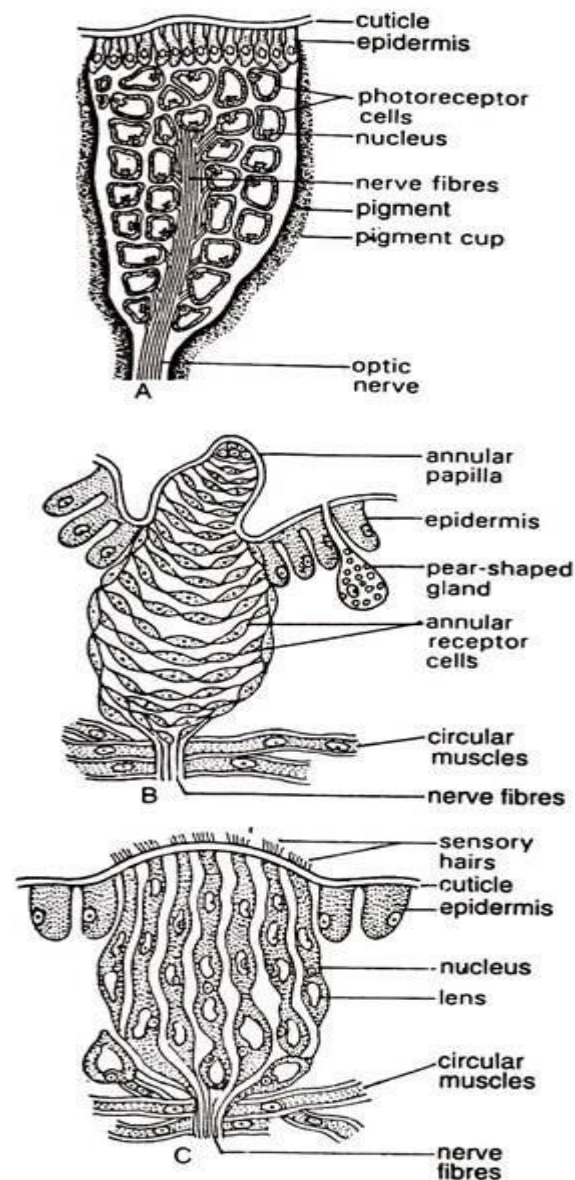


Fig. 24.35. Hirudinaria sp. Receptors and sense organs (vertical section). A. Eye. B. Dorsal segmental receptor. C. Annular receptor

1. Eye

Five pairs, one pair in each of the five segments (2 to 5), at right angle to the body surface.

- a. Cylindrical in shape, the cells of the walls of the cylinder are pigmented and the structure is called pigment cup.
- b. A convex, transparent cuticle and epidermal layer form the broad convex surface of the eye.
- c. Large, clear, refractile cells bearing a crescentic hyaline substance, the lens or optic organelle at the centre, arranged in longitudinal rows, are present in the cylinder. The cells are photoreceptors and possibly can distinguish between light and darkness.
- d. An optic nerve enters the cylinder near its base and runs along the middle line.

2. Segmental Receptor:

- a. The receptors are small, white areas, segmentally arranged on elevated, elliptical papillae and located in the first annulus of each segment (Fig. 24.35B).
- b. Each segment bears four pairs of the receptors on the dorsal and three pairs on the ventral surface.
- c. Two types of cells, tactile or tango-receptor and photoreceptor, are present in a receptor.
- d. The tactile cells are slender, with hair-like processes at the free ends. The optic organelles or the lens is present in the photoreceptor.

3. Annular Receptor:

These are thirtysix in number, eighteen on the dorsal and eighteen on the ventral surface, arranged in a line across the middle annulus of each segment.

- a. A receptor is formed of a group of flattened, overlapping cells, projecting beyond the integument.
- b. The receptors are tactile in function.

4. Free Nerve Endings:

The free nerve endings are present all over the body between epidermal cells. The ganglion cells of the nerve endings occur beneath the epidermis. The receptors help to detect chemical changes in water.