NERVOUS SYSTEM OF EARTHWORM

The nervous system of earthworm consists of three parts namely,

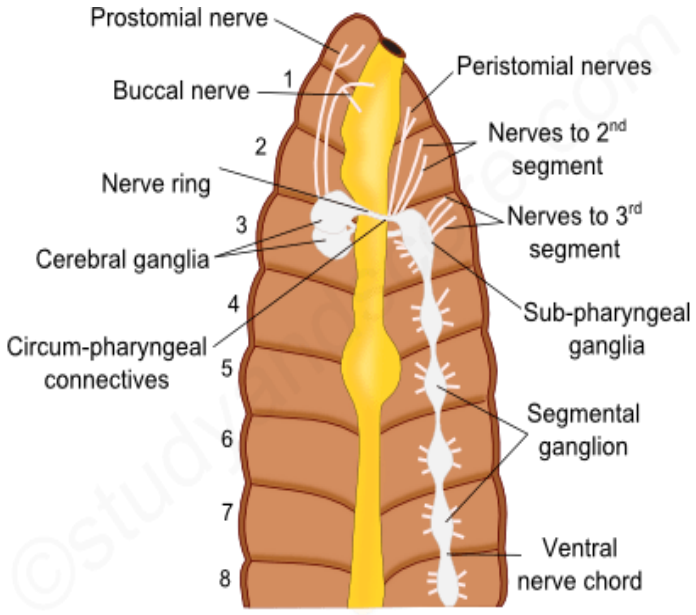
- Central nervous system
- Peripheral nervous system
- Sympathetic nercous system

Central Nervous system: It includes following structures:

- Cerebral ganglia- There are two pear shaped cerebral ganglia fused together at 3rd segment called brain.
- Circumpharyngeal connective- Two circumpharyngeal connectives arise from each cerebral ganglion laterally. They encircle pharynx and fuse at 4th segment. The fused portion is called sub pharyngeal ganglia.
- Ventral nerve cord- It is white rod like structure, which starts running from sub- pharyngeal ganglia towards posterior end. In each segment, ventral nerve cord swells which is called segmental ganglia. Actually, there are two cords fuse together to form single ventral nerve cord. Ventral nerve cord is composed of nerve cells and nerve fibers. There are 4 giant fibers on mid dorsal side of nerve cord which conducts impulses rapidly. The outer covering of ventral nerve cord is called peritoneum.

Peripheral nervous system: It includes nerve fibers or nerve, which arises from central nervous system.

From cerebral ganglia, 8-10 nerves arise and supply to prostomium, buccal chamber, and pharynx.
From circumpharyngeal connectives, two pairs of nerves arise and supply to 1st and 2nd segment.
From subpharyangeal ganglia, three pairs of nerve arise and supply to 2nd, 3rd and 4th segment.
From each segmental ganglion, three pairs of nerves arise and supply to respective segment.
Sympathetic nervous system: It consists of nerve plexuses extensively branched and distributed beneath epidermis, alimentary canal that is connected to circumpharyngeal connectives.



NERVOUS SYSTEM OF PHERETIMA

Working

Earthworm nervous system, Earthworm sense organs, central nervous system, peripheral nervous system, buccal receptor, epidermal receptors, photoreceptors

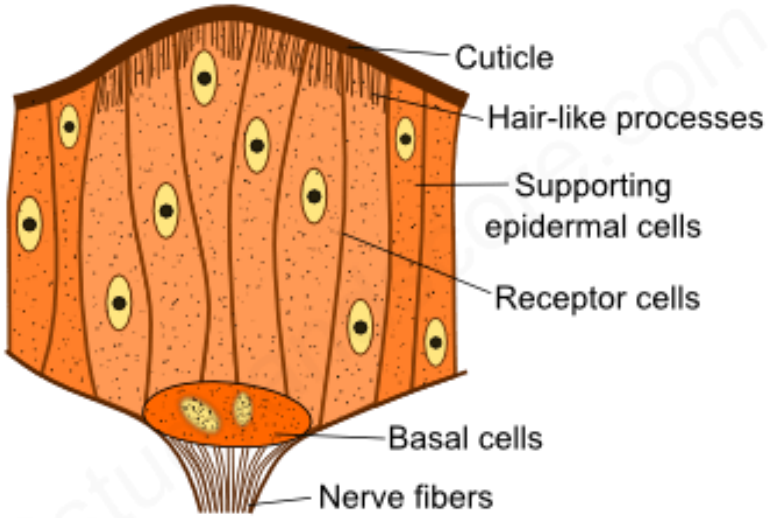
Working of nervous system: The sensory cells from different parts of the body receive impulse. Sensory fibers (afferent fibers) carry impulse to central nervous system. Motor fibers (efferent fibers) carry impulse back to effective organs or different parts of body from central nervous system. In earthworm, impulse is also travel from one ganglion to another ganglion through ventral nerve cord.

SENSE ORGANS OF EARTHWORM

Earthworms have well-developed sense organs. These sense organs are simple in structure consisting of one single cell or a group of specialized ectodermal cells. Pheretima has three types of sense organs:

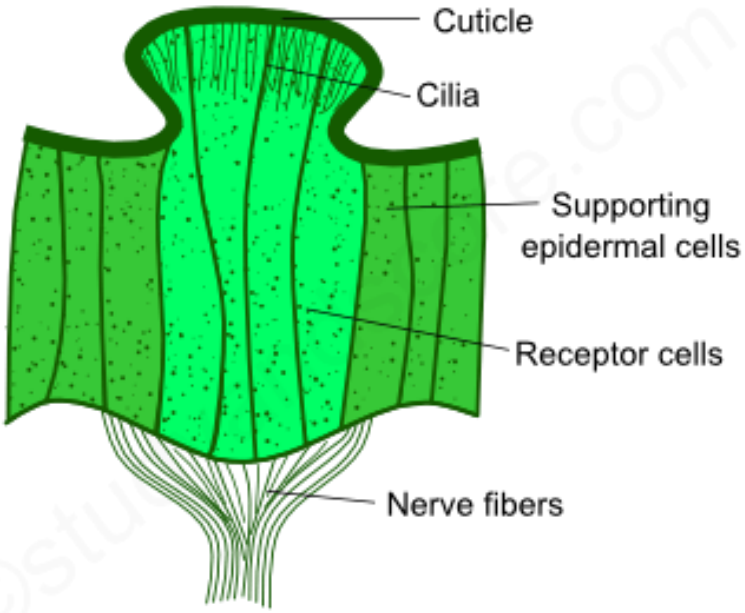
Epidermal receptors: These receptors are well distributed all over the epidermis. They are more abundant on the lateral sides and ventral surface of the body. Each receptor has an elevated cuticle covering a group of tall, slender and columnar receptor cells, bearing small hair-like processes at their outer ends and connected with nerve fibers at their inner ends. They are surrounded on all sides by ordinary

supporting epidermal cells. They are tactile in function and also respond to chemical stimuli and changes in the temperature.



EPIDERMAL RECEPTORS

Buccal receptors: These receptors are restricted only to the epithelium of the buccal chamber. They are similar to the epidermal receptors except that they have broader outer ends. Also the sensory hairs are more deeply situated and better developed. These receptor cells have deeply seated nucleus. These receptors are gustatory and olfactory in function. They also respond to chemical stimuli.



BUCCAL RECEPTORS

Photo-receptors: These are photo sensitive or light sensitive receptors which are restricted only to the dorsal surface of the body. They are more numerous on prostomium and peristomium but their number gradually decreases as we move towards the posterior end of the body. They are totally absent in the clitellar region.

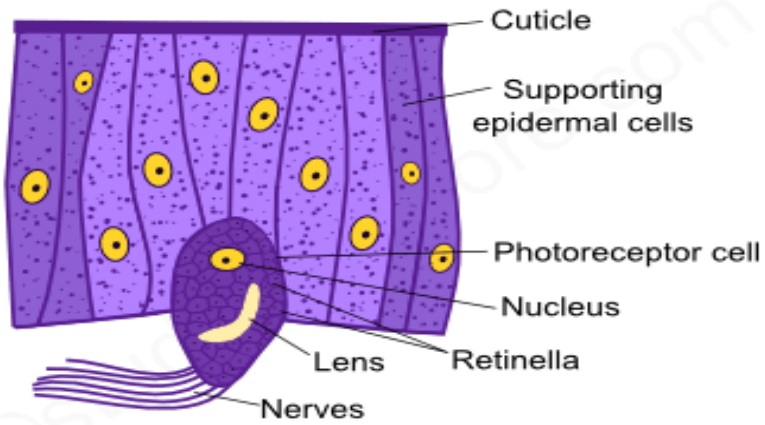


PHOTO RECEPTORS

Each photoreceptor consists of a single ovoid cell with a nucleus and clear cytoplasm containing a network of neurofibrils and a small transparent L-shaped lens or phaosome, made up of a hyaline substance. The lens focuses the light from all directions on neurofibrils. All the neurofibrils converge to an afferent nerve fibre which leaves the cell at its base to join the central nervous system. Photoreceptors enable worms to judge the intensity and duration of light.

General Characteristics of Phylum Cnidarians (Coelenterata)

BSc. Part I Zoology (Hons) Paper I

In 1887 Leuckart coined the name Coelenterata. This Coelenterata included sponges and Ctenophores. In 1888 Coelenterata is divided into 3 phyla.

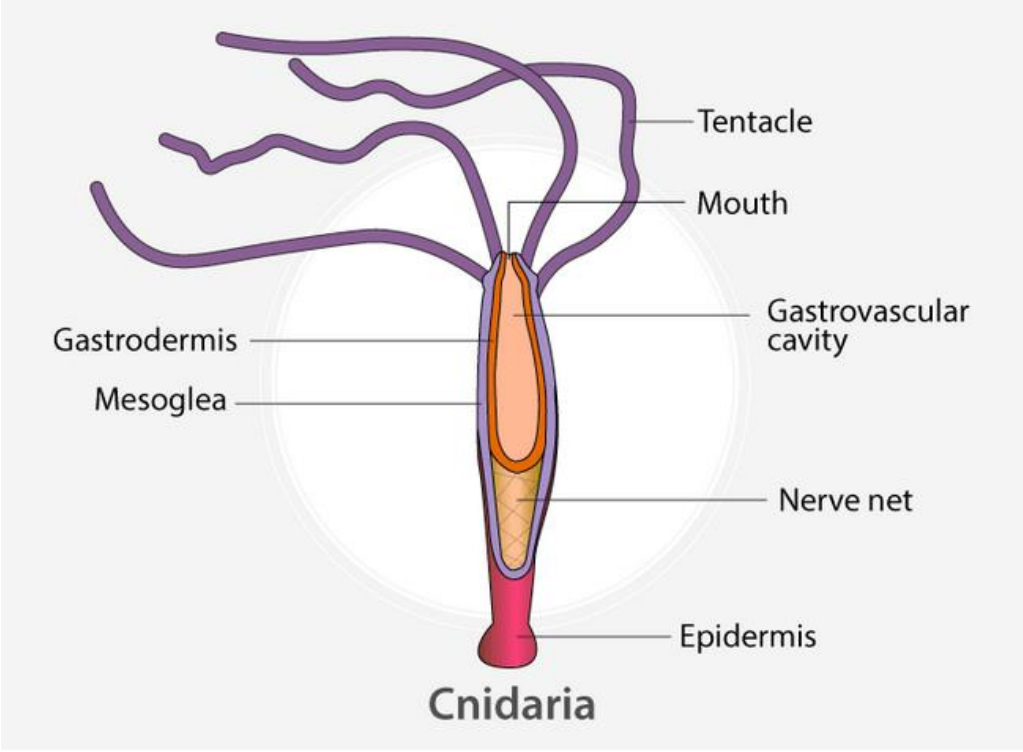
1) Spongiaria 2) Cnidaria and 3) Ctenophora.

Therefore, **Cnidaria** is the most suitable name for this phylum. Coelenterata was divided into Cnidaria (for coelenterates proper) and Acnidaria (for the ctenophores). Hyman regarded ctenophora as a separate phylum.

1) Huxley (1856) proposed the name Hydrozoa.

2) Hackle in 1891 proposed the name Scyphozoa.

3) Ehrenberg in 1833 proposed the name Anthozoa.



GENERAL CHARACTERS:

The coelenterates are radial symmetrical, tentacle bearing aquatic organisms.

1. All are aquatic, mostly marine but a few are fresh water forms. Ex: Hydra.
2. They may be solitary or colonial.
3. They may be sedentary or free-swimming.
4. Head and segmentation is absent.
5. Tentacles encircle the mouth in one or more whorls. They are used for food capture, and defense.
6. These are all diploblastic animals. They show ectoderm and endoderm. In between jelly like mesoglea is present.
7. The cnidoblasts are important defensive and offensive cells. They are useful for food capture.
8. Undifferentiated free interstitial cells are found among the epithelial cells.
9. Mouth is present. Anus is absent.
10. Mouth leads into a central cavity called 'Coelenteron. Hence the name Coelenterate'.
11. Coelenterates are acoelomate. Because there is no true body cavity, or coelom.
12. Respiratory, circulatory and excretory systems are absent.
13. These are radial symmetrical animals.
14. Nervous system is diffused type.
15. Polyp is a nutritive zooid and fixed zooid. The medusa is a free swimming zooid and sexual zooid.
16. Nutrition is intercellular and intracellular.
17. Locomotion in medusa is by muscles.
18. In Coelenterates Polymorphism tendency is seen in some examples.
19. Asexual reproduction is by budding.
20. Sexual reproduction takes place by the development of gonad and sex cells. Planula larva is seen.

Distribution and abundance

Many of the world's benthic (bottom-dwelling) ecosystems are dominated by anthozoans. Although soft and hard corals coexist in virtually all tropical areas appropriate for either, coral reefs of the tropical Indo-Pacific are built mainly by members of the anthozoan order Scleractinia (hard corals); whereas on coral reefs of the Caribbean members of the anthozoan subclass Alcyonaria (soft corals) are much more prominent. Aside from being the most numerous and covering the greatest area of any animals on the reef, the corals structure their environment, even after death. Soft corals contribute greatly to reef construction by the cementing action of the skeletal debris (spicules), filling in spaces between hard coral skeletons.

Soft-bodied anthozoans are similarly dominant in other seas. Temperate rocky intertidal zones in many parts of the world are carpeted with sea anemones. They sequester the space that is therefore made unavailable to other organisms, thus having a profound impact on community structure. The curious hemispherical anemone *Liponema* is the most abundant benthic invertebrate in the Gulf of Alaska, in terms of numbers and biomass. Anemones cover parts of the Antarctic seabed, and they occur near the deep-sea hot vents.

1. Habitat:

All are aquatic and are mostly marine, except a few like Hydra, are fresh water.

2. Body Form:

Body form varies considerably. Many colonial cnidarians like Obelia are trimorphic, having three kinds of zooids — polyps, blastostyles and medusae. Occurrence of more than one type of individuals in their colonies performing different functions is called polymorphism.

3. Symmetry:

They show radial symmetry.

4. Germ Layers:

Cnidarians are diploblastic animals, i.e., derived only from two embryonic germ layers, viz., ectoderm and endoderm.

5. Level of Organization:

They are the first multicellular animals from evolution point of view, which show tissue level of organization.

6. Body wall (Fig. 4.12):

The body wall consists of two layers of cells; outer epidermis and inner gastro dermis. There is a non-cellular gelatinous layer, called mesogloea, between the epidermis and the gastro dermis.

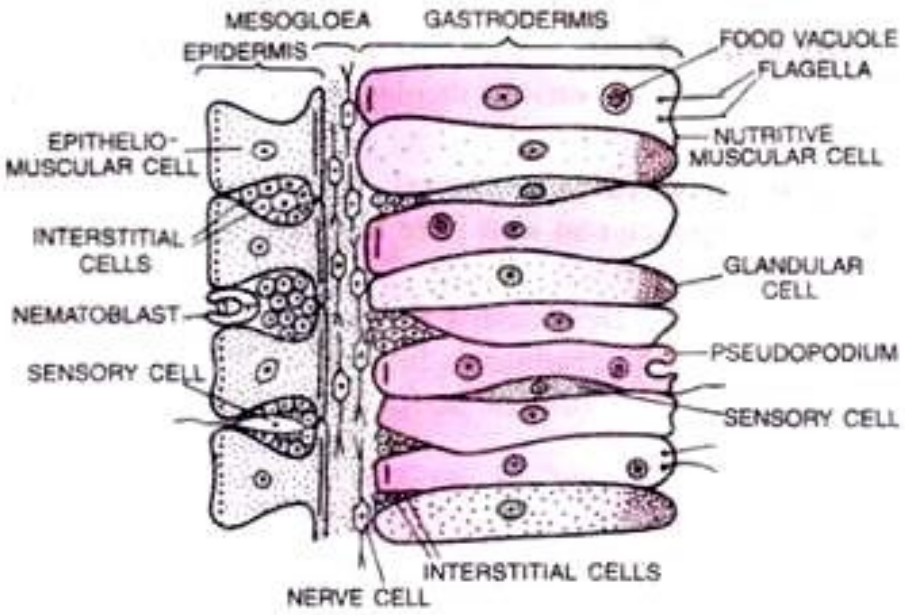


Fig. 4.12. L.S. Body wall of *Hydra*.