

NEET Biology

Short Notes

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In this article, we are providing **short notes on the Structural Organization in Animals:**

Earthworm which is an important chapter for [NEET 2019](#). This is an important section to pay attention from the Unit Structural Organization in Plants and Animals as every year **2-3 questions** are asked from this chapter. This chapter is completely theoretical and needs a lot of revision. In this article, Morphology and Anatomy of Earthworm is discussed in brief important for last days revision. Let's begin with a brief introduction about the Earthworm. Moreover, you can download the Structural Organization in Animals: Earthworm Notes PDF, we have shared at the end.

STRUCTURAL ORGANIZATION IN ANIMALS

EARTHWORM-

Also known as **farmer's friend**, the organism belongs to **Annelida** phylum. Their house is **soil** and food is **organic matter**. Species of the organism found in India are *Pheretima* and *Lumbricus*.

MORPHOLOGY OF EARTHWORM-

They are reddish brown in colour and their body is in shape of a long cylinder. Earthworms possess ring like segmented body/metamers that is their body is divided into small segments. **It is also known as metameric segmentation.**

The dorsal/ front side of the organism has blood vessels and belly has genital openings. **Prostomium and peristomium** of earthworm are seen in the first segment on anterior end. Peristomium/buccal segment bears mouth and fleshy lobe like aperture called **Prostomium** which is located above the mouth. These two organs help earthworms in burrowing. **Glandular tissue** is located from segment **14-16** and is known as **clitellum** which distinguishes **mouth and tail endings**. The body of earthworm is studied under three different heads with respect to clitellum-

- Preclitellar
- Clitellar
- Postclitellar

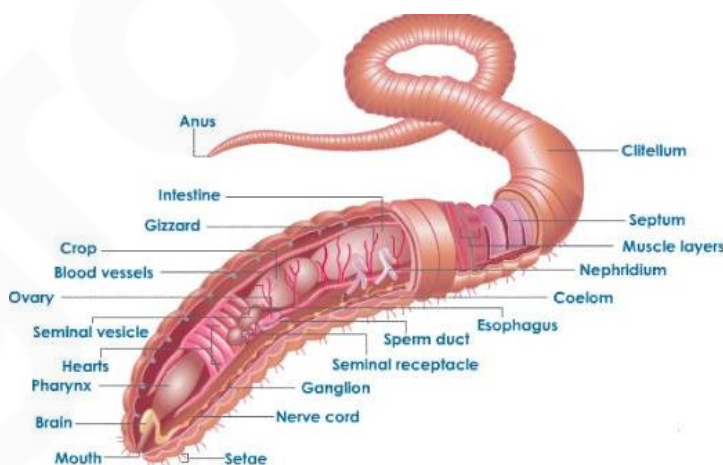


Fig: Labelled diagram of earthworm

The organisms are hermaphrodites in nature as they have both the sex organs. There are small apertures/openings in the body of earthworm which are seen from segment 5-9. They are 8 in number and are called as **spermathecal apertures**. Other apertures include-

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- **Anal aperture**- for the exit of faeces and is located in the posterior end.
- **Mouth aperture**- for the intake of food and is located in the anterior end of the first segment.
- **Male gonopores**- openings for sperm ducts and are located ventrally on the 18th segment.
- **Female gonopores**- opening for the exit of eggs and is located on the median aperture.
- **Nephridiopores**- apertures for excretory organs scattered throughout the body and located in the first and last three segments. Specialized structures called **setae** are present in all the segments. They are not seen in first, last and clitellum segments.
- **Dorsal pores**- these pores are for the communication of earthworm's body cavity with exterior and are located in intersegmental grooves.



Fig: Segments in earthworm

ANATOMY-

The external body of earthworm is covered by a thick membrane which is non cellular in nature. This membrane is known as **cuticle**. Below, the outer protective membrane, there is a layer of **epidermis**, below that there are two **muscular layers** and then is the innermost layer which is **coelomic epithelium** which further consists of a single membrane of **glandular columnar epithelium**.

DIGESTIVE SYSTEM-

Digestive system includes **alimentary canal** which is also known as food pipe. It is the longest tube in earthworm's body which starts from **segment 1 and goes up to the last segment**. It starts from **mouth/ oral/buccal cavity** which is located from segment 1-3, then passes through **pharynx**, **oesophagus** which is located from segment 5-7, then **muscular gizzards** which are located from **8-9 segments**, **stomach** which is located from **segment 9-14**, then passes through **intestine** and ends at **anus**. The **typhlosole** is located from **segment 26-35** in intestine. The main function of typhlosole is to increase the surface area for better absorption.

Digestion is a step by step process as the food passes by each organ after entering into the alimentary canal. **Muscular gizzards acts as grinder and blends the soil particles and other food matter.**

CIRCULATORY SYSTEM-

Earthworms have closed circulatory system which means that flow of blood is closed inside blood vessels. Circulatory system includes **hearts, capillaries, loops, blood vessels and blood glands**.

There are two types of vessels observed in earthworms-

- **Blood vessels located behind 13th segment/intestinal region**- includes median longitudinal blood vessels, intestinal blood plexus, commissural vessel, Integumentary vessels and nephridial vessels.



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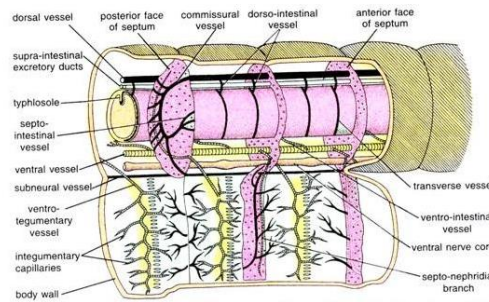


Fig: Blood vessels behind the 13th segment

- **Blood vessels located in anterior 13 segments-** further studied under three heads- median longitudinal vessels, hearts and anterior loops and blood vessels of the gut. There are 16 hearts in earthworm. Hearts located in segment 12th and 13th are present on dorsal and oesophageal vessels; lateral-oesophageal hearts. The hearts in segment 7th and 9th are lateral hearts. Loop like vessels located in 10th and 11th segments are anterior loops. They lack valves. Blood glands- located in 4th, 5th and 6th segment above the pharyngeal mass and are red in colour. These glands manufacture haemoglobin and blood corpuscles.

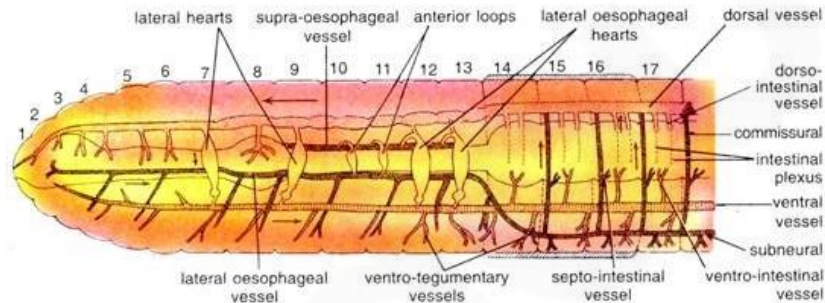


Fig: Blood vessels located in the anterior 13 segments.

RESPIRATORY SYSTEM-

There is no separate system is seen in earthworms for respiration as in humans. Gaseous exchange happens through moist body surface of the organism and this is known as the method of **diffusion**.

EXCRETORY SYSTEM-

Excretory system removes waste from the body and in earthworm, this system consists of **nephridia**. **Nephridia are coiled tubular structures which are located on the segments of the organism**. On the basis of their location on the segment, there are three types of nephridia-

- **Septal nephridia** (last 15 Segments)
- **Integumentary nephridia** (last 3 segments)
- **Pharyngeal nephridia** (4-6 segments)

The main function of these coiled structures is to maintain the body volume of the organism. All the types of nephridia share similar structure. A small funnel shaped structure is connected to nephridia. The function of this structure is to transport waste fluids which are further removed by digestive tube.

NERVOUS SYSTEM-

Nervous system is the controller of whole body. All types of neural responses (muscular and sensory input) are controlled by **ganglion cells**. These cells are the clusters of mass cells. These cells are also arranged in segments. They are joined with **nerve cords** (which is situated in segment 3 and 4) for the proper functioning of the all the neural activities. **Nerve cords branches and covers pharynx and joins to central ganglion cells in the front portion which makes sensory output and commands to muscular responses inside the organism's body**. Central nervous system of earthworm is studied under two heads

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- Nerve rings- ring like spherical structure located in segment 3rd and 4th.
- Ventral nerve cord- thread like structure that extends up to last segment.

SENSORY SYSTEM-

- They are organisms without eyes.
- **They sense the changes around them via specialized sensory receptor cells.**
- **Epidermal receptors are located all over the epidermis. They respond to chemical stimuli and temperature changes.**

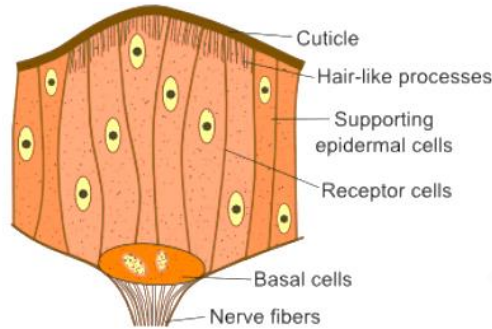


Fig: Epidermal Receptors in earthworm

- **Buccal receptors** respond to chemical stimuli. They perform gustatory and olfactory functions and they are located in buccal chamber.

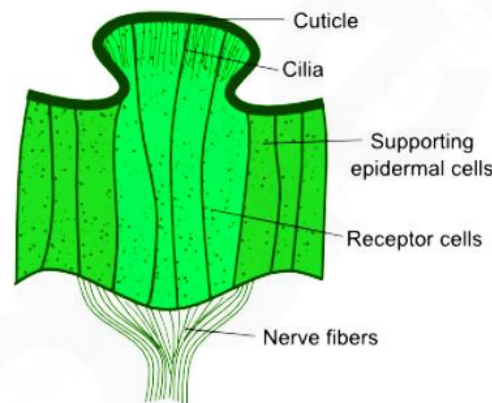


Fig: Buccal Receptors in earthworm

- Receptors that are sensitive to light and are located only on the dorsal surface are photoreceptors.

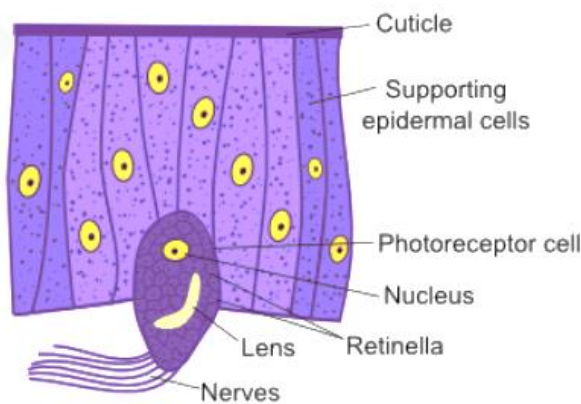


Fig: Photoreceptors in earthworm



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REPRODUCTIVE SYSTEM-

Since earthworms are hermaphrodites, they have both sex organs male and female in one body. If we talk about male sex organs, earthworms have

- Pair of testes - located on the 10th and 11th segment. They produce sperms.
- Testis sacs- located on 10th and 11th segment. Fluid filled sacs that surrounds testis.
- Vas deferentia- located till 18th segment
- Two accessory glands- located on 17th and 19th segment.
- 2 pairs of seminal vesicles to store sperms. Located at 11th and 12th segment.
- Male genital pores- located in 18th segment in which spermatic ducts and prostatic gland opens.
- Spermiducal funnel- found in two pairs. Located in 10th and 11th segment.
- Prostate gland- pair of glands which is white in color and are located in 16th- 20th segment. From each prostate gland, a prostatic duct arises.

The female reproductive system in earthworms has-

- Oviduct- located on 14th segment. Opens through female genital pores.
- 2 ovaries- located on 12th and 13th segment. It contains ova.
- Spermatheca- flask shaped for storing sperms. Located from 5th -9th segments. Sperms on maturation travel back to testis sac via spermiducal funnel.

During the time of sexual intercourse/ copulation, two organisms exchange their sperms. After that, sperm, eggs and nutritive fluid gets deposited in an organ called **cocoon** which is later accumulated in the soil. There is no larva seen in their reproduction, direct earthworms are formed.

IMPORTANCE OF EARTHWORMS TO MANKIND-

As we already know that there are many different names by which earthworms are known, **farmer's friend/ecosystem engineers**. It is so because of the various biological, chemical and physiological changes they bring to soil profile.

- 1) The most important point is that they **improve the fertility of soil**.
- 2) They are foods of fishes, frogs, toads, moles and some macraea people.
- 3) There are many people who earn their living by supplying such organisms to laboratories for research purposes.

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