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EARTHWORM ANATOMY

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I. OBJECTIVE:

To become familiar with the external and internal anatomy of the earthworm, *Lumbricus terrestris*.

II. BACKGROUND:

Earthworms are members of Phylum Annelida (**annel** = a little ring), the segmented worms. They have **bilateral** (**bi** = two, **later** = the side) symmetry and a “tube-within-a-tube” body plan. A distinguishing feature of this phylum is the division of the body into segments. This segmentation is both external and internal with many structures/organs repeated in each segment. The body is in three tissue layers: **ectoderm** (**ecto** = outside, out, outer; **derm** = skin), **mesoderm** (**meso** = middle), and **endoderm** (**endo** = within,

inner). The **coelom** (**coel** = hollow) is a cavity between some of the layers of the mesoderm. The circulatory system is a **closed circulatory system**, meaning that the blood remains within the blood vessels (rather than an open system in which the “blood” bathes the body organs for at least part of its journey).

Earthworms live in the soil, working their way through it to ingest and digest organic matter within the soil. They play an important part in aerating and fertilizing the soil.

III. MATERIALS NEEDED:

dissecting tray (Please note that this is not a toy. Try to avoid unnecessary pin holes in the wax and DO NOT CARVE, chop, or otherwise mutilate the wax.)

dissecting tools

rinsed, preserved earthworm

opt. dissecting microscope

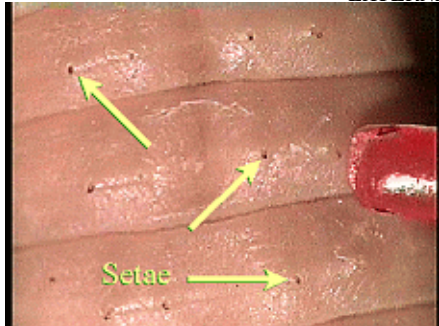
xs slide of earthworm segment (Z1250) and microscope

any available photos, etc.

large earthworm model plus any available plastic mounts

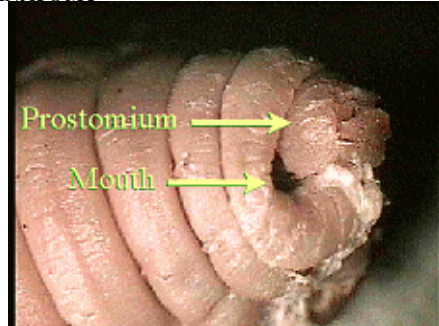
IV. PROCEDURE:

EXTERNAL ANATOMY

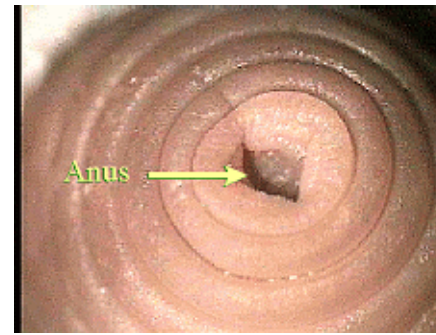


1. Feel the bristly **setae** (**seta** = bristle) on each segment, along the sides and bottom. Note that there are four pairs. Two pairs are on the sides (**laterally**--**later** = the side) and two pairs are on the bottom (**ventrally**--**venter** = the underside, belly).

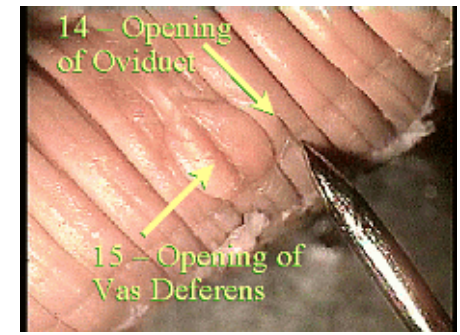
2. Note the conspicuous swelling near the **anterior** (the front--**ante** = before) end called the **clitellum** (**clitell** = a pack saddle). The smooth side is the top (**dorsal**--**dorso** = the back) and the segmented side is the bottom (**ventral**).



3. On the very anterior tip of the worm is a projection called the **prostomium** (**pro** = before, in front of; **stoma** = mouth). The **mouth** lies ventrally between this and the first segment. Count the number of segments between the front of the worm and the front edge of the clitellum, as well as the number of segments included in the clitellum.



4. On the **posterior** (the rear--**post** = behind, after) end, note the slit-like **anus** in the last segment.

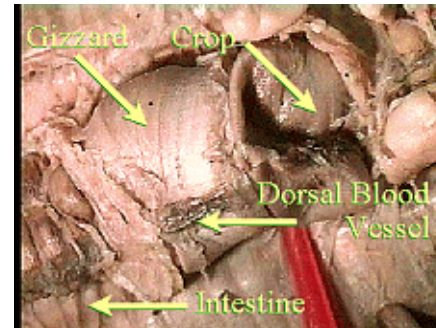
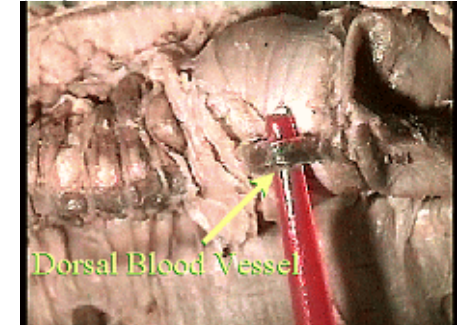


5. On the **ventral** (bottom) surface of segment 15, note the pair of (larger) openings of the **vasa deferentia**. On the ventral surface of segment 14, you can see the (smaller) openings of the **oviducts** (**vasa** = a vessel, duct; **deferens** = to carry away; **ovi** = egg).

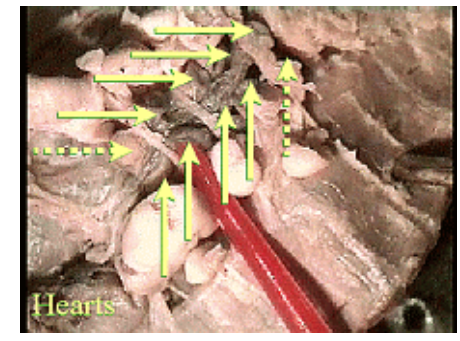
INTERNAL ANATOMY

1. On the dorsal surface of the earthworm, beginning at the clitellum, cut a slit posteriorly (toward the rear) for about 25 segments. You must cut very shallowly to avoid cutting the internal organs. Turn the scissors and cut anteriorly to the prostomium, again, being careful not to cut the internal organs.

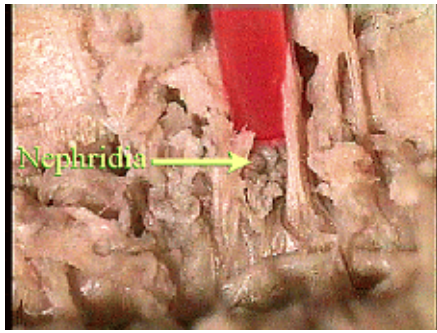
2. Pin the worm to the tray near the anterior and posterior ends and every five segments (5, 10, 15, etc.) along the body. You may have to carefully remove/cut the **septa** (**septum** = a fence) separating the segments to open up the body wall. The **dorsal blood vessel** and **digestive tract** should be exposed at this point.



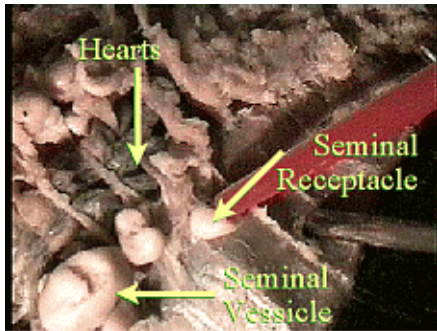
3. Examine the **digestive tract**. From the **mouth** back, locate the **pharynx**, **esophagus** (**eso** = within, inward; **phago** = to eat), **crop**, **gizzard**, and **intestine**. Refer to diagram, any available photos, and/or large earthworm model.



4. Examine the **circulatory system**. Locate the **dorsal blood vessel**, smaller **segmental vessels** coming from it, **5 pairs of hearts** in segments 7-10 (count from placement of pins), **ventral blood vessel** (you may have to carefully snip a piece of intestine and hold it up to see this).

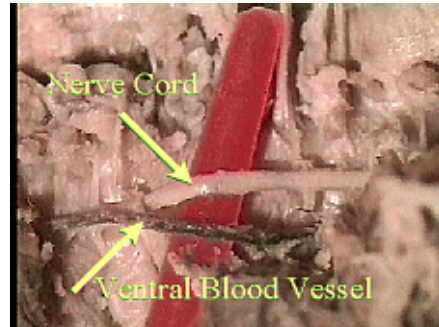
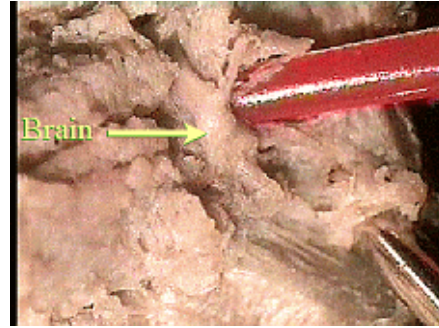


5. To the sides/under the digestive tract are the paired **nephridia** (**neph** = kidney), which may be too small to see well with the unaided eye.



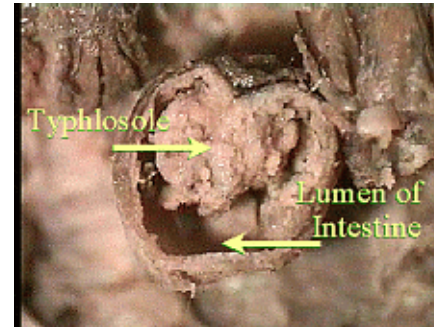
6. The **reproductive system** is located under the digestive tract in approximately segments 10-15. Earthworms are **hermaphroditic** (**Hermes** = messenger god--Mercury; **Aphrodite** = goddess of love--Venus), that is, they have both sexes and when they mate, they fertilize each other. **Seminal vesicles** are large, floppy, whitish structures in segments 9-13. The tubes from them to segment 15 are the **vasa deferentia**. Attached to the anterior septum of segment 13

is a pair of whitish, grape-clustered **ovaries** which are very difficult to see. The **seminal receptacles**, sperm-storage areas within the female reproductive tract, are smaller, whitish organs near the seminal vesicles. **Oviducts** start at the ovaries, go past the seminal receptacles, then to segment 14, from which they open to the outside.



7. Note the **ventral nerve cord** with **segmental ganglia** (**ganglion** = a knot on a string). If you lift a section of the digestive tract/blood vessels, the nerve cord should be seen lying on the ventral surface of the body cavity.

body cavity. Often there is a tangled network visible within the coelom which is part of the **nephridia**, the excretory organs. Each nephridium opens to the outside via a **nephridiopore** (which may not be visible on your slide).



3. Examine the central tube. Note that its upper (dorsal) surface is folded into the digestive tract. This portion is called the **typhlosole** (**typhlo** = blind; **solen** = channel, pipe), and helps to increase the surface area of the **digestive tract**. The layers, from outside in, are the **chloragen cells**, then thin **muscular layers** (both **mesoderm**), then the **gastric epithelium** (**gastro** = stomach, **theli** = nipple), which is **endoderm** tissue, as the lining of the digestive tract is known as the **lumen**. Dorsally and ventrally of the digestive tract run the dorsal and ventral **blood vessels**. Ventrally, in the coelom, there is a **nerve cord** that runs the length of the body.

V. DATA:

Take notes, draw and label what you see.

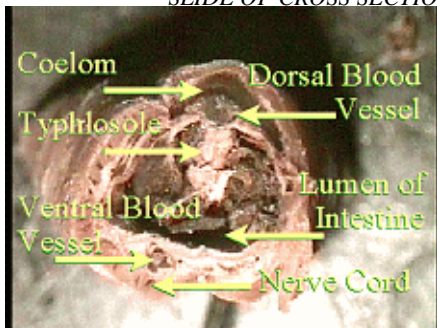
VI. DISCUSSION:

1. Were you surprised to find out that earthworms really do have body parts/organs? Which did you find the most interesting? Why?
2. Can you think of any organ/system present in humans that is not

present/represented in earthworms? How do you think that worms can get along without this system?

3. Include any other comments, etc. that you may have.

SLIDE OF CROSS SECTION OF EARTHWORM SEGMENT



Observe a prepared slide and also cut a

thin cross-section through your worm and view with a dissecting scope.

1. Note/draw the layers in the body wall from the outside in: **cuticle** secreted by the epidermis, **epidermis** (**epi** = upon, over, beside)--made of **ectoderm** tissue, then **circular muscle layer**, **longitudinal muscle layer**, and **parietal peritoneum** (**pariet** = a wall; **peri** = around; **ton** = something stretched; **-eum** = a place where; **peritoneum** = the membrane around the intestines)--all **mesoderm** tissues (**meso** = middle). Note the four areas where the setae are located, although you may not see the actual **setae** in your slide.

2. Note the **coelom** (**coelo** = hollow), the