Ministry of higher education and scientific research
university of Baghdad
College of science
Department of biology

Theoretical Helmanthology

2022-2021

المرحلة الرابعة - الدراستين الصباحية والمسائية

الفصل الدراسي الاول

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Lab 1

Phylum: Platyhelminthes

- Dorso-ventrally flattened worms
- Bilaterally symmetrical
- Possess an incomplete digestive tract
- Lack body cavity (Acoelomate)
- Without special skeletal, circulatory or respiratory systems.
- The excretory system is based on the flame cells.
- They are mostly hermophroditic (Both sexes are contains in one individual) with few exceptions.

LEARNING OBJECTIVES

• Understand medically important helminthes including their life cycles, modes of transmissions, clinical features, diagnosis, and prevention.

INTRODUCTION

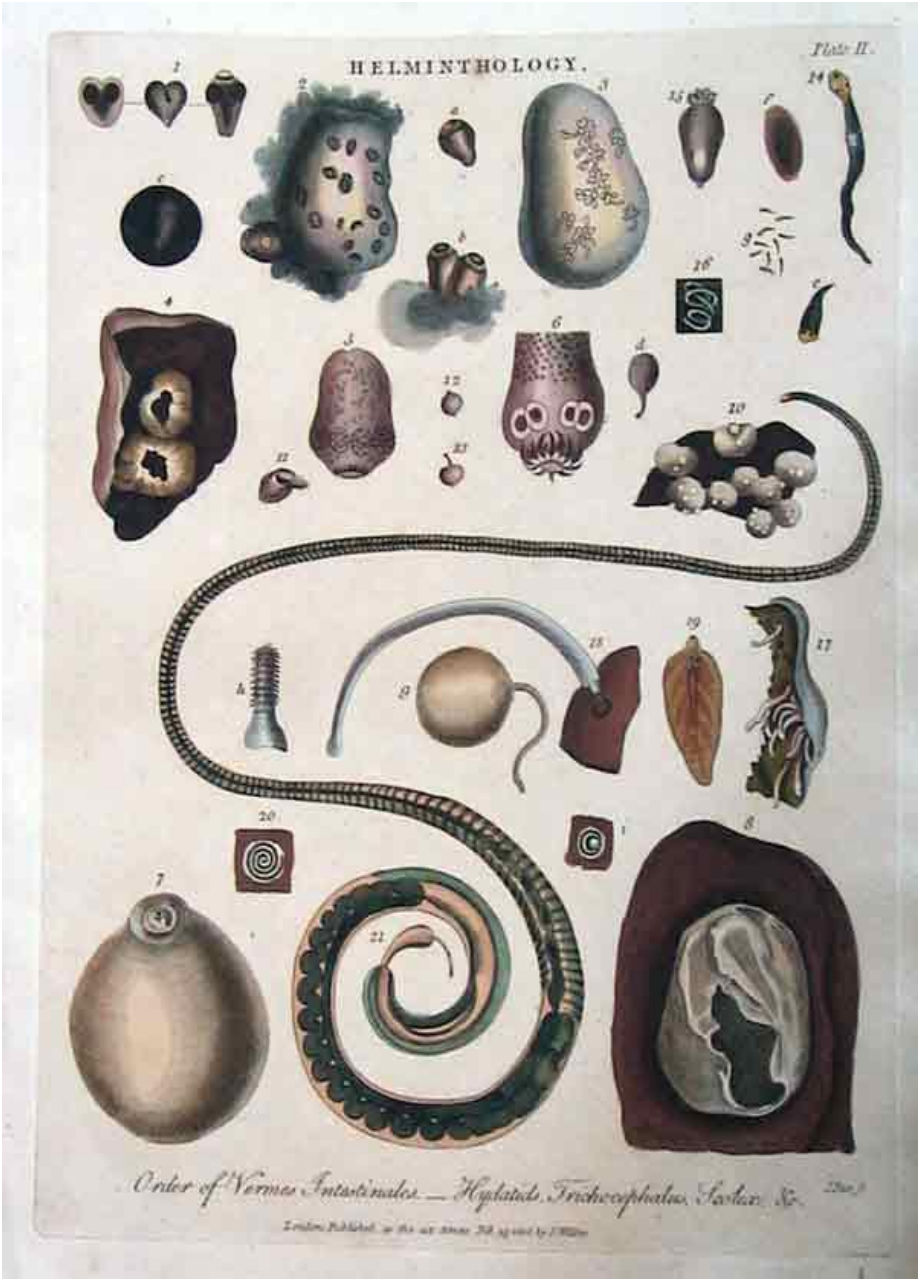
Medical helminthology is the study of parasitic worms

Helminthes are metazoa (multi-cellular organisms)

Cause of high mortality of people worldwide

Cause anemia and malnutrition

Cause economic loss as a result of infections of domestic animals



Order: Digenea

Divided into four groups according to the site where worm presence:

1- Liver Fluke
2- Intestinal Fluke
3- Lung Fluke
4- Blood Fluke

Digenic trematoda is divided according to number and position of suckers into:

Paramphistomum

Fasciola

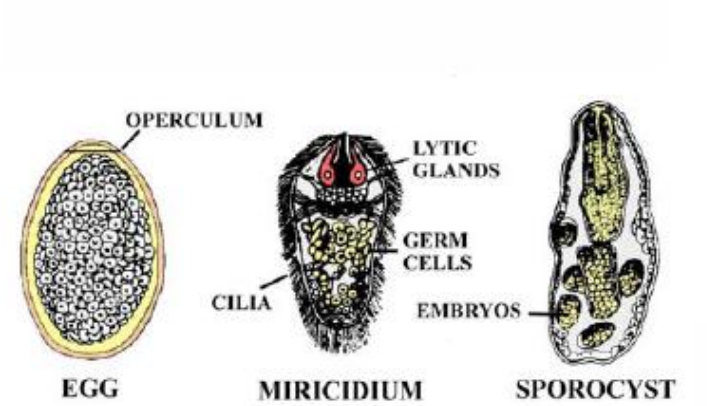
Echinostoma

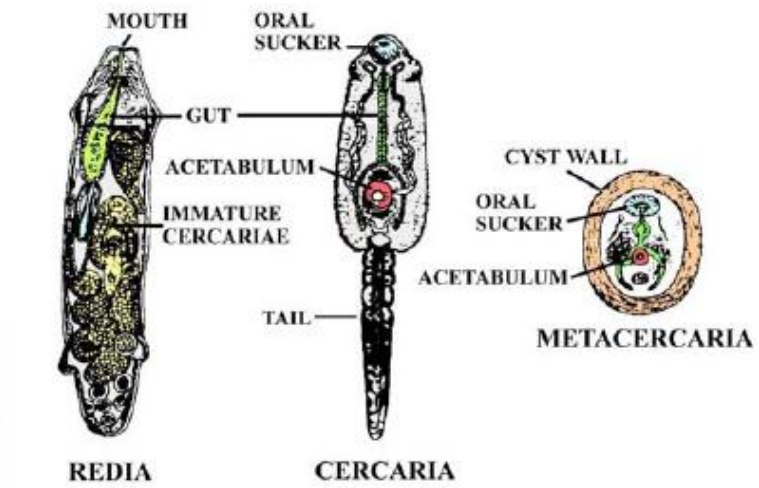
Bucephalus

Alaria canis

Notocotylus

Lab2
Life Cycles





Liver Flukes
Fasciola hepatica

Scientific name :*Fasciola hepatica*

Common name: Sheep liver fluke

Disease: Liver rot

Infective stage: Metacercaria

1st intermediate host: *Lymnea*

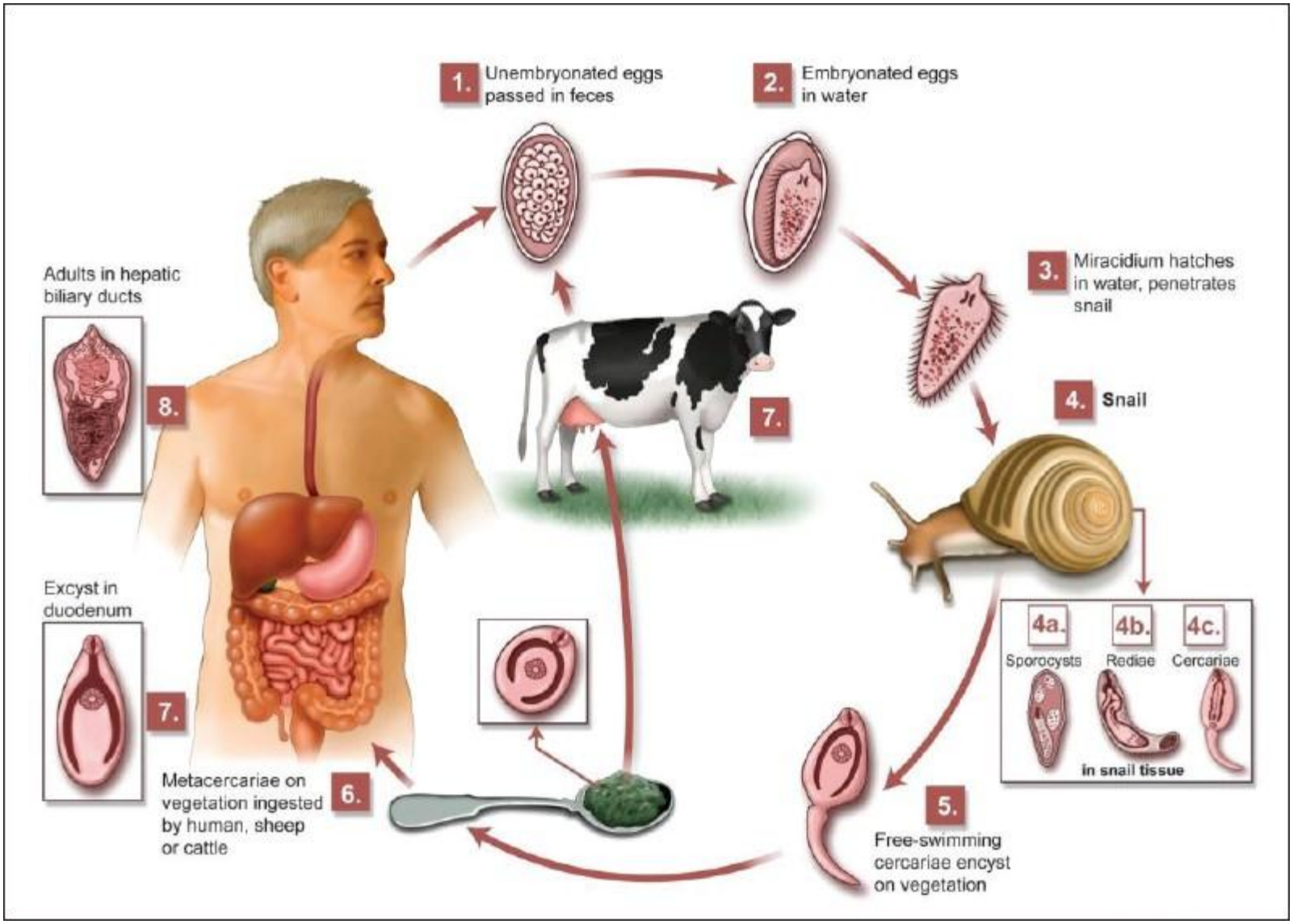
2nd intermediate host: aquatic vegetation (water cress)

Diagnosis: ova are found in faeces

Presence in the host: The adults live in the Bile ducts of sheep, goats, caws, and sometimes could infect human

Fasciola hepatica يصل طولها الى ٣٠ ملم

Fasciola hepatica life cycle



Lab3
Intestinal flukes

Common name/ location: Giant intestinal fluke/ human small intestine, found in pigs as well

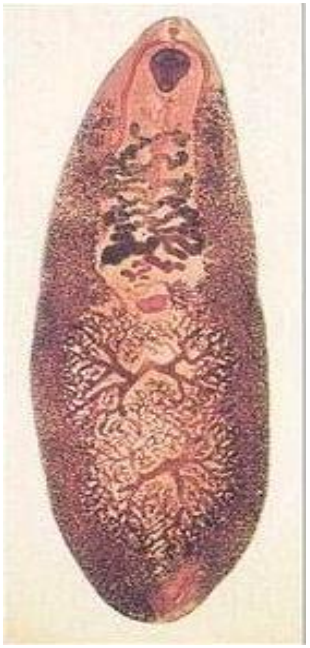
Length: 25-75 mm

Disease: Fasiciolopsiasis

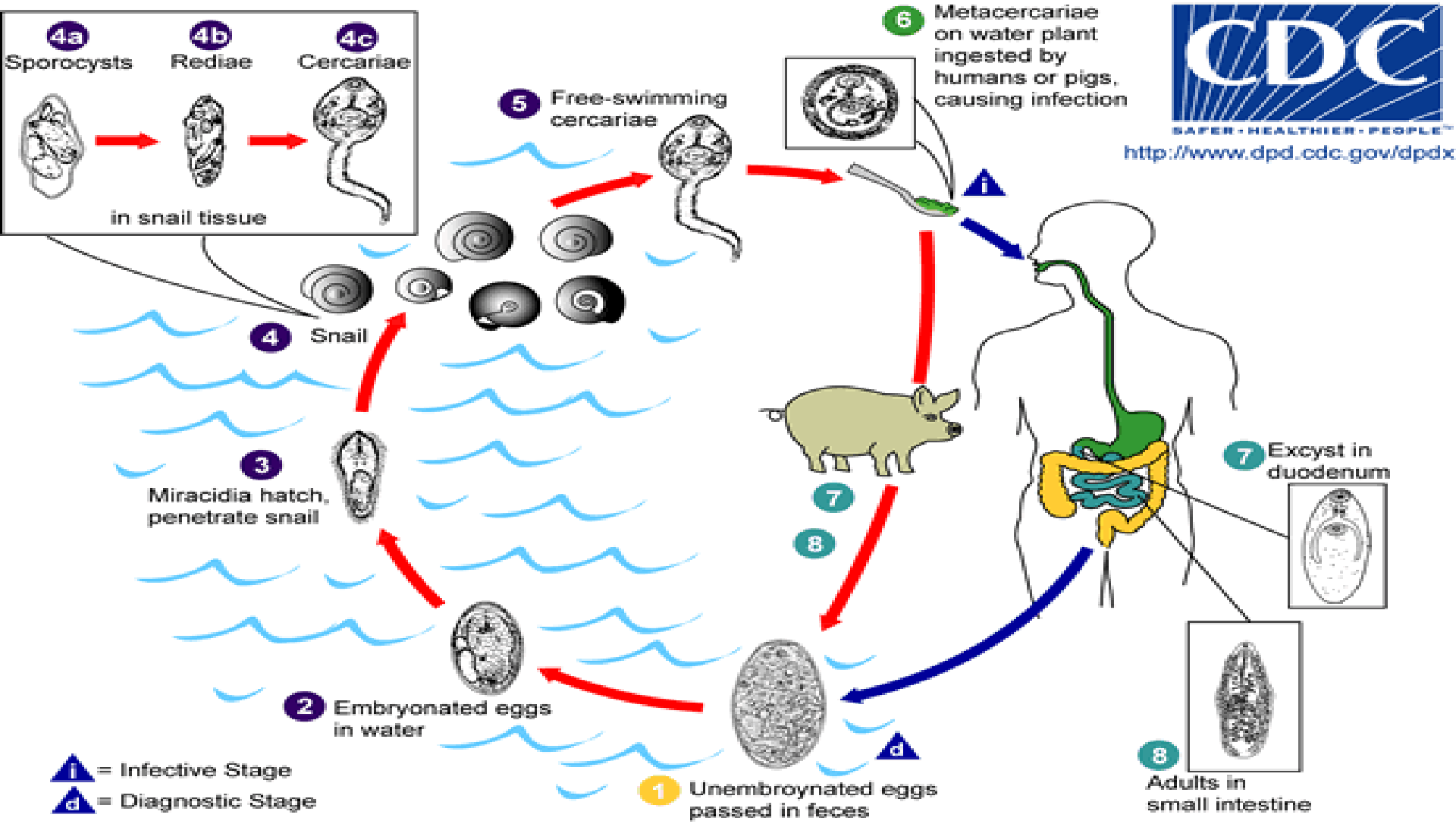
Infective stage: Metacercaria

Intermediate host: 1- Snail *Segmentina*
2- Water chestnut

Diagnosis: Ova in feces (unemberyonated ova)



Fasciolopsis buski life cycle



Heterophyes heterophyes

Common name/ location : Small intestine fluke/ live in small intestine between the villi of human/ other mammals that eating fish

Length: 0.1 – 1.7 mm

Disease: Heterophyiasis

Infective stage: Metacercaria

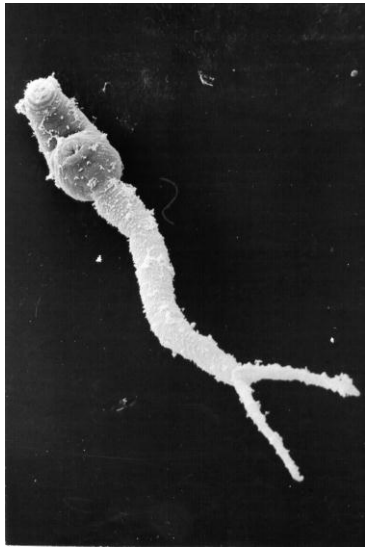
Intermediate host: 1- *Pirenella conica*
2- *Mugil*

Diagnosis: ova in feces (Emberyonated)

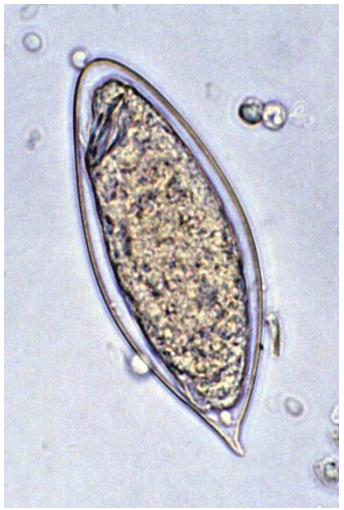
Lab4 Class: Trematoda
Blood Flukes

- *S. haematobium* - Africa and middle east
- *S. mansoni* - Africa and Latin America
- *S. japonicum* – Pacific region
- Dioecious (male and female)

- Cercaria of schistosoma spp is forked tailed cercaria
- No redia in their life cycle stages



Blood flukes eggs (ova)



S. haematobium egg
big, with terminal spine,
Secreted with urine

S. mansoni egg
Bigger, with lateral spine,
Secreted with stool

S. japonicum egg
small, with reduces lateral spine (knob)
Secreted with stool

Female ovary and uterus location

	S. haematobium	S. mansoni	S. japonicum
Ovary	2nd half of body	1st half of body	Middle of body
Uterus	Long with 20-30 ova	Short with 1-4 ova	Long with 50-100 ova

Male cuticula type and length

S. haematobium	S. mansoni	S. japonicum
Cuticula with fine tegument	Cuticula with coarse tegument	Smooth cuticula
10-15 mm	6.5-9.9 mm	12-20 mm

Male testes and intestine (ceca) junction

	S. haematobium	S. mansoni	S.japonicum
Junction	2nd part of body	1st part of body	3rd part of body
Testes	Big in cluster (4-5)	Small in cluster (6-9)	Lined (6-8)

Lab 5 General characteristics:

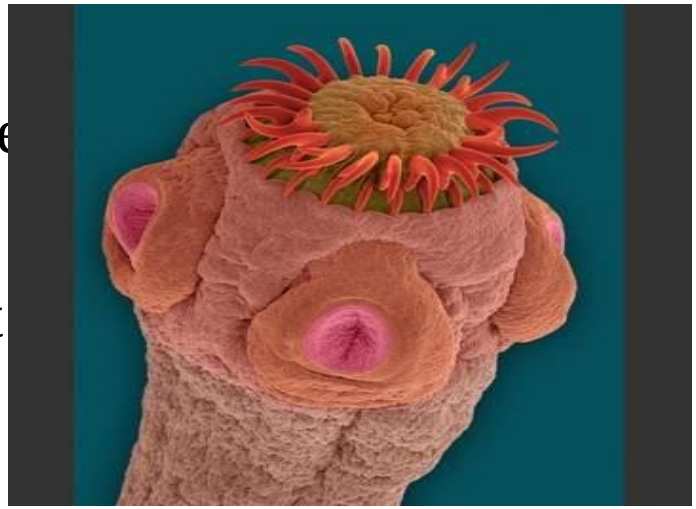
1- All species are parasitic

2- Flat-segmented body, various length, few mm to several meters

3- No digestive system, cuticle of the body has pores in which nutrients is absorbed

4- Adult tapeworms inhabit the small intestine

4- Excretory and nervous systems are present



General characteristics

5- Body consist of 3 regions:

a- scolex: suckers either bothria
(grooves), muscular suckers
(acetabula, cup shape) or hooks (armed)

b- Neck: germinal portion

c- Strobila: immature,

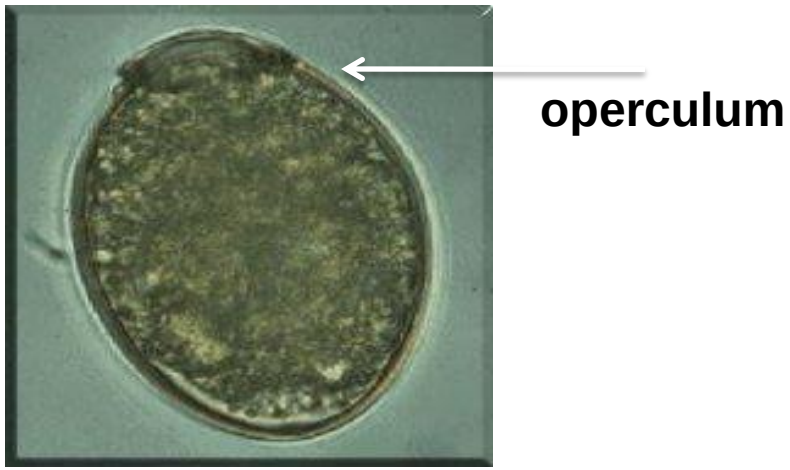
mature, gravid proglottid

6- All are hermaphrodite, each segment has developed reproductive system (male & female).

Orders of Human parasitic cestoda

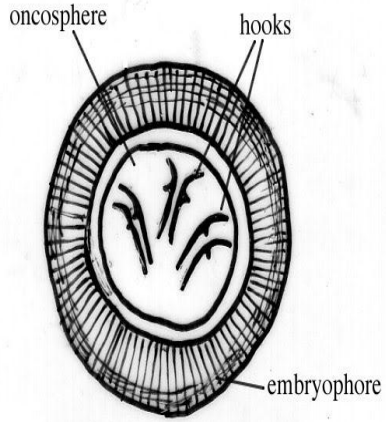
Order: Pseudophyllidae

- Operculated ova
- Ciliated hexacanth embryo.



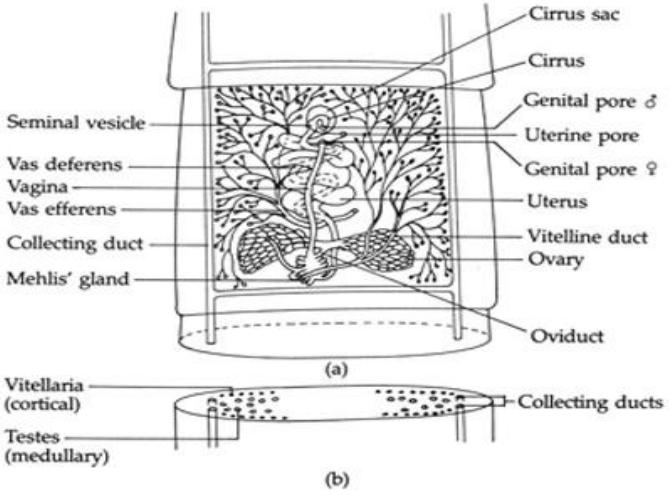
Order: Cyclophyllidea

- Non-operculated ova
- Non-ciliated hexacanth embryo.



Pseudophyllidae

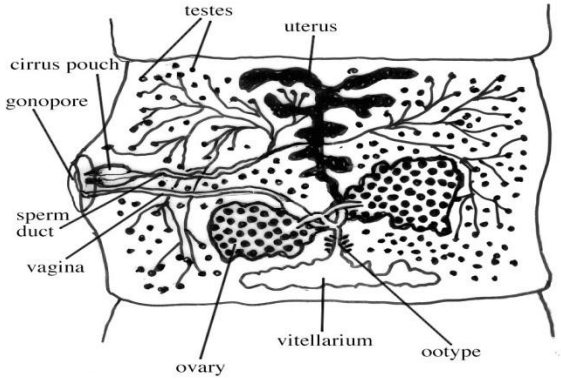
-Uterus with ventral pore so ova discharged regularly
-Most proglottids are of same maturity
-Common genital opening on ventral side
-Yolk gland distributed all over the proglottid



Cyclophyllidea

-Uterus with no pore, ova discharged with gravid proglottid
-Proglottids are of different maturity
-Lateral common genital opening

-Single yolk gland or 2 lobed

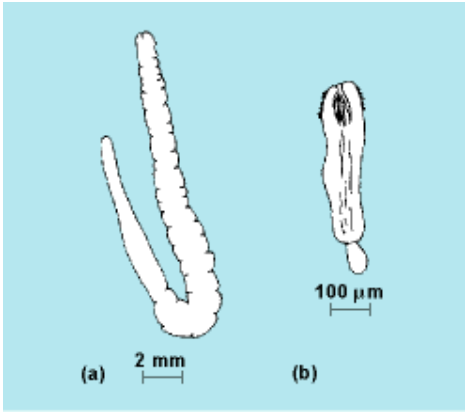


Pseudophyllidae

- Two larval stages,

a- procercoid in *Cyclops*

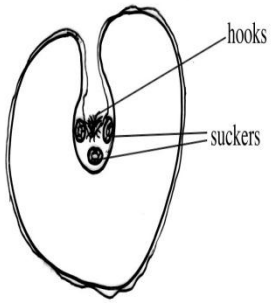
b- plerocercoid in fish



- Scolex has 2 bothria

Cyclophyllidea

- One larval stage called *cysticercus* (bladder worm) live in voluntary muscles of intermediate host



•Scolex has 4 acetabula

Diphyllobothrium latum

- Common name/location: broad or fish tapeworm/ small intestine of human and other mammals feed on fish
- Length: 3-10 meters.
- Proglottids no. 3000-4000.
- Disease: Diphyllobotheriasis
- Infective stage: Plerocercoid
- Intaermediate host: 1- *Cyclops*

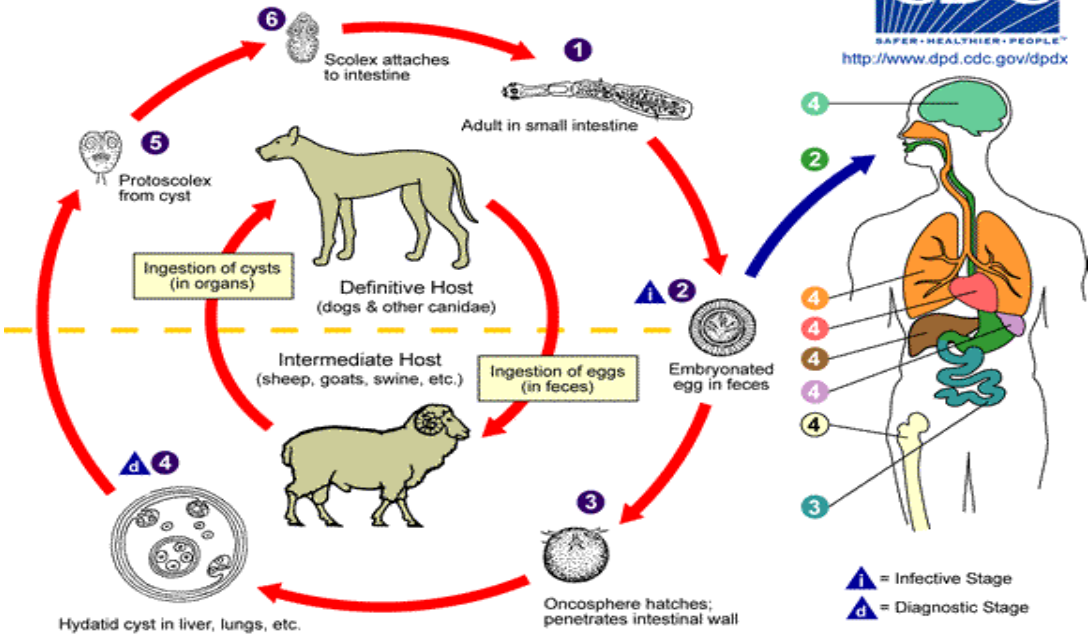
  2- Fish
- Diagnosis: ova in stool.

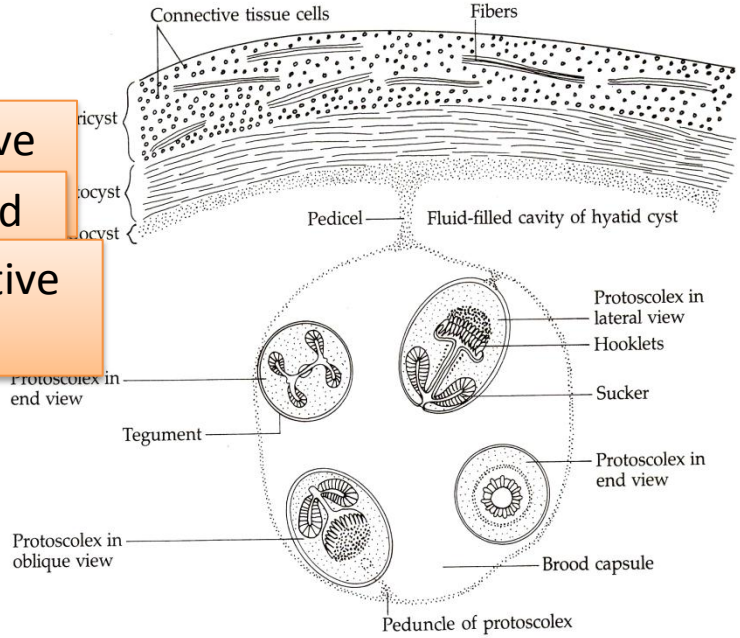
Lab 6.*Echinococcus granulosus*

- **Common name/Location**: Hydatid tapeworm الشريطية العدرية/ small intestine of carnivorous mammals.
- **No. of proglottids**: 3
- **Intermediate host**: livestock (ماشية) and human.
- **Final host**: carnivorous (dogs, fox etc.)
- **Infective stage of intermediate host:** egg
- **Infective stage of final host:** hydatid cyst الكيس المائي
- **Disease:** Hydatid cyst (Echinococcosis)

- **Diagnosis**: X-ray, Ultrasound, MRI or serology.

Echinococcus granulosus
Life cycle





Connective

Laminated

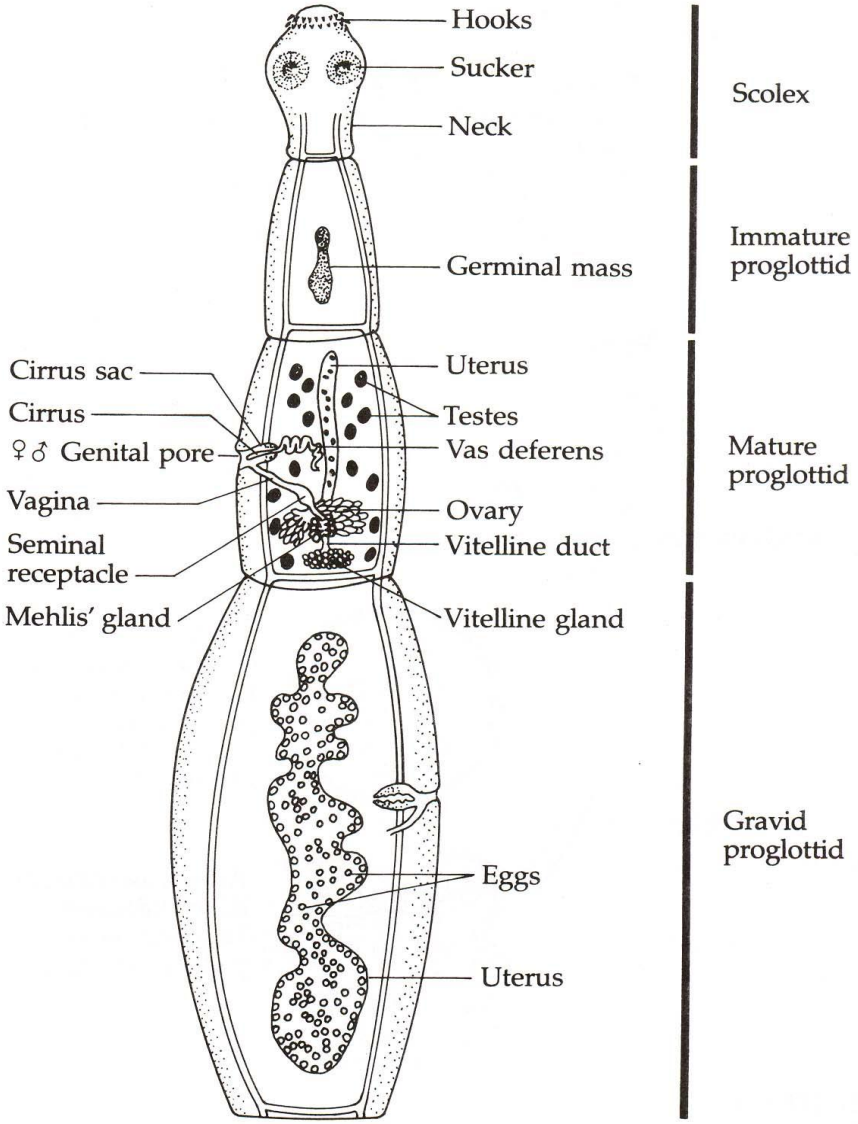
Germinative layer

Echinococcus granulosus
c.s in hydatid cyst

Echinococcus multilocularis

- Common name/Location: Alveolar hydatid tapeworm الشريطية الحوصلية/ small intestine of carnivorous mammals.
- Intermediate host: small rodents and rarely human.
- Final host: carnivorous (dogs, fox) sometimes dogs and cats.
- Infective stage of intermediate host: egg
- Infective stage of final host: hydatid cyst الكيس المائي
- Disease: Alveolar echinococcosis
- Diagnosis: X-ray, Ultrasound, MRI or serology.

Echinococcus granulosus w.m



2-7 mm

Hymenolepis nana

Common name/location: Dwarf tapeworm,
small intestine of human and rats.

Length: up to 40 mm.

Proglottids no. 150-200.

Disease: Hymenilepiasis.

Infective stage: cycticercoid

Intermediate host: fleas and grain beetles.

Diagnosis: ova in stool.

Dipylidium caninum

Common name/location: double pored dog tapeworm or cucumber tapeworm, small intestine of dogs and cats, rarely humans (children).

Length: 10- 40 mm.

Intermediate host: fleas of dogs and cats, dog's lice.

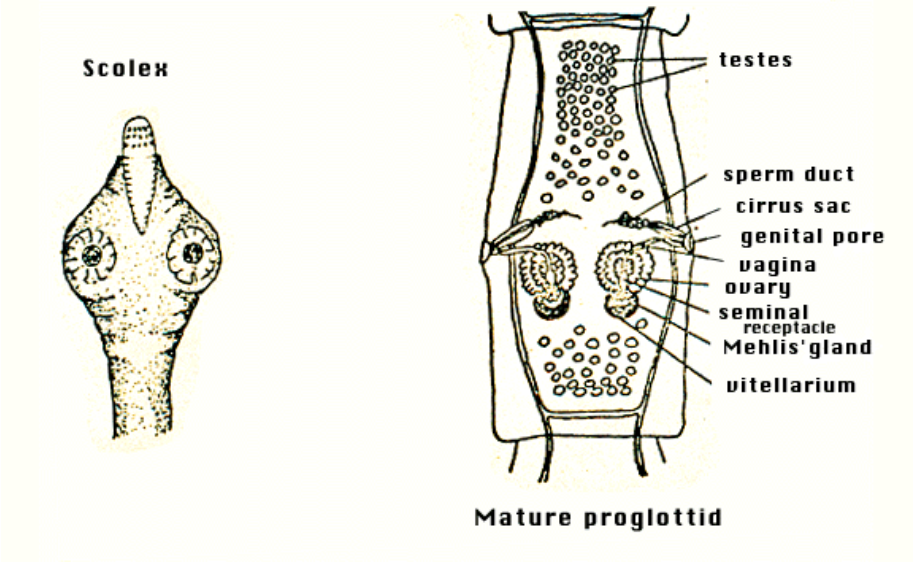
Disease: Dipylidiasis

Infective stage: cycticercoid

Diagnosis: ova packets or gravid proglottids in stool.

Dipylidium caninum

- Scolex has rostellum with four rows of hooks.



Lab 7General Characteristic

Threadlike “worms” covered by a thick cuticle

Un-segmented, cylindrical, bilaterally symmetrical

Have a complete digestive tract with both oral and anal openings

They are long-lived (1-30+ years)

Most nematodes are dioecious and males are smaller than females

Adult anterior- may have hooks, teeth, or cutting plates in the buccal cavity

Complete reproductive organs

Males have testes, vas deferens, seminal vesicle and an ejaculatory duct
Females have ovaries, oviduct, seminal receptacle, uterus and vagina

Both free-living and parasitic

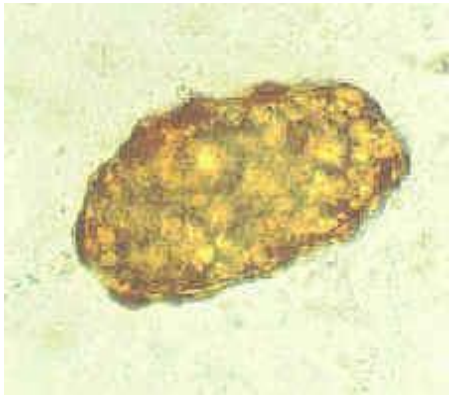
Vary greatly in size- from a few millimeters to over a meter

Male worms - frequently have a curved or coiled posterior end with copulatory spicules; Some species exhibit a copulatory bursa

Phasmids

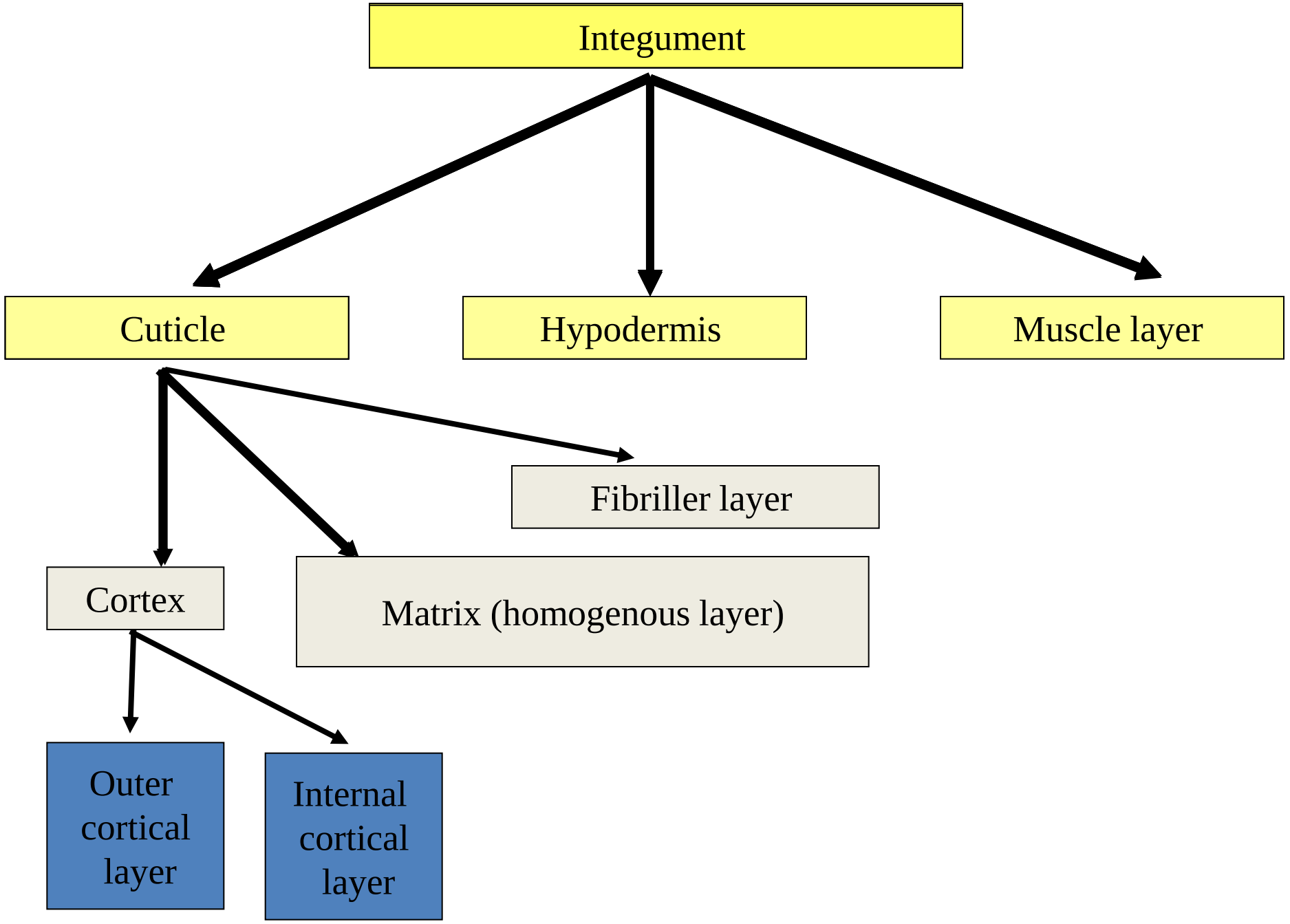
Characterized by unicellular sensilia in the lateral tail region, considered as excretory structures and act as chemo and sensory receptors.

Ascaris lumbricoides
Common name /Location: Abdominal snake/ small intestine in human
Length: 25-35cm
Infective stage: egg with L2
Disease: Ascariasis
Diagnosis: Fertilized and unfertilized egg

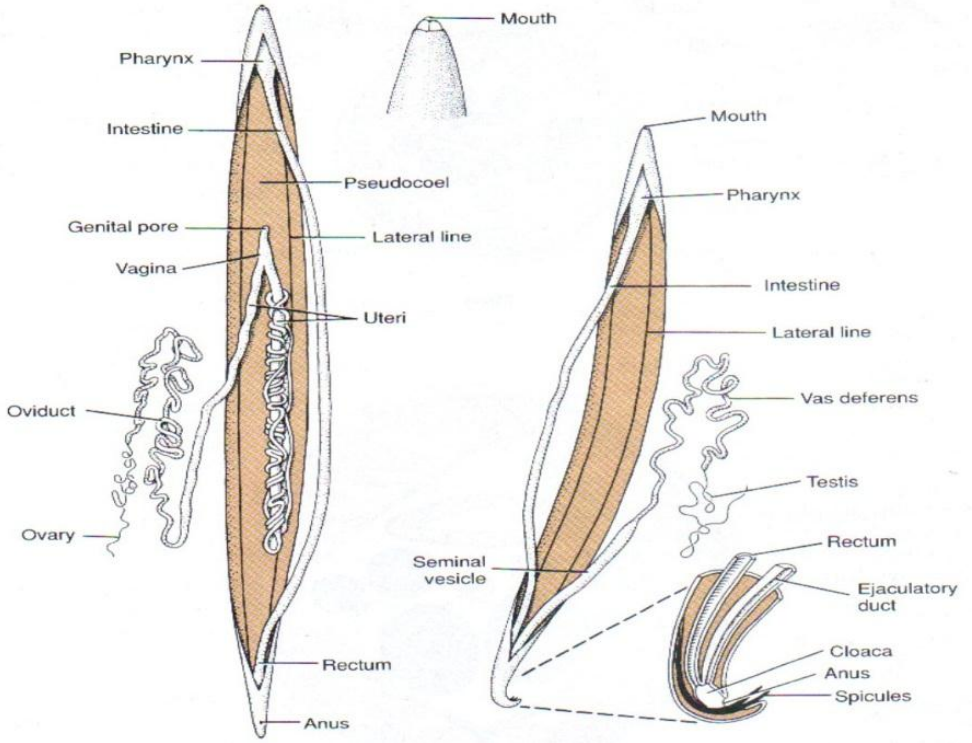


Fertilized eggs: broad oval in shape The shell is thicker and consists of, proteinaceous layer, vitelline layer, chitinous layer, lipid layer. The content is a fertilized ovum.

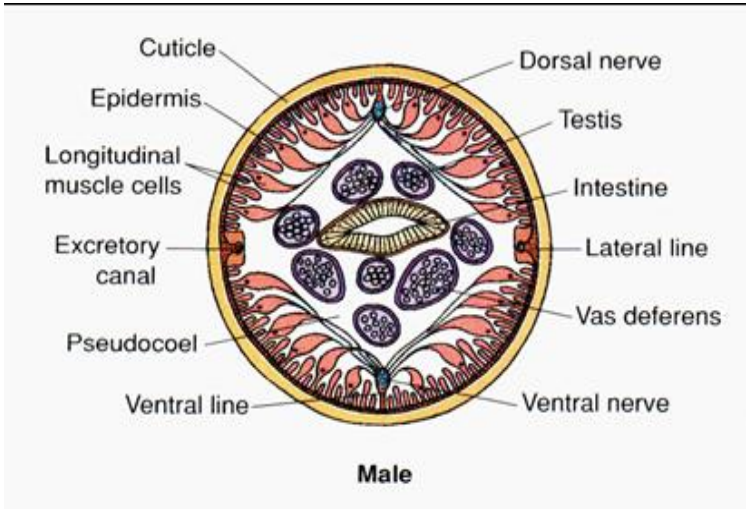
Unfertilized egg: Longer and slender than a fertilized egg. The chitinous layer and proteinaceous coat are thinner than those of the fertilized eggs. The content is granules various in size.


Integument
Cuticle
Hypodermis
Muscle layer
Fibriller layer
Cortex
Matrix (homogenous layer)
Outer cortical layer
Internal cortical layer

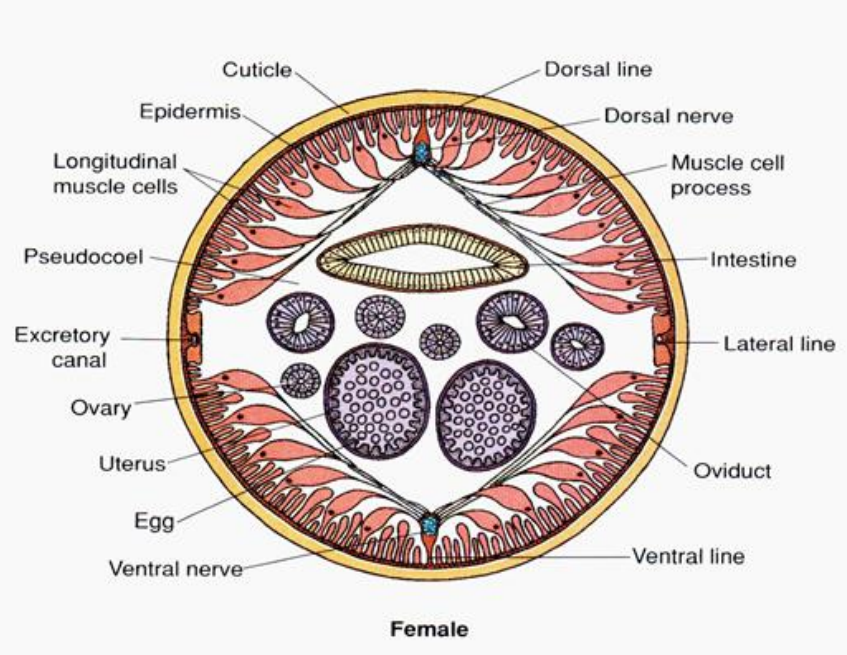
Ascaris lumbricodes male and female



C.S *Ascaris* male



C.S *Ascaris* female



Lab 8 Strongyloides stercoralis

Common name/Location: Human round worm**,** The adults lives in small intestine of human

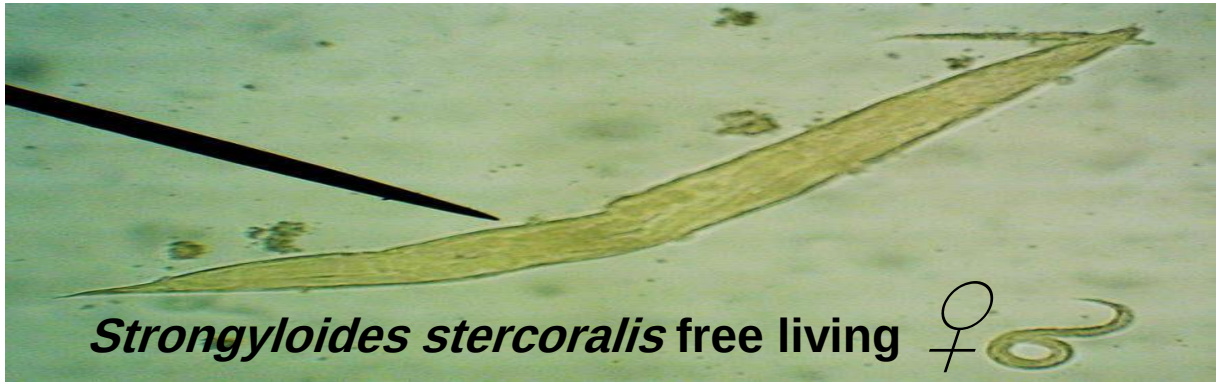
Disease: Strongyloidiasis

Infective stage: Filariform larva

Diagnoses: Rhabditiform larva in feces

Strongyloides female free living	Strongyloides female parasitic living
Size: 1mm X 50-70 µm.	Size: 2.2mm X 0.04 µm.
Sexual fertilization.	Parthenogenesis fertilization.
Genital pore locate in the middle of the body.	Genital pore locate in the last third part of the body.
Esophagus is rhabditiform	Esophagus is filariform
The uterus contain more eggs.	The uterus contain less eggs.

Strongyloides stercoralis



Lab 9 Phasmidia and Aphasmidia

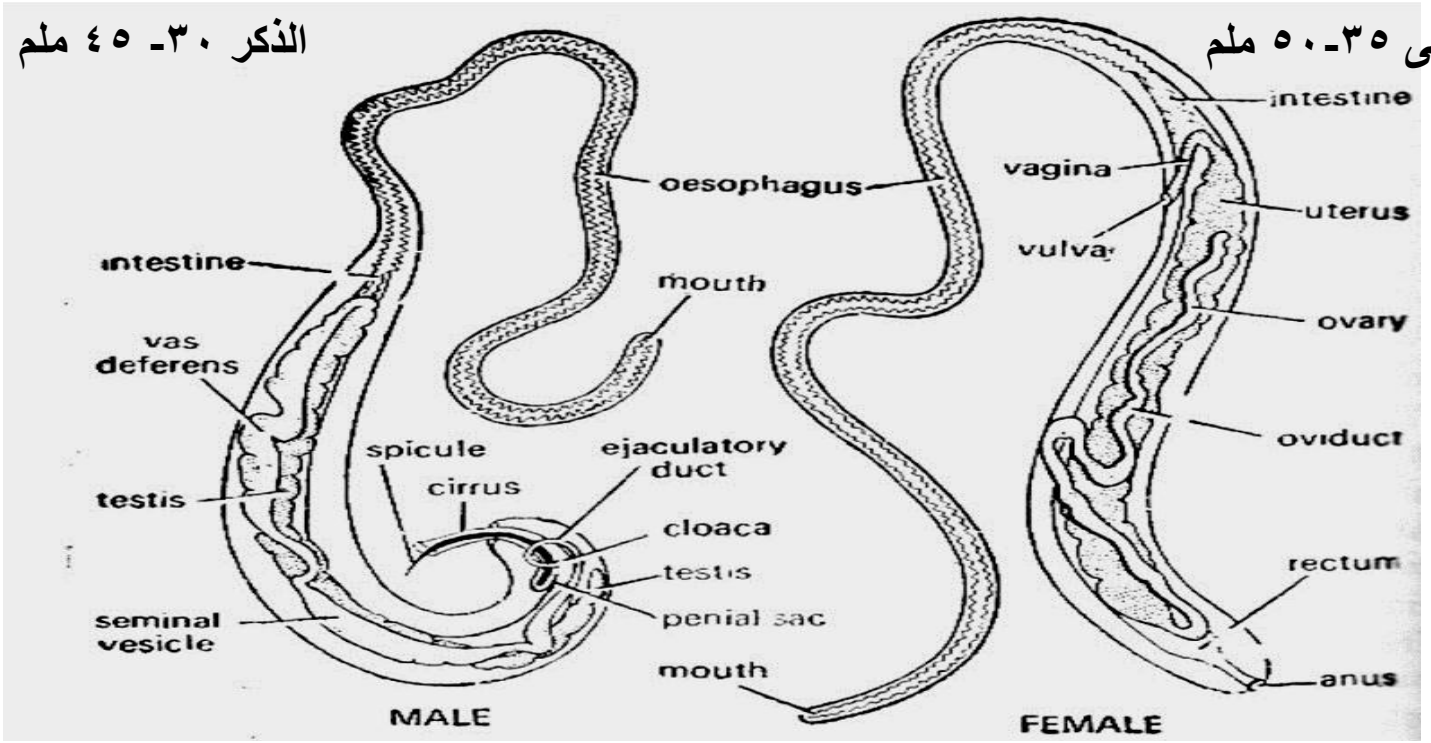
This phylum divided into two subclasses depend on presence or not presence fine structures called Phasmids

Phasmidia	Aphasmidia
Have phasmids	Don't have phasmids
Male have two copulatory spicules	Male has one copulatory spicule

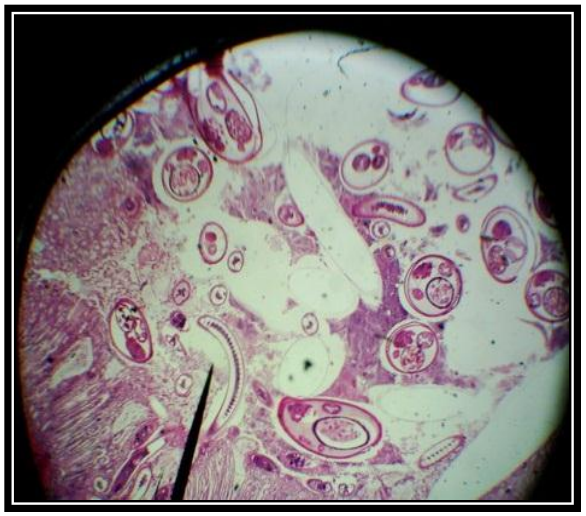
Subclass: Aphasmidia
Trichuris trichura

- **Common name**: Whipworm
- **Location**: Large intestine in human
- **Length**: up to 50 mm.
- **Disease**: Trichuriasis or whipworm infection
- **Infective stage**: egg with L1
- **Diagnosis**: Football-shaped eggs with polar plugs in feces

Trichuris trichiura



Prolapse of rectum due to infection of ***Trichuris trichiura***



C.S in Rectum Show heavy infection of ***Trichuris trichiura***

Wuchereria bancrofti

- **Location**: Adult live in the major lymphatic ducts of humans, they are normally found in the afferent lymph channels in the lower half of the body.

Disease: Bancroftian filariasis

Intermediate host: *Anopheles, Aedes, Culex*

Infective stage : Filariform larva (L3)

Diagnosis:

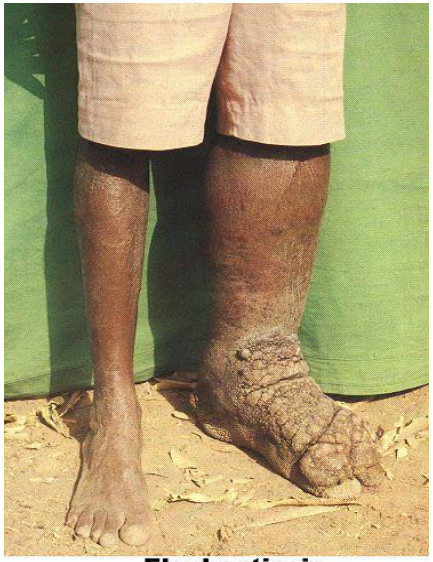
1- Presence of microfilaria in blood smears

2- Presence non adult worms in the biopsy for infective lymph node.

3- Skin test by using powdered prepared from filaria that infect dogs.

Wuchereria bancrofti microfilaria

Size Range: 240 – 300 µm long



Elephantiasis
Ursache: lymphotrope Filarien (Fadenwürmer)

Wuchereria bancrofti infection
Elephantiasis

Lab 10 Subclass: Phasmidia

Enterobius vermicularis

Common name: Pinworm or seat worm

Location: Cecum in human

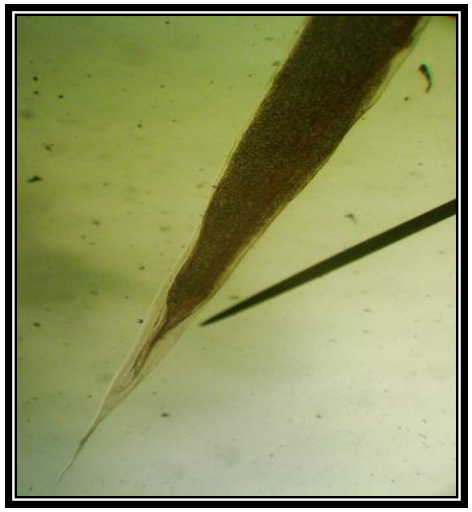
Length: up to 13 mm.

Disease: Enterobiasis

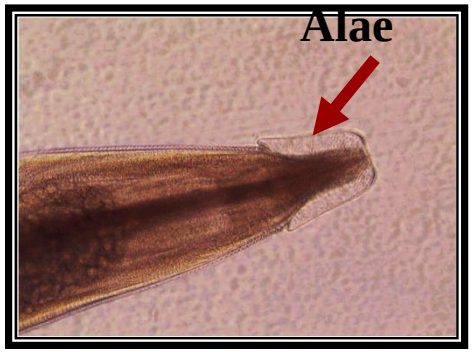
Infective stage: Egg with L3

Diagnosis: Eggs with D shape

Anterior region



Female
posterior region



Male
posterior region

Enterobius vermicularis Life cycle