

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



Theoretical Helmanthology

2020-2021

المرحلة الرابعة - الدراساتين الصباحية والمسائية
الفصل الدراسي الثاني

تدريسي المادة
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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 hermaphroditic (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:



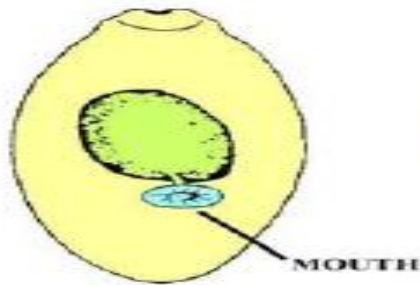
Paramphistomum



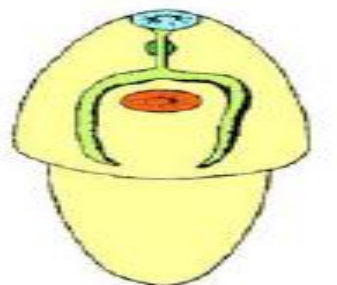
Fasciola



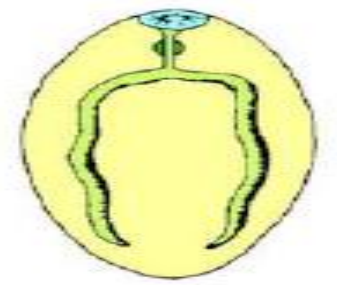
Echinostoma



Bucephalus



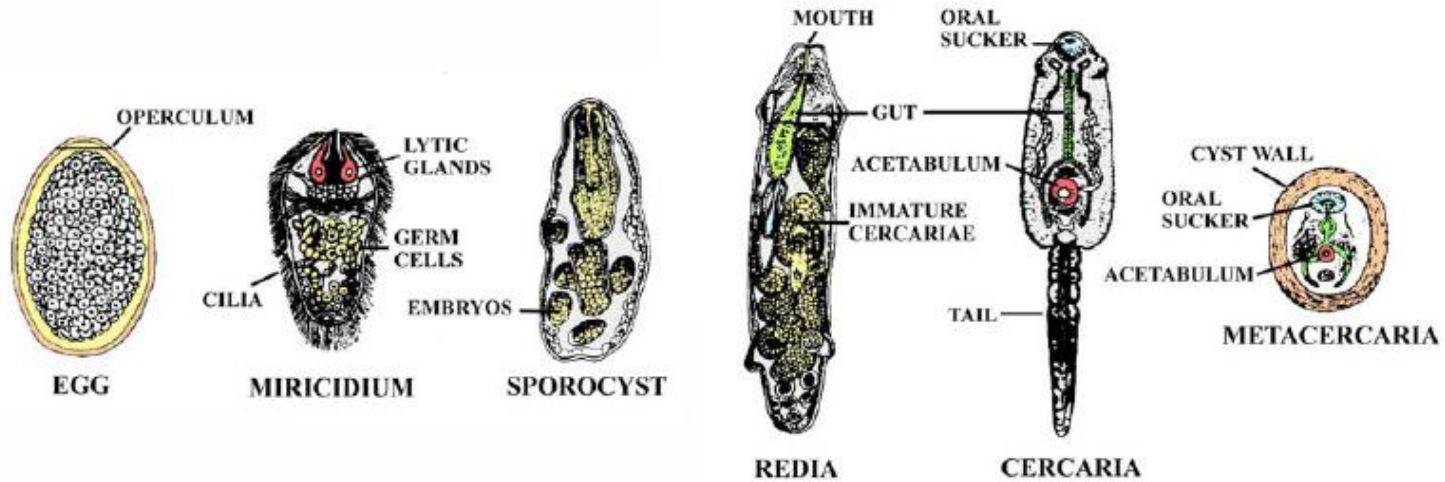
Alaria canis



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

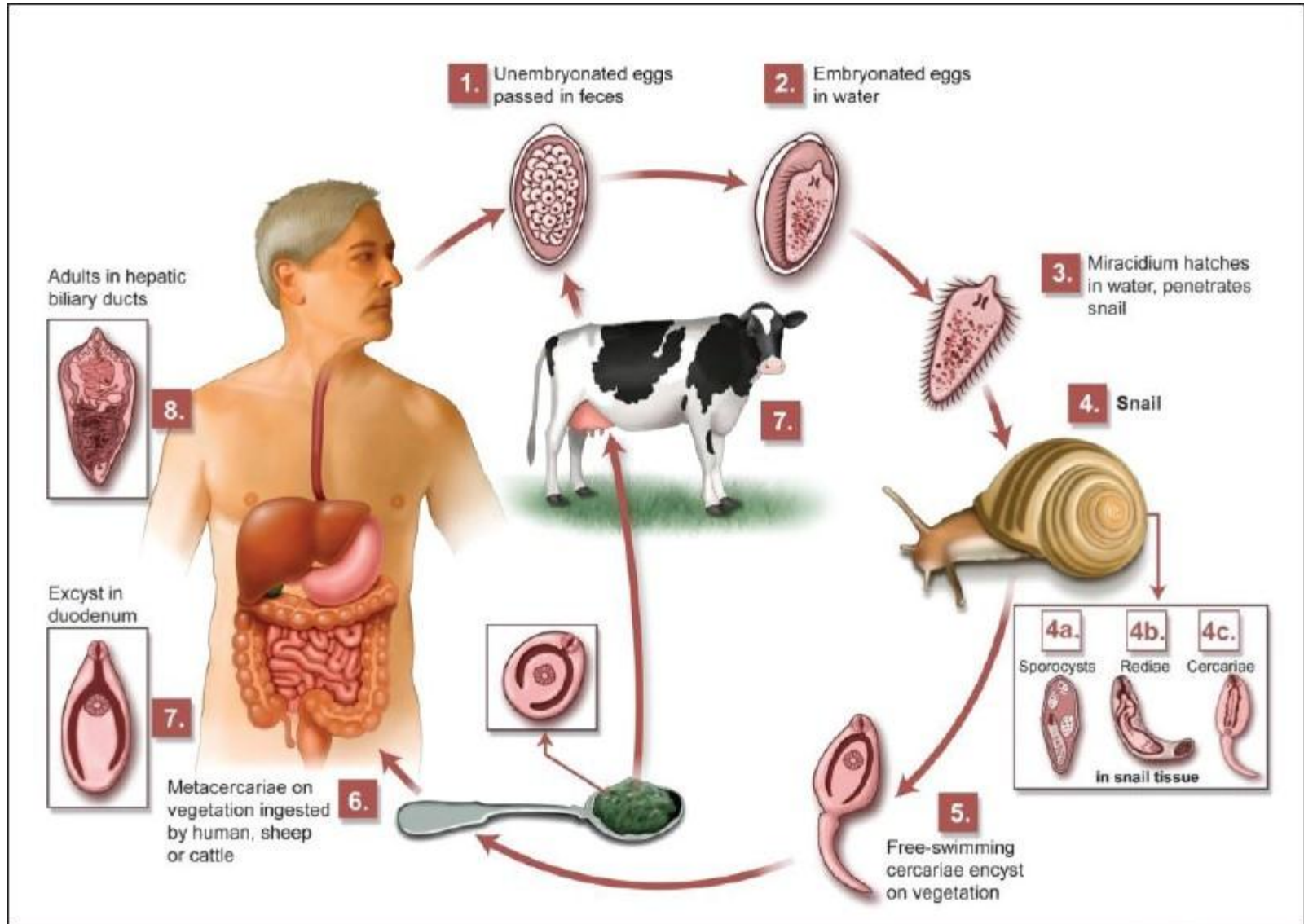
Presence in the host: The adults live in the Bile ducts of sheep, goats, caws, and sometimes could infect human



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

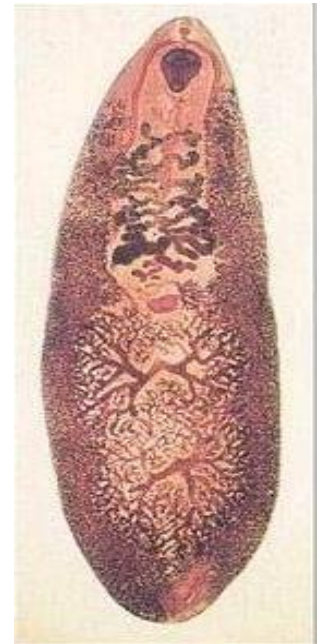
Length: 25-75 mm

Disease: Fasciolopsiasis

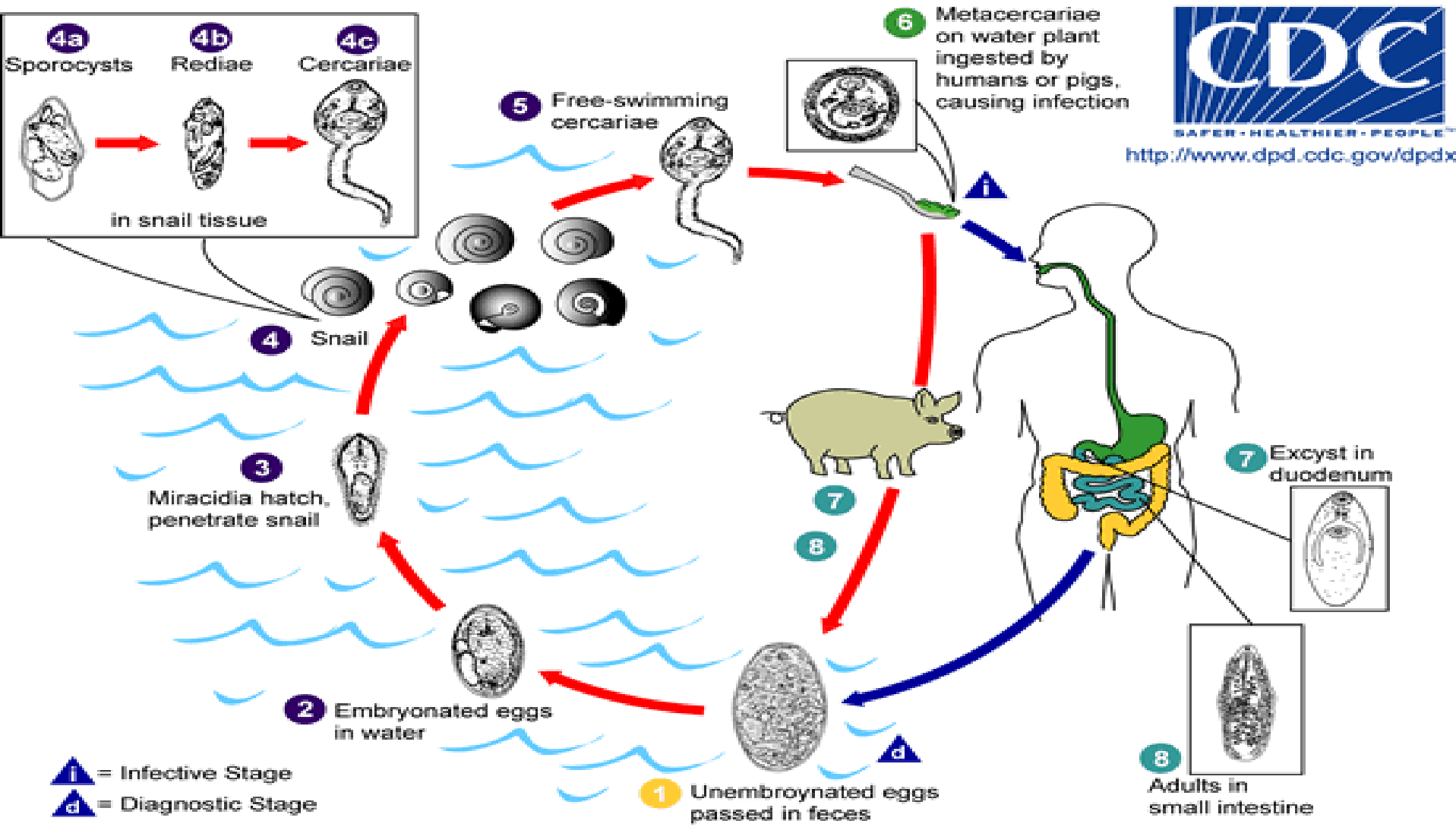
Infective stage: Metacercaria

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

Diagnosis: Ova in feces (unembryonated 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

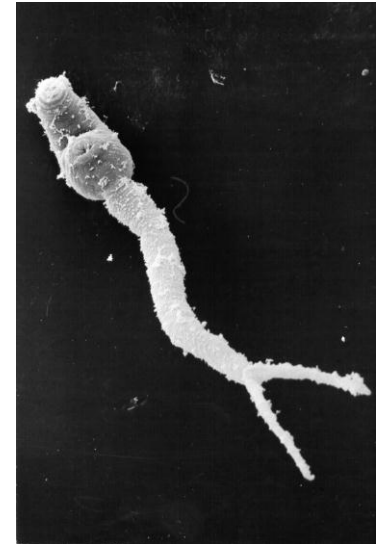
Intermediate host: 1- *Pirenella conica*
2- *Mugil*

Diagnosis: ova in feces (Embryonated)



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

	<i>S. haematobium</i>	<i>S. mansoni</i>	<i>S. japonicum</i>
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

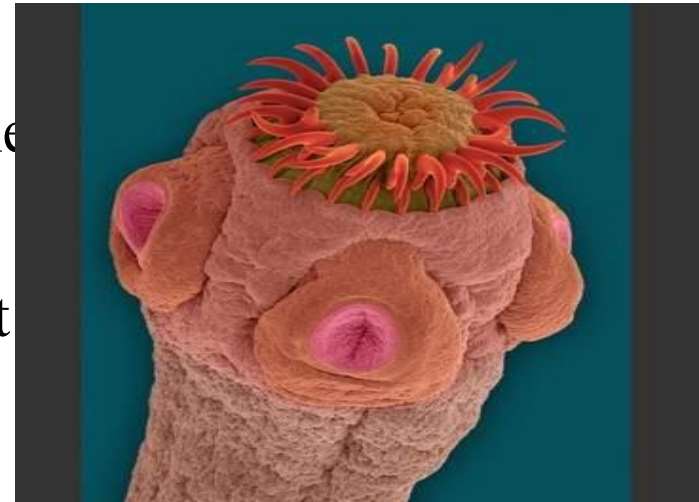
<i>S. haematobium</i>	<i>S. mansoni</i>	<i>S. japonicum</i>
Cuticula with fine tegument	Cuticula with coarse tegument	Smooth cuticula
10-15 mm	6.5-9.9 mm	12-20 mm

Male testes and intestine (ceca) junction

	<i>S. haematobium</i>	<i>S. mansoni</i>	<i>S. japonicum</i>
Intestine Junction	2 nd part of body	1 st part of body	3 rd 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).

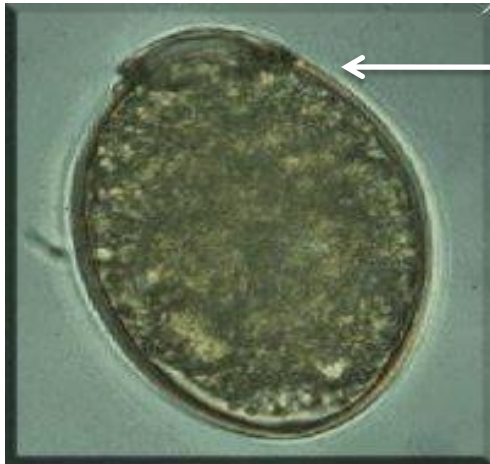
Orders of Human parasitic cestoda

Order: Pseudophyllidae

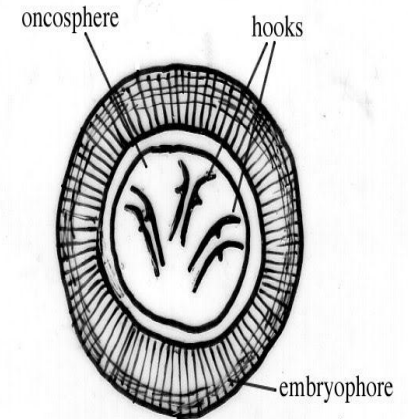
- Operculated ova
- Ciliated hexacanth embryo.

Order: Cyclophyllidea

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



operculum

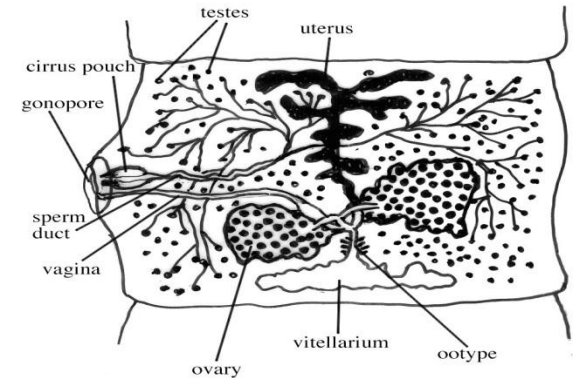
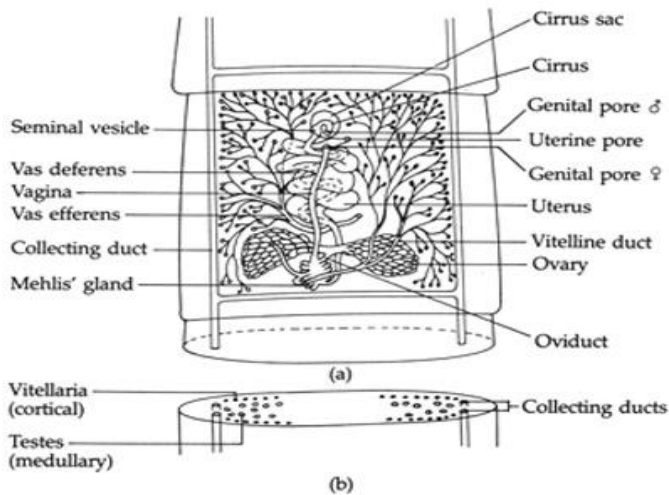


Pseudophyllidae

- 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

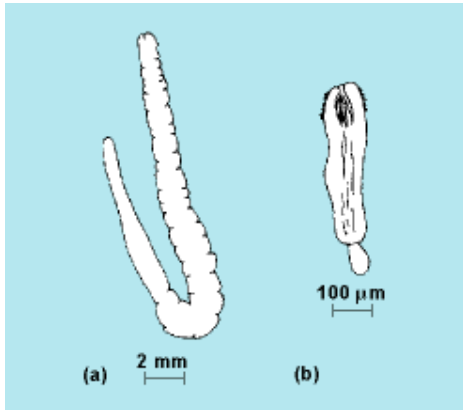
Cyclophyllidea

- 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- proceroid in *Cyclops*
b- plerocercoid in fish

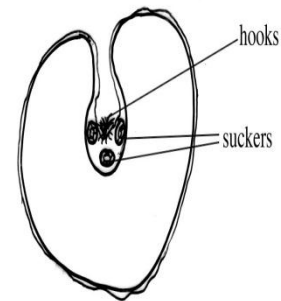


- Scolex has 2 bothria



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: Diphylllobothriasis
- Infective stage: Plerocercoid
- Intermediate host: 1- *Cyclops*
2- Fish
- Diagnosis: ova in stool.



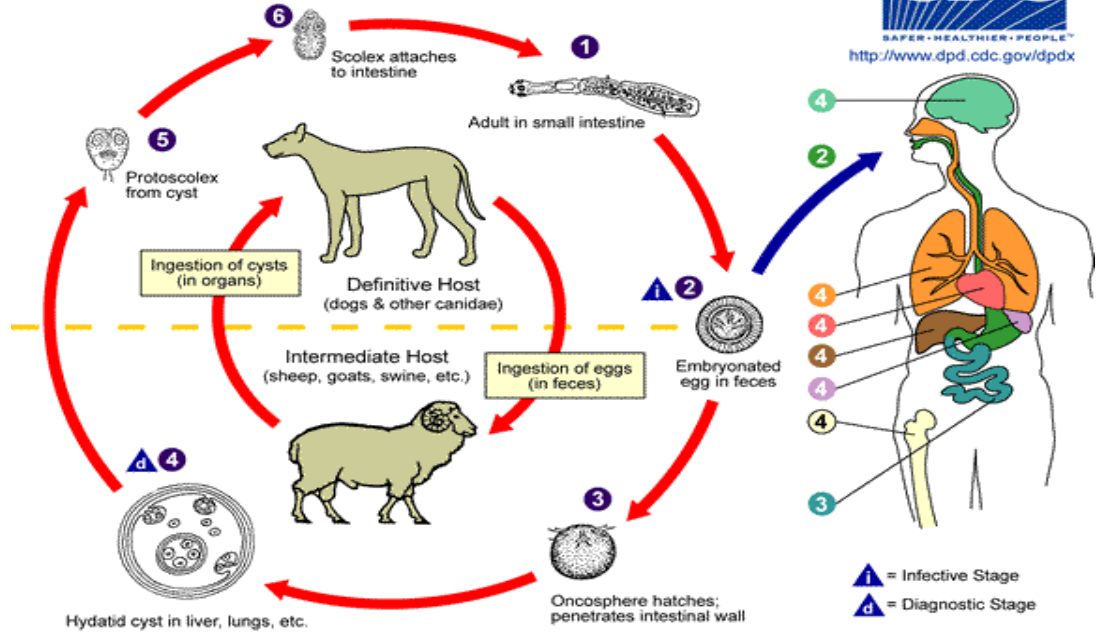
Lab 6. *Echinococcus granulosus*

- **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)

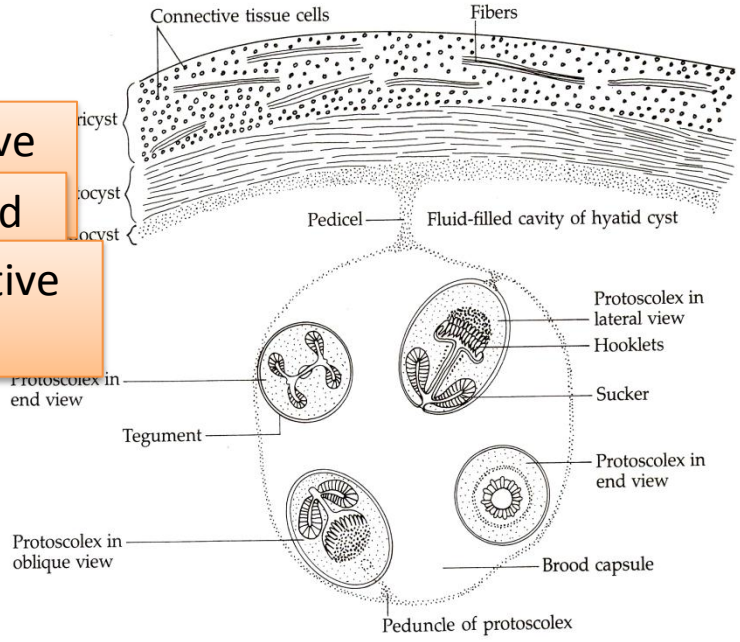
- **Diagnosis:** X-ray, Ultrasound, MRI or serology.

Echinococcus granulosus

Life cycle



Connective
 Laminated
 Germinative
 layer



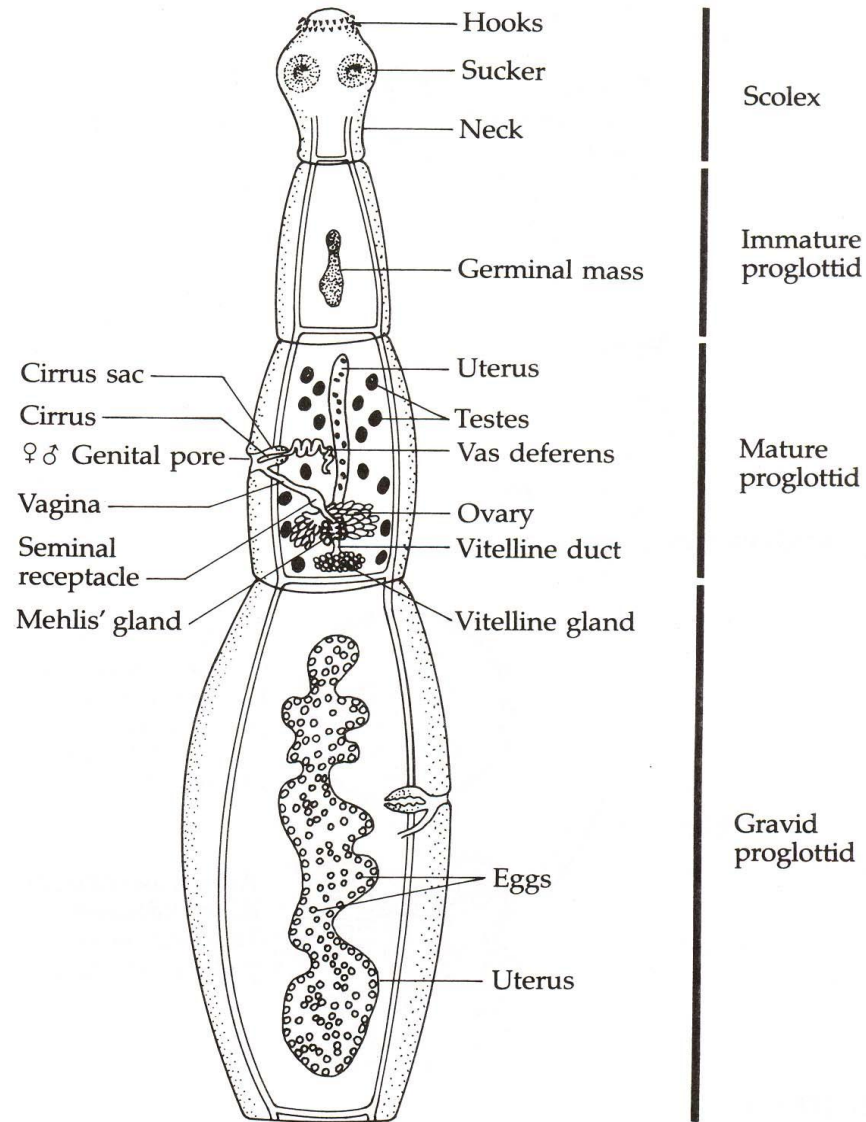
Echinococcus granulosus

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: cycticeroid

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: cycticercoïd

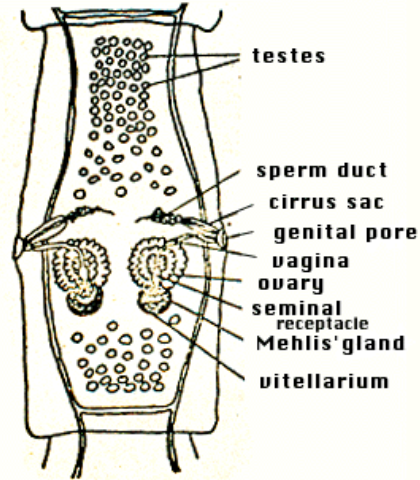
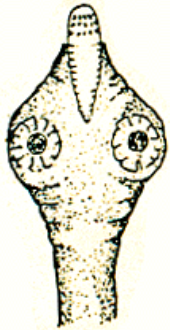
Diagnosis: ova packets or gravid proglottids in stool.



Dipylidium caninum

- Scolex has rostellum with four rows of hooks.

Scolex



Mature proglottid

Lab 7 General 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

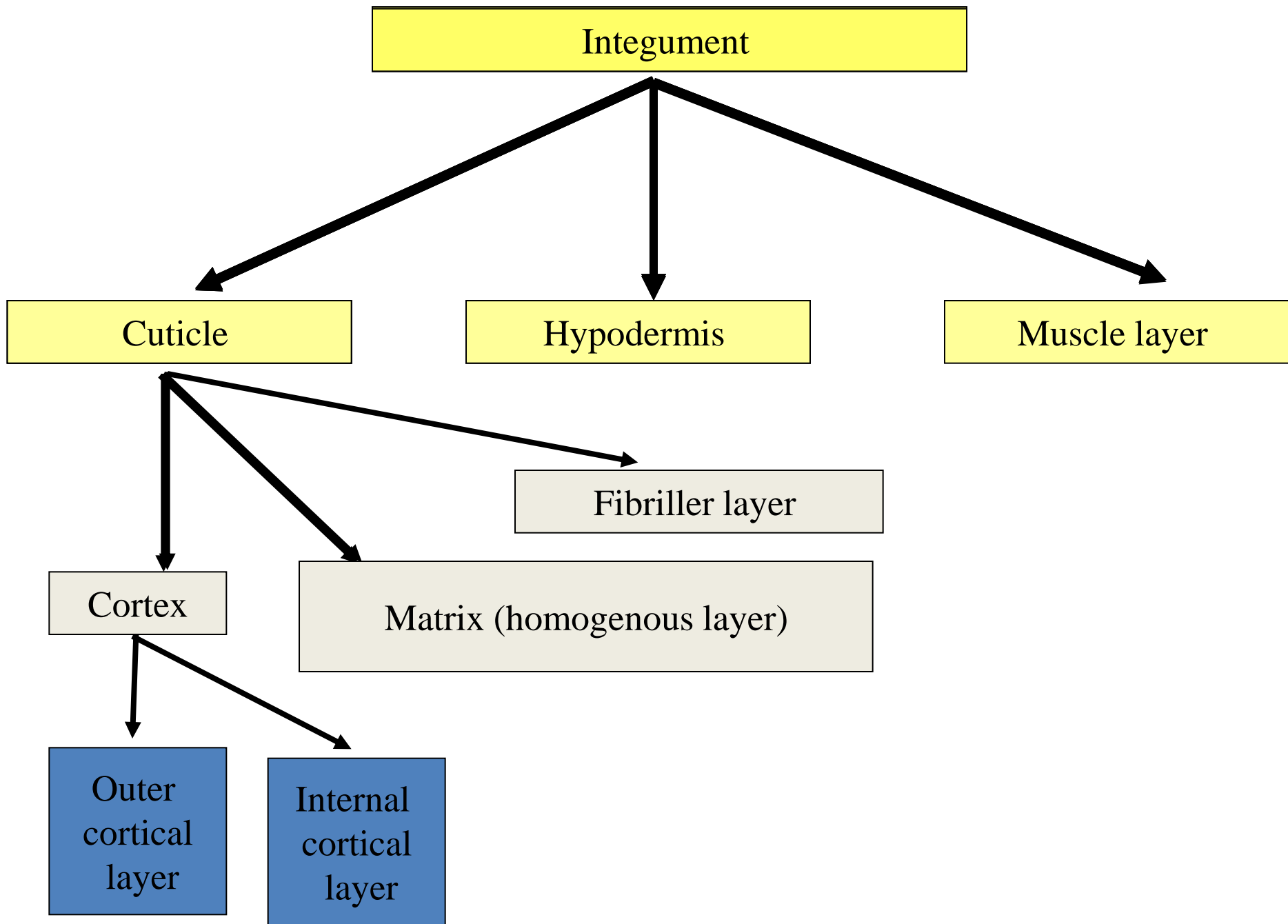
Disease: Ascariasis

Diagnosis: Fertilized and unfertilized egg

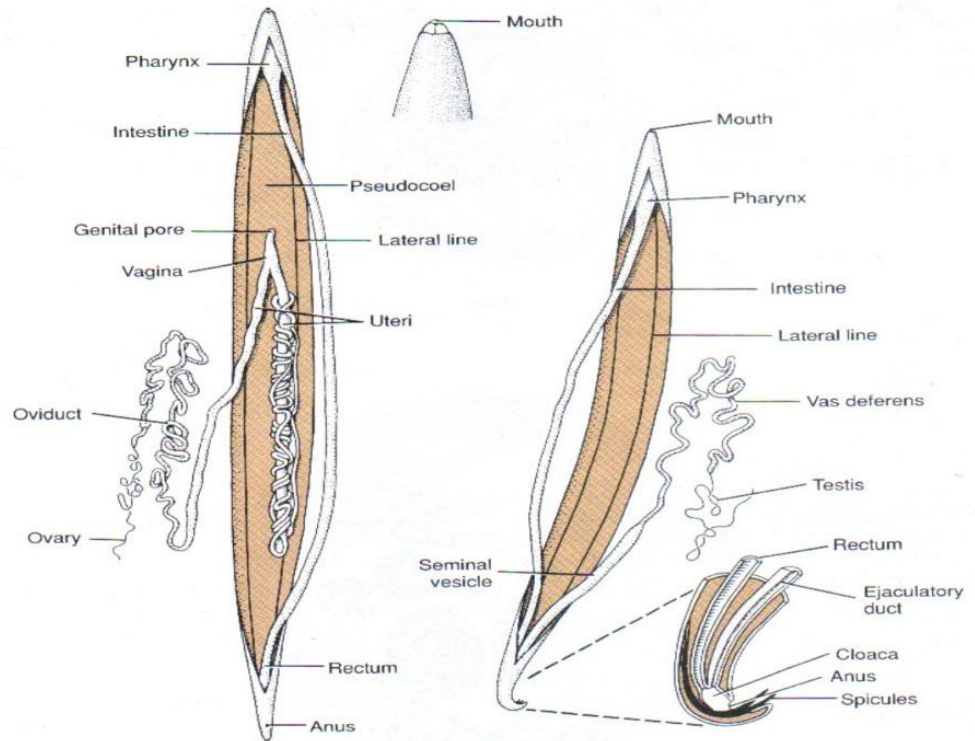


Fertilized eggs: broad oval in shape
The shell is thicker and consists of, proteinaceous layer, vitelline layer, chitinous layer, lipid layer. The content is a fertilized ovum.

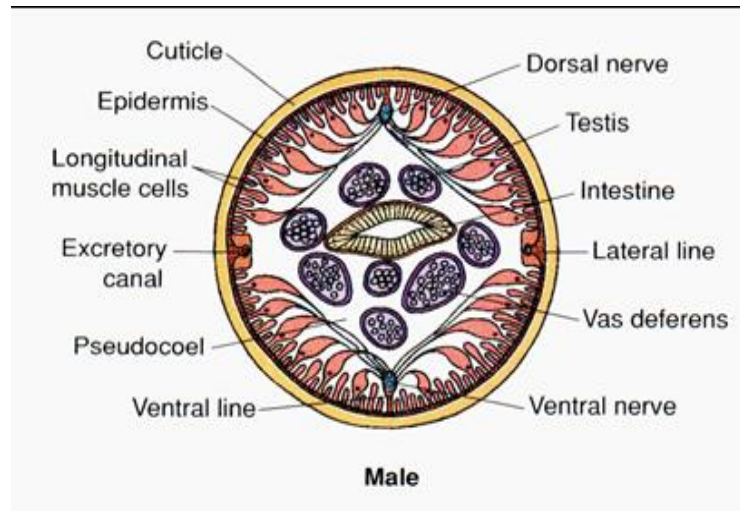
Unfertilized egg: Longer and slender than a fertilized egg. The chitinous layer and proteinaceous coat are thinner than those of the fertilized eggs. The content is granules various in size.



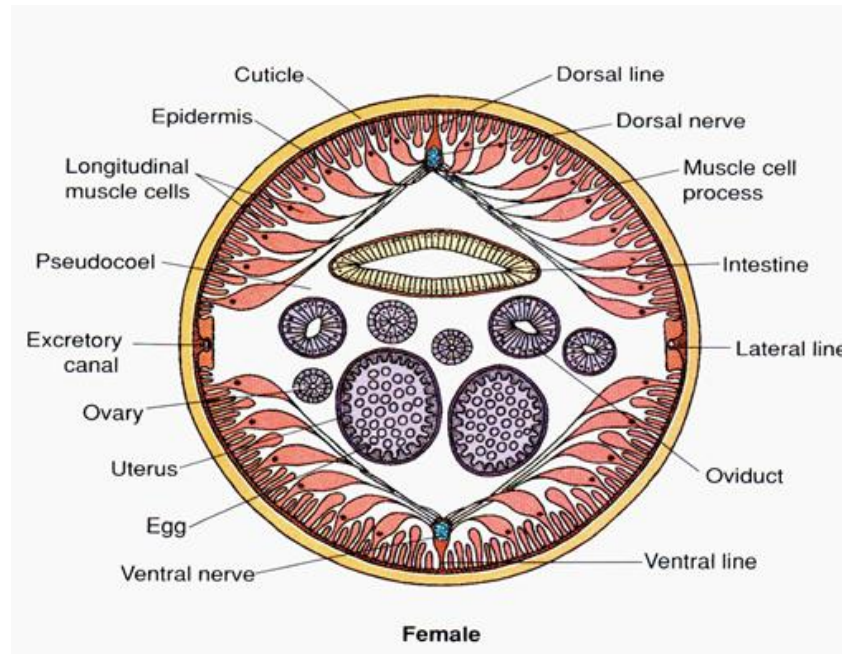
Ascaris lumbricoides male and female



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

1

Male have two copulatory spicules

Male has one copulatory spicule

2

Subclass: Aphasmidia

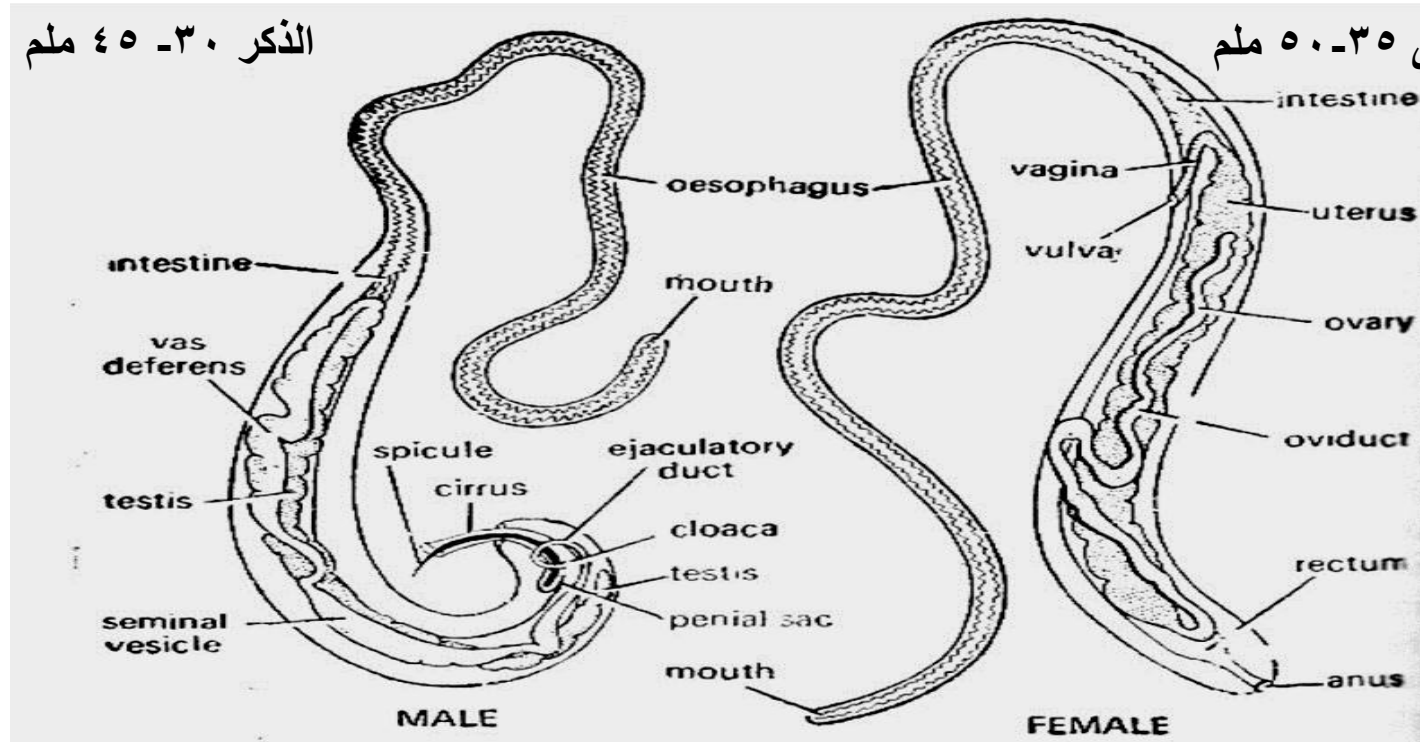
Trichuris trichura

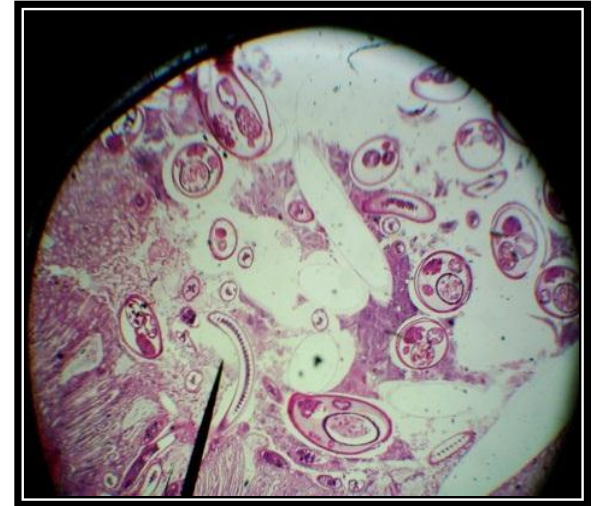
- **Common name:** Whipworm
- **Location:** Large intestine in human
- **Length:** up to 50 mm.
- **Disease:** Trichuriasis or whipworm infection
- **Infective stage:** egg with L1
- **Diagnosis:** Football-shaped eggs with polar plugs in feces

Trichuris trichiura

الذكر ٣٠ - ٤٥ ملم

الأنثى ٣٥ - ٥٠ ملم





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.

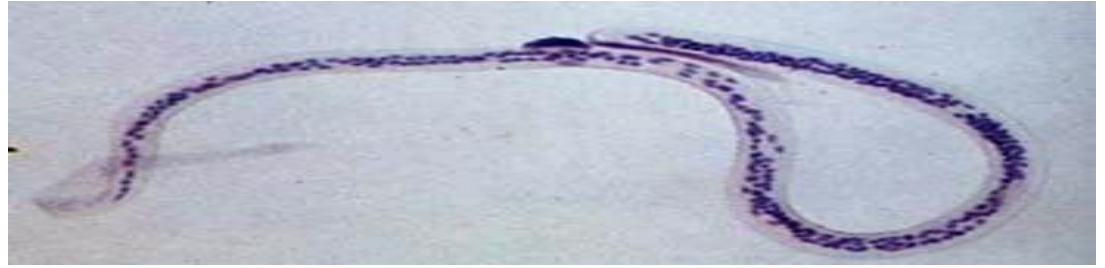
Disease: Bancroftian filariasis

Intermediate host: *Anopheles, Aedes, Culex*

Infective stage : Filariform larva (L3)

Diagnosis:

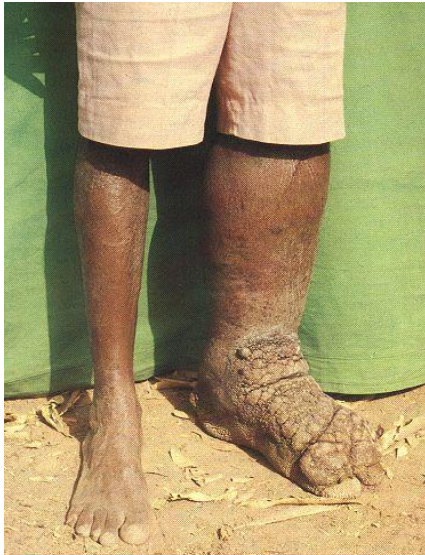
- 1- Presence of microfilaria in blood smears
- 2- Presence non adult worms in the biopsy for infective lymph node.
- 3- Skin test by using powdered prepared from filaria that infect dogs.



Wuchereria bancrofti microfilaria



Size Range: 240 – 300 μm long



Elephantiasis

Ursache: lymphotrope Filarien (Fadenwürmer)

Wuchereria bancrofti infection

Elephantiasis

Lab 10

Subclass: Phasmodia

Enterobius vermicularis

Common name: Pinworm or seat worm

Location: Cecum in human

Length: up to 13 mm.

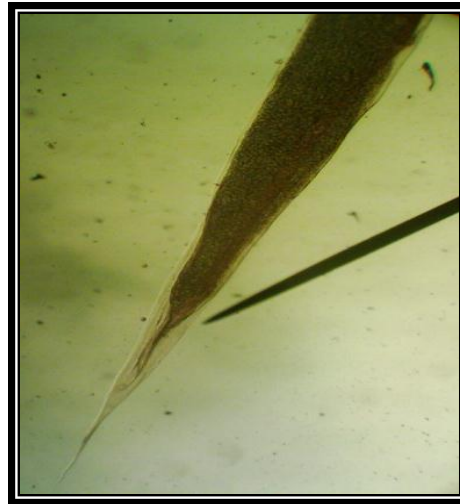
Disease: Enterobiasis

Infective stage: Egg with L3

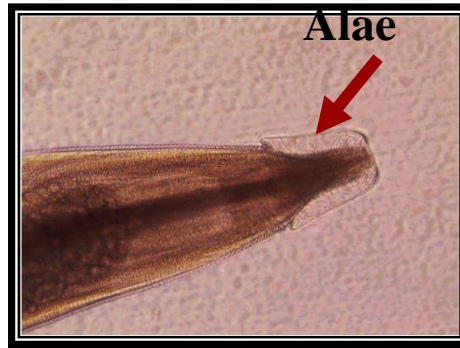
Diagnosis: Eggs with D shape



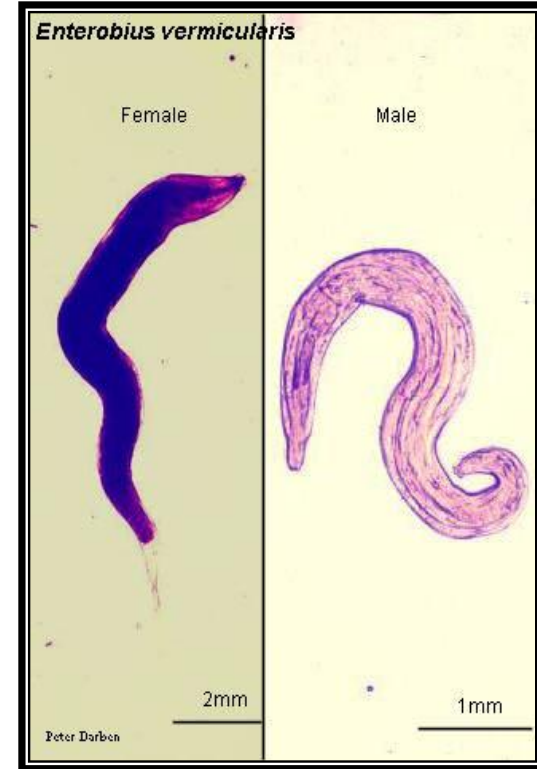
Anterior region



**Female
posterior region**



**Male
posterior region**



Enterobius vermicularis Life cycle

