



Microbiology

Subject :

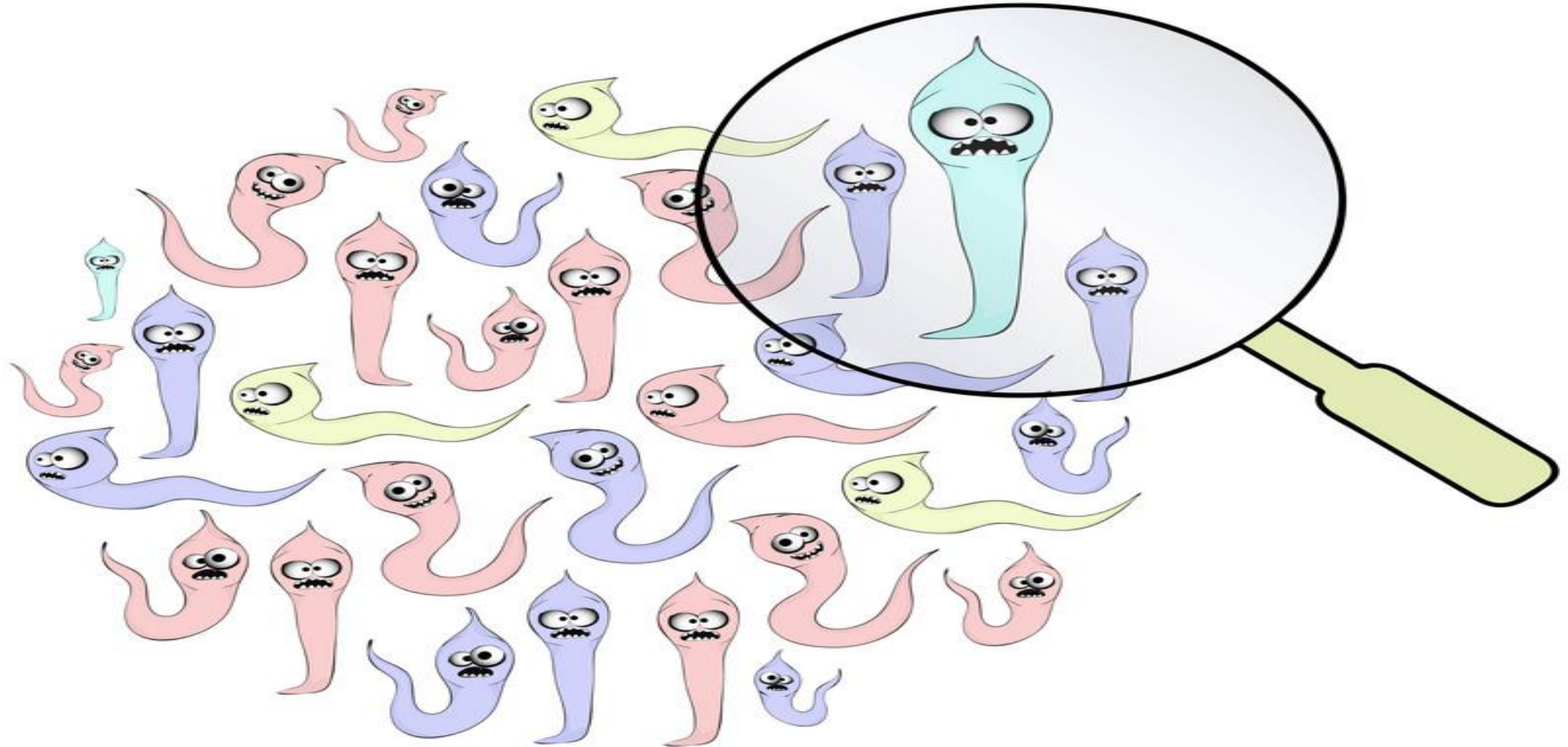
Lec no : 21

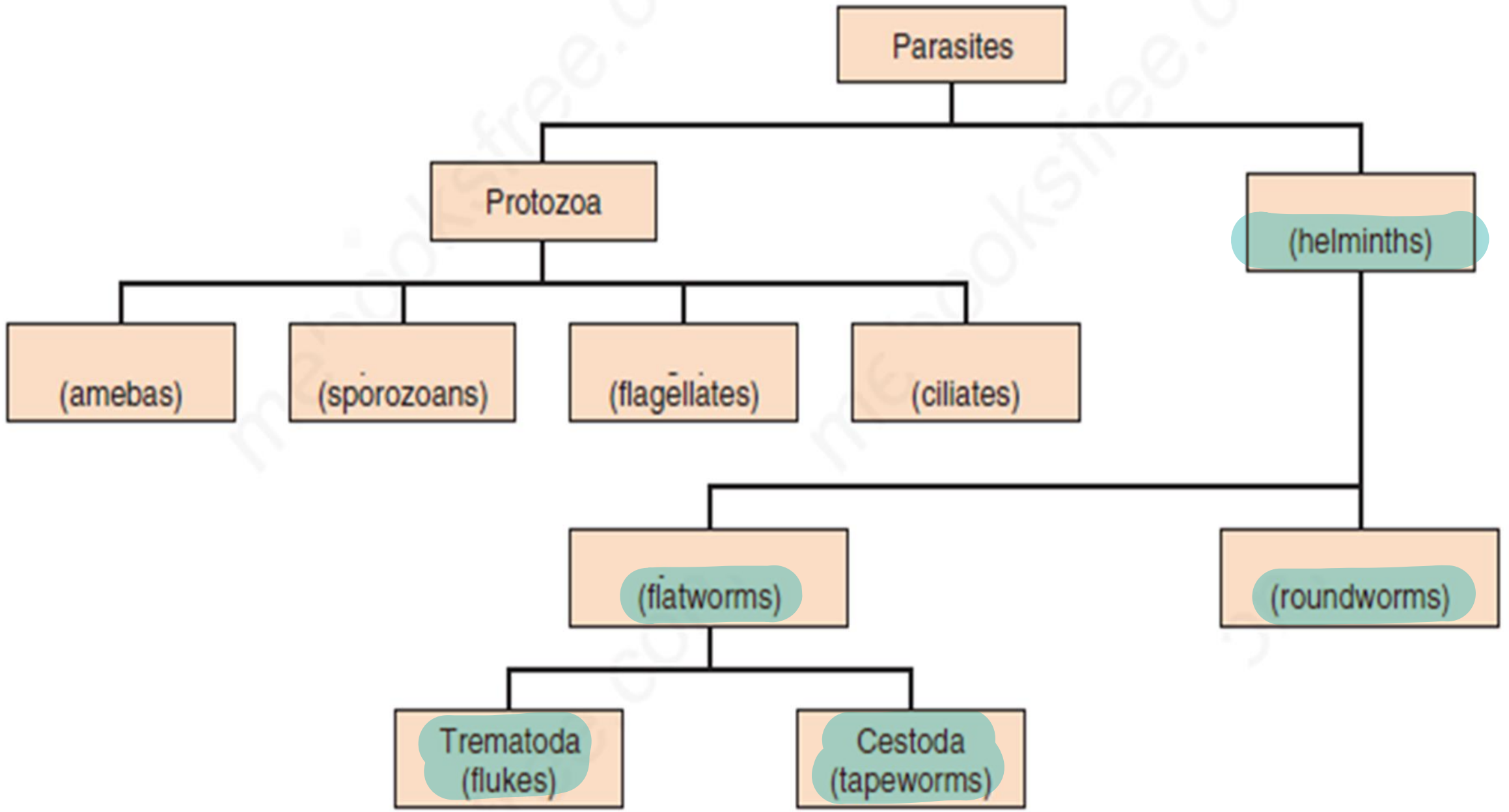
Done By : Tabark Aldaboubi

وَقُلْ رَبِّ زِدْنِي عِلْمًا

Helminths

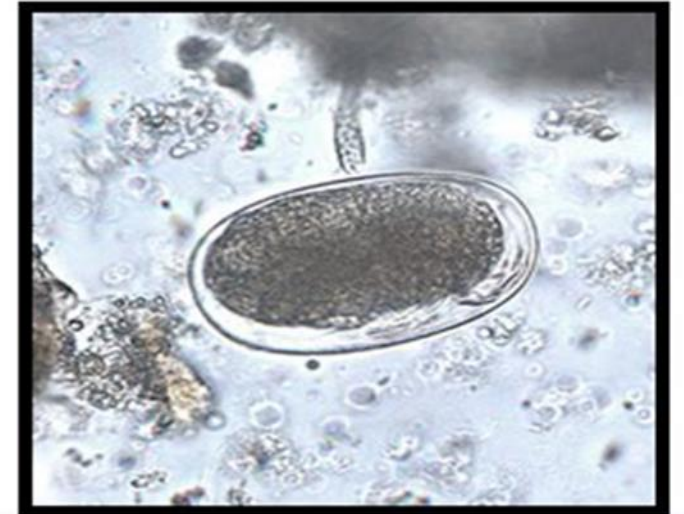
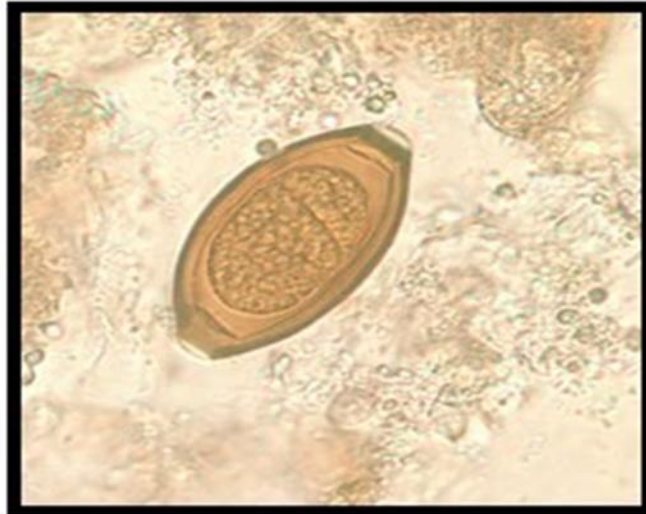
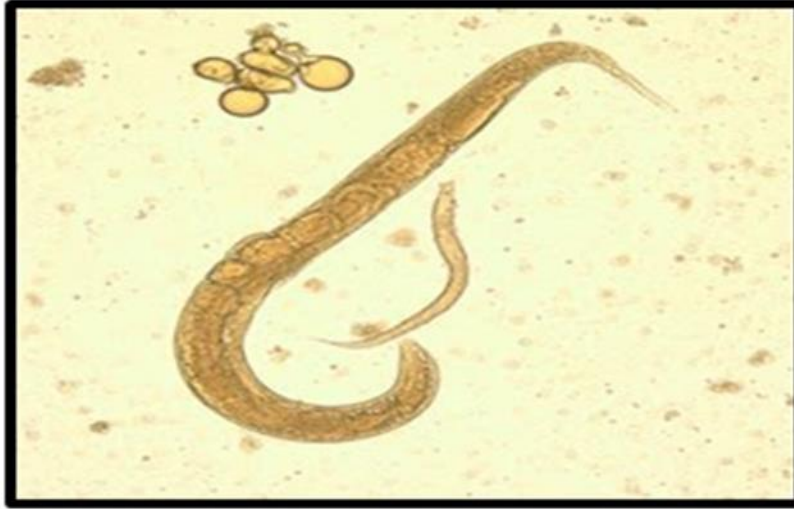
By prof. Hala Tabl





1

Nematodes (Round worms)



Medically important nematodes:

A) Intestinal nematodes:

a. Small intestine:

- 1) *Ascaris lumbricoides*.
- 2) *Ancylostoma duodenale*.
- 3) *Necator americanus*
- 4) *Strongyloides stercoralis*
- 5) *Trichinella spiralis*

b. Large intestine:

- 1) *Enterobius vermicularis*.
- 2) *Trichuris trichura*

B) Tissue Nematodes:

- 1) *Wuchereria bancrofti*
- 2) *Brugia malayi*
- 3) *Loa loa*
- 4) *Onchocerca volvulus*
- 5) *Dracunculus medinensis*

General morphology:

➤ Adult is an elongated, **cylindrical** and **unsegmented** with tapering ends.

اسطوانية
لهوليب

عبارة عن one unit
مشن رح تكون مقسمة

➤ They have lumen (cross-section of the worm shows a cavity within which lie the different organs).

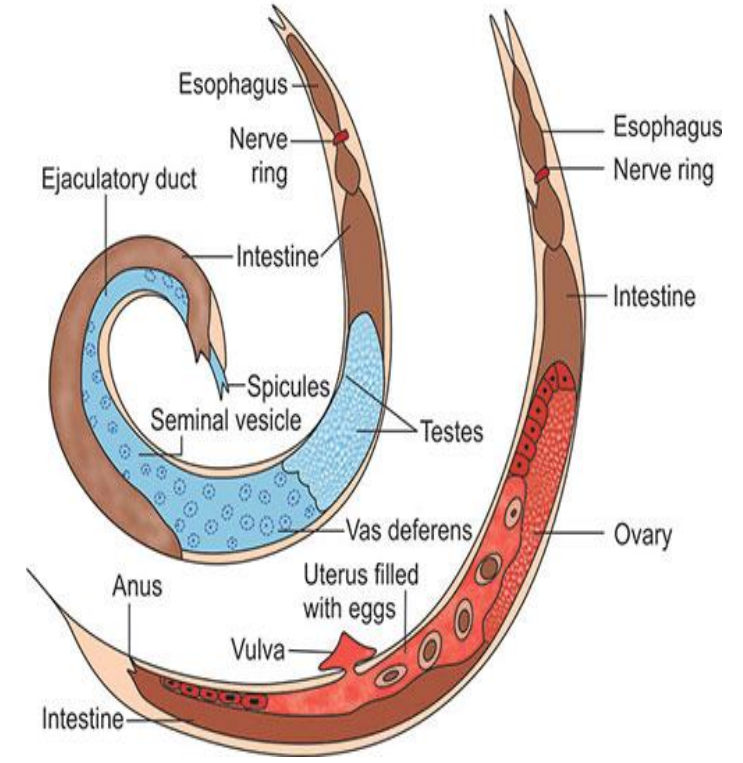
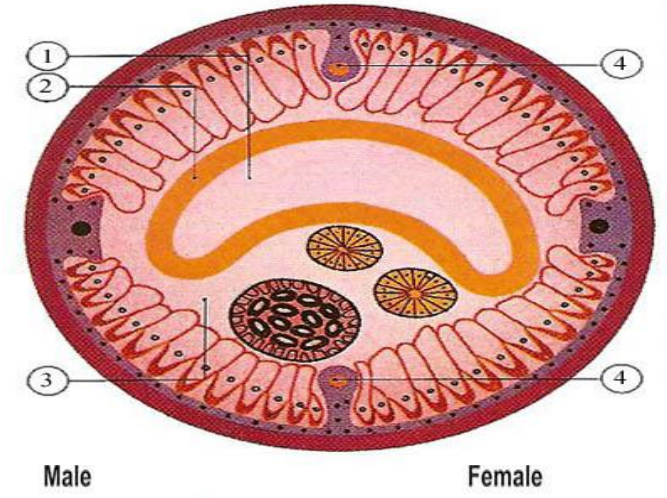
عندها اسنفا

➤ All have **toothed** mouth, intestine and anus.

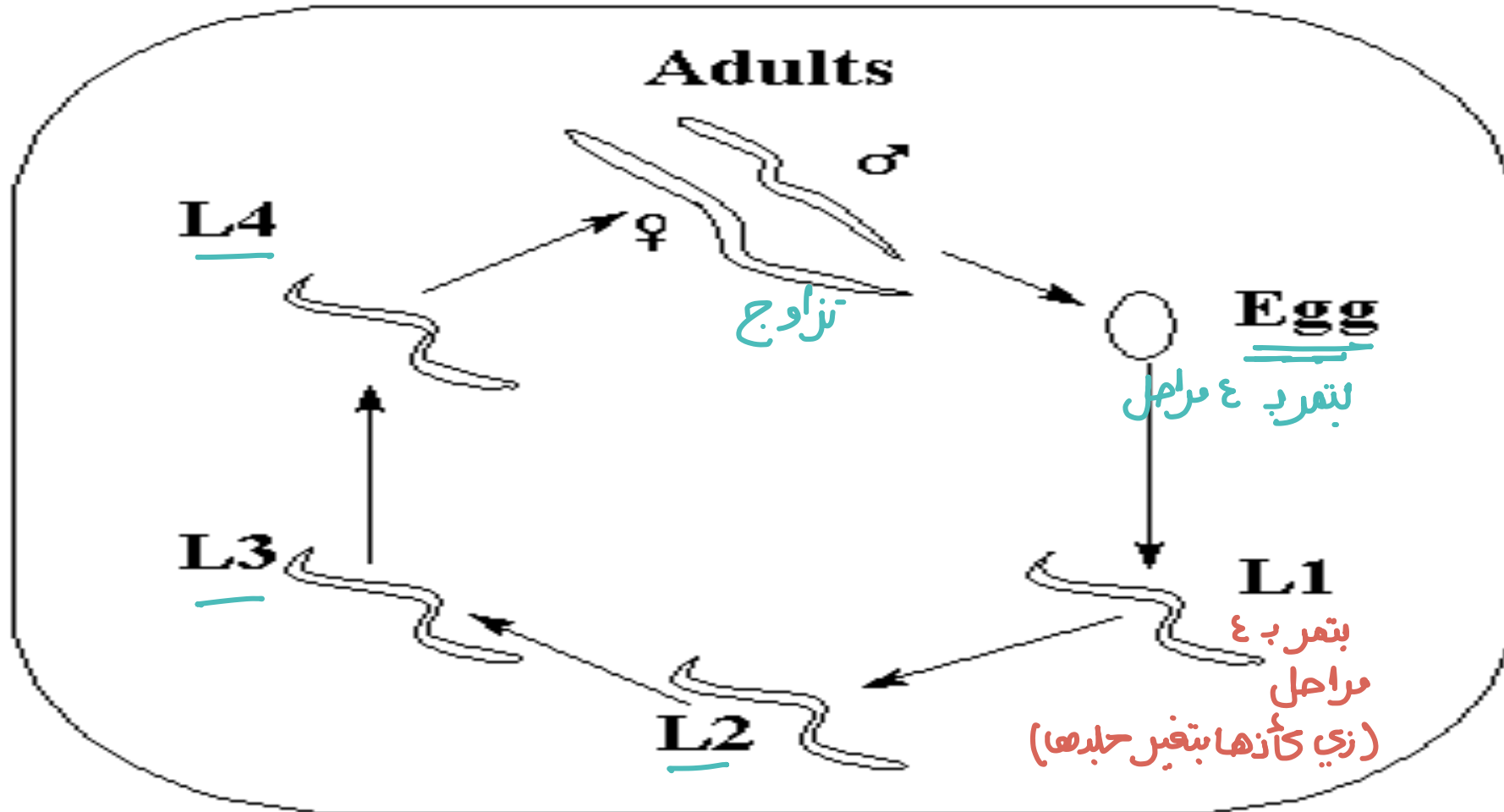
➤ Have **separate sex**, male is smaller than female & its posterior end is curved ventrally.

افخم من ال female

male



- In nematode life cycle, there are four larval stages, followed by the adult.
- Egg → Rhabditiform larva (L1→L2) → Filariform larva (L3 → L4) → Adult



Ascaris lumbricoides (giant round worm)

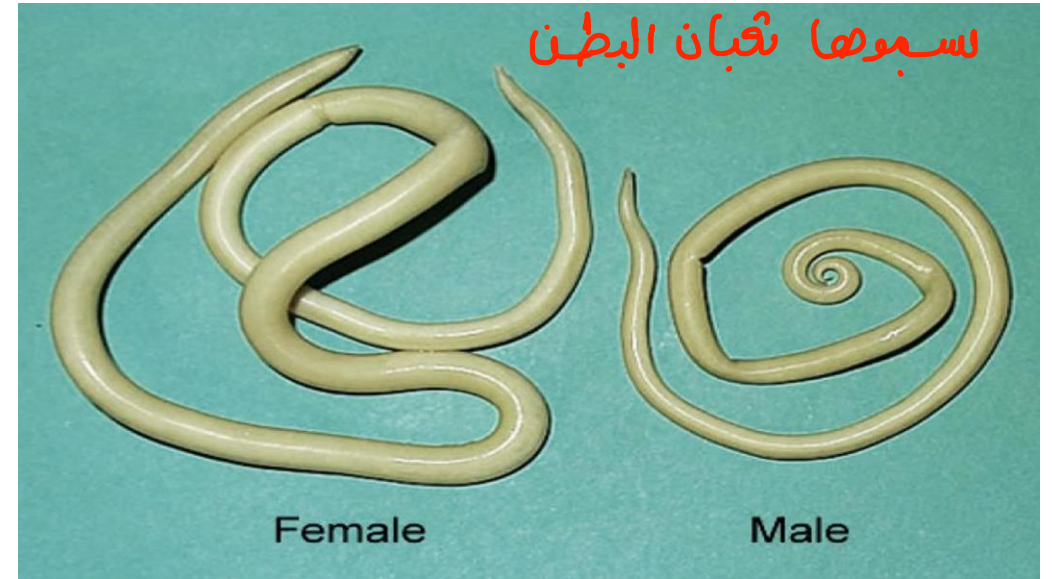
Adult:

ابيض

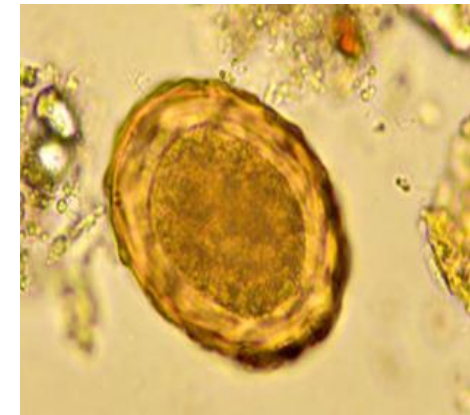
- Whitish in color.
- Male 15 to 30 cms, female 20 to 40 cms.

Egg:

1. Unfertilized egg
2. Fertilized (immature) egg ما اتملت
3. Embryonated (mature) egg: اتملت
(contain 2nd stage larva).
infected stage نفس



Embryonated



Fertilized



Unfertilized

Life cycle

بيجي شخص سليم يوكل او يشرب اشي بحتوي ع هاي ال egg بتوصل لعند ال small intestine وهناك بتفقس بطلع منها larva بروحووا يخرقوا ال wall ويوصلوا لل circulation ويوصلوا لل lung بكيروا ل 2 تحولت ل L3 و L4 كبروا وعقلوا وبدهم يرجعوا لبيتهم لل small intestine كيف بدهم يرجعوا!!!! بروحووا يعملوا حركة بمنتهى الغباء! بطلعوا لل bronchi ثم trachea ثم larynx ثم pharynx والشخص بس يبلى ريقه بترجع ينزلوا لل small intestine

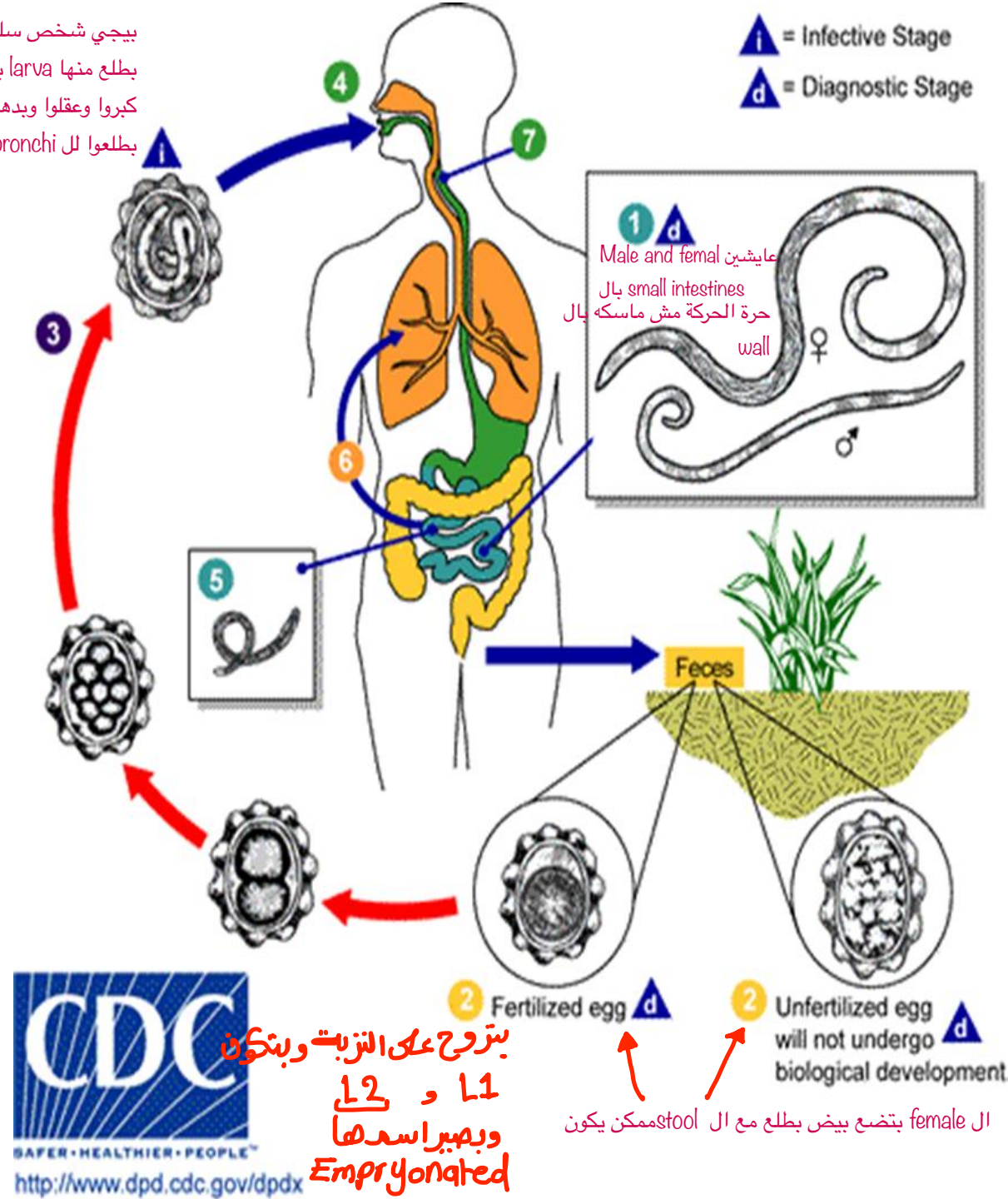
Habitat: Small intestine (unattached).

Definitive host: Man.

Infective stage: Embryonated egg.

Mode of infection: ingestion of food contaminated by embryonated egg.

Diagnostic stage: Immature egg or adult worm or rarely larva in sputum.



Ascaris lumbricoides (giant round worm) بتعمل مرض → **Ascariasis**

Pulmonary phase (loeffler's syndrome): باصحبة result from larval migration to the lung → cough, wheezing, dyspnea, blood tinged sputum.

Intestinal phase: The presence of the adult worms in the intestine. Small

➤ **Intestinal ascariasis** may be asymptomatic (الاشهر) or may presents with abdominal colic, vomiting, dyspepsia and diarrhea or constipation.

➤ **Complications are mainly related to:**

1- **Adult worm burden:** Heavy infection cause **intestinal obstruction**. في worm كثيرة بال intestine يتسبب الازعاج.

2- **Migration of adult worm into unusual sites:**

• To gall bladder and biliary tracts: التهاب المرارة cholecystitis, stone formation. حصوات

• To appendix: التهاب زائدة دودية Acute appendicitis and peritonitis.

• To the stomach. It may be vomited out at night through mouth or nose or enter larynx to cause asphyxia. (Rare)



معلومة مهمة
Female بتتوالع بكل فرد → 200 000 بومضة

2

Ancylostoma duodenale (Human hookworm)

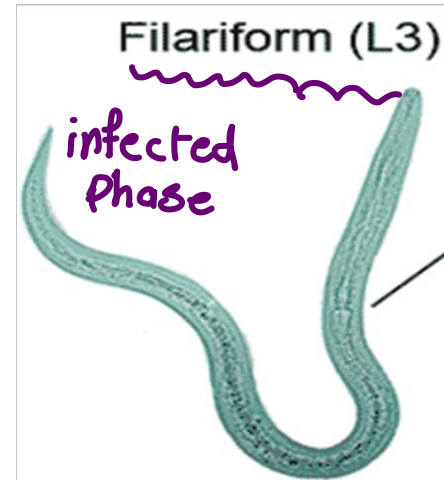
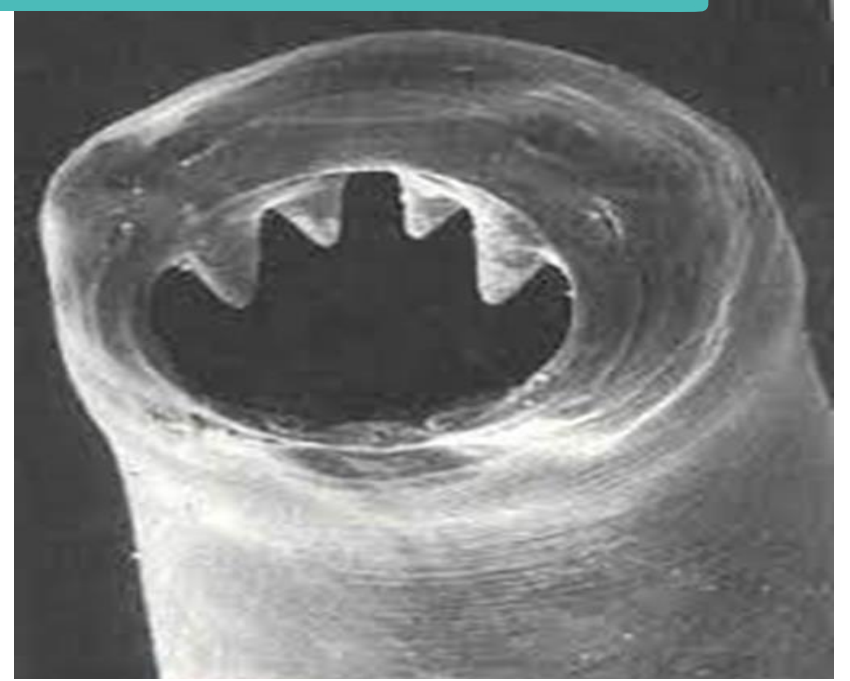
دودة خيطافية (مصاصة دماء)

Adult: Wall of *Attache* *intestine* بتغذي على الدم وبتعمل

-Small nematodes, Male 8 -11mm, Female 10-13 mm. حابتجاوز سانتيمونص.

-The mouth is well developed, with a 3 pair of teeth on either side of the median line and a smaller pair in the depths of the buccal capsule.

Egg: colorless, segmented with 4 blastomeres.



Life cycle

Habitat: Small intestine attached by

teeth to the mucosa.

Definitive host: Human.

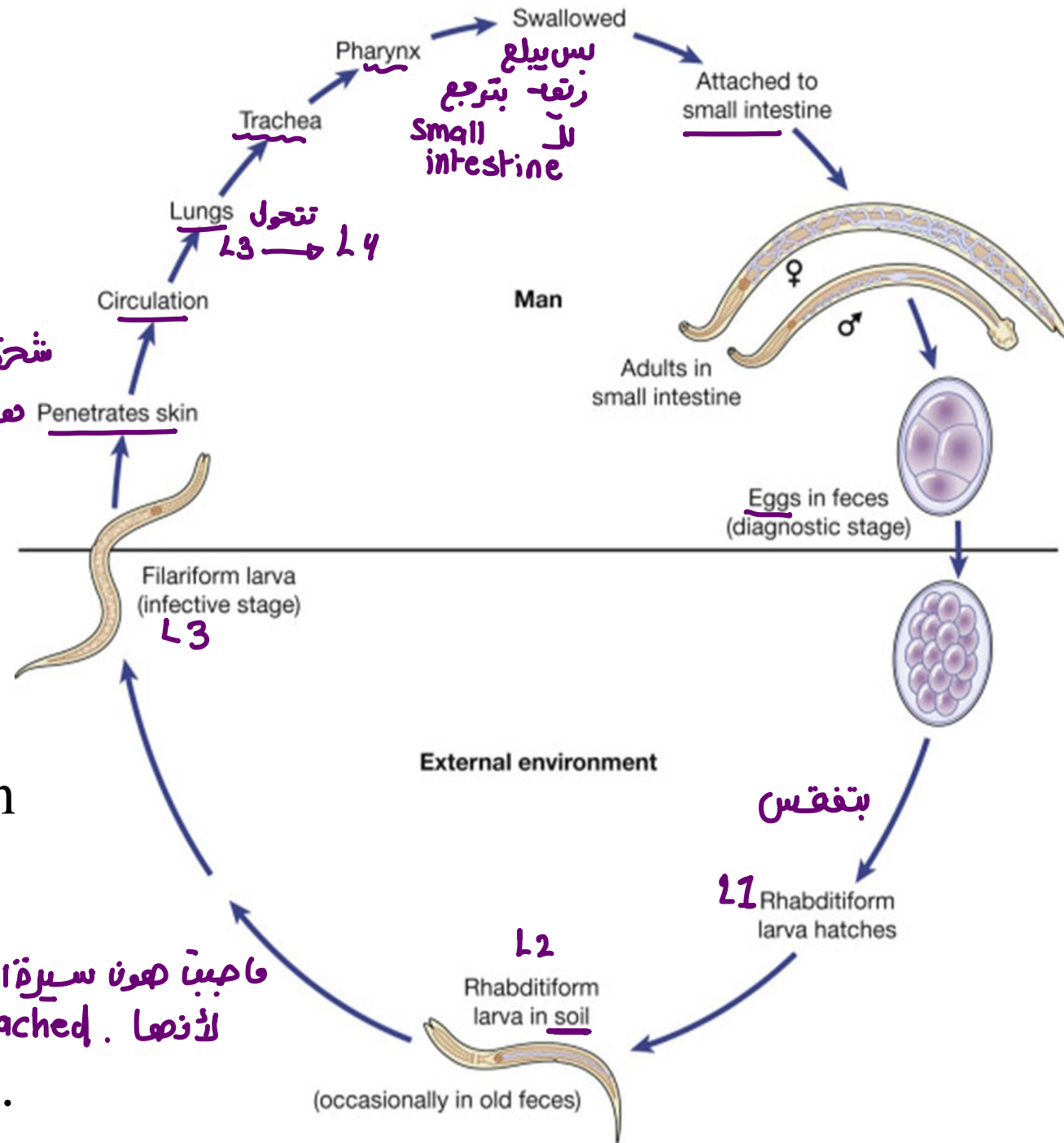
Infective stage: Filariform larva (L3).

Mode of infection: penetration of skin

by filariform larvae present in soil.

Diagnostic stage: Egg or L3 in sputum.

Rare



Ancylostoma duodenale (Human hookworm)
دودة خيطانية (مماثلة دماء)

تقول
مرض

Ancylostomiasis

➤ **Cutaneous phase:** *inflammation* كل مكان بتمسس فيه تحة الجلد بتعمل

Creeping eruption: reddish itchy papule along the path traversed by filariform larvae (larva migrans).



➤ **Pulmonary phase: Loeffler's syndrome.** نفس الي علته
Ascariis

➤ **Intestinal phase:**

* اهم اشئ نعملوا هذا المرض
تكون Attached بال wall (بتعمل ulcer بكل مكان عشان تتغذى بالدم)

Microcytic hypochromic anaemia: The most prominent characteristic in دوية

moderate or heavy chronic infection which result from:

1- Continuous blood loss through punctured sites at the site of attachment.

2- Feeding of the worm (a single adult sucks 0.3ml of blood/ day). مهمته

لو عنا 10 ديدان رح يمتصوا 3ml باليوم // عنا 100 يمتصوا 30ml باليوم.

3

Enterobius vermicularis

Pinworm, Thread worm, Oxiuris, Seatworm

منتشرة عند
الأطفال ♀

Adult:

male → Fertilization نقطة

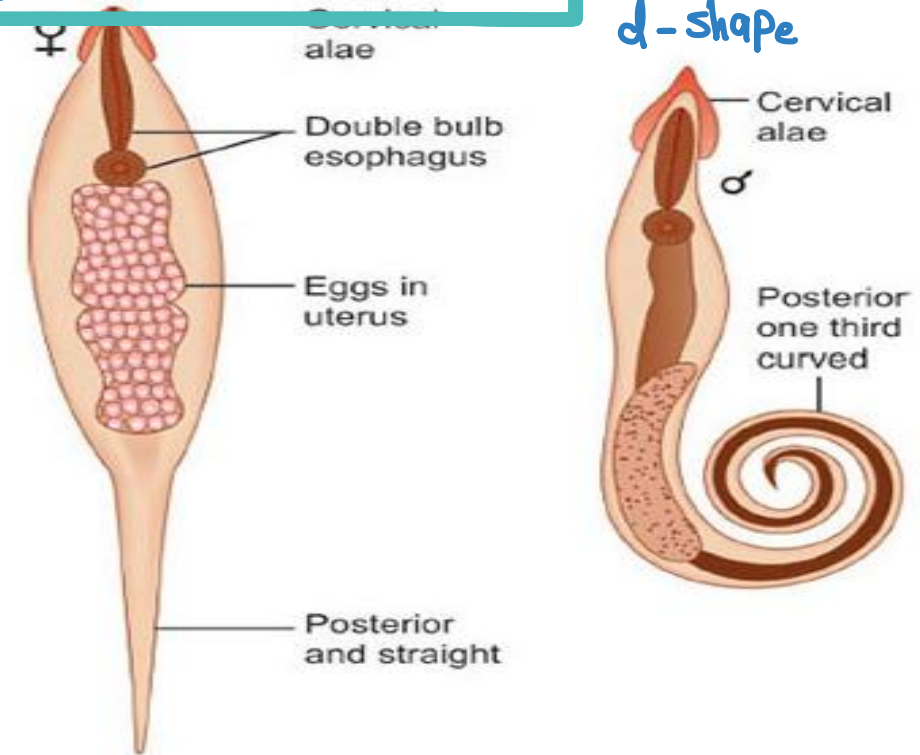
The adult is 5-10 mm in length.

صبي الي تبديل كل المشاكل

The Female has straight pointed tail, while the زبي الدبوس

male posterior end is curved.

Egg: The egg is plano-convex (D-shaped).



Life cycle

Habitat: Large intestine (unattached).

Definitive host: Man.

Infective stage: Embryonated eggs.

Mode of infection: (highly infectious)

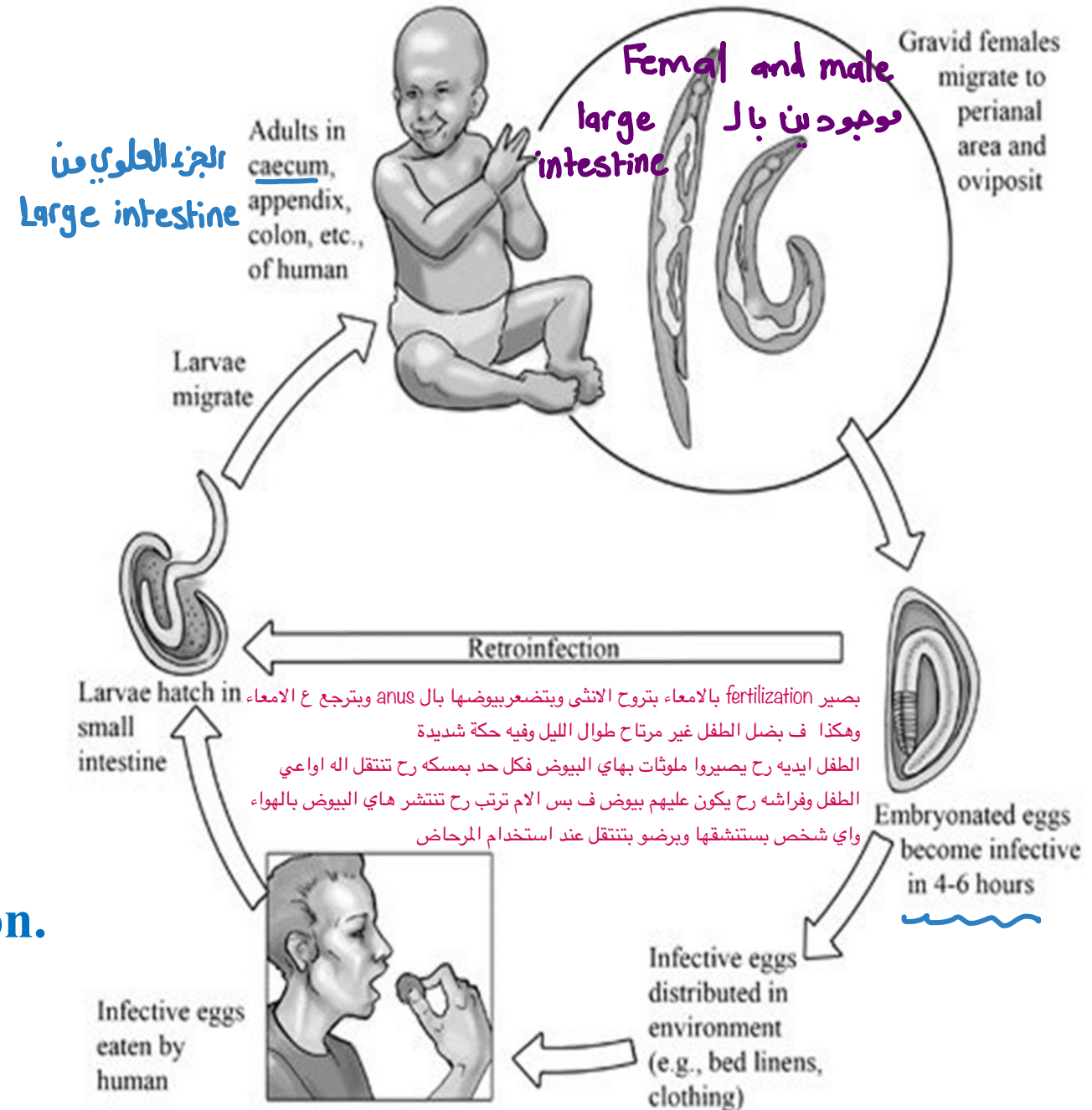
1) Ingestion of eggs through contaminated food or contaminated nails. 2) Toilet seats.

3) Inhalation and then swallowing eggs

from the air, contaminated blankets.

4) External autoinfection. 5) Retro-infection.

Diagnostic stage: Eggs or adult worm in stool
ما بوخذ العينه من ال stool
لانه نسبة البيوض قليلة فباخذها
perianal swab.

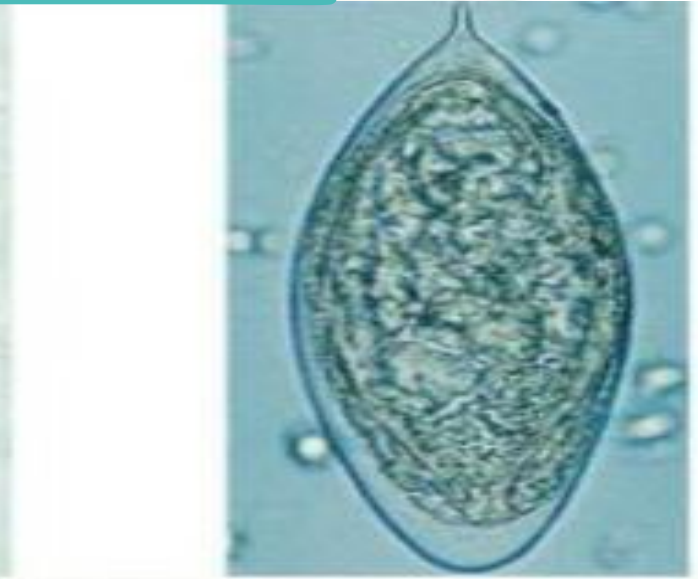
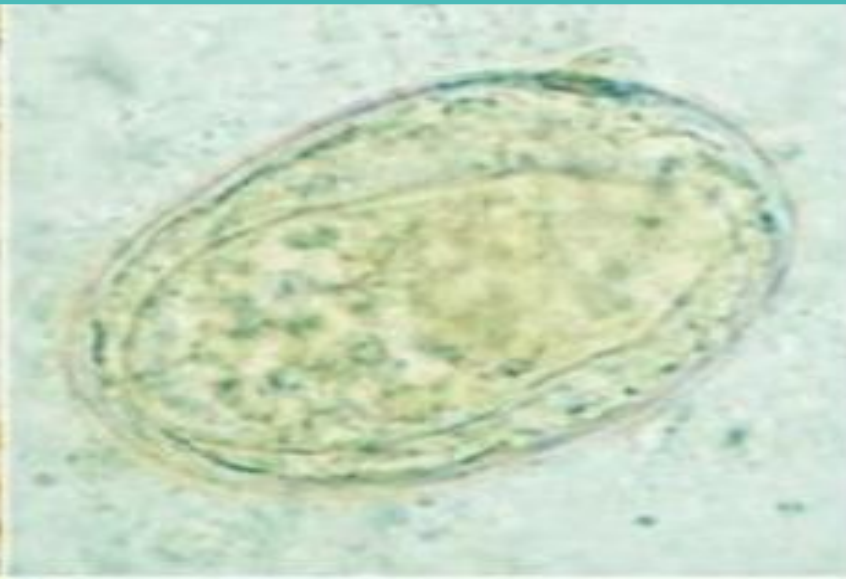


Enterobius $\xrightarrow[\text{مرض}]{\text{تدخل}}$ Enterobiasis

- Enterobiasis is highly infectious disease affect mainly **children**.
- Adult female worm inhabits large intestine and daily nights lays eggs around the anus causing severe **nocturnal perianal pruritis (pruritis ani)**, *inflammation* *شديد*, insomnia and restlessness.
- In girls, it may cause vulvovaginitis, urethritis, enuresis and recurrent urinary tract infections. *تبول لا ارادي*

4

Trematodes (flukes)



Medically important Trematodes (flukes):

بتعیش فی ال Venous plexus

1- Blood flukes e.g. *Schistosoma mansoni* and *S. haematobium*.

موجودة فی bile duct

2- Liver flukes e.g. *Fasciola gigantica* and *F. hepatica*.

3- Intestinal flukes e.g. *Heterophyes heterophyes*.

4- Lung flukes e.g. *Paragonimus westermani*.

* رح نشرح اولی وحدة

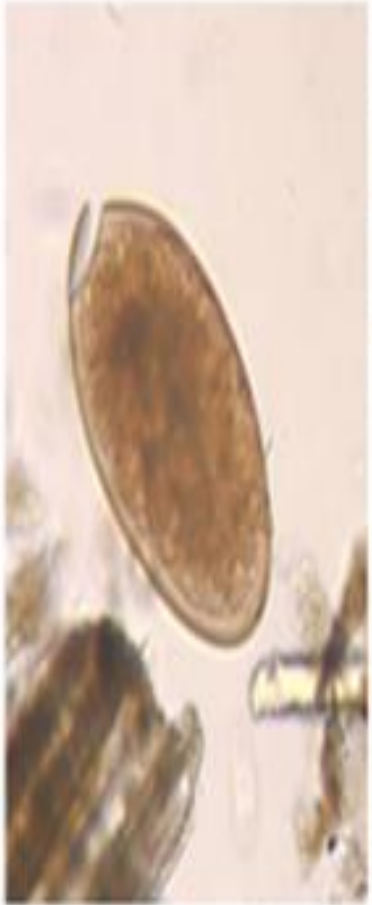
General characteristic morphology of Trematodes:

A) Adult form:

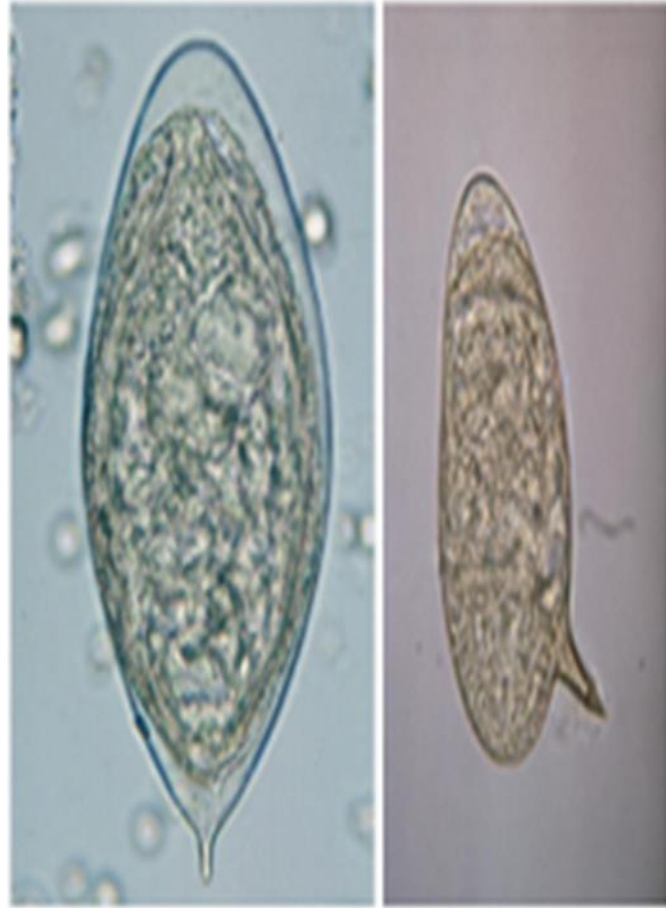
- Flat (NO body cavity), leaf-shaped **unsegmented**.
زي درقـ الشجر (غير مقسمات)
- **Organ of fixation:** They all live in lumens and so they possess **suckers** (oral and ventral suckers), except *H. heterophyes* which has extra genital sucker.
اعضاء بتساعدھا تثبت بال wall ناعـ Lumen
- All are **hermaphroditic** (The adult worm contains male and female genital organs) **except** schistosomes have separate sexes.
في نفس ال worm

B) The eggs are usually oval and **operculated** **except** for schistosomes, which are spined.

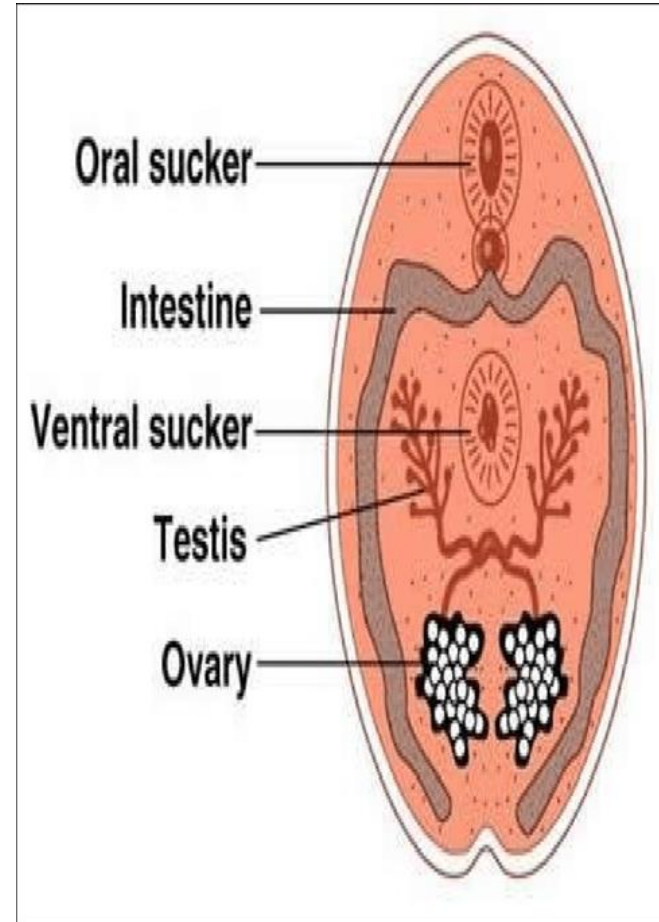
الشواك



Operculated egg



Spined egg



Adult worm



General life cycle of Trematoda

- All medically important trematodes:

a. Requires definitive host (**vertebrate**) and intermediate host (**snail**).
قوة

Some trematodes may require two intermediate hosts, snail¹ and fish².

b. The eggs must reach water source (either fresh or brackish) to hatch.
مصدر

Schistosoma

تعمل مرضها (بالهارسيا) عرضها صنف بمصر

وهو سبب وفاة عبد الرحيم حياض



صعب عبارة عن warm

وحدة بس مبيد

انها ثنين

وسمها

Schistosoma

الدودة ذات الحسد

المنسوب



Morphology

Adult: Typical female measures 2 cm in length and the male measures 1.5 cm, the male surrounds the female almost completely, facilitating copulation.

معجزاً

Egg: With lateral spine in *S. mansoni* and terminal

in *S. haematobium*.

Cercaria:

Has a bifurcated tail.

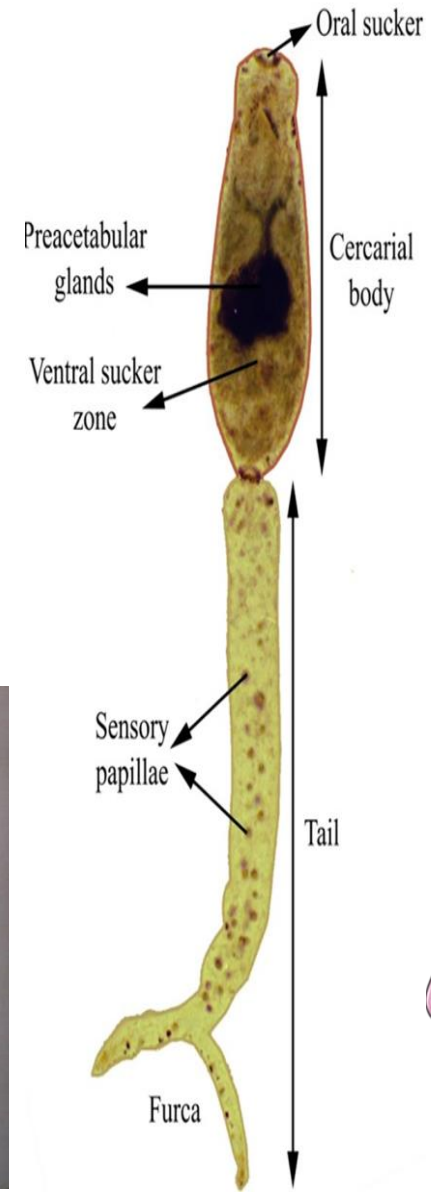
فقسوا



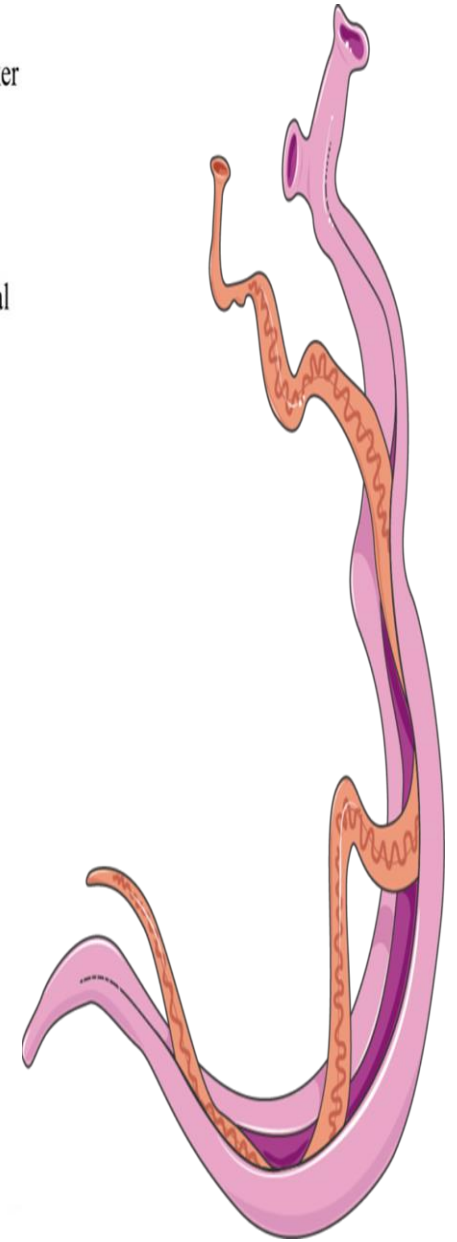
S. Haematobium



S. mansoni



Cercaria



Adult worm

Life cycle

Habitat:

Schistosoma mansoni

S. haematobium

Mesenteric or vesical venous plexus

Definitive host: Man.

Intermediate host:

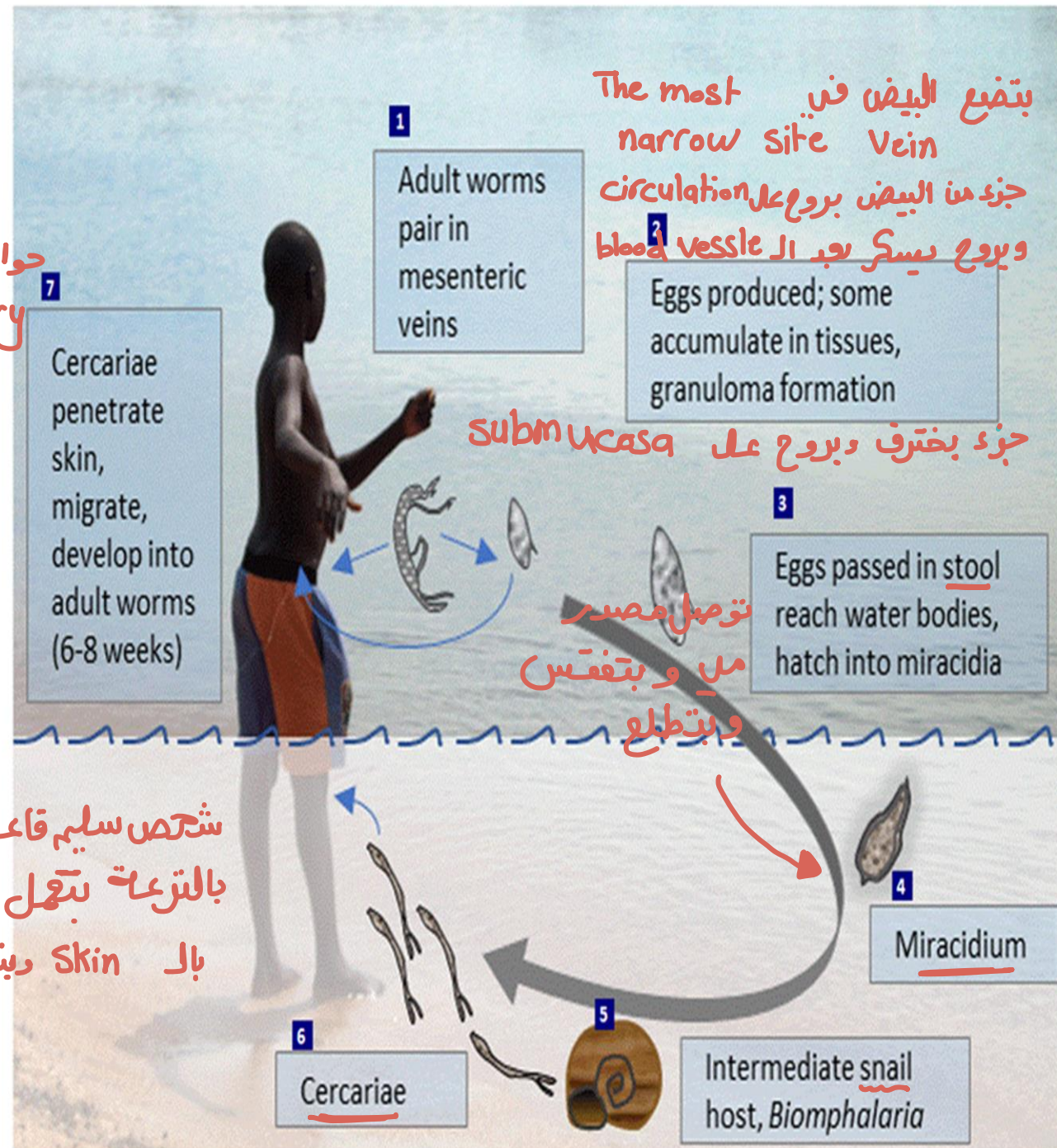
Biomphalaria alexandrina snail.

Infective stage: Forked tailed Cercaria.

Mode of infection:

skin penetration by cercariae.

Diagnostic stage: Eggs in stool or urine



Schistosomiasis (Bilharziasis)

نسبة الى هذا العالم .

Bilharziasis, is named after Theodor Bilharz, who first described a case of urinary schistosomiasis in 1851.

يتكون حواصين الـ eggs

Intestinal schistosomiasis (Schistosoma mansoni): Granulomata formed around eggs lodged

in the intestinal mucosa and the liver leads to:

- Abdominal pain, dysentery, fever, anorexia and loss of weight.

حواصين الـ Portal (التي يتجمع فيها كل الـ Vein تاعة الـ GI) فلما يسير يجمع الدم .

fetal condetion

- Hepato-splenomegaly, liver fibrosis, portal hypertension, ascites and bleeding varices.

Urinary schistosomiasis (Schistosoma haematobium): Terminal hematuria and dysuria.

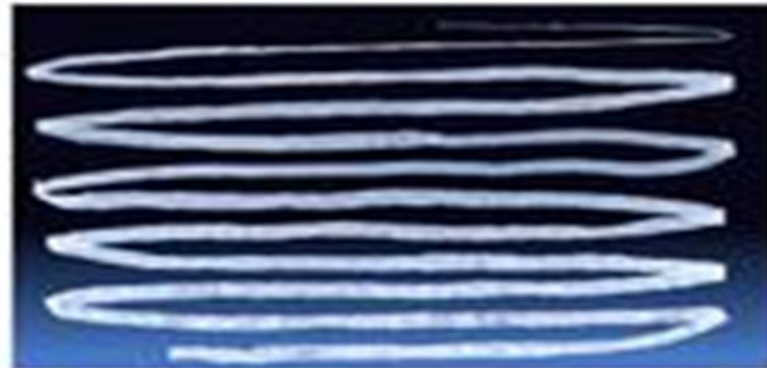
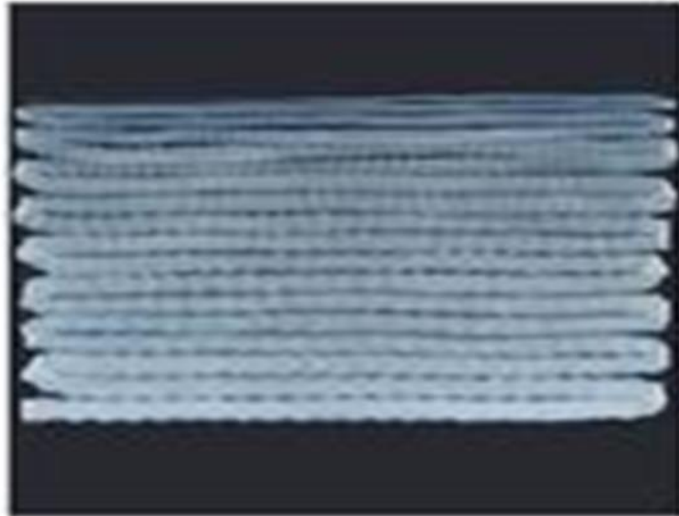
Ureteral obstruction with consequent hydroureter and/or hydronephrosis and bladder carcinoma

Cestode (tapeworm, 绦虫)

الدويان السَّورِيَّة



Figure 43-8. Suckers of *T. saginata* on their surface.



Medically important Cestodes: راج نوحذ منهم اشياء معينة

1. Intestinal cestodes

(man acts as definitive host):

- *Diphyllobothrium latum* (fish tapeworm)
- *Taenia solium* (pork tapeworm) and
Taenia saginata (beef tapeworm)
- *Hymenolepis nana* (dwarf tapeworm)

2. Tissue cestodes

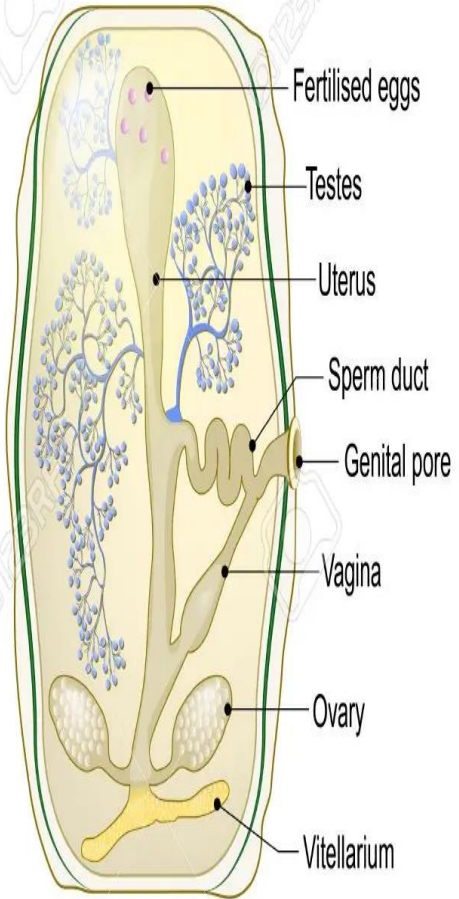
(man acts as intermediate host):

- Spargana of *Diphyllobothrium mansonii*.
- Cysticercus of *Taenia solium*.
- Hydatid cyst of *Echinococcus granulosus*.
- Coenurus of *Multiceps multiceps*.

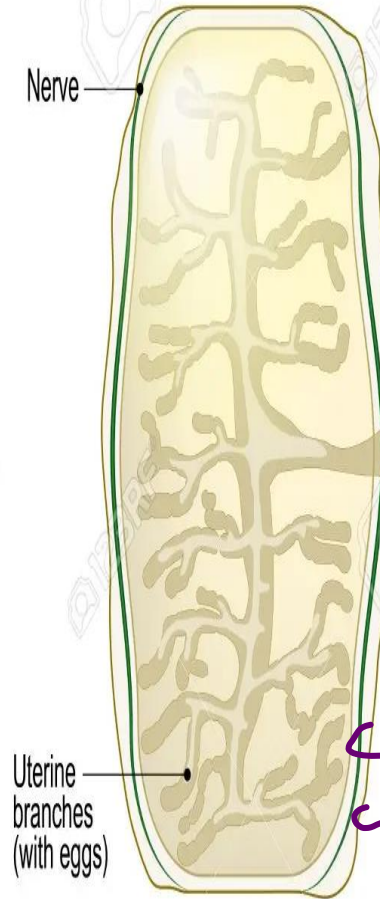
General characteristic of Cestodes:

- Adult are usually **flat (No body cavity)**, tape-like, **segmented**.
- The length of some cestodes may reach 10 meters.
- They possess scolex, neck, and proglottids.
- The scolex may be equipped with **suckers, hooks, or grooves**.
- The **neck is the actively dividing part** with regenerative capacity.
- The proglottids **near the neck, are young immature segments**, behind them are the mature segments, and at the **hind end, are the gravid segments**.
- All tapeworms are **hermaphrodites** (mature segment contains both male and female genital organs).

SEXUALLY MATURED PROGLOTTID



GRAVID PROGLOTTID



rostellum hook

راس فيها
organ of fixation

scolex

لو شلنا الدودة وضلت ال neck بتراجع تنقسم ويتكون دودة جديدة

sucker

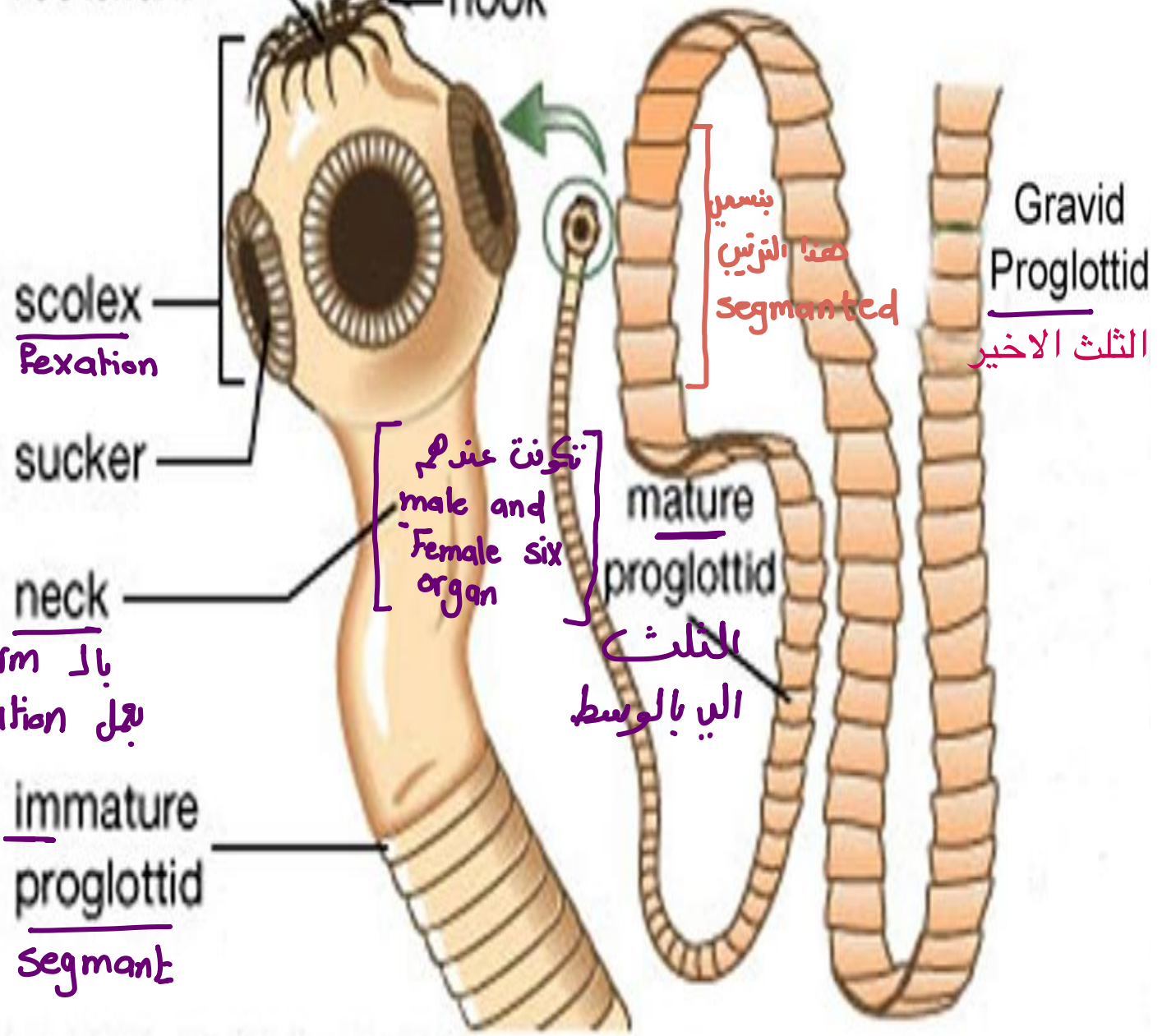
اهم جزء

neck

بال arm regeneration

الثالث الاول

immature proglottid or segment



بنسب
هذا الترتيب
segmented

الثالث الاخير

تكونت عندهم
male and female sex organ

الثالث
الي بالوسط

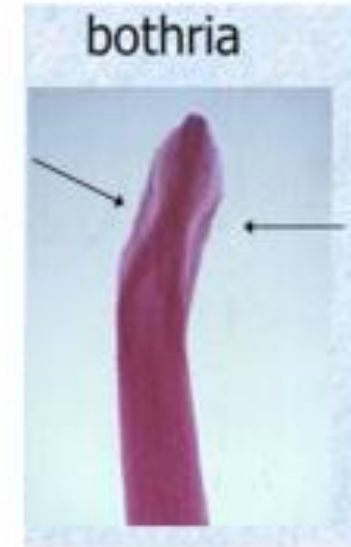
Scolex → sucker
hook
Groove



Taenia solium
(4 Suckers & hook)



Taenia saginata
(4 Suckers only)



Diphylobothrium latum
(Bothrium = Groove)

General life cycle of Cestodes:

All medically important cestodes require:

a. Definitive host (vertebrate).

b. Intermediate host:- Beef in *T. saginata*.

بتختلف حسب نوع الدودة

- Pork in *T. solium*.

الاهم - Cyclops and fish (two intermediate hosts) in *D. latum*.

Mode of infection: By ingestion of infective stage in contaminated undercooked beef, pork or fish.

Diphelobothriasis تحتوي ع groove

- Caused by *D. latum*. طويلة وشريهة كثييير ف بتوكل اكل كثير من غذاء الشهص الي موجودة فيه ، المريض عطول جوعان وبوكل كثير ومع ذلك بخسر وزن
- GIT disturbances: nausea, vomiting and diarrhea.
- Hunger pain, loss of weight as the adult worm absorbs large quantities of nutrients.
- Intestinal obstruction may occur related to large number of long worms. بتسكرو الامعاء
- **Macrocytic hyperchromic anemia** as the adult worm absorbs large quantities of **vitamin B12**. الاهم : بتحب كثير الفيتامين B12 بتسبب نقص فيه ويتسبب انيميا من هاي النوع

Echinococcus granulosus

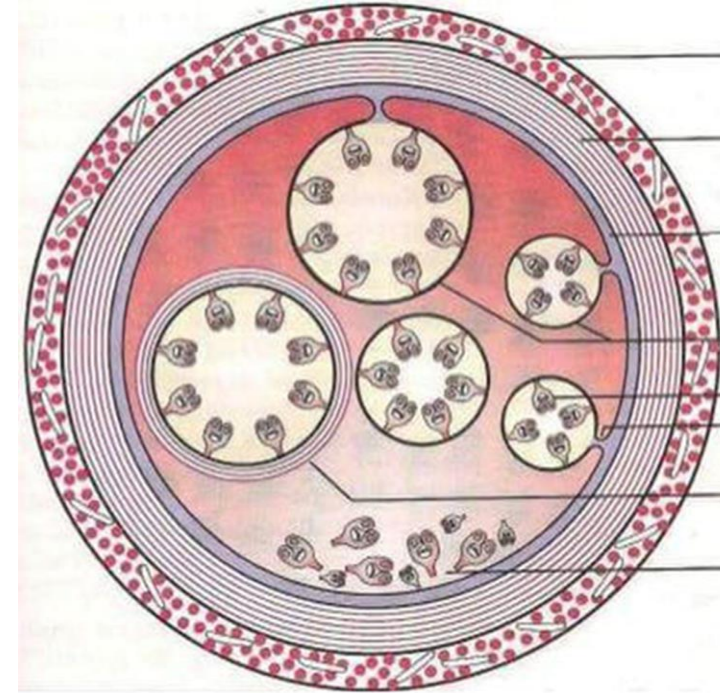
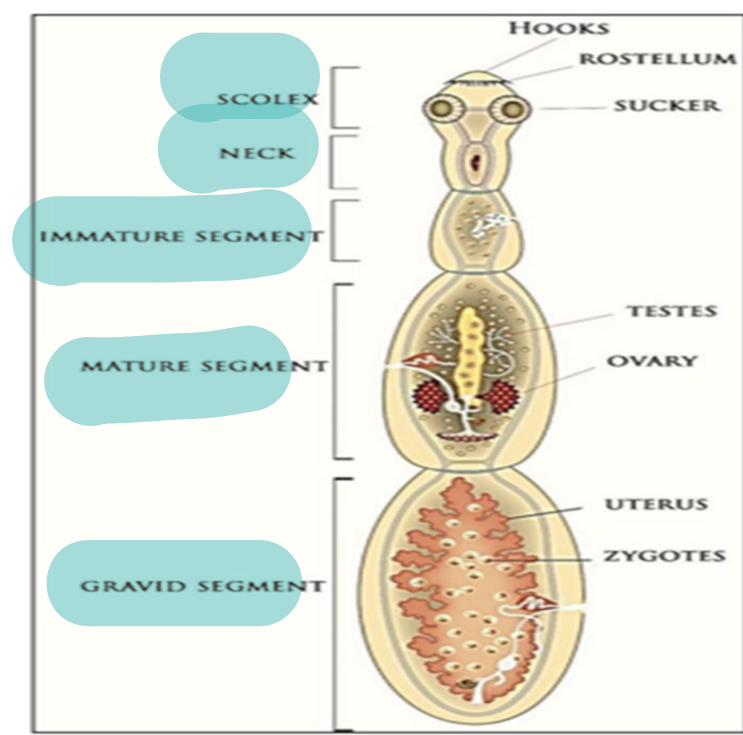
Adult: The smallest tapeworm of medical importance (2.5-9mm).

اقصر دودة شريطية

It has three proglottids, immature, mature and the last one is gravid.

Hydatid cyst: فيها fluid كثير وفيها scolexes رأس الدود

- The larval form of *E. granulosus*.
- Sphere-shaped and unilocular and contains hydatid fluid.
- The slowly growing hydatid cysts can reach a volume of many liters and contains many thousands of scolexes.



Hydatid disease

الدودة هاي موجودة عند الحيوانات وخصوصا الكلاب

- It is a zoonotic disease in which adult *E. granulosus* inhabits the small intestine of carnivores (e.g. dogs). Man is an accidental host infected via ingestion of eggs.
 يكون هون accidental host وبنصاب بحالة ingestion of egg
- The **liver is the most common site** of the hydatid cyst (66%).
- The cyst causes impairment of the affected organs due to pressure and erosion of blood vessels.
 بروج ع ال intestine ثم لل circulation وبتفقس ويطلع larva وبتروح لاماكن مختلفة اهمها الكبد
- Sudden release of cystic fluid can precipitate an anaphylactic reaction that may be lethal, and the associated dissemination of scolexes can result in multiple hydatid cyst formation.

A gentle reminder

تمسك بدُعائك لأنك تدعو
الذي لا يرُد عبده مهزوماً أبداً



Which one of the followings is TRUE regarding *Schistosoma mansoni*?

A) It is hermaphroditic.

B) Adult is cylindrical with cross-section shows a cavity.

C) Snail is an essential part of its life cycle.

D) The normal habitat is the lumen of large intestine.

E) The diagnostic stage is operculated egg.

You are a volunteer with “Doctors Without Borders” in Africa. In certain villages, you detect anemia in a significant number of children. This is most likely due to infection with which one of the following?

A) Ancylostoma duodenale.

B) Ascaris lumbricoides.

C) Enterobius vermicularis.

D) Taenia saginata.

E) Taenia solium.

Which of these blood changes could be seen with Diphelobothriasis?

A) Normocytic normochromic anemia.

B) Macrocytic hyperchromic anemia.

C) Microcytic hypochromic anemia.

D) Leucopenia.

E) Pancytopenia.

The diagram represents a scolex of one of the tapeworm. Intermediate host of this worm is:

- a) Salmon fish.
- b) Pork.
- c) Beef.
- d) Snail.
- e) Cyclops.



Thank
you



