

Intestinal Helminths

Dr: MONA BADR

PROTOZOA

HELMINTHS

Unicellular
Single cell for all functions
Intestinal ,blood & tissue.

Multicellular
Specialized cells
Intestinal & tissue.

1:Amoebae: move by pseudopodia.
2:Flagellates: move by flagella.
3:Ciliates: move by cilia
4:Apicomplexa(Sporozoa)
tissue parasites

Round worms (Nematodes):
- elongated, cylindrical, unsegmented.
Flat worms :
- Trematodes: leaf-like, unsegmented.
- Cestodes: tape-like, segmented.

Nematodes: Location in the human body

- **Intestinal nematodes**
- **Tissue nematodes**

1-Nematodes : General features

1. **Elongated worm, cylindrical, un-segmented and tapering at both ends.**
2. **Variable in size, measure <1 cm to about 100cm.**
3. **Sex separate and male is smaller than female**



Nematodes: common intestinal infections

1. *Enterobius (Oxyuris) vermicularis*
(Pinworm, seatworm, threadworm)
2. *Trichuris trichiura* (whipworm)
3. *Ascaris lumbricoides* (roundworm)
4. *Ancylostoma duodenale & Necator americanus*
(hookworms)
5. *Strongyloides stercoralis*

1-Enterobius vermicularis (THREAD WORM)

(Common names :Pin worm, seat worm,)

- Found all over the world but more common in temperate regions and in Saudi Arabia.
- Children are more often involved than adults , it tends to occur in groups living together such as families , army camps or nursery.
- **Adult worms** are mainly located in lumen of cecum and the female migrate to rectum to deposits her eggs on the anus and perianal skin.
- .Adult worm can be seen by naked eye as white thread \pm 1cm.
 - Male is smaller than female \pm 0.5cm, with coiled end.
- .
 -

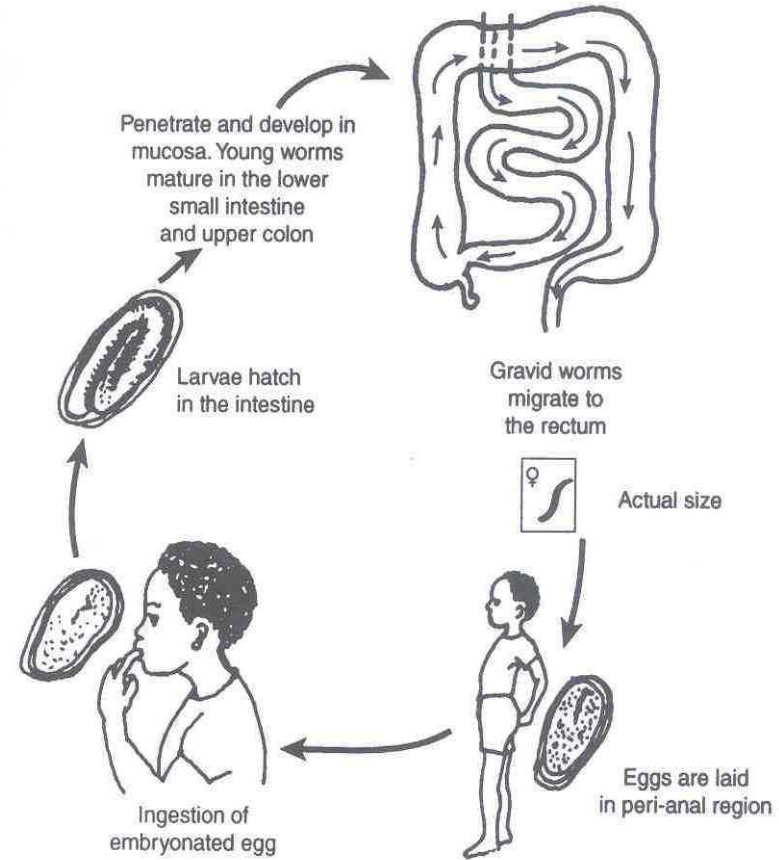
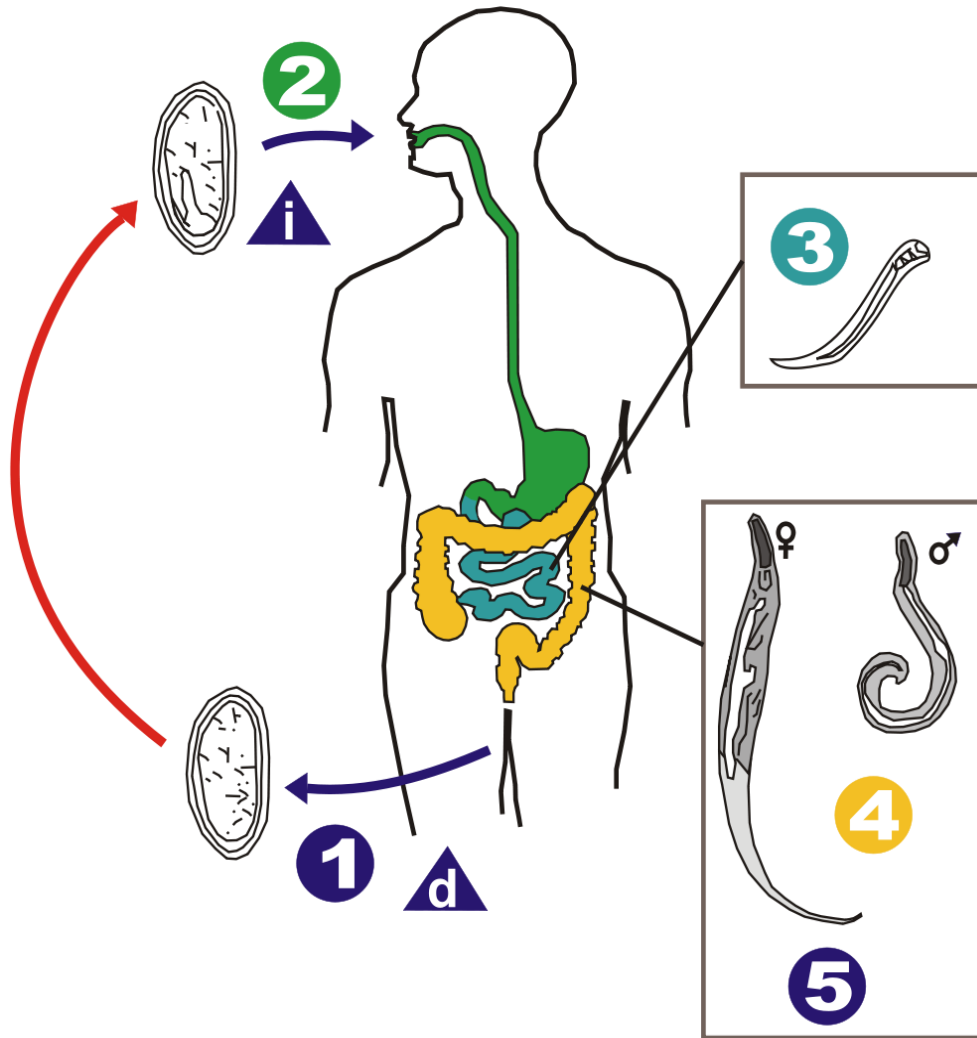


1-Enterobius vermicularis (THREAD WORM)

- Found all over the world but more common in temperate regions.
- Children are more often infected than adults, it tends to occur in groups living together such as families, army camps or nursery.
- Adult worms are mainly located in lumen of cecum and the female migrate to rectum to deposit her eggs on perianal skin.
- Direct human to human infection occurs mainly by swallowing the eggs. In addition, **autoinfection** occurs by contamination of the fingers.
- It can be seen by naked eye as white thread \pm 1cm.
 - Male is smaller than female \pm 0.5cm, with coiled end.



Enterobius vermicularis (pin worm)



Clinical manifestations of pin worm

- **The most common symptom is perianal itching, also known as pruritus ani ,**
- **which can be very troublesome and occurs more often during the night, persistent itching may lead to inflammation and secondary bacterial infection of the perianal region . also adult worm can lodged in the lumen of appendix cause appendicitis.**
- **Infected children may suffer from emotional disturbance ,insomnia ,anorexia , loss of weight and loss of concentration and enuresis.**
- **Ectopic infection occurs in infected adult female when invade vulva and vagina result in valvo-vaginitis, salpingitis.**

Enterobius vermicularis

(Oxyuris)

DIAGNOSIS :

Unlike other intestinal Nematodes, the eggs are not usually found in feces .The best method is to look for them around the anus by taking an anal swab or by using **CELLULOSE ADHESIVE TAPE**, the examination should be done before defecation or bathing.

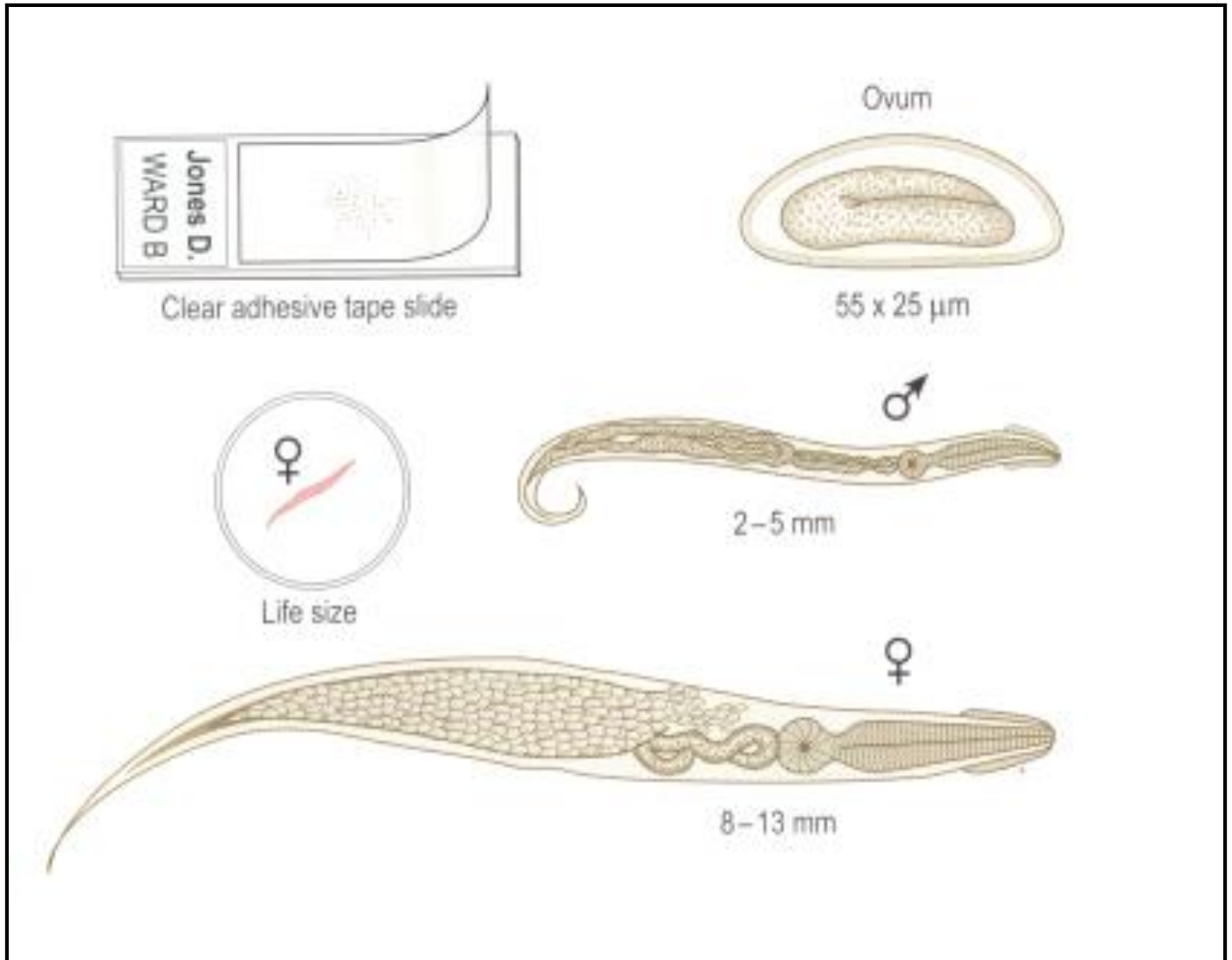
Treatment

Albandazole , Mebendazole

for whole family

Enterobius vermicularis

(pin worm)

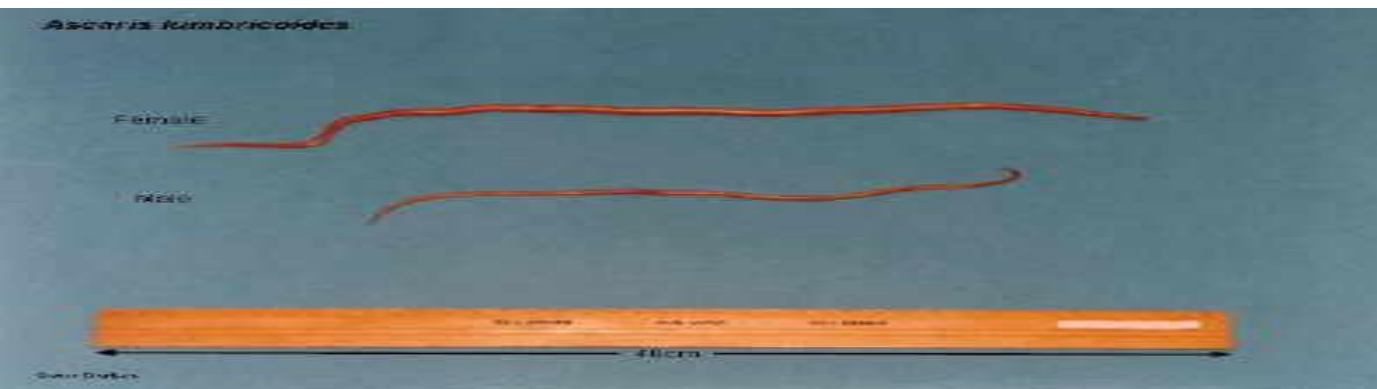


Ascaris lumbricoides (roundworm)

The commonest human helminthes infection all over the world.

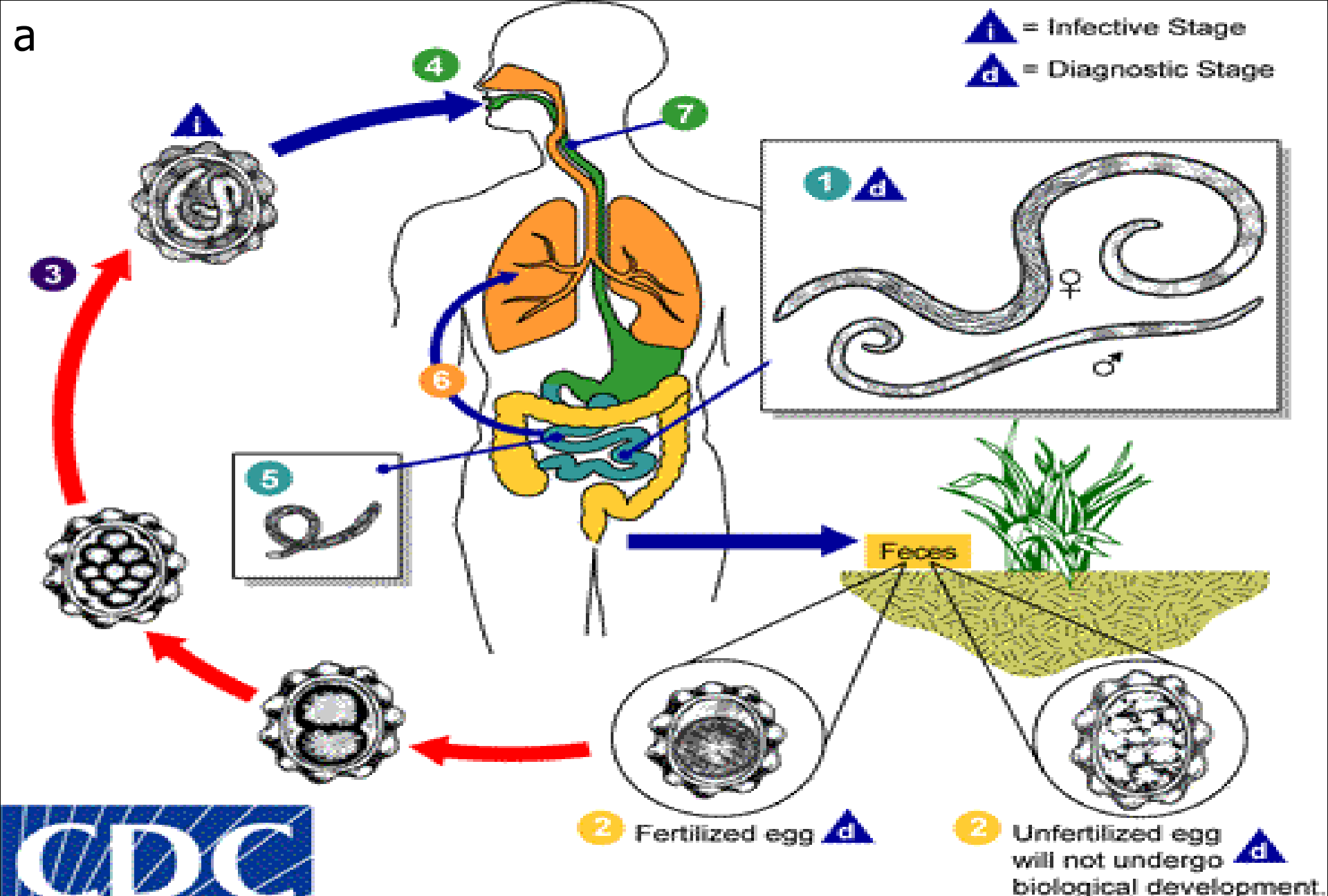
The large round worm which is normally located in the small intestine.

- Found in **jejunum** and upper part of **ileum**.
- Female \pm **20** cm longer than male \pm **10** cm
- Feed on semi digested food.

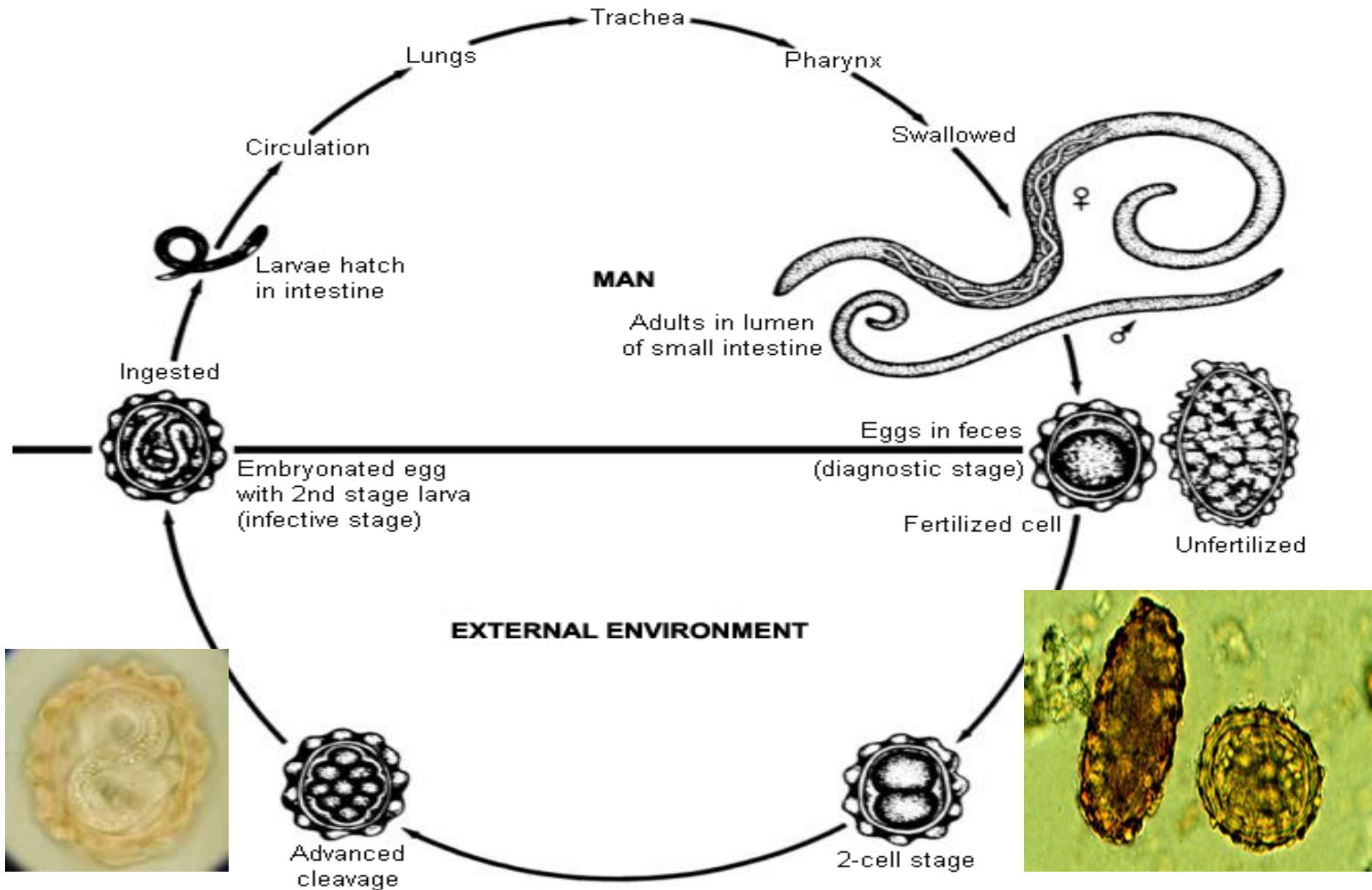


Life cycle of Ascais Lumbricoides

Infection starts when man ingest an **Embryonated egg** contaminated with food or water(**soil**), then this **embryonated egg** become a **Larva** in the duodenum, and penetrate the wall of the **duodenum** , enter the blood stream to the heart , liver and enter the **pulmonary circulation** and stay in the **alveoli** ,where it grow for three weeks then **Larva** passes from respiratory system to be **coughed up** ,swallowed ,returned back to the small intestine where it mature to adults male &female ,fertilization take place producing eggs which pass in stool as **Fertilized eggs** or **unfertilized eggs** ,only **fertilized eggs** can be survive in the(**soil**) for 2 weeks to become an **Embryonated egg** ready to infect human with contaminated food.



Ascaris lumbricoides life cycle



Pathogenicity

■ 1-Migrating LARVA :

- *Ascaris pneumonia , some times LARVA reach aberrant sites like brain ,heart or spinal cord can cause unusual disturbance.*

■ 2-Adult WORM:

- *The worm consumes proteins and vitamins from host's diet and leads to malnutrition.*
- *Can cause intussusception, intestinal ulcers and in massive infection can cause intestinal obstruction.*

Ascaris lumbricoides (roundworm)

Pathology:

■ 1-Adult worm:

Light infection : asymptomatic.

Heavy infection : intestinal obstruction

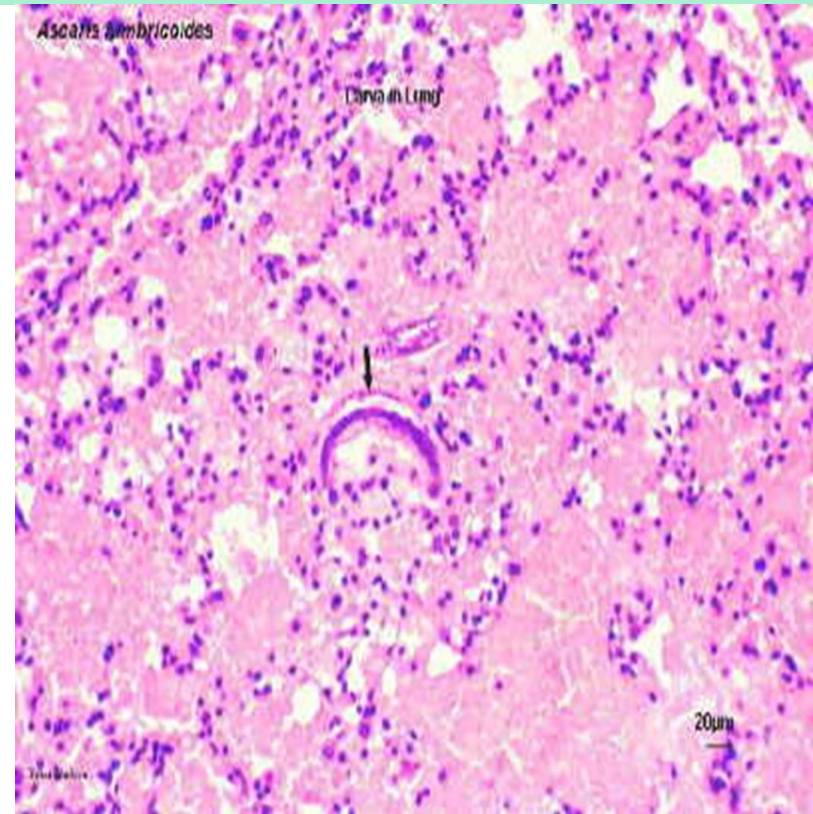
Migrating adult : to bile duct -jaundice

■ 2-Larvae: Loeffler`s syndrome

Pneumonitis and bronchospasm, cough with bloody sputum

Eosinophilia, urticaria

Ascaris lumbricoides (roundworm)



Loeffler`s syndrome: Larvae in lung
pneumonia ,cough ,bloody sputum

Ascaris lumbricoides (roundworm)

Diagnosis:

- eggs (fertilized) or unfertilized eggs in stool.
- larvae in sputum.**
- adult may pass with stool.

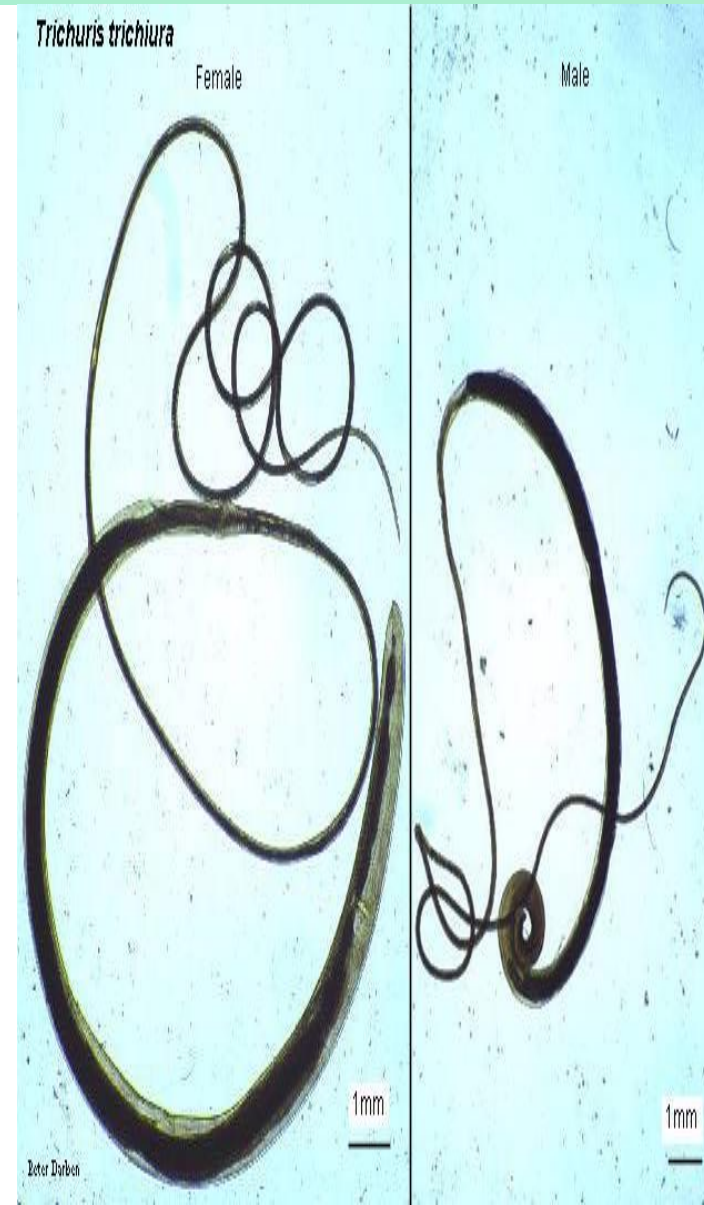


Treatment: Albendazole , Mebendazole

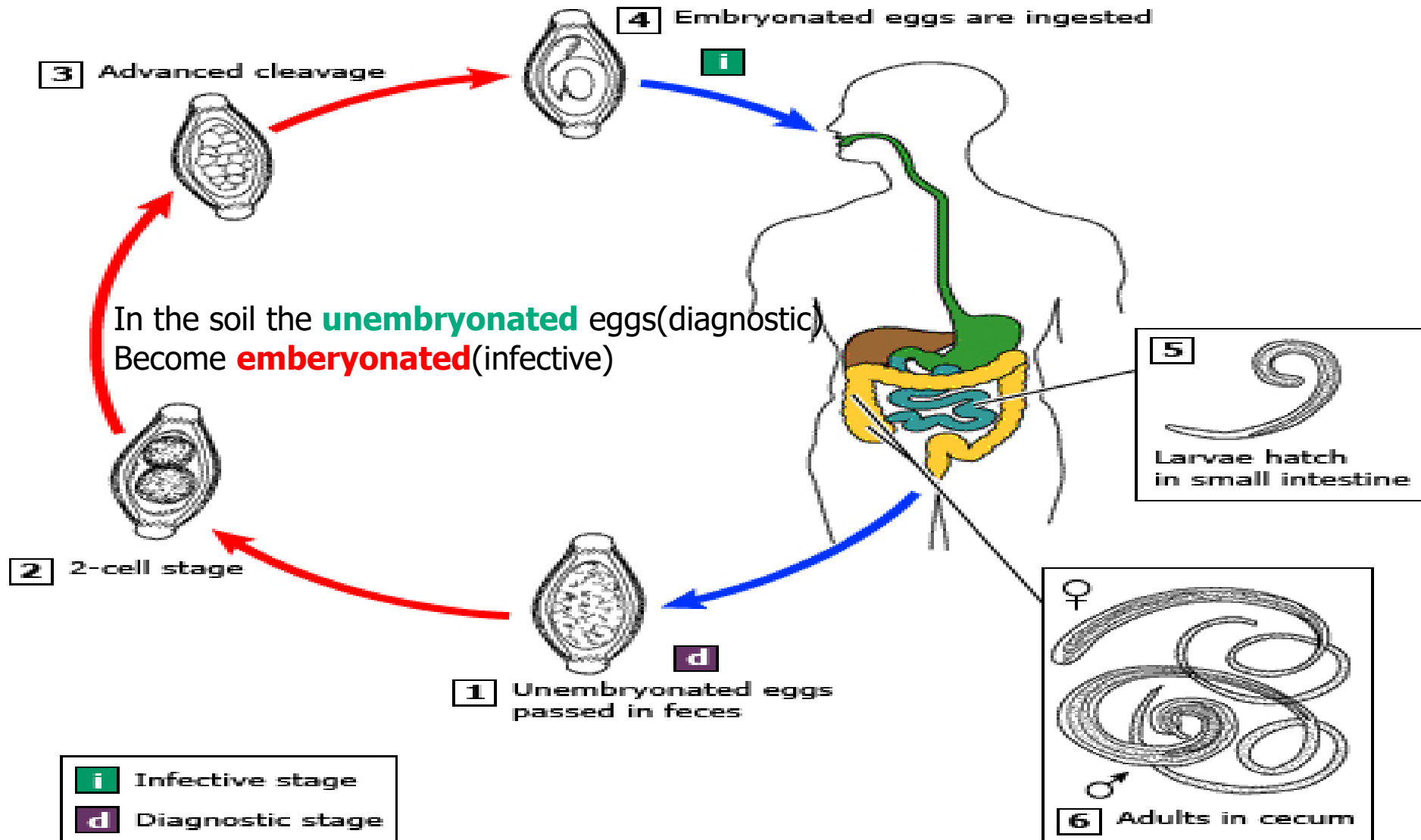
Trichuris trichiura (whipworm)

World wide ,common in poor sanitation.

- It coexists with *Ascaris* because of similar requirement.
- Adult live in **large intestine** especially **caecum** and **appendix** –in heavy infection the whole length of large intestine affected.
- Male and female worm have **narrow anterior** portion penetrate the intestinal mucosa



Trichuris trichiura (Whipworm)



- **Life cycle and transmission** —

The life cycle for trichuriasis begins with passage of **unembryonated eggs(diagnostic stage)** in the stool . In **the soil**, the eggs become embryonated and become infective in 15 to 30 days. After ingestion of contaminated food or water with soil contains

embryonated eggs(infective stage),

in the small intestine the **larvae** will hatch and become mature into **adult worms**, which become established in the **cecum and ascending colon** after two to three months.

- The adults measure approximately 4 cm in length. The females begin to produce eggs 60 to 70 days after infection and shed 3000 to 20,000 eggs per day. The life span of the adults is one to three years

Trichuris trichiura (Whipworm)

clinical finding

- **light infection** : asymptomatic
- **heavy infection** : abdominal pain ,bloody diarrhea. **Rectal prolapse** in children is a common complication.
- **-Diagnosis:** egg in stool characterized by its barrel shape with mucoid plugs at each pole

Unembryonated eggs

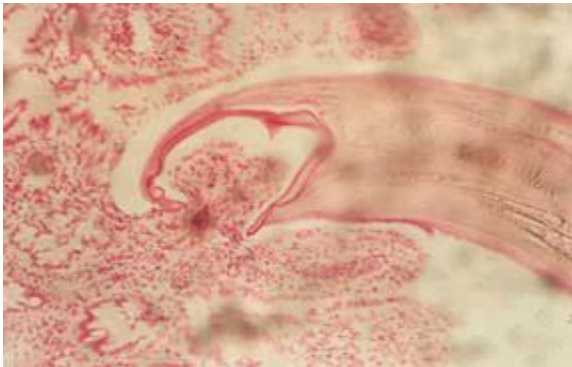


Treatment :Albendazole.

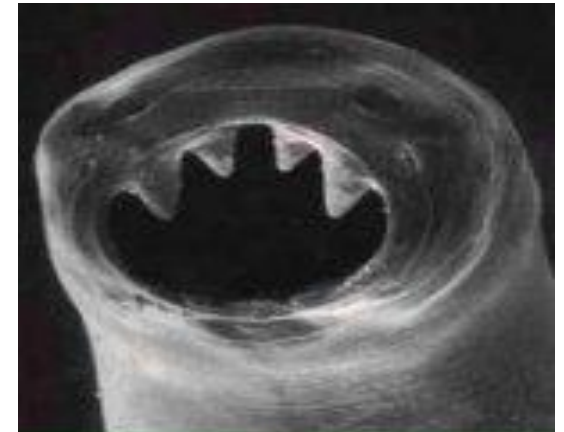
Hook worms

Ancylostoma duodenale & *Necator americanus*

- A common cause of **anemia**.
- Found in **small intestine** mainly jejunum.
- Its buccal capsule (mouth) lined with hard hooks, triangular **cutting plates** and **anticoagulant glands**.



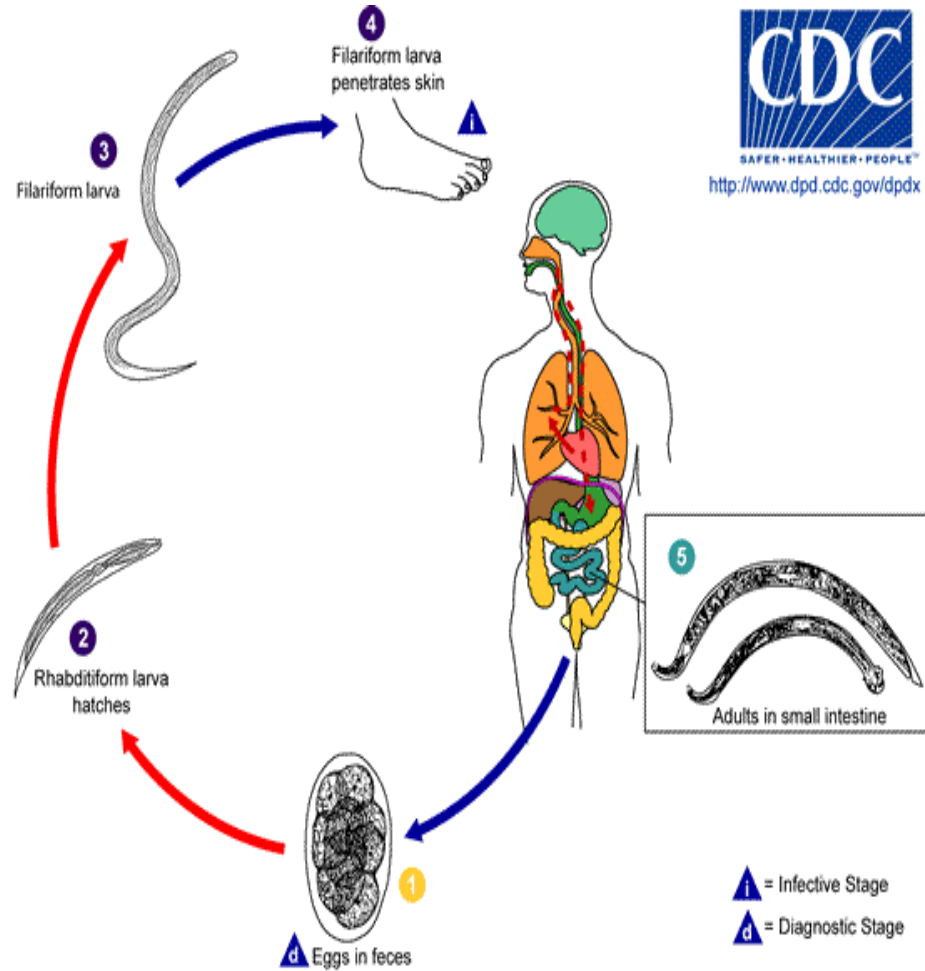
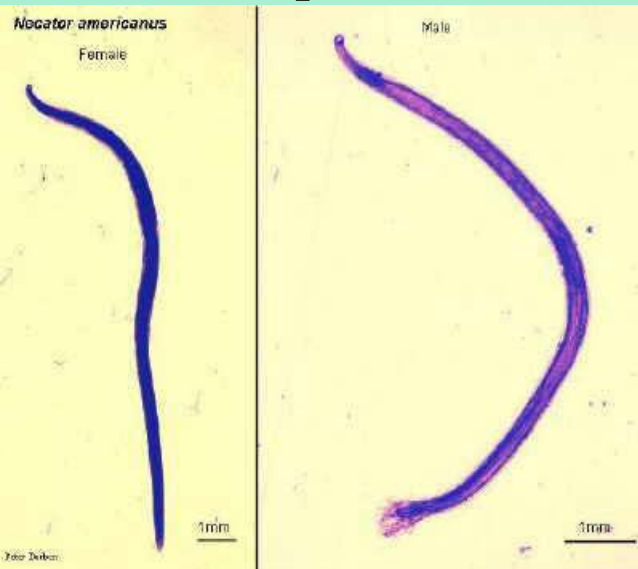
- Buccal cavity attached to intestinal mucosa



Hookworm

Hook worms

Ancylostoma duodenale & *Necator americanus*



<http://www.dpd.cdc.gov/dpdx>

Infection occurs by penetration of the larva to the human skin, In the soil eggs(diagnostic stage) become larva (infective stage)

Pathology & clinical picture:

- larvae:

- **At the site** of entry of larvae intense itching (ground itch) and dermatitis.
- **Migration phase:**
 - cough with bloody sputum
 - pneumonitis and bronchitis but less severe than *Ascaris*, eosinophilia, urticaria.

- Adult worm:

- low worm burden (INFECTION): **no** symptoms.
- Moderate to heavy burden:
 - Epigastric pain, vomiting, hemorrhagic enteritis.
 - Protein loss: hypo-proteinaemia, edema.
 - **Anemia**: due to withdrawal of blood by parasites and hemorrhage from punctured sites lead to **severe anemia** = **microcytic-hypochromic anemia**.
 - **Iron deficiency anemia.**

Hook worms

Diagnosis and treatment

- **Diagnosis:**
- -Eggs in stools.;
- -occult blood (+)

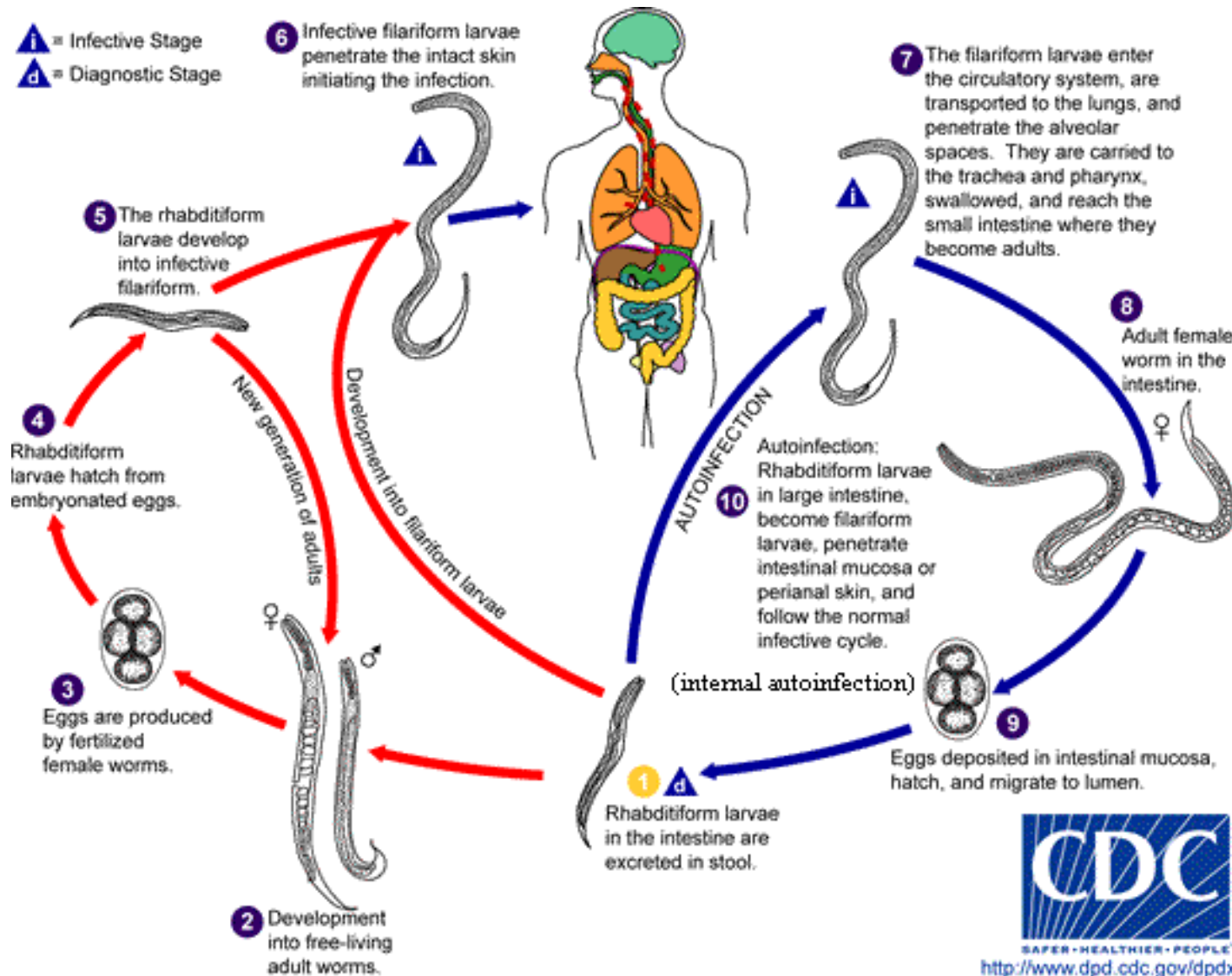


Treatment: Albendazol, Mebendazole

Strongyloides stercoralis

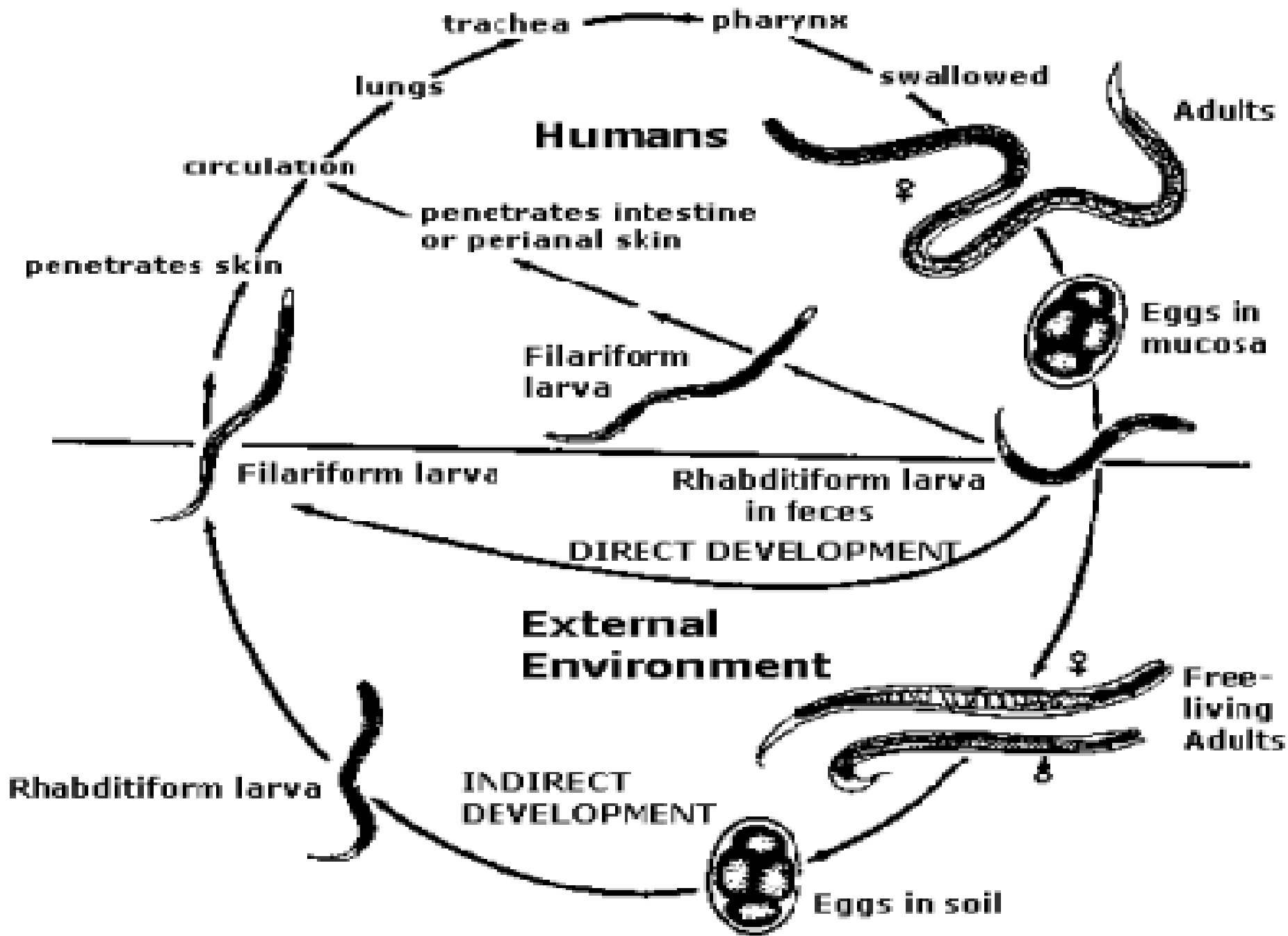
- Widely distributed in tropical area at Asia, Africa & South America .
- fatal dissemination in **immuno-compromised host.**
- It is **smallest** pathogenic nematodes \pm **2.5mm.**
- adult live **in mucous** membrane of duodenum jejunum rarely mucous membrane of bronchus.
- ***AUTOINFECTION IS VERY IMPORTANT CRITERIA .***

Strongyloides stercoralis



Strongyloids Stercoralis

- **1-Rabbitiform larva (diagnostic stage)** are excreted in the stool to the soil , to become adult male and female, where fertilization take place to produce eggs.
- 2- Larva hatch from the eggs in the soil and become **Filariform larva (infective stage)** .
- 3-Infection take place by **penetration** of the Filariform larva to human skin ,which enter the circulation to the lung → trachea
- → swallowed and reach the small intestine to become adult male and female ,starts to produce eggs ,which become **Rabbitiform larva** and excreted in the stool to start another cycle in the soil.
- **INTERNAL AUTOINFECTION** in immunocompromised patients ,**Rabbitiform larva** in the intestine can be transferred to become **filariform larva** and penetrate the intestinal mucosa and peri-anal skin and produce infection.



Strongyloides stercoralis:

Pathology and clinical picture:

- **Cutaneous** little reaction on penetration.
sever dermatitis at perianal region in
case of external autoinfection.
- **Migration** :same as hook worms .
- **Intestinal:** inflammation of upper intestinal mucosa,
diarrhea, upper abdominal pain colicky in nature.
- **Disseminated strongyloidiasis** : in patient with
immunodeficiency ,uncontrolled diarrhea , necrosis
,perforation--peritonitis--death.

Strongyloides stercoralis

Diagnosis:

rhabditiform larvae
diagnostic stage in:

- Stool examination
- Duodenal aspirate

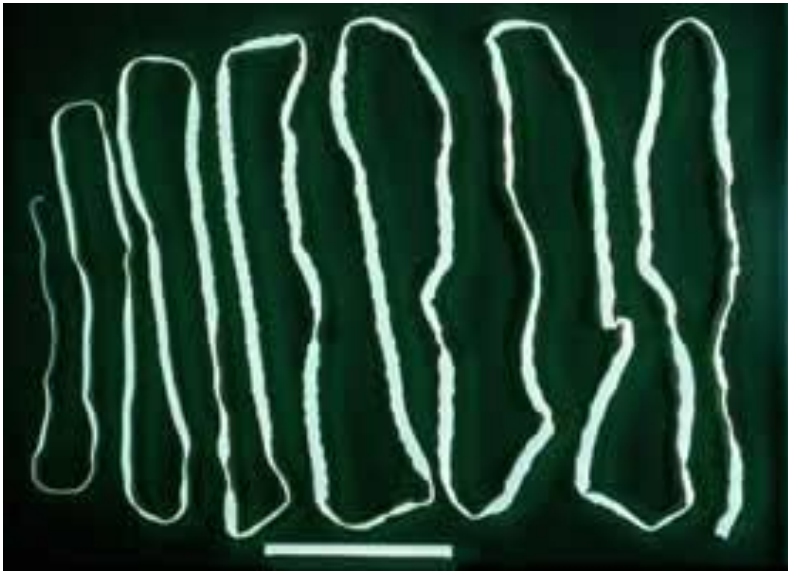


Treatment :

Albandazole, Mebendazole

2-Tapeworm (Cestodes) Infections

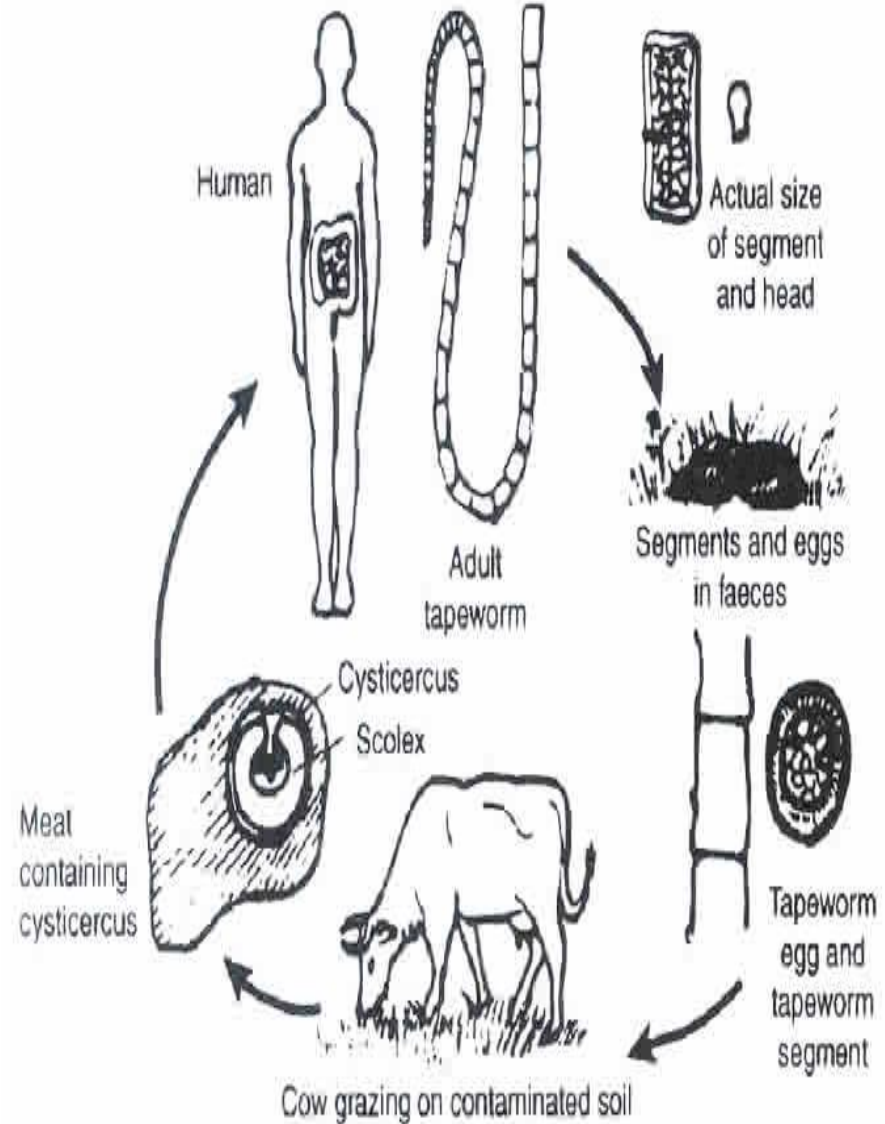
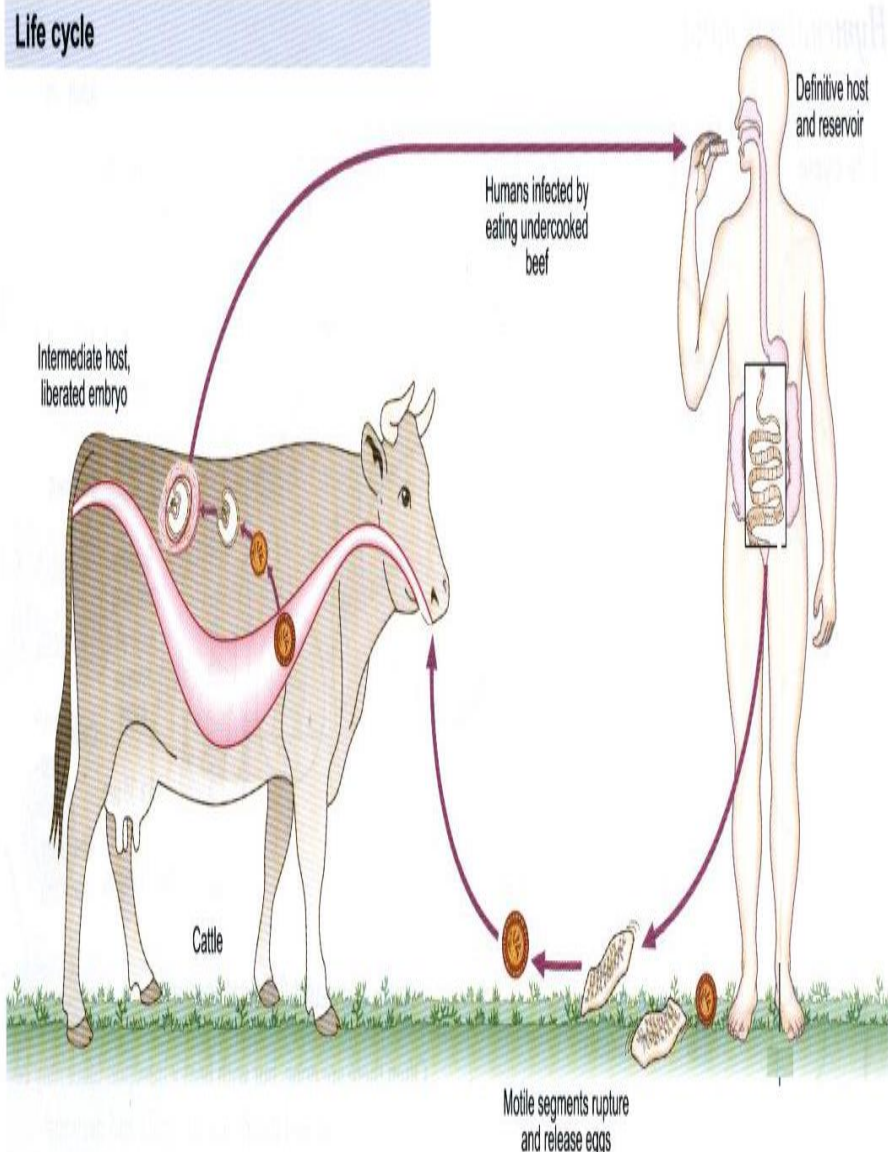
TAPEWORM	DISEASE	TRANSMISSION OF INFECTION	LOCATION OF ADULT IN HUMANS	LOCATION OF LARVA IN HUMANS	CLINICAL PICTURE	LAB.
						DIAGNOSIS
<i>Taenia saginata</i>	taeniasis	ingestion of larva in undercooked beef	Small Intestine	not present	vague digestive disturbance	eggs or proglottids in stools
<i>Taenia solium</i> - <u>ADULT</u>	taeniasis	ingestion of larva in undercooked pork	Small Intestine	not present	vague digestive disturbances	eggs or proglottids in stools
<i>Taenia solium</i> - <u>LARVA</u> (cysticercus cellulosae)	Cysticercosis	ingestion of egg	not present (except in autoinfection : ,small intestine)	sub-cutaneous muscles brain,eyes	depending on locality: from none to epilepsy	X - ray,CT,MRI Serology
<i>Hymenolepis nana</i>	hymenolepiasis	ingestion of egg	Small Intestine	Intestinal Villi	Enteritis diarrhoea	eggs in stools
<i>Echinococcus granulosus</i>	hydatid disease	ingestion of egg	not present	Liver, lungs, Bones etc	depending on locality	X-ray,CT,US Serology Hydatid sand



Taenia saginata

Human(definitive host harboring adults) infected by eating Under cooked beef contains **cysticercus** in the muscle of the cattle(intermediate host).

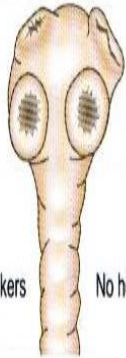
Life cycle



Taenia saginata

- Is an obligatory parasite of man ,the adult worm live in the **SMALL INTESTINE** .
- **CATTLE** become infected by ingesting grass contaminated with **eggs or gravid segments** which passed from human faeces. In the cattle the onchosphere hatches out go to circulation and transformed to cysticercus stage in the muscle known as **CYSTICERCUS BOVIS**.
- Man become infected by eating **undercooked** or improperly cooked beef , the adult worm lives in **small intestine** of man passing **eggs** and **gravid proglottids** to the environment.
- The majority of cases are Asymptomatic ,some patients have vague intestinal discomfort ,vomiting and diarrhoea.

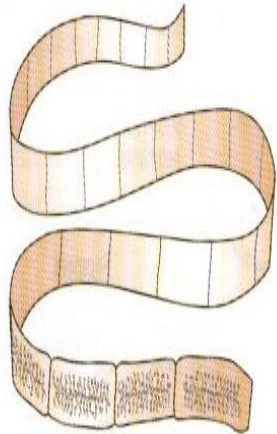
Scolex
←1-2 mm→



4 suckers No hooklets

5-10 m

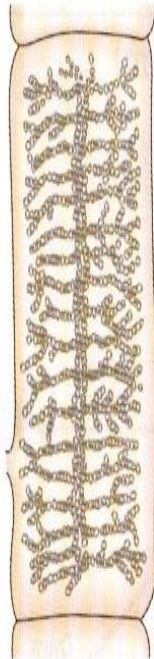
1000-2000 segments



Ovum
30-40 µm



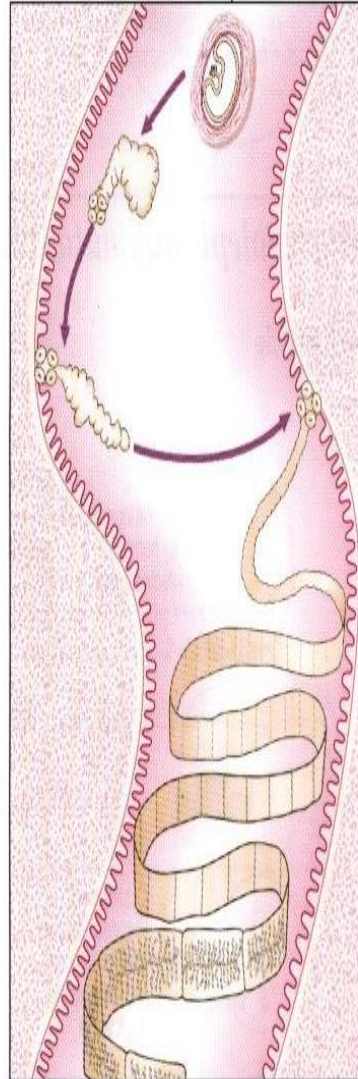
Gravid segment



Uterus with 15-30 lateral branches

16-20 x 5-7 mm

Scolex evaginates in small intestine and attaches itself to mucosa of jejunum



T.Saginata infection is usually asymptomatic, but in heavy infection often result in weight loss, dizziness, abdominal pain, diarrhea and loss of appetite.

Diagnosis :
detection of eggs in stool or gravid segment.

Maturation time 8-10 weeks.

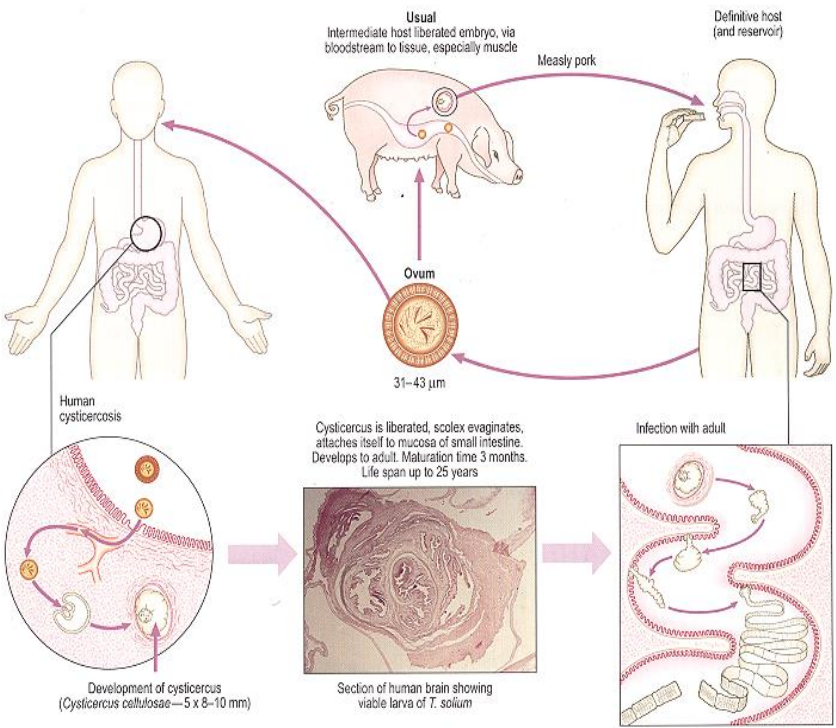
Life span up to 25 years

Cestode (tape) worms

Life cycle of *T. Solium*

Taenia solium (pork tapeworm)

Life cycle



Pathology and Clinical features

Infection by larvae (cysticercosis). Cysticerci, generally multiple, may occur in any site but are more frequent in the brain and muscle. They excite reaction in the area, especially when they die, which manifests as inflammation, fibrosis and later some calcification. This leads to focal CNS syndromes, especially epilepsy.

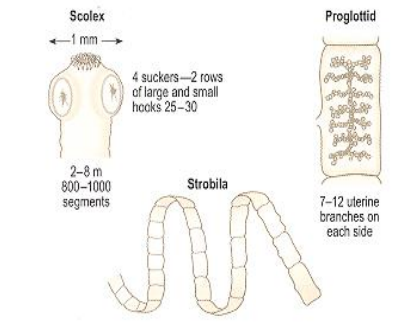
Infection with adults. Often there can be no pathology, but there might be mild irritation of intestinal mucosa.

Laboratory diagnosis

Eosinophilia.

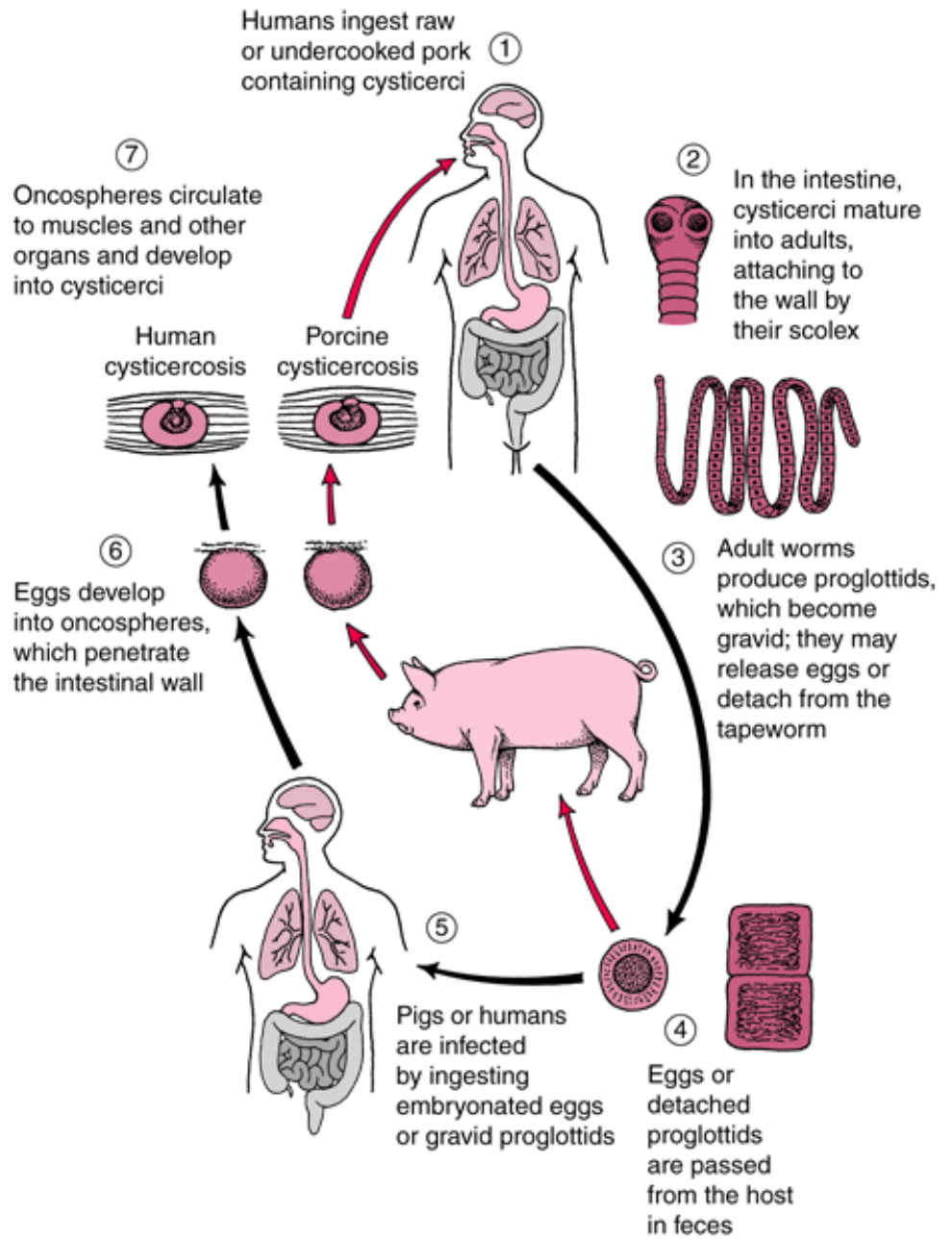
Larval infections. There are several methods, including histological examination of biopsy material, serology (IFAT, ELISA, EITB) and radiology (CT or MRI scan of the brain, X-ray of the thigh muscles).

Pure infection with the adult. Gravid segments, ova and scolex can be found in faeces. The uterine branches of the mature segments can be demonstrated by injection of Indian ink through the uterine pore.



Distribution

5 million people infected worldwide. *Taenia solium* is endemic in pig-rearing areas of the world where hygiene and animal husbandry are poor.

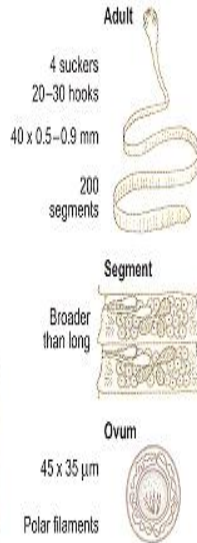
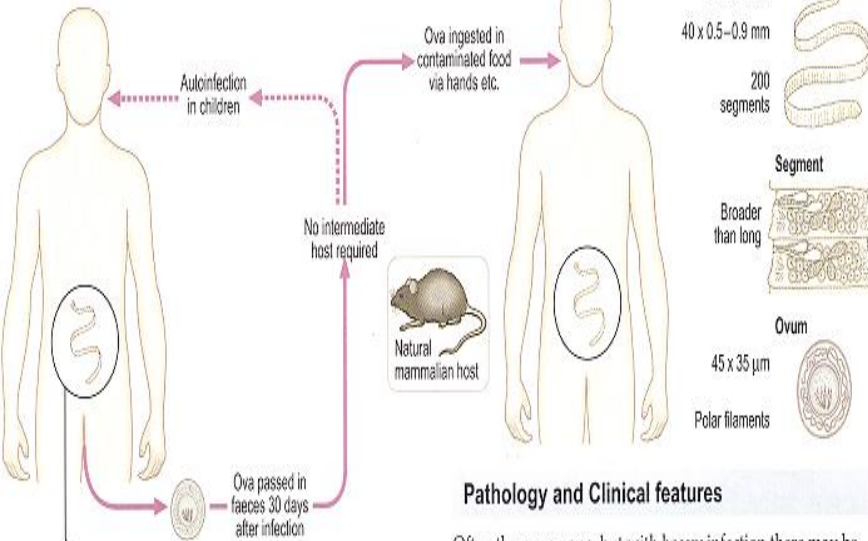


HYMENOLEPIS NANA

Dwarf tape worms

Hymenolepis nana

Life cycle



Pathology and Clinical features

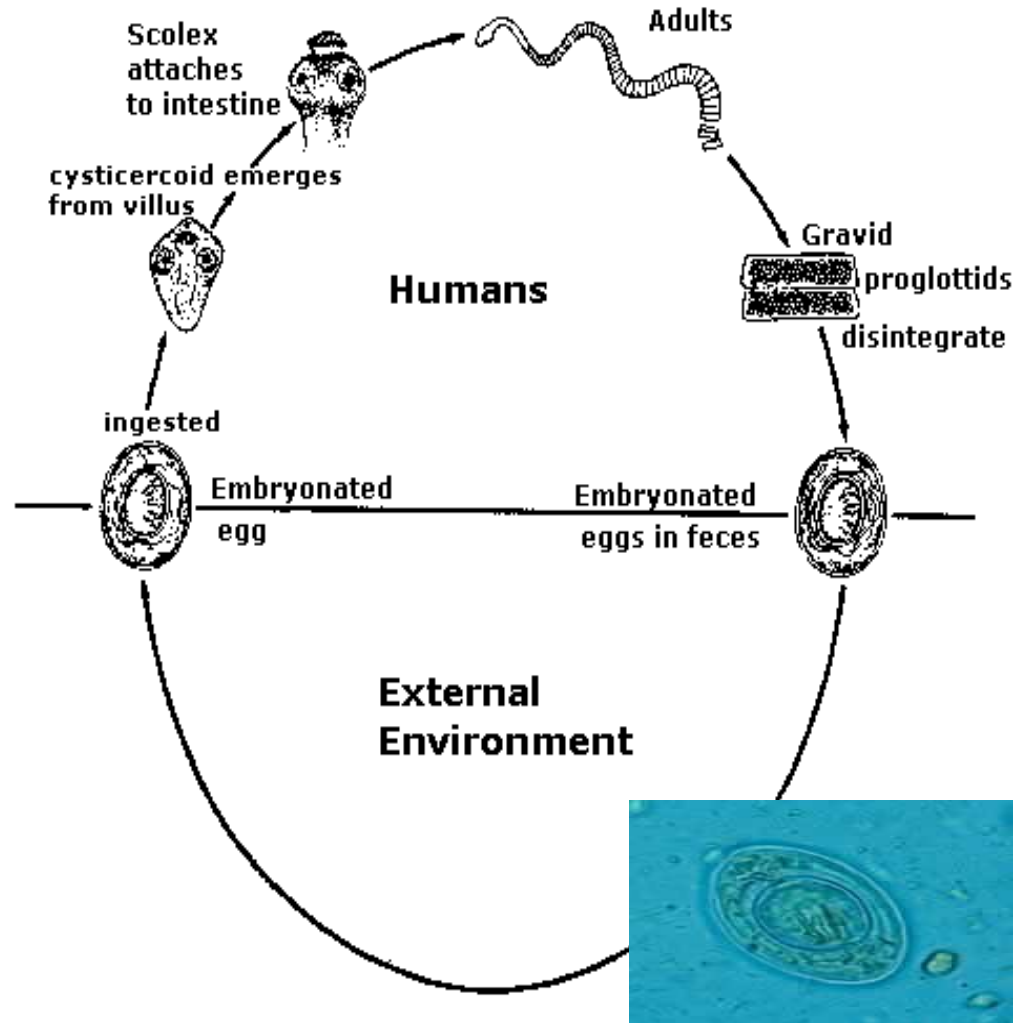
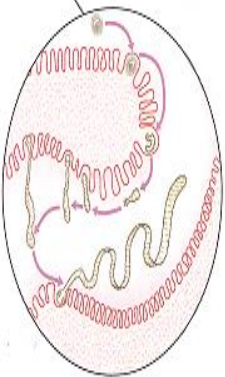
Often there are none, but with heavy infection there may be abdominal pain and diarrhoea. Anaemia and nervous symptoms, including dizziness and irritability, can occur in children.

Laboratory diagnosis

Eosinophilia may be present. Ova found in faeces.

Distribution

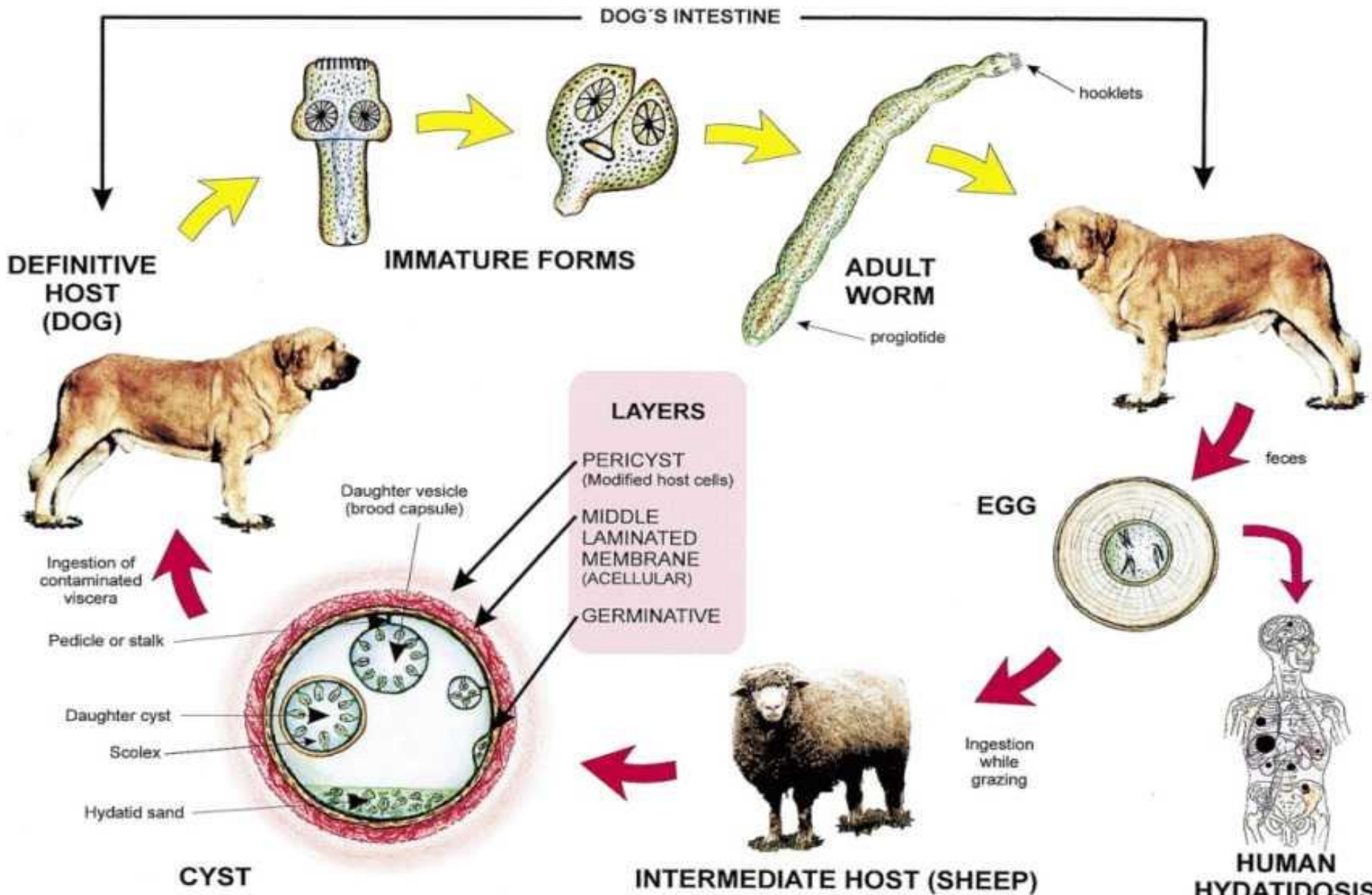
36 million people are infected worldwide.

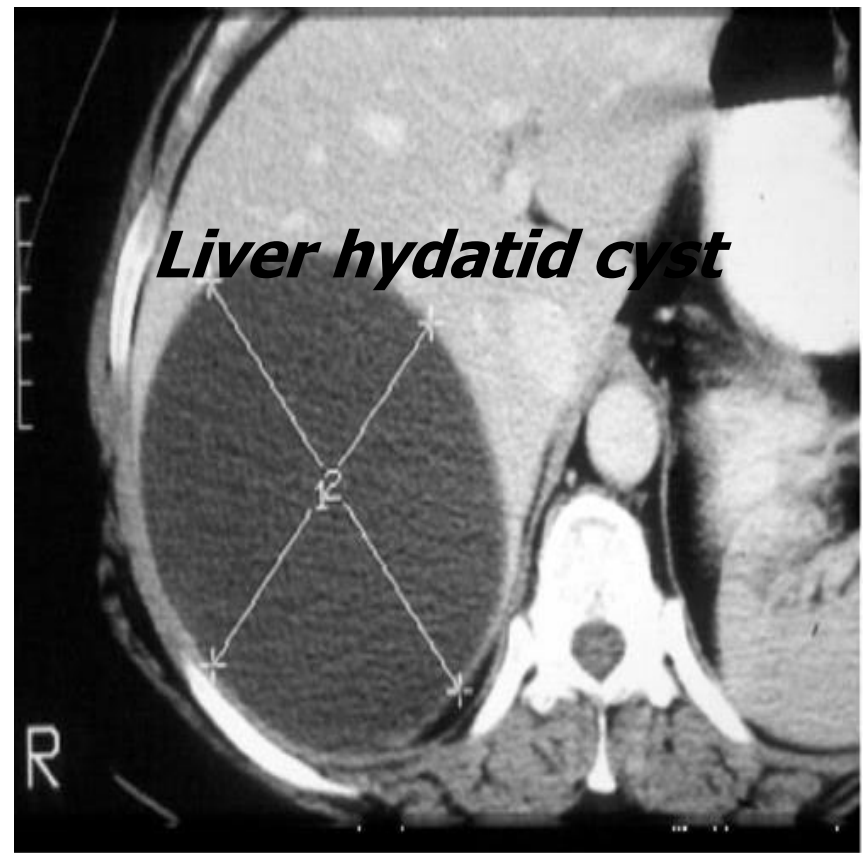


Life cycle of *Echinococcus granulosus*

- 1-The adult worm located in the small intestine of the dogs (definitive host).
 - 2-Eggs and gravid segments are then discharged in the feces of the infected dogs having ***Onchosphere***.
 - 3- Eggs and gravid segments contain **onchosphere** are ingested by various animals e.g sheep goats and **accidentally man**.
- These **onchosphere** hatches in the duodenum and penetrate the circulation and reach various organs mainly **the liver** and **the brain** causing **HYDATID CYST**.

Echinococcus granulosus





Diagnosis :

- 1- radiological examination.**
- 2- immunological tests.**

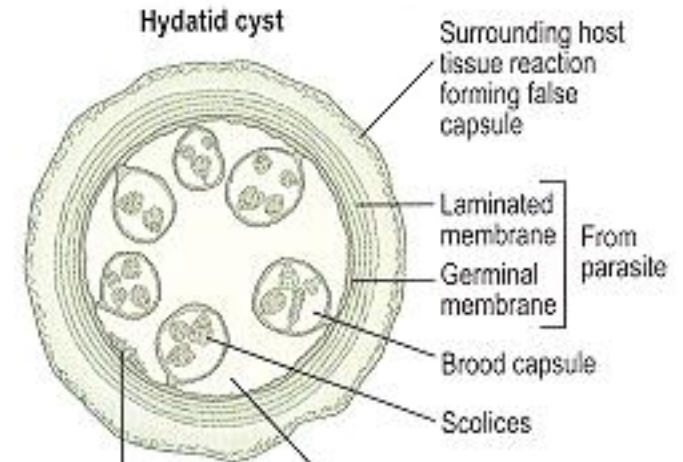
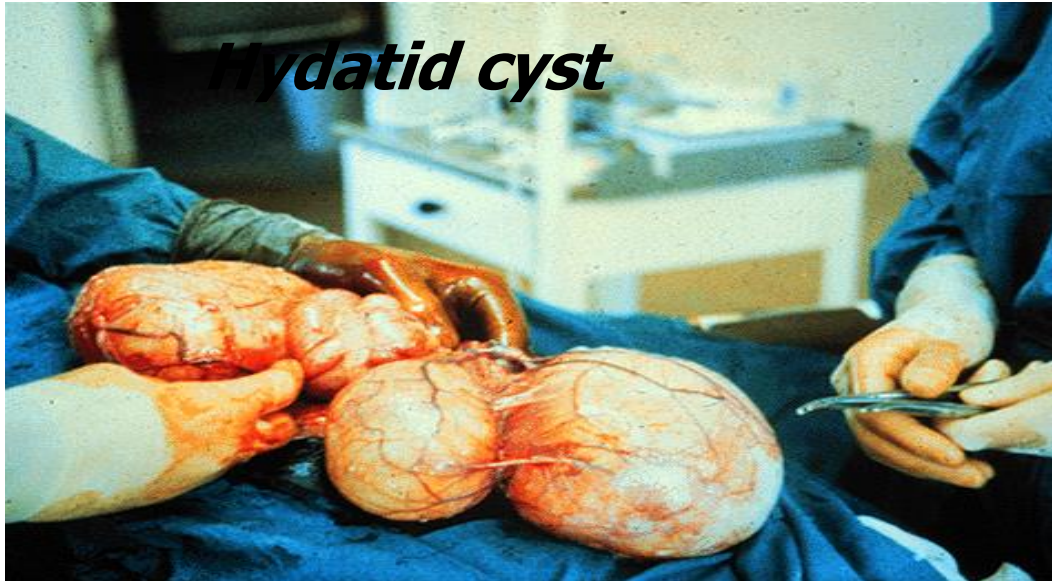
Treatment:

Intestinal stages: Praziquantel

Tissue stages (Hydatid , cysticercosis):

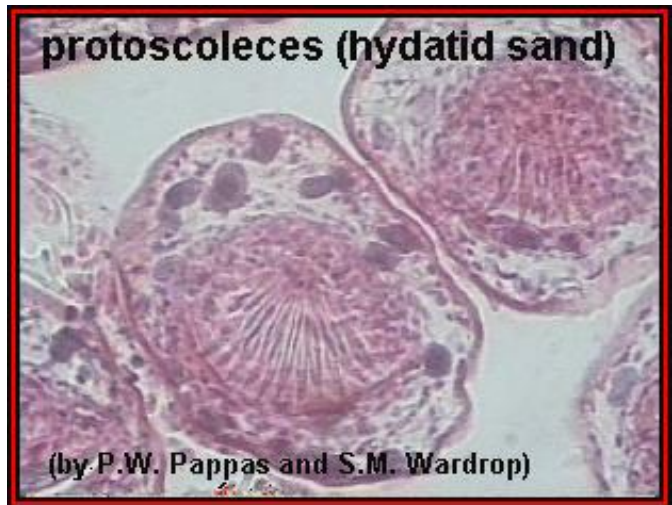
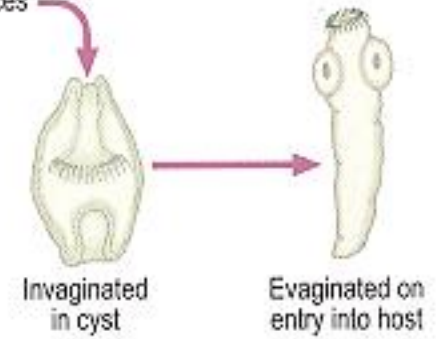
Depends on clinical condition : Surgical and/or
Albendazole

Hydatid cyst



Hydatid sand
Remains of germinal epithelium
Brood capsules
Protoscolices

Cyst fluid
Salts
Enzymes



(by P.W. Pappas and S.M. Wardrop)

