



Intestinal Helminths

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PROTOZOA	HELMINTHS
Unicellular Single cell for all functions	Multicellular Specialized cells
1:Amoebae: move by pseudopodia. 2:Flagellates: move by flagella. 3:Ciliates: move by cilia 4:Apicomplexa(Sporozoa) tissue parasites	<u>Round worms (Nematodes):</u> - elongated, cylindrical, unsegmented. <u>Flat worms :</u> - Trematodes: leaf-like, unsegmented. - Cestodes: tape-like, segmented.

Nematodes : General features

1. **Elongated worm, cylindrical, unsegmented 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: Location in the human body

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

Nematodes: common intestinal infections

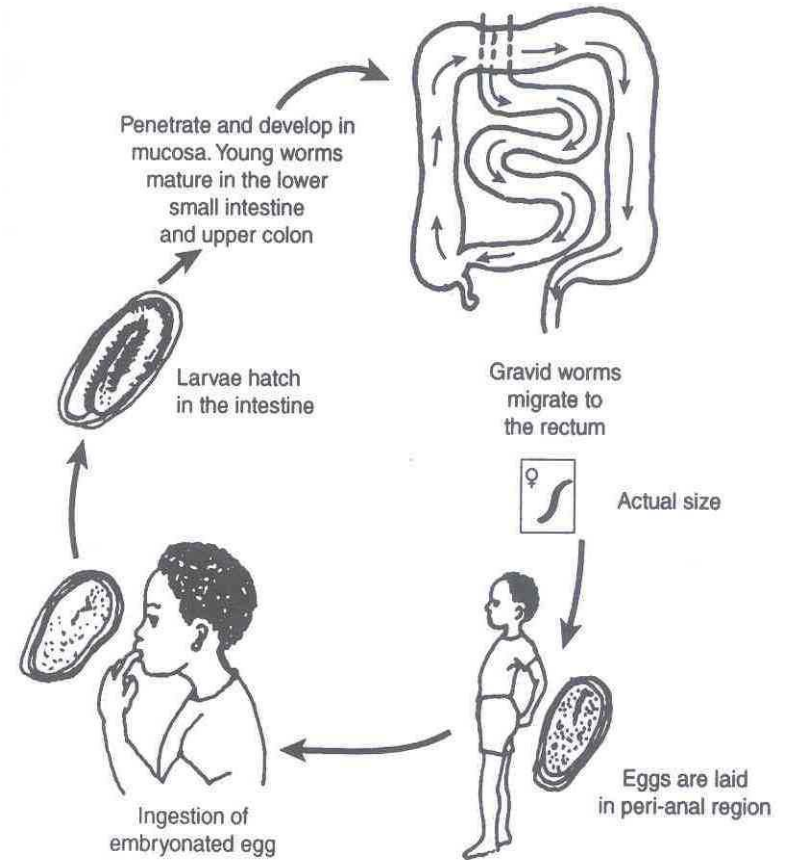
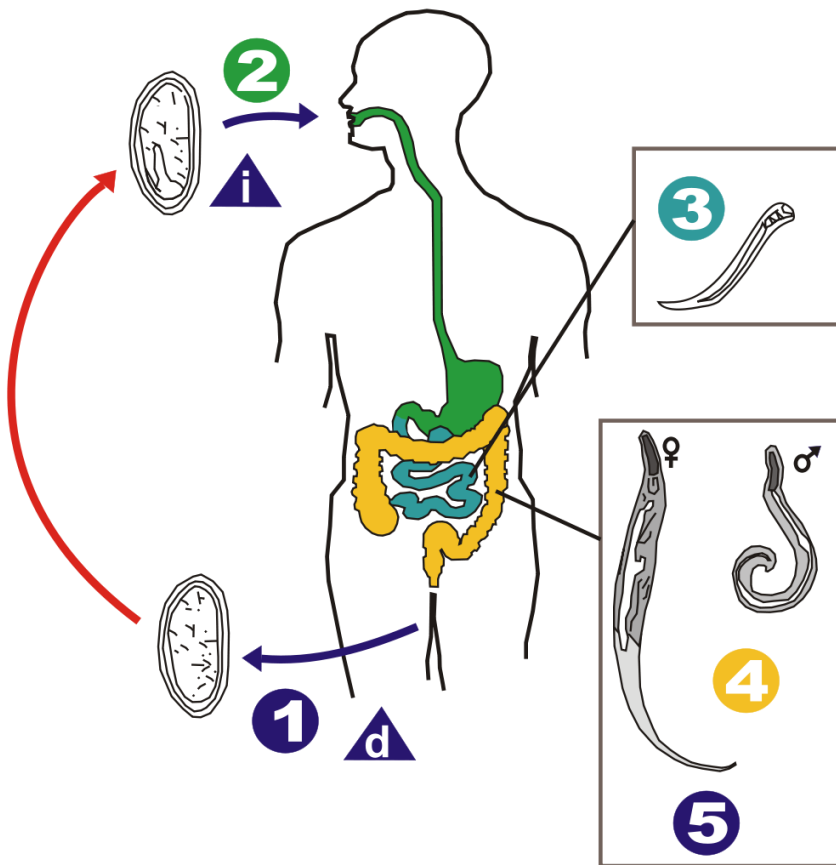
1. *Enterobius (Oxyuris) vermicularis*
(Pinworm, seatworm, threadworm)
2. *Trichuris trichiura* (whipworm)
3. *Ascaris lumbricoides* (roundworm)
4. *Ancylostoma duodenale* & *Necator americanus*
(hookworms)
5. *Strongyloides stercoralis*

1-Enterobius vermicularis (THREAD WORM)

- 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



Enterobius vermicularis (Oxyuris)

- **Majority of infections are asymptomatic.**
- **Main clinical presentation 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 peri-anal region.**
- **Infected children may suffer from emotional disturbance ,insomnia ,anorexia , loss of weight and loss of concentration and enuresis.**
- **Ectopic enterobiasis occurs in infected adult female when invade vulva and vagina result in valvo-vaginitis, salpingitis , also adult worm can lodged in the lumen of appendix cause appendicitis.**

Enterobius vermicularis (Oxyuris)

DIAGNOSIS :

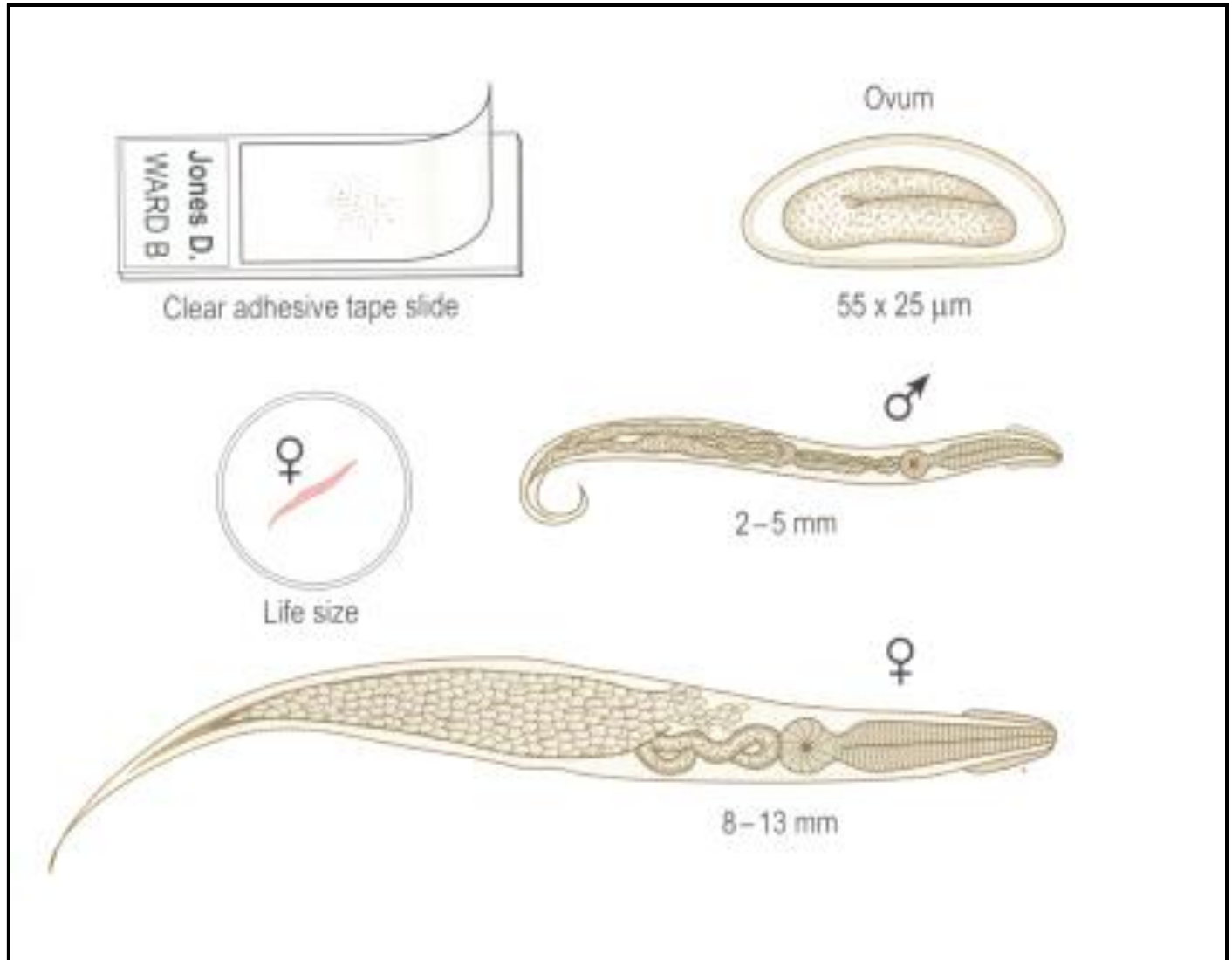
Unlike other intestinal Nematodes, the eggs are not usually found in feces .The best method is to look for them around the anus by taking an anal swab or by using **CELLULOSE ADHESIVE TAPE**, the examination should be done before defecation or bathing.

Treatment

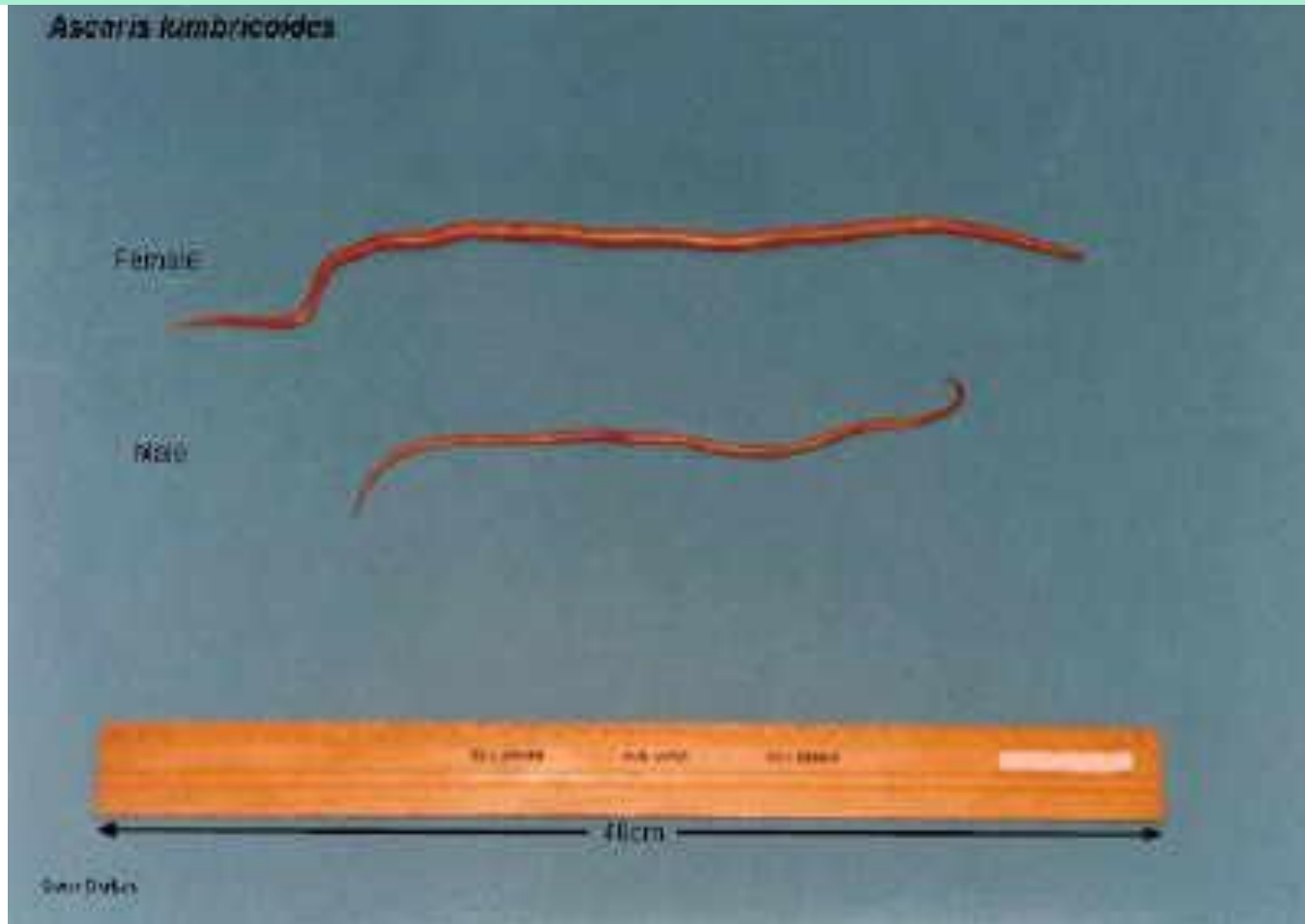
Albandazole , Mebendazole

for whole family

Enterobius vermicularis (Oxyuris)



Ascaris lumbricoides (roundworm)



Ascaris lumbricoides (roundworm)

The commonest human helminthes infection all over the world.

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

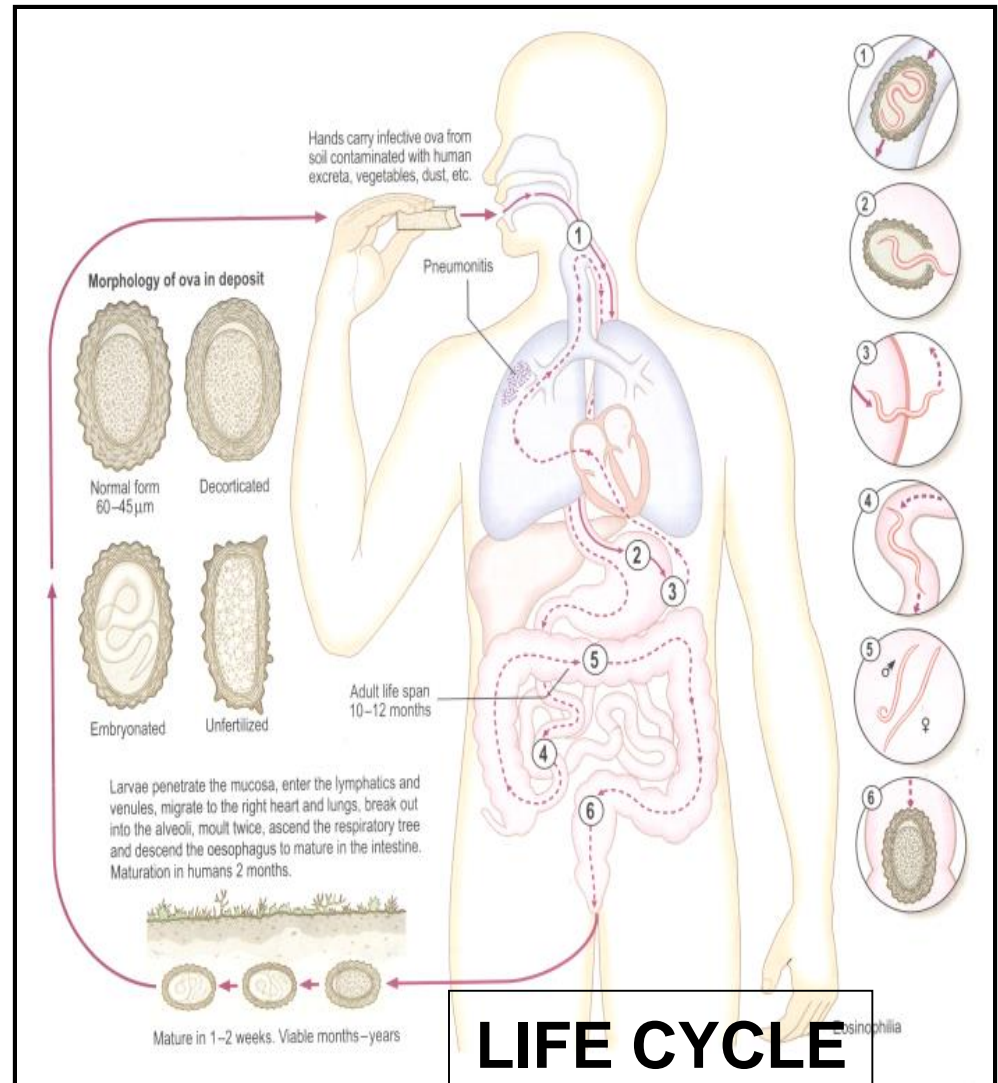
- Found in **jejunum** and upper part of **ileum.**
- Female \pm **20** cm longer than male \pm **10** cm
- Feed on semi digested food.



Ascaris lumbricoides (roundworm)

Infective stage is embryonated egg

Diagnostic stage is unfertilized egg



Life cycle of Ascais Lumbricoides

It infect the human when man ingest an **fertilized egg** contaminated with food or water, then this fertilized egg become a **Larva** that penetrate the wall of the **duodenum** and enter the blood stream to the heart , liver and enter the pulmonary circulation and stay in the **alveoli** ,where it grow and molts for three weeks then **Larva** passes from respiratory system to be **coughed up** ,swallowed ,returned to the small intestine where it mature to adults male &female ,fertilization take place producing eggs which pass in stool.

Pathogenicity

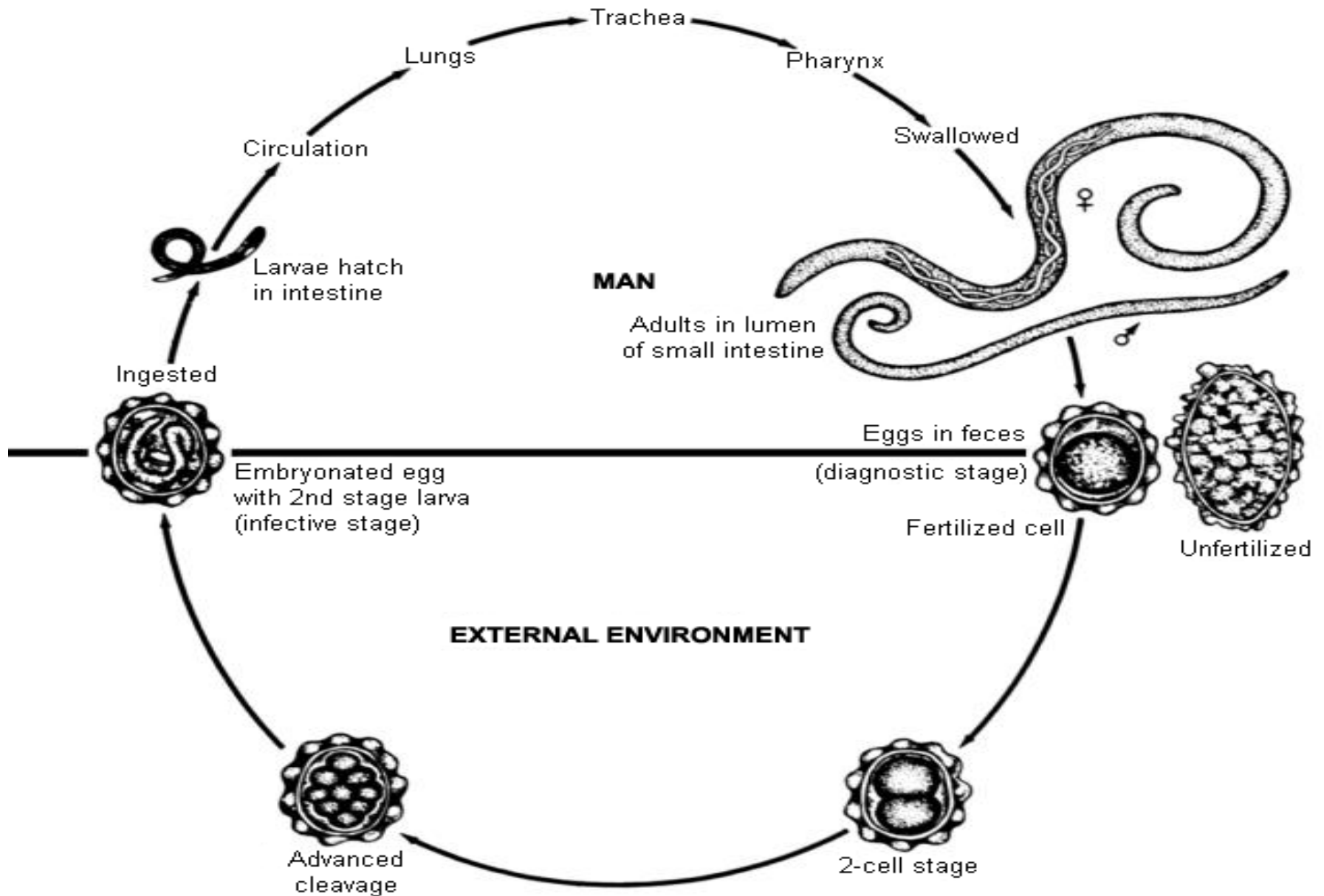
■ 1-Migrating LARVA :

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

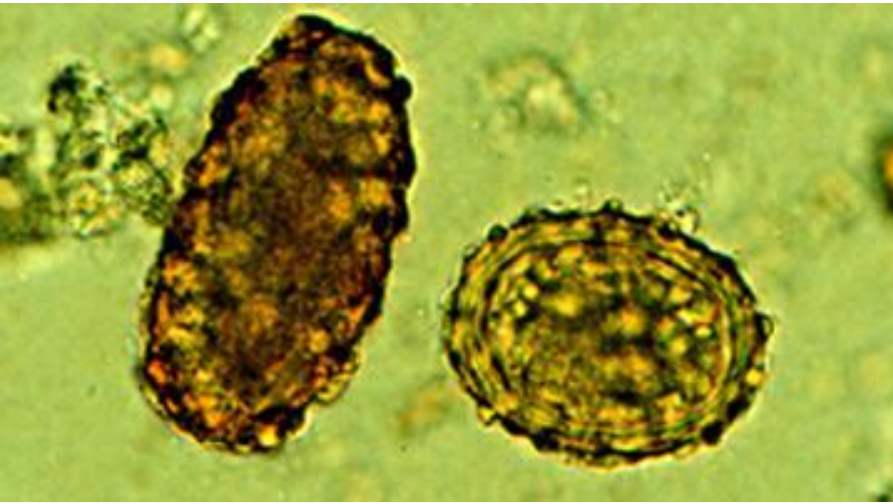
■ 2-Adult WORM:

- *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 life cycle



Ascaris eggs



Ascaris larva emerging from egg



Ascaris egg

(embryonated)

Ascaris lumbricoides (roundworm)

Pathology:

- **1-Adult worm:** *(small intestine)*

Light infection : asymptomatic.

Heavy infection : intestinal obstruction

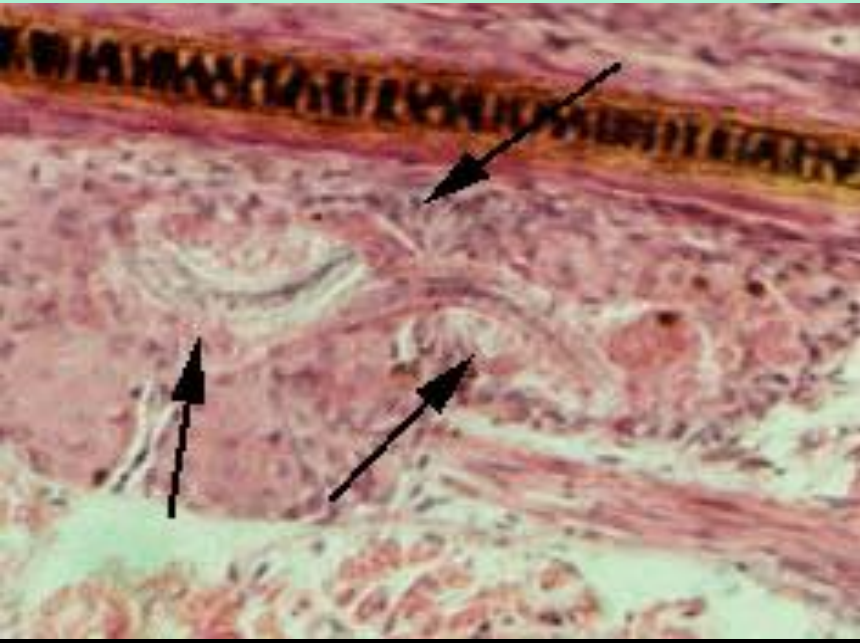
Migrating adult : to bile duct -jaundice

- **2-Larvae:** Loeffler`s syndrome

Pneumonitis and broncho-spasm, cough with bloody sputum

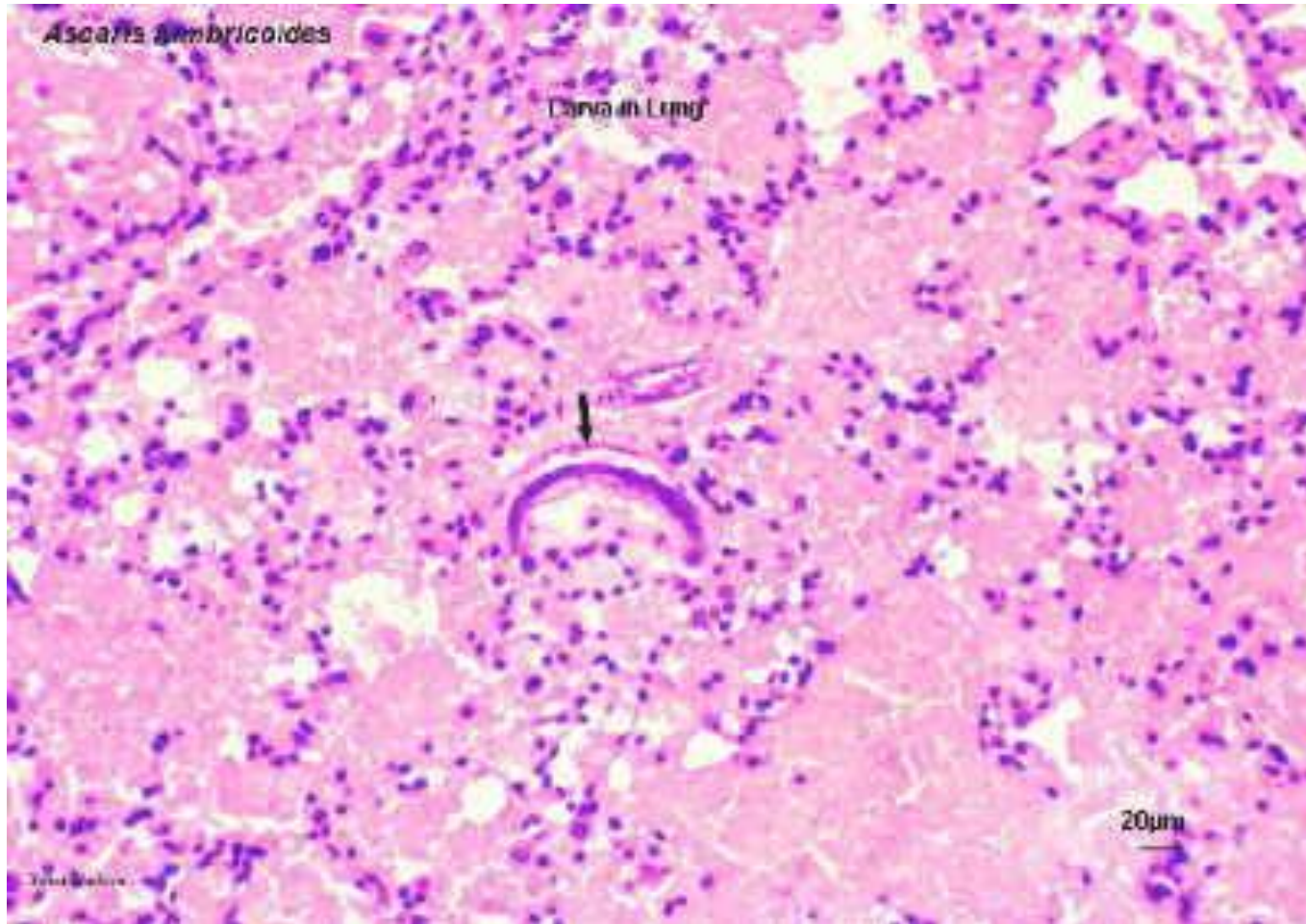
Eosinophilia, urticaria

Ascaris lumbricoides (roundworm)



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

Ascaris lumbricoides (roundworm)



Ascaris larva in lung

Ascaris lumbricoides (roundworm)

Diagnosis:

- eggs in stool.
- larvae in sputum.
- adult may pass with stool.

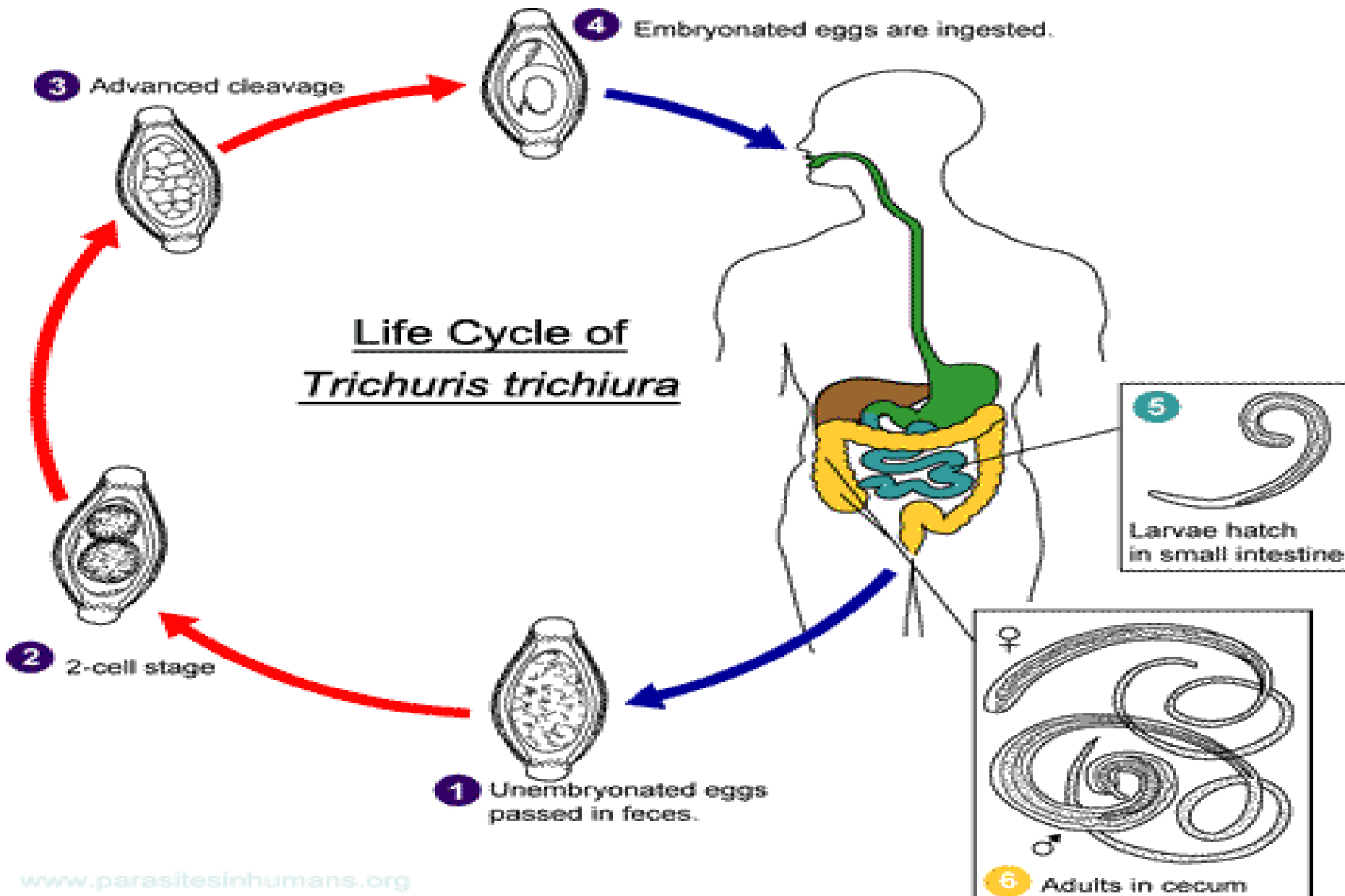


Treatment: Albendazole , Mebendazole

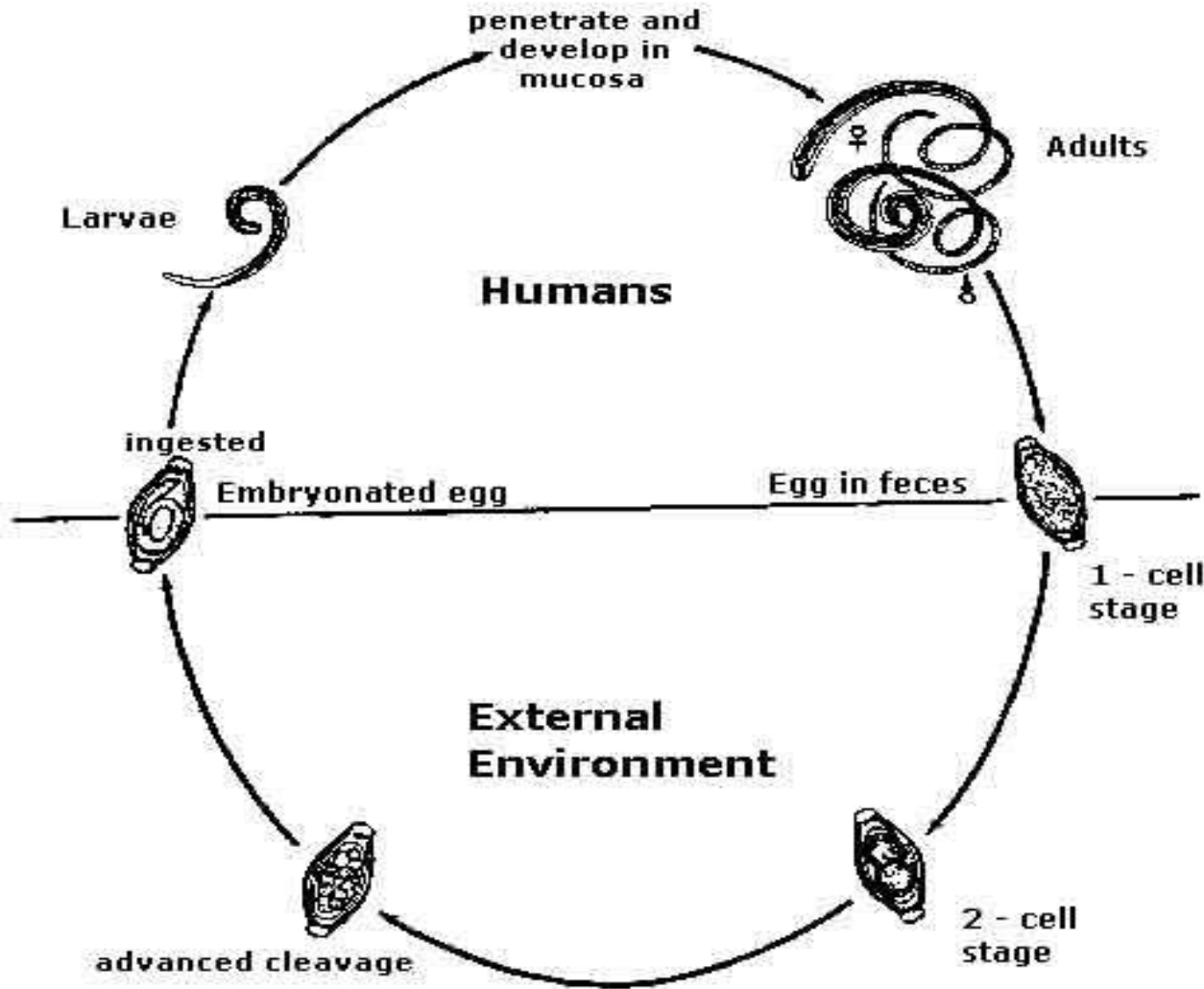
2-Trichuris trichiura (Whipworm)



Life Cycle of
Trichuris trichiura



Trichuris trichiura



Infective stage is embryonated egg

Diagnostic stage is egg in stool

Trichuris trichiura (whipworm)

World wide ,common in poor sanitation.

- It coexists with *Ascaris* because of similar requirement(the eggs to be embryonated egg infective stage it needs to be 3 weeks in the soil).
- 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)

Pathology

- **light infection** : asymptomatic
- **heavy infection** : abdominal pain ,bloody diarrhea. **Rectal prolapsed** in children is a common complication.

-

Trichuris trichiura (Whipworm)

- **-Diagnosis:** egg in stool characterized by its barrel shape with mucoid plugs at each pole .

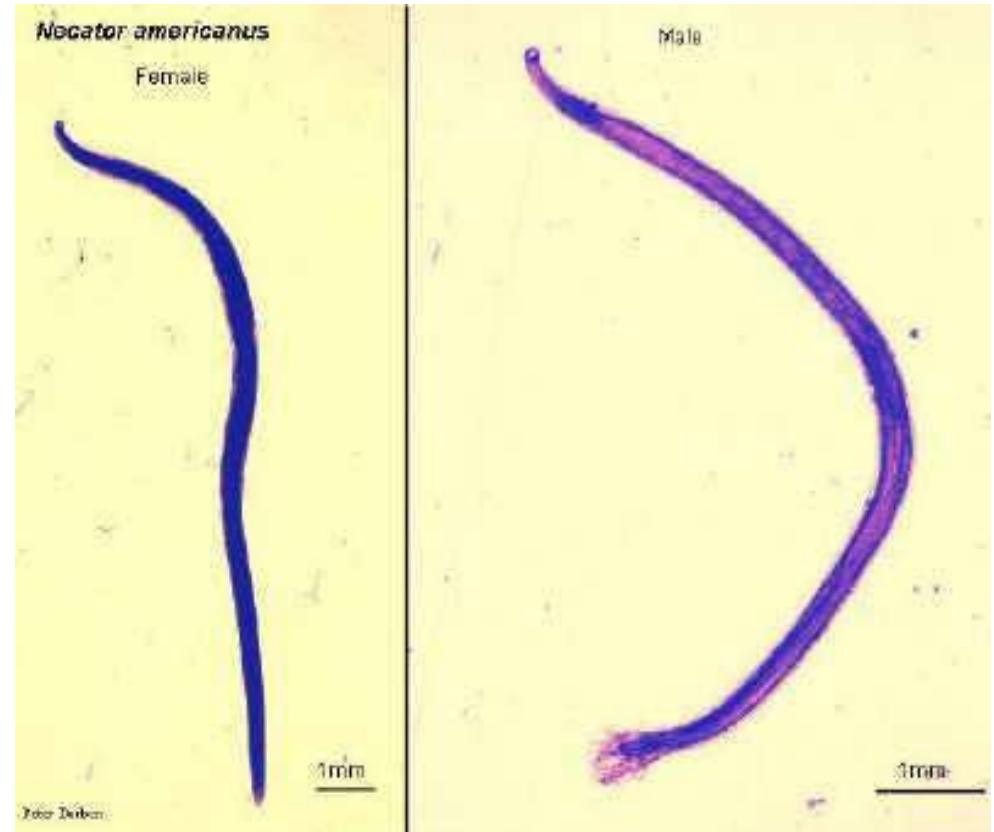
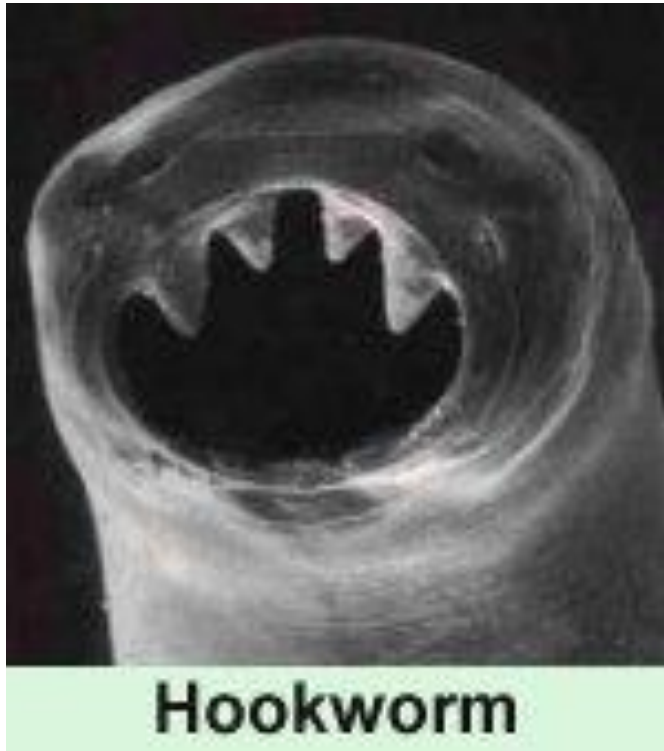


- **Treatment** :Albendazole.



Hook worms

Ancylostoma duodenale & *Necator americanus*



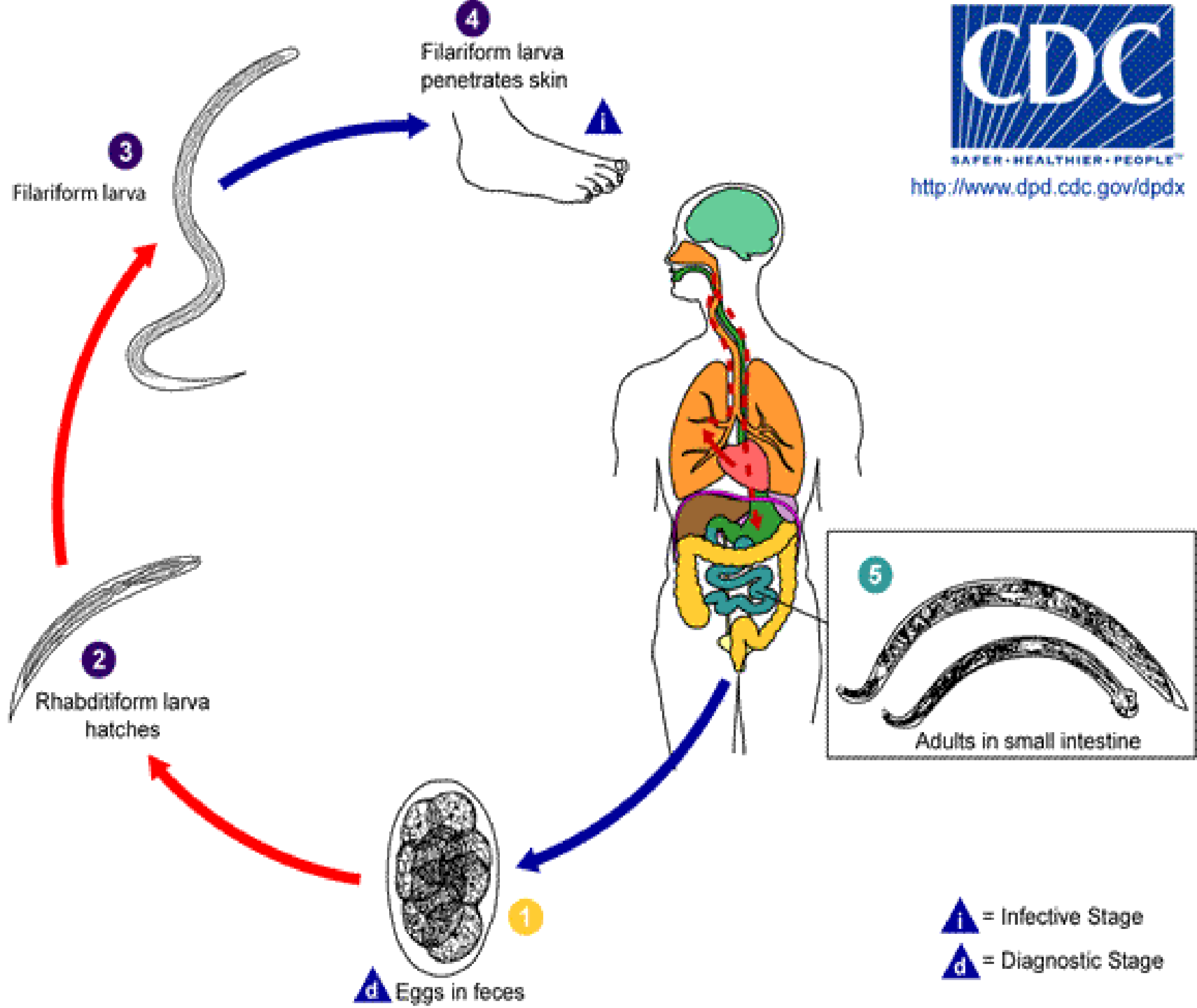
Its buccal capsule (mouth) lined with hard hooks, triangular **cutting plates** and **anticoagulant glands**.

Hookworm

There are no specific symptoms or signs of hookworm infection, but they give rise to a combination of intestinal inflammation and progressive iron-deficiency anemia and protein deficiency



Filariform Larval (infective stage) invasion of the skin can produce a skin disease called cutaneous larva migrans also known as *creeping eruption*, this is commonly caused by walking barefoot through areas contaminated with fecal matter. Larva migrate through the vascular system to the lungs, and from there up the trachea, and are swallowed. They then pass down the esophagus and enter the digestive system, finishing their journey in the small intestine where the larvae mature into adult worms. They mate inside the host, females laying up to 30,000 eggs per day, which pass out in feces (diagnostic stage). The eggs need to be in soil for about one week to become **FILARIFORM LARVA**



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 hypo chromic anemia**.

Hook worms

Diagnosis and treatment

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



Treatment: Albendazol, Mebendazole

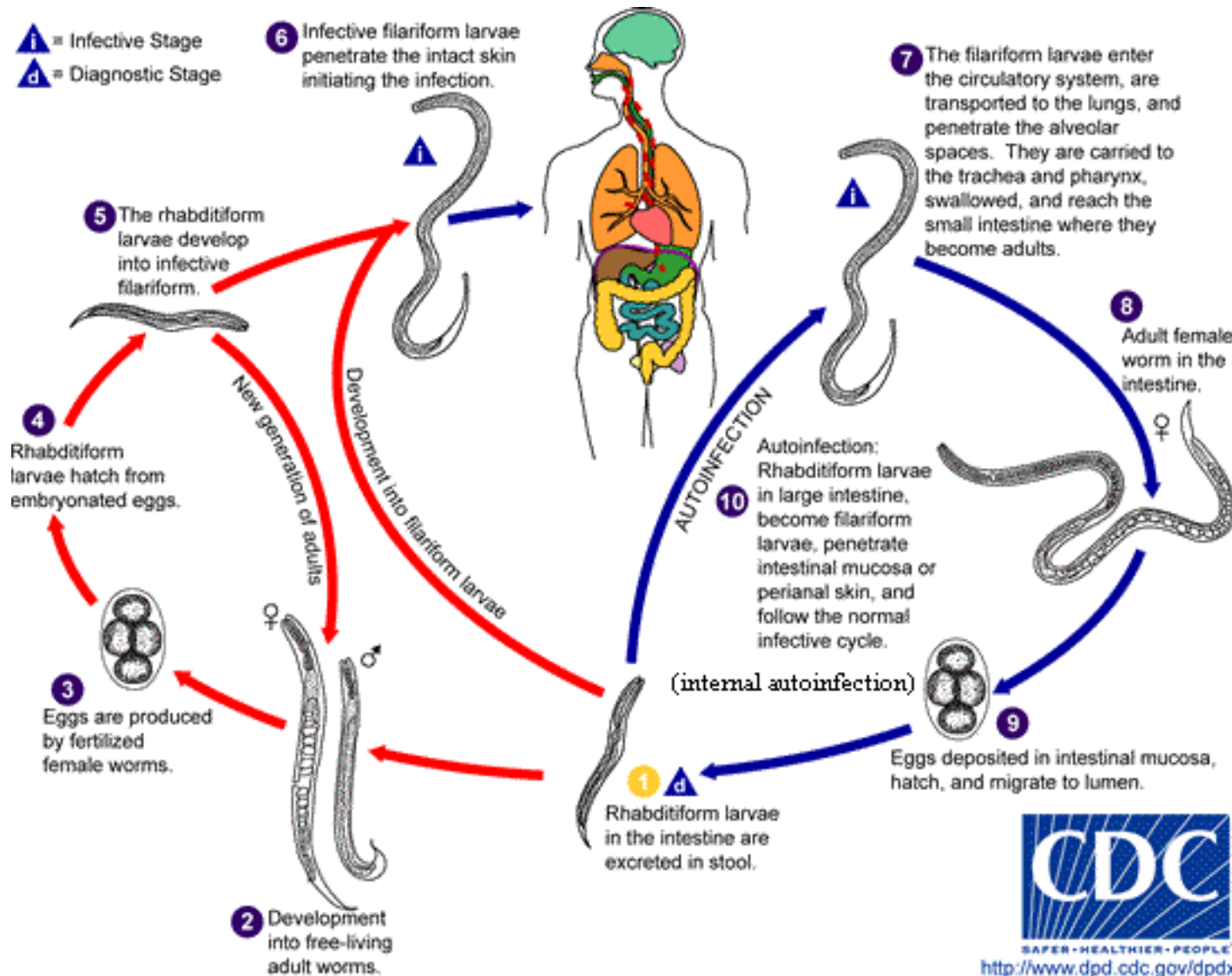
Strongyloides stercoralis

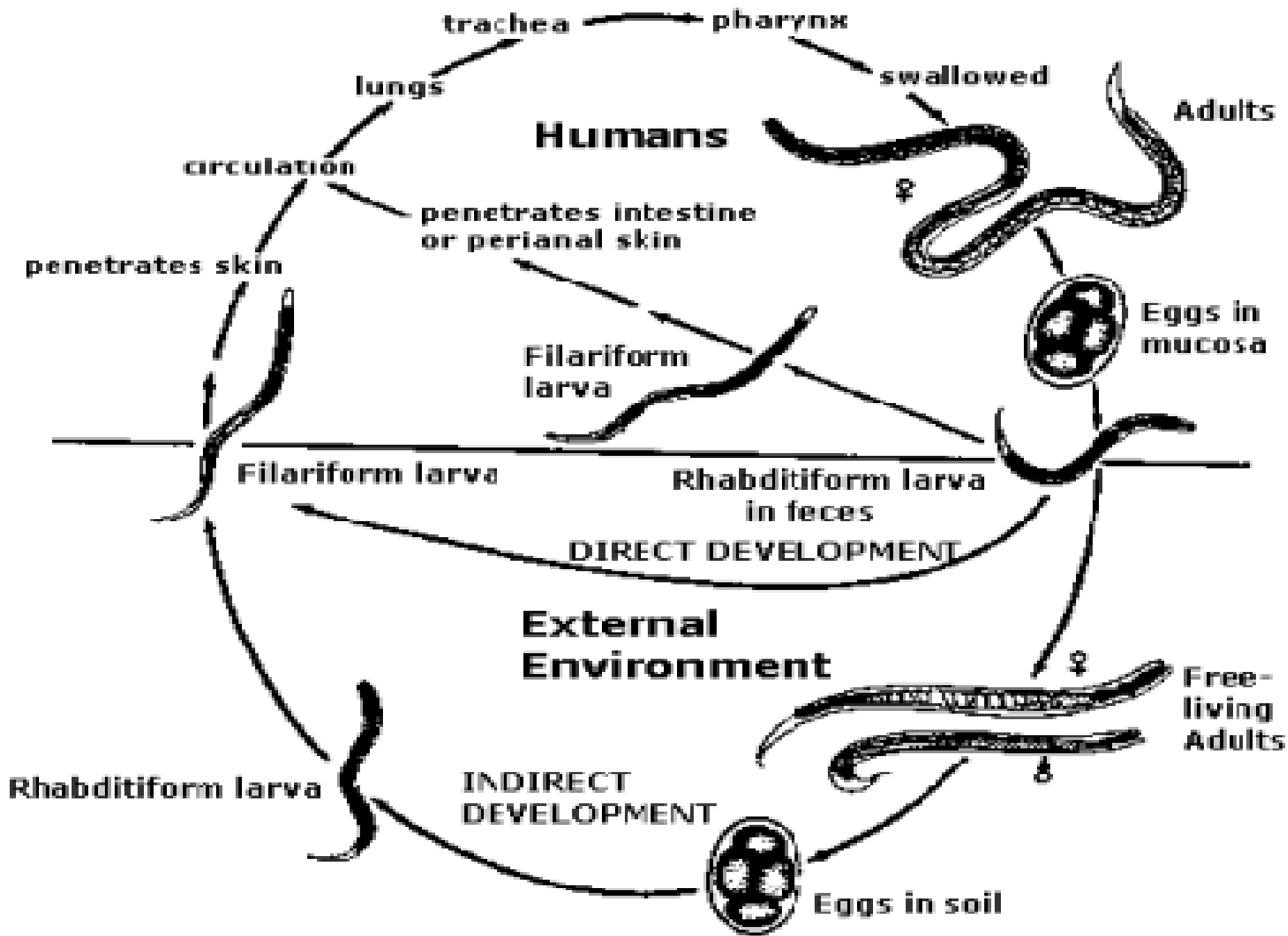
- Widely distributed in tropical area at Asia, Africa & South America .
- fatal dissemination in **immuno-compromised host.**
- It is **smallest** pathogenic nematodes $\pm 2.5\text{mm}$.
- adult live **in mucous** membrane of duodenum jejunum rarely mucous membrane of bronchus.
- ***AUTOINFECTION IS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

Strongyloides stercoralis life cycle

- The parasite shows 3 different modes of development:
- **1-Direct development:** The rhabditiform larva pass from stool and become directly a Filariform larva if the environment of the soil is suitable.
- **2-Indirect development :** in external environment Rh. larva becomes free living adults, produce eggs ,rhabditiform larva and Filariform larva(Infective stage).
- **3-AUTOINFECTION:** mainly in immunocompromised patients
 - **Internal** :when the rhabditiform larva become a filariform larva in the intestine and penetrate the intestine
 - **External** : fecal contamination of skin –Rh larva > filariform penetrates the skin

Strongyloides stercoralis





Strongyloides stercoralis:

Pathology and clinical picture:

- **Cutaneous** little reaction on penetration.
sever dermatitis at perianal region in
case of external autoinfection.
- **Migration** :pneumonitis during larval migration. .
- **Intestinal:** inflammation of upper intestinal mucosa,
diarrhea, upper abdominal pain in the epigastria colicky
in nature.
- **Disseminated strongyloidiasis** : in patient with
immunodeficiency ,uncontrolled diarrhea –
granulomatus changes –necrosis--perforation--
peritonitis--death.

Strongyloides stercoralis

Diagnosis:

rhabditiform larvae
diagnostic stage in:

- Stool examination
- Duodenal aspirate

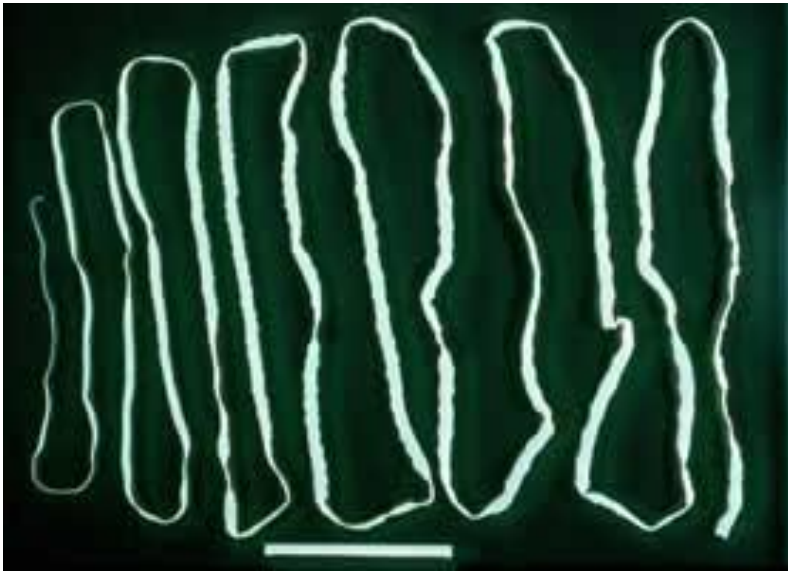


Treatment :

Albandazole, Mebendazole

Common Tapeworm 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



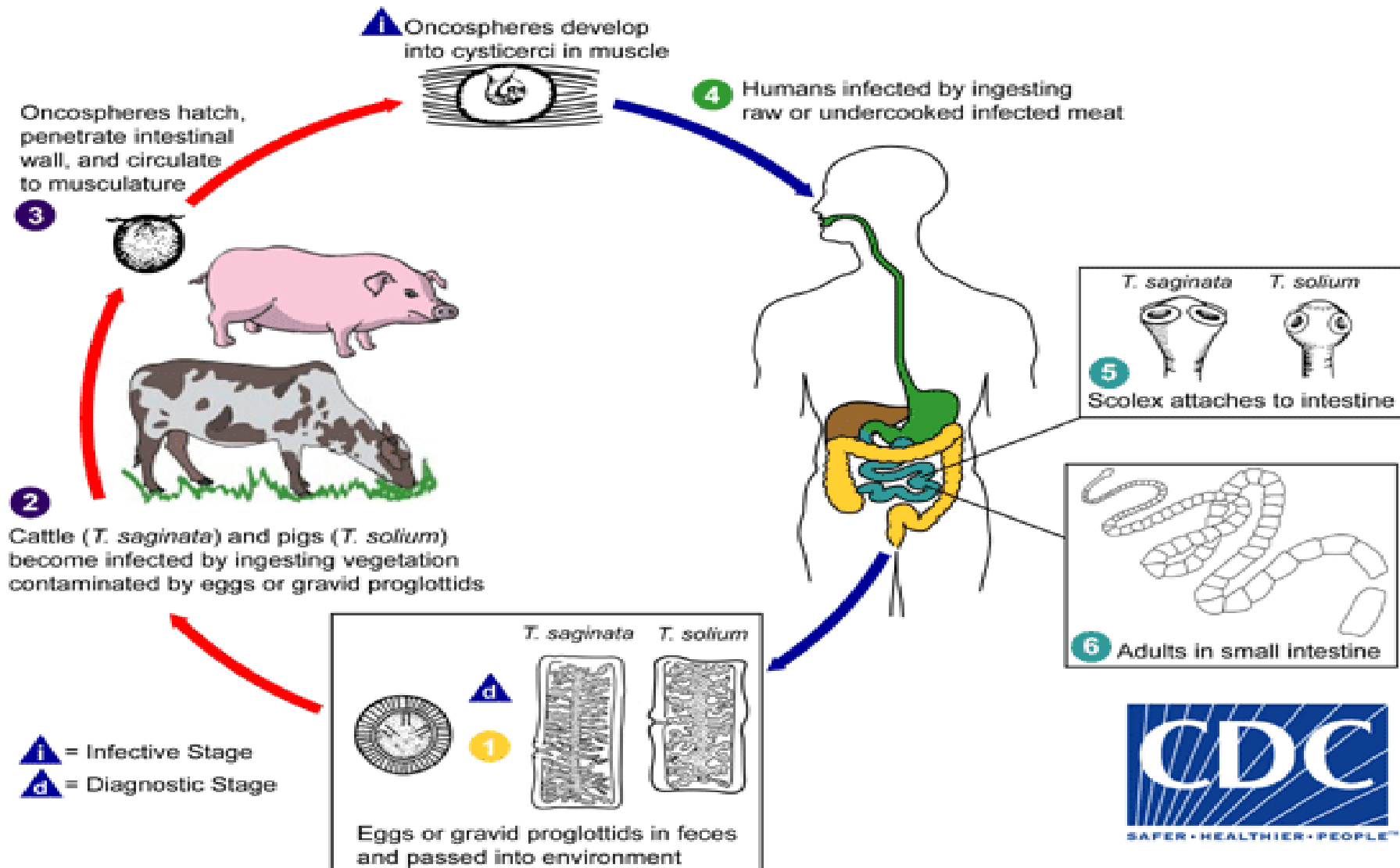
Taenia saginata

Taenia saginata

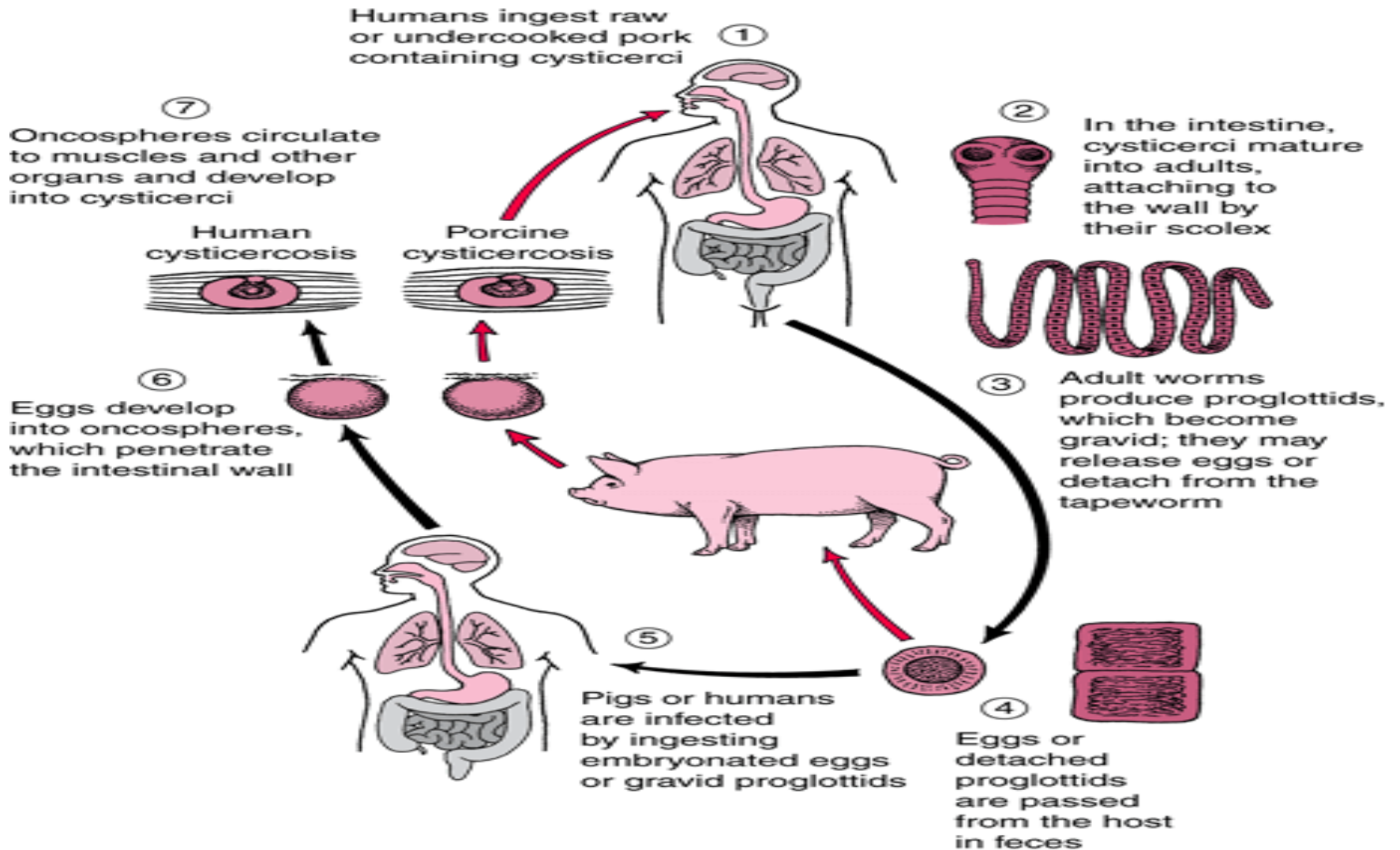
- Is an obligatory parasite of man ,the adult worm live in the **SMALL INTESTINE** .
- **CATTLE** become infected by ingesting grass contaminated with **eggs or gravid segments** which passed from human faeces. In the cattle the onchosphere hatches out go to circulation and transformed to cysticercus 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.

Life cycle of

Taenia saginata



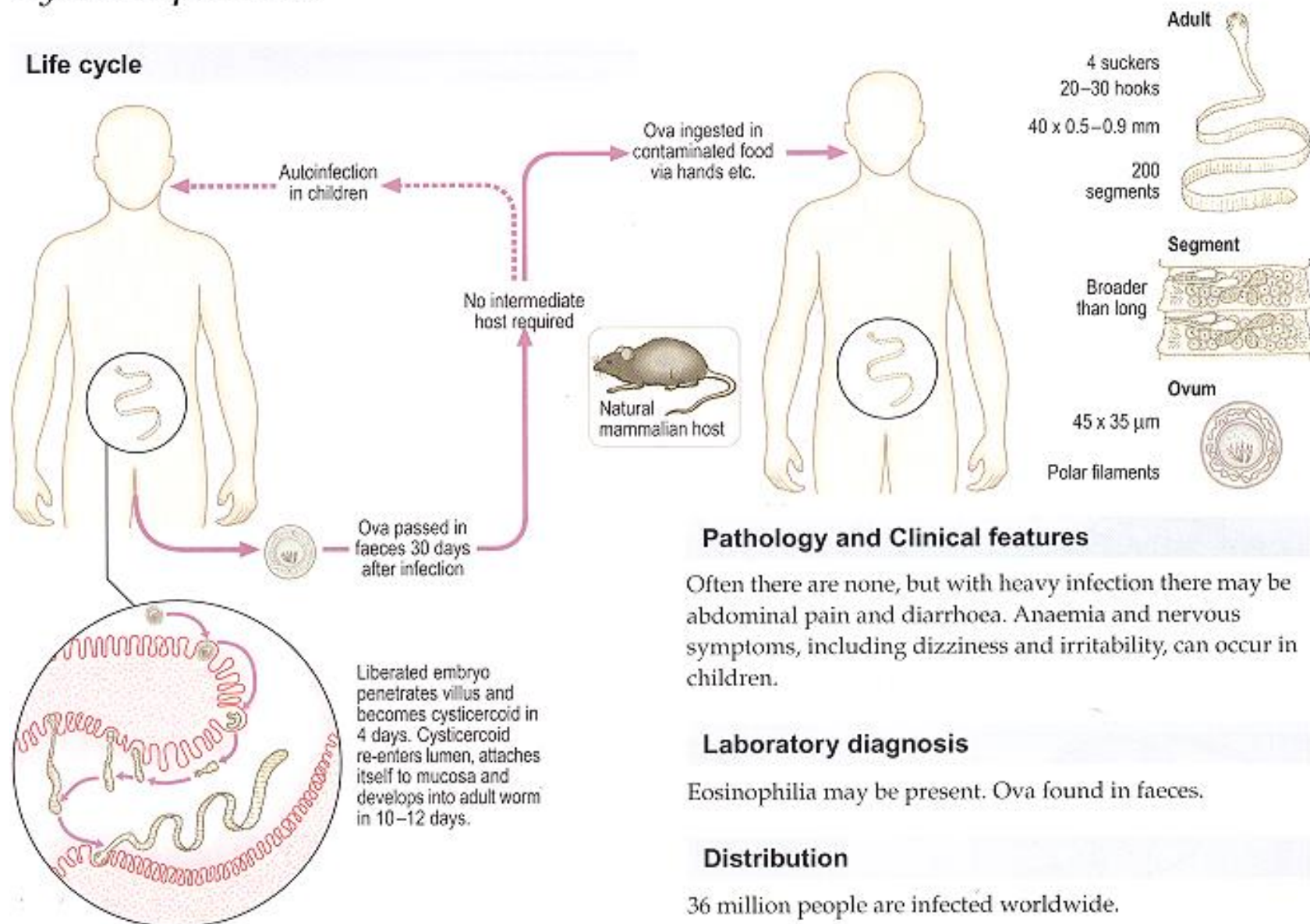
Taenia Solium



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.

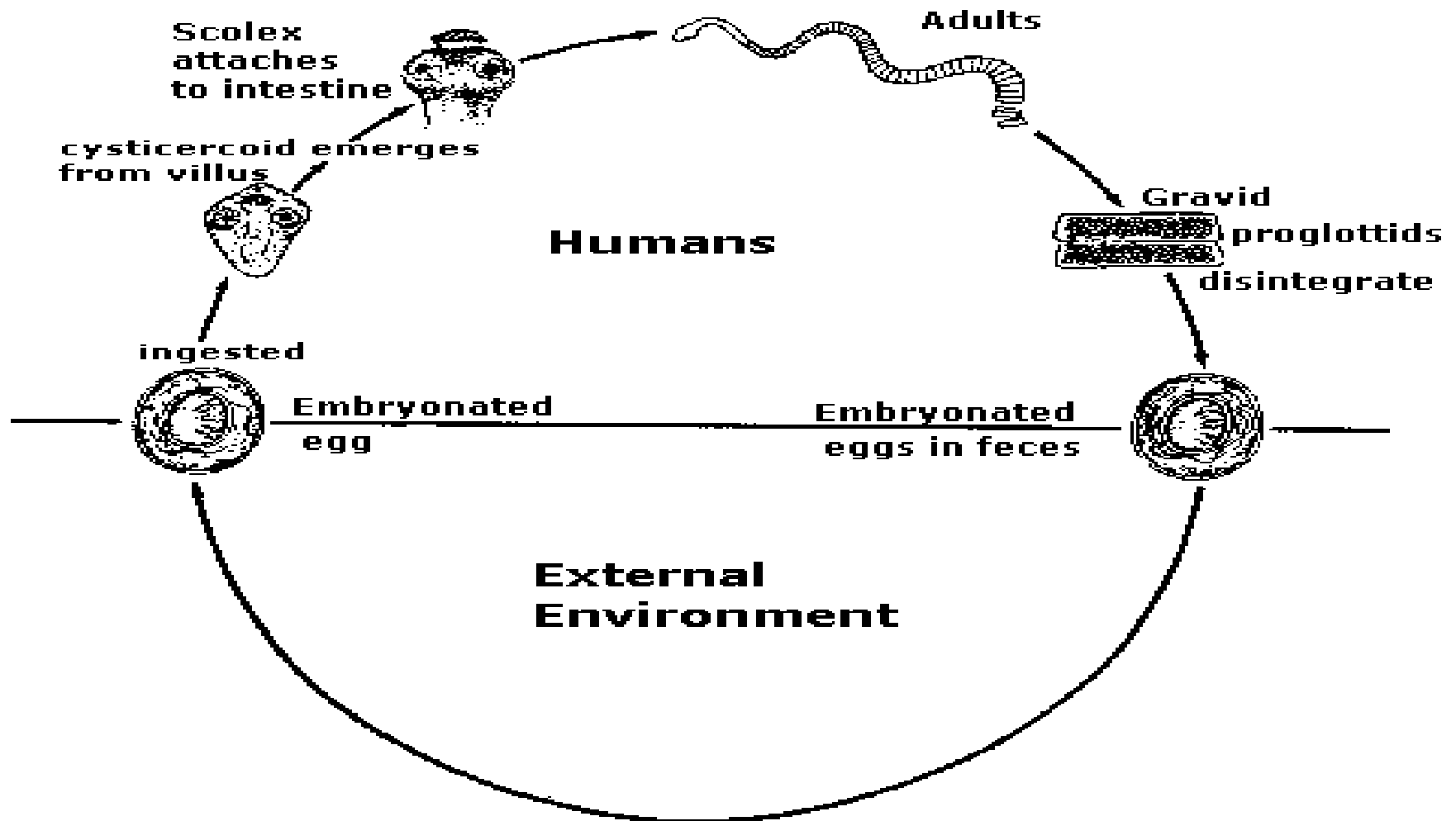
Laboratory diagnosis

Eosinophilia may be present. Ova found in faeces.

Distribution

36 million people are infected worldwide.

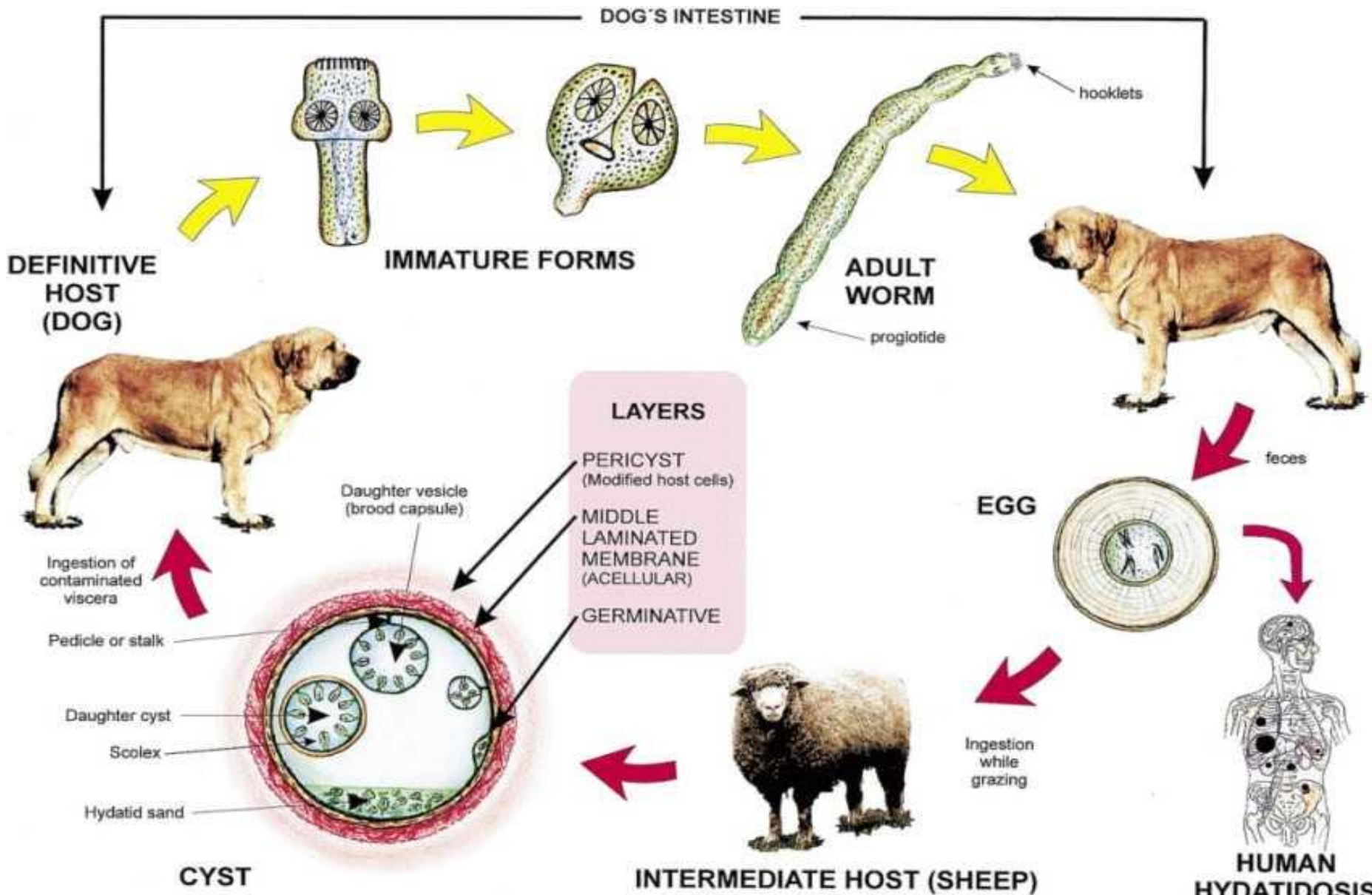
Hymenolepis nana





Hymenolepis nana

Echinococcus granulosus

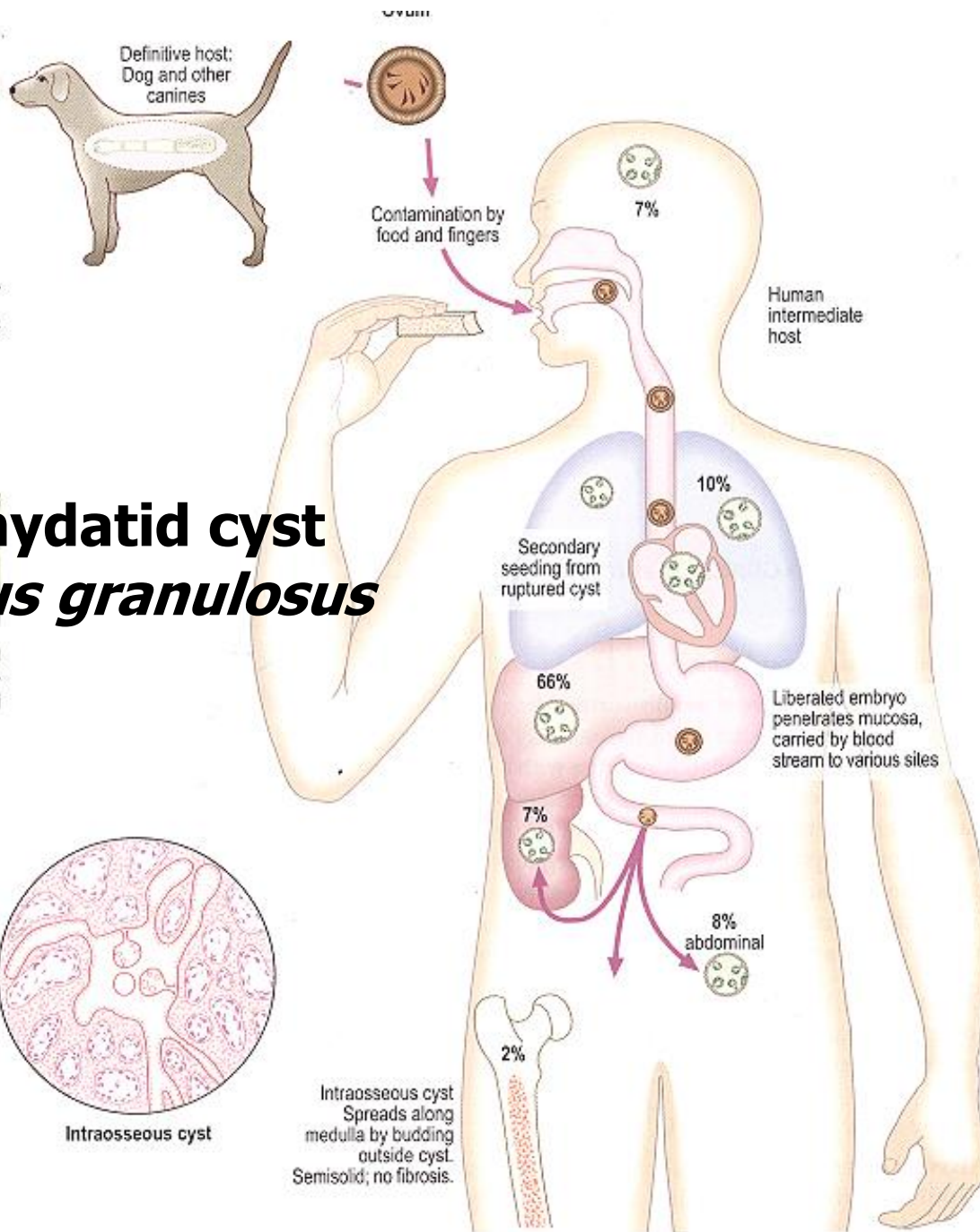


E. granulosus requires two host types, a **definitive host** and an **intermediate host**. The definitive host of this parasite are **dogs** and the intermediate host are most commonly sheep, cattle, pigs, goats, and camels and also **Humans** can also be an intermediate host for *E. granulosus* .

E. granulosus is ingested and attaches to the mucosa of the intestines in the **definitive host** and there the parasite will grow into the adult stages

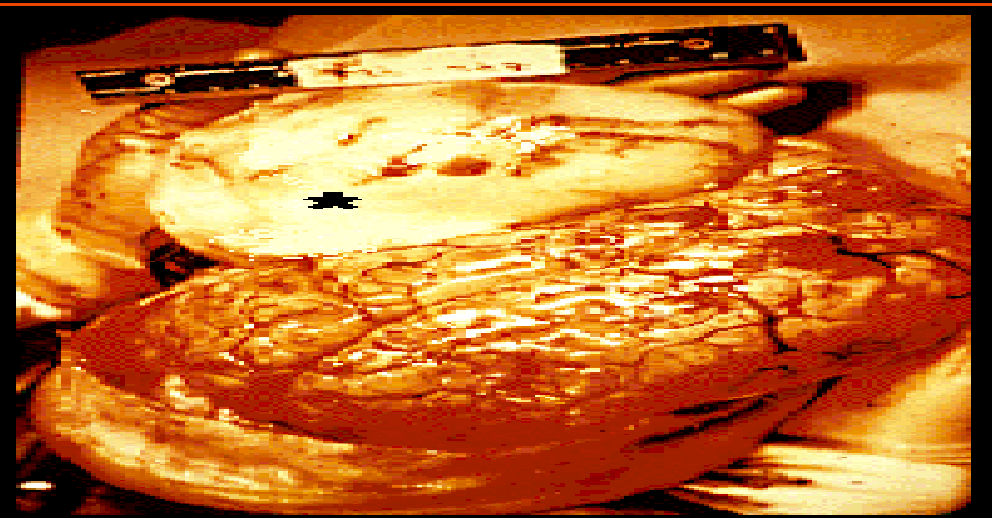
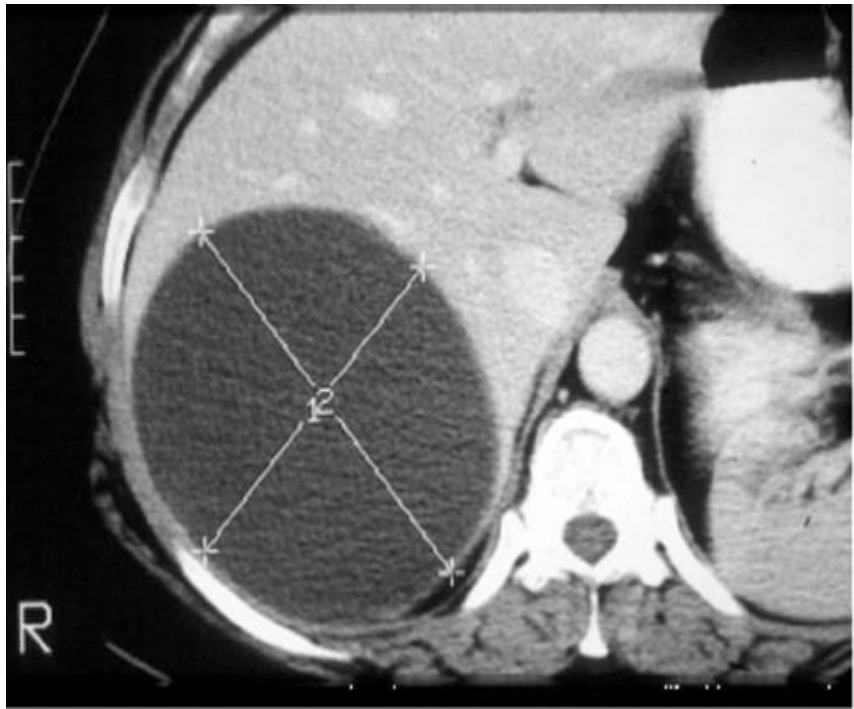
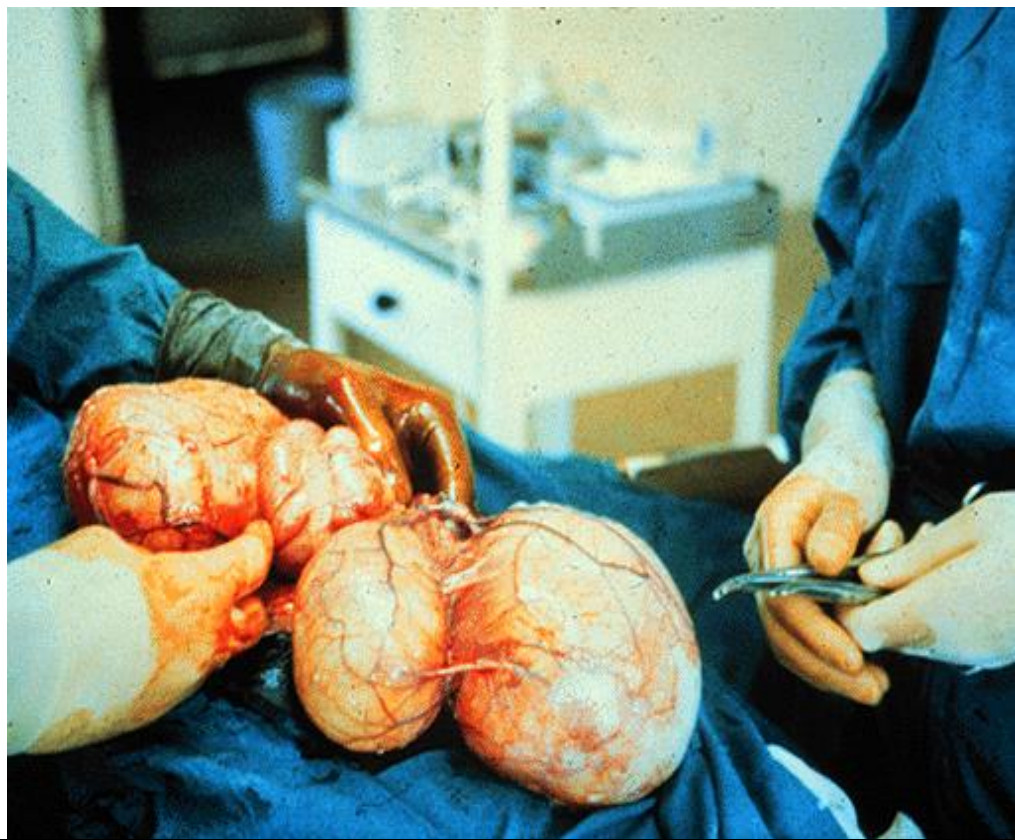
Adult *E. granulosus* release eggs within the intestine which will be transported out of the body via feces.

Human contract hydatid cyst disease by ingestion of *Echinococcus Granulosus* eggs, usually by hand-to-mouth contact with infected dog feces. The ingested eggs migrate to the various body tissues, and produce hydatid cysts. The life cycle is terminated at this point Symptoms vary, depending on the location of the cyst in tissues. Although cysts may form in many areas of the body, **the lung and the liver** are most commonly affected. One serious complication of hydatid cyst disease is the risk of anaphylactic shock, following rupture of the cyst.



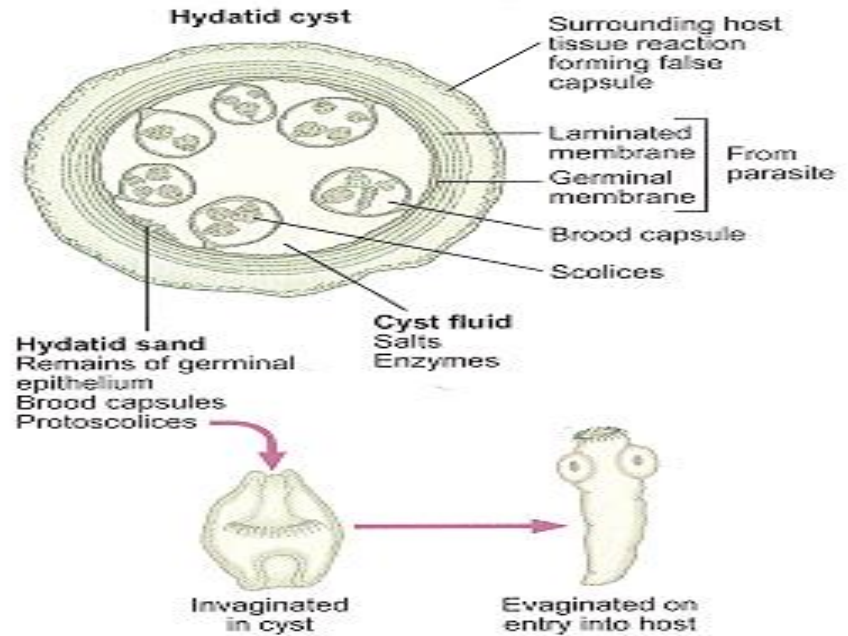
Location of hydatid cyst

Echinococcus granulosus



Cerebral hydatidosis

hydatid cyst, which may reach large size, has a laminated outer layer, and an inner layer of germinal tissues from which the daughter cysts and brood capsules (smaller cysts containing several developing inverted scolices) bud. The cyst also contains loose pieces of germinal tissue and scolices. This is known as hydatid sand. In addition, there is a great deal of fluid inside the cyst.



Diagnosis of Hydatid cyst

- Imaging : computed tomography (CT), magnetic resonance imaging (MRI) revealed a cystic swelling with smooth outline.
- Microscopy: hydatid sand
- Serologic tests; to detect specific antibodies

Treatment of Tapeworms

- Intestinal stages: Praziquantel
- Tissue stages (Hydatid , cysticercosis):
 - Depends on clinical condition : Surgical and/or Albendazole