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	Round worms (Nematodes): - elongated, cylindrical, unsegmented. Flat worms: - 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**

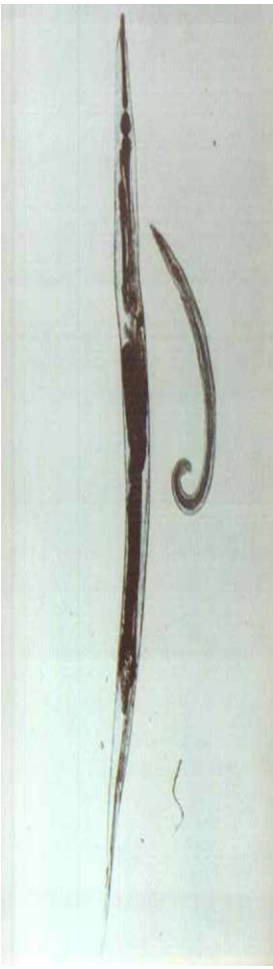
Nematodes: common intestinal infections

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

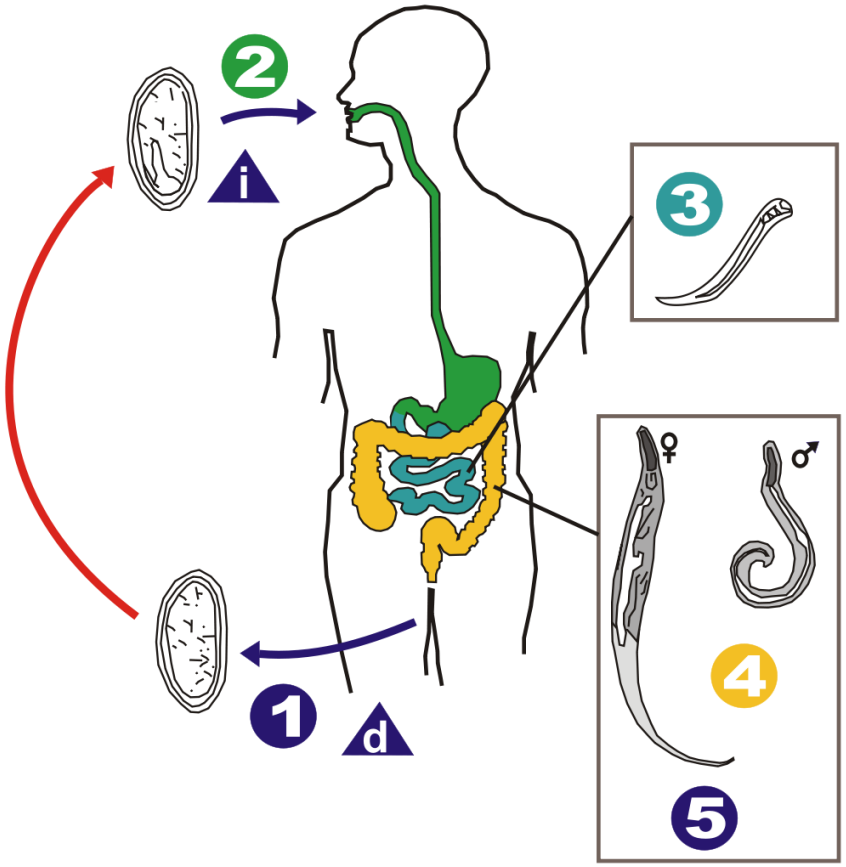
1- Enterobius vermicularis (THREAD WORM)

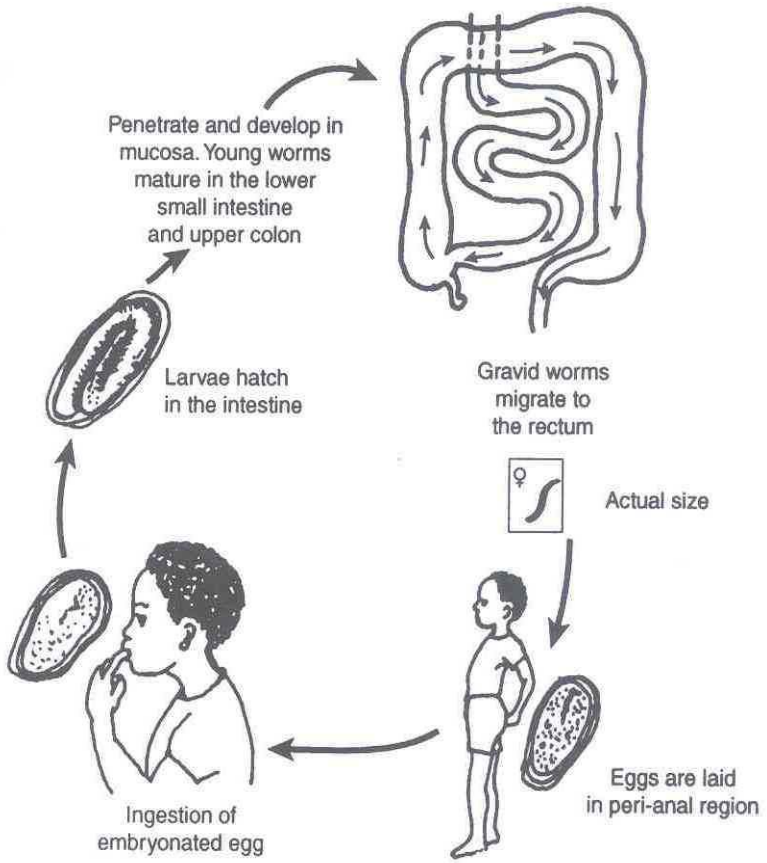
(Common names: Pin worm, seat worm)

- Found all over the world but more common in temperate regions.
- Children are more often evolved 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 ± 1cm.
  - Male is smaller than female ± 0.5cm, with coiled end.



Enterobius vermicularis





Enterobius vermicularis (Oxyuris)

Pathology

- 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-vagintis, 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

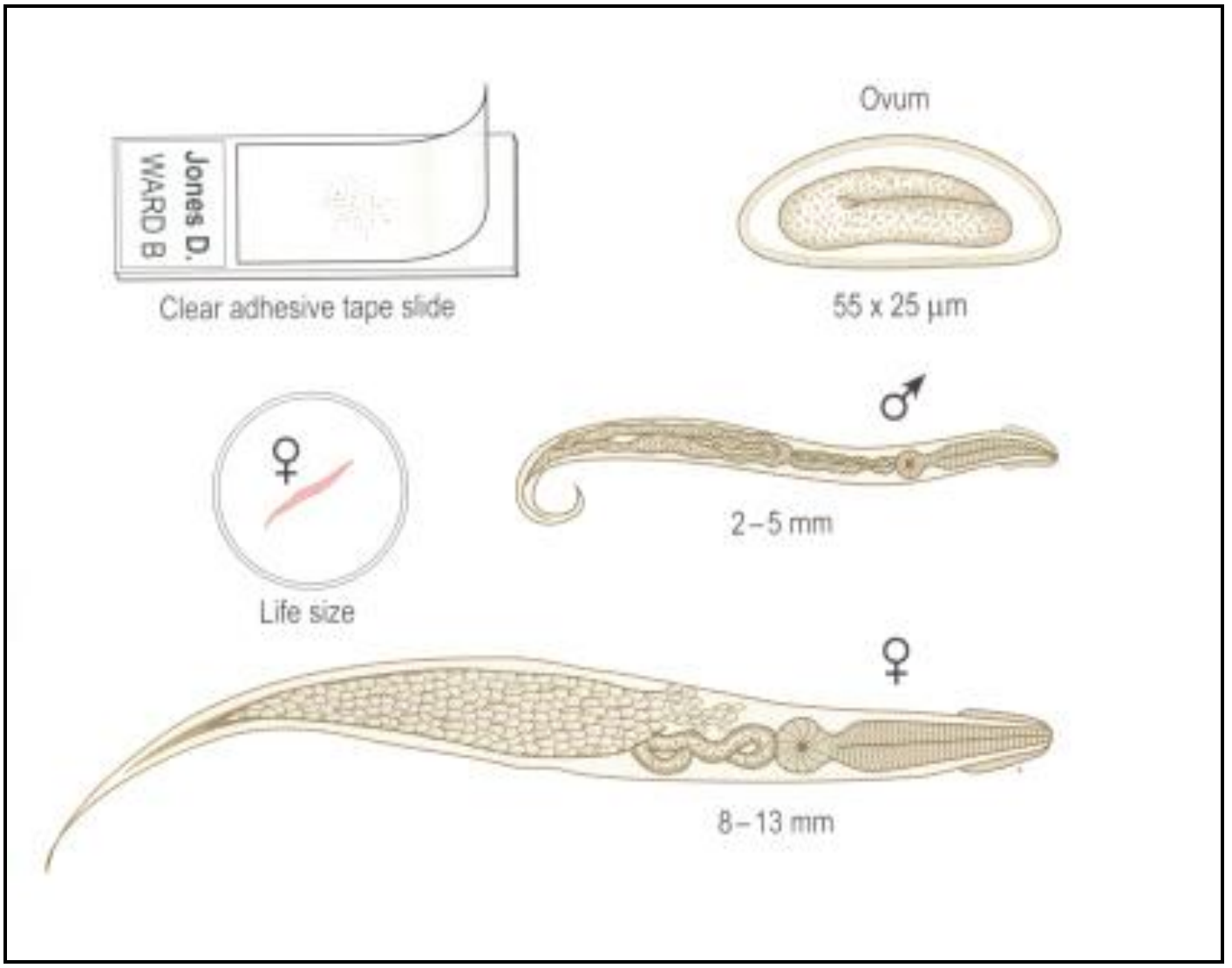
CELLULOSE ADHESIVE TAPE

the examination should be done before defecation or bathing.

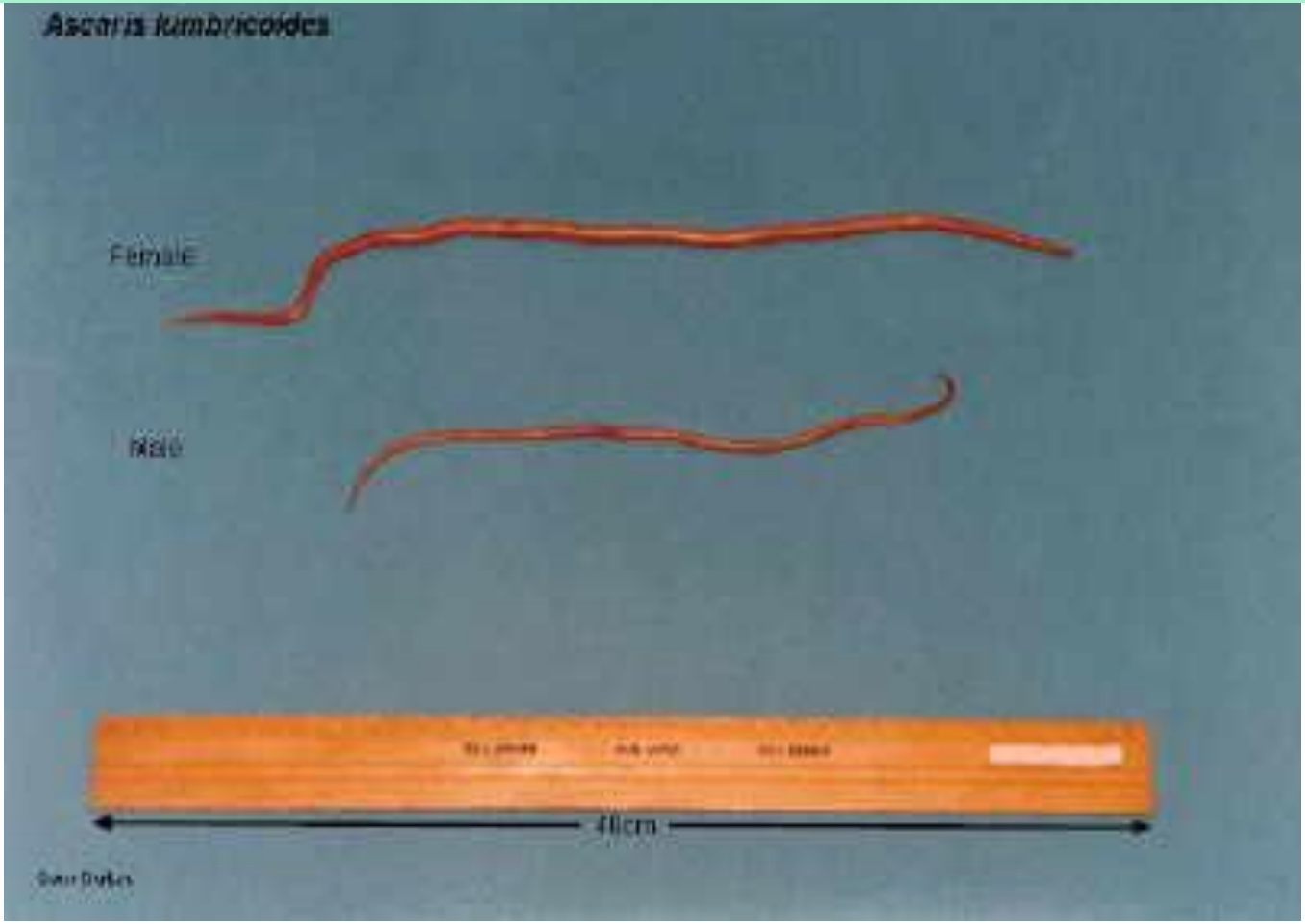
Treatment

Albandazole or Mebendazole for whole family

Enterobius vermicularis (Oxyuris)



Ascaris lumbricoides (roundworm)



Ascaris lumbricoides (roundworm)

The commonest human helminths infection all over the world.

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

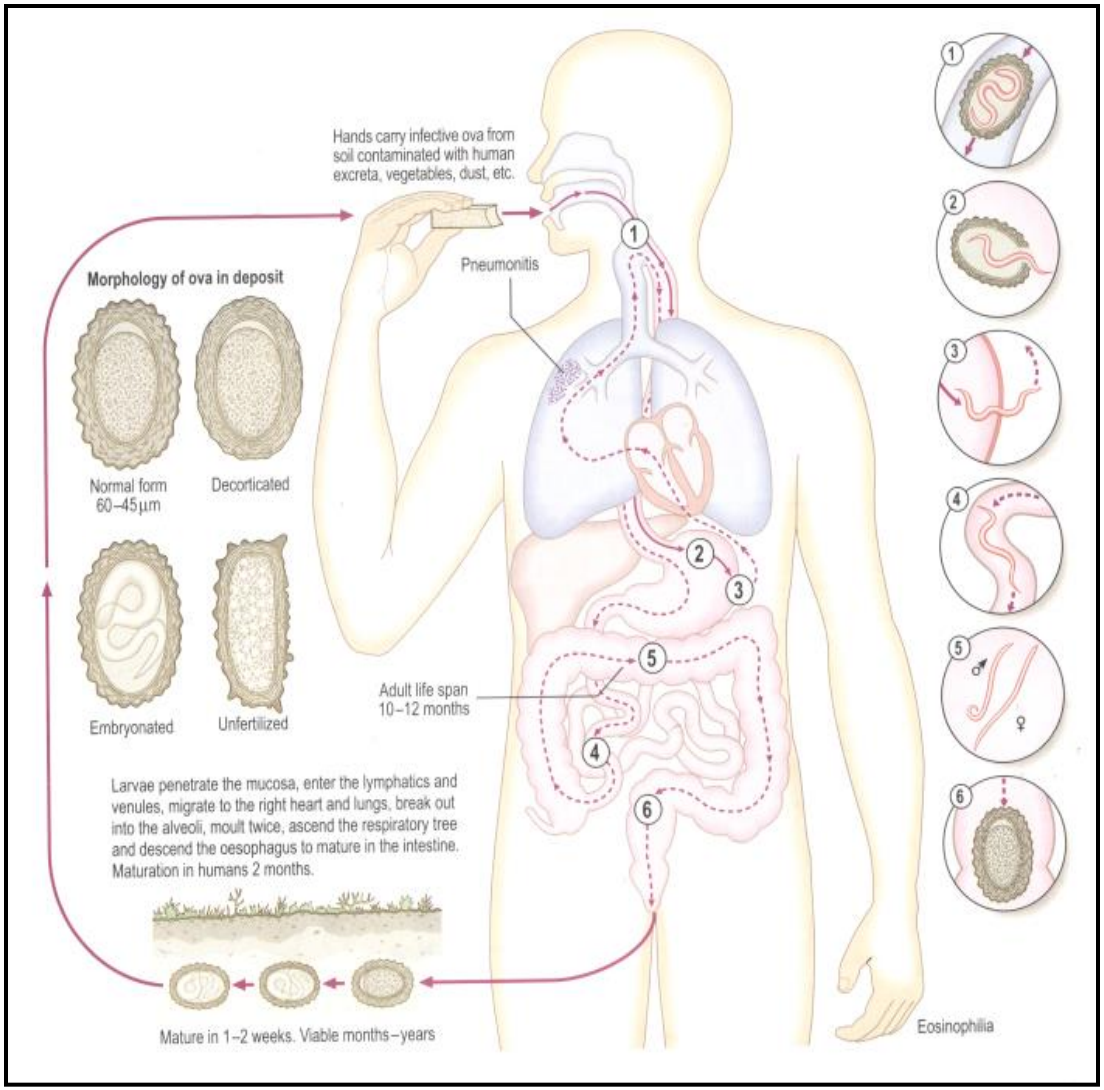
- Found in **jejunum** and upper part of **ileum**
- Female ± **20** cm longer than male ± **10** **cm**
- Feed on semi digested food.

Ascaris lumbricoides (roundworm)

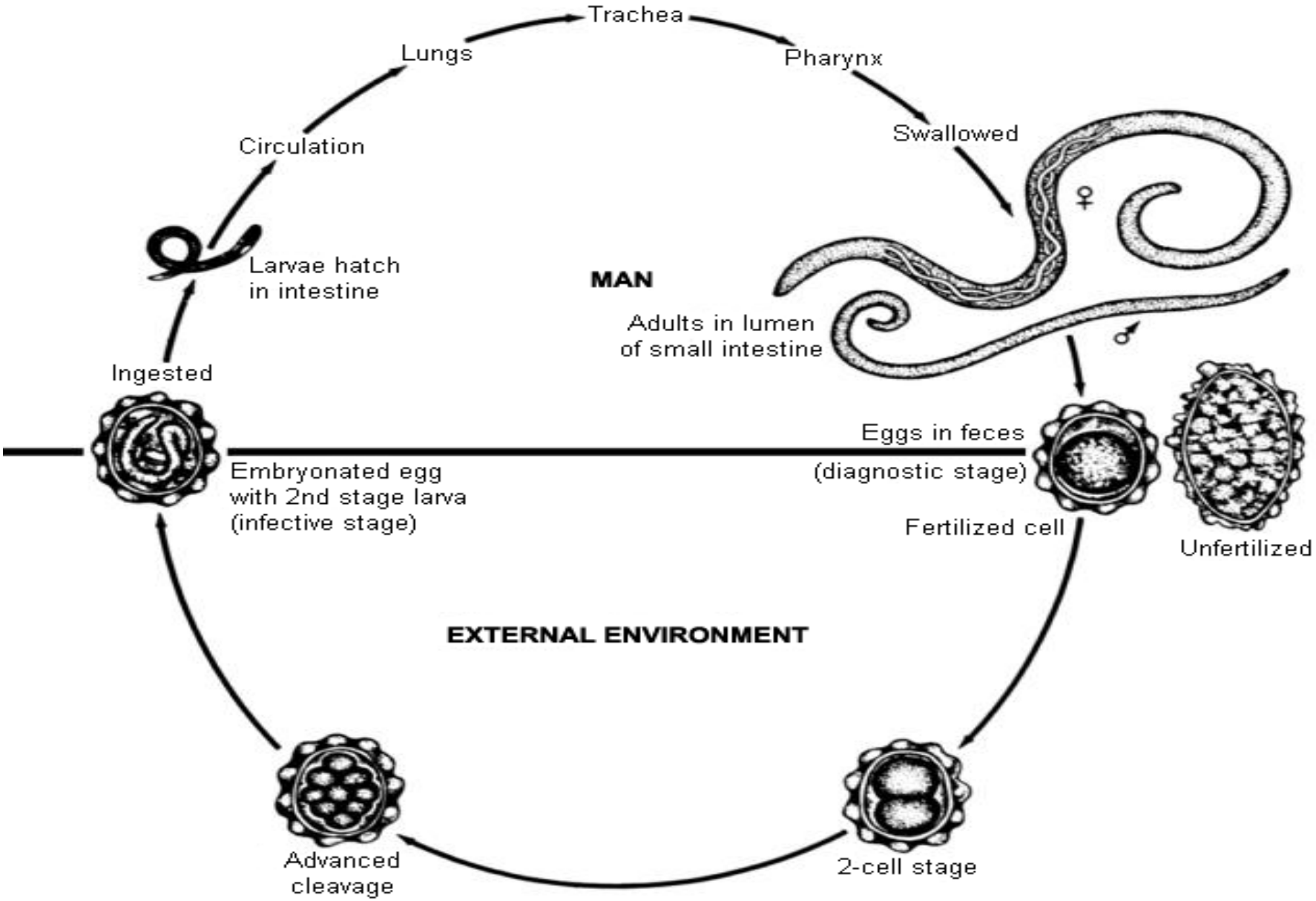
Infective stage:
embryonated egg

LIFE CYCLE

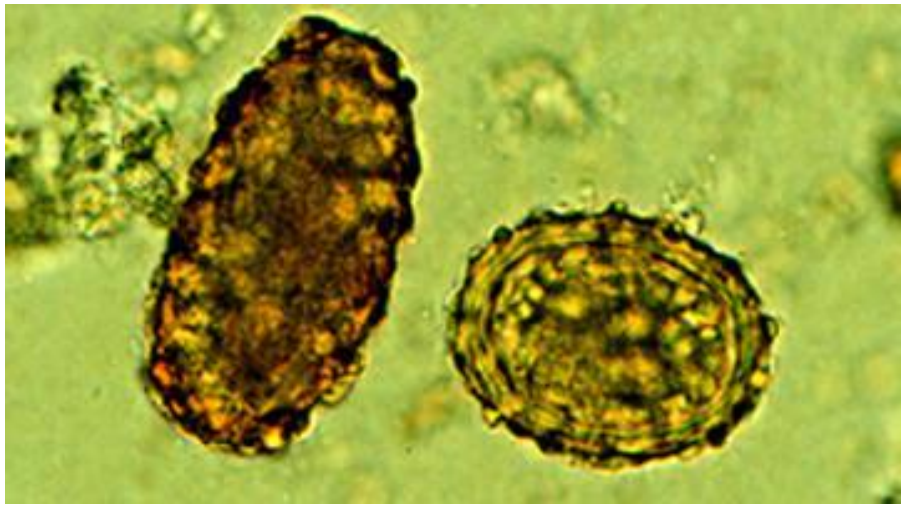
Diagnostic stage:
unembryonated egg



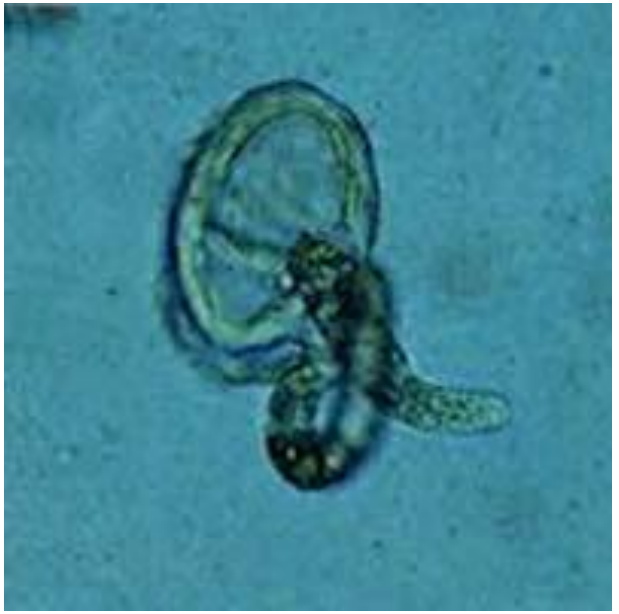
Ascaris lumbricoides life cycle



Ascaris eggs



Ascaris larva emerging from egg



Ascaris egg (embryonated)

Ascaris lumbricoides (roundworm)

Pathology:

- **1-<u>Adult worm</u>**: (small intestine)

  Light infection : asymptomatic

  Heavy infection : intestinal obstruction

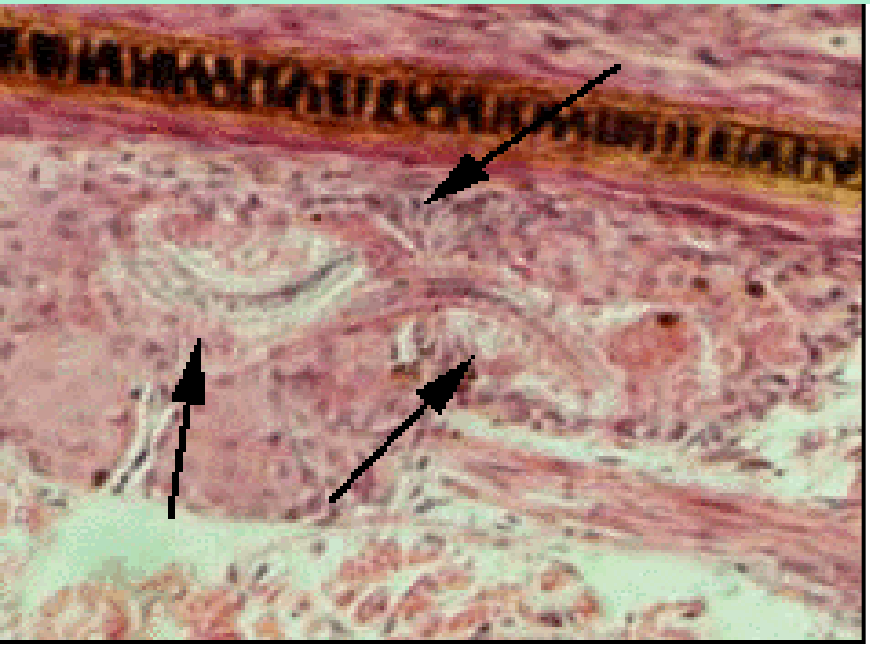
  Migrating adult : to bile duct-jaundice

- **2-<u>Larvae</u>:** **Loeffler`s syndrome**

  Pneumonitis and broncho-spasm, cough with bloody sputum

  Eosinophilia, urticaria

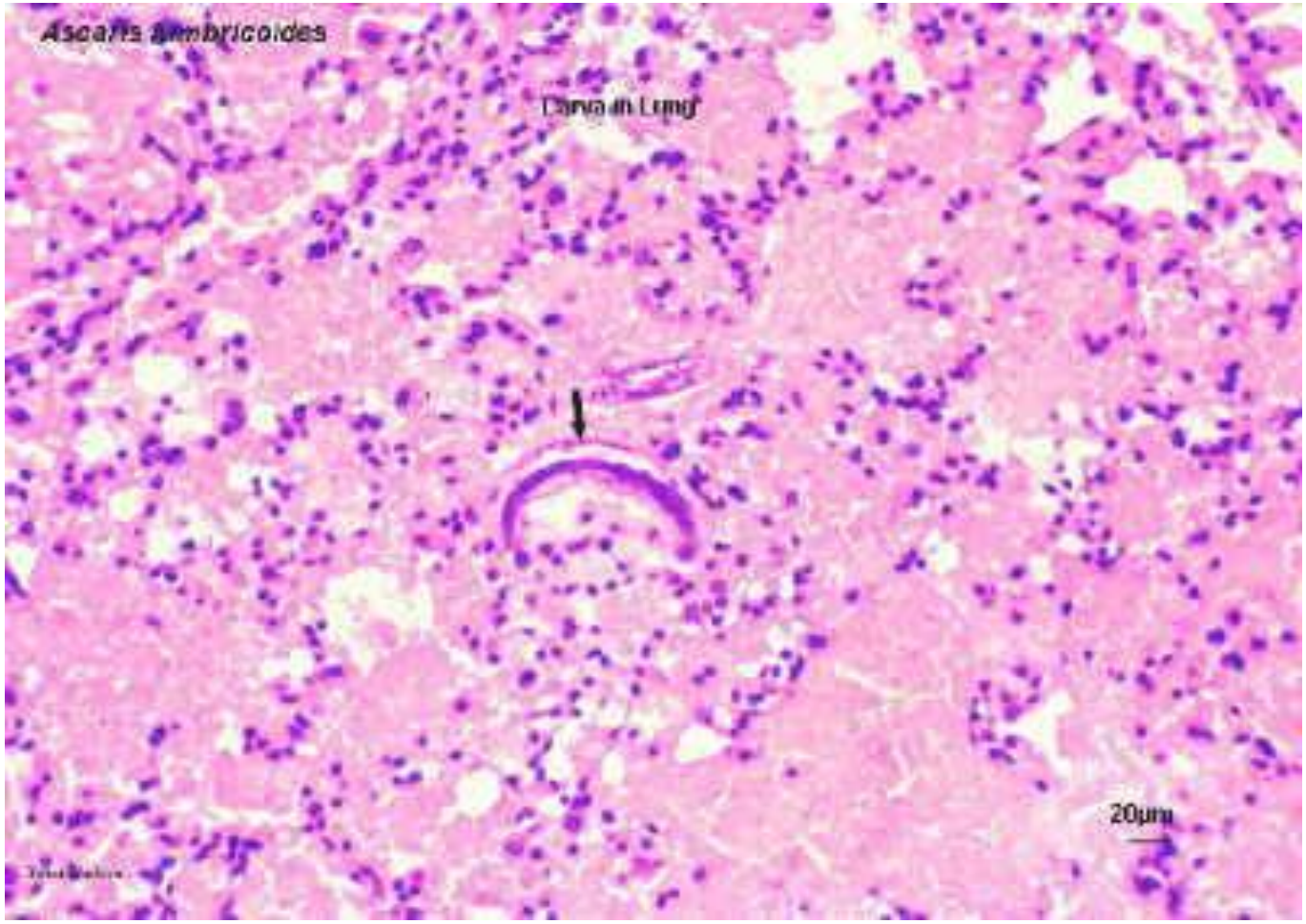
Ascaris lumbricoides (roundworm)



Loeffler`s syndrome: Larvae in lung

pnuomonia, cough, bloody sputum

Ascaris lumbricoides (roundworm)



Ascaris larva in lung

Ascaris lumbricoides (roundworm)

Diagnosis:

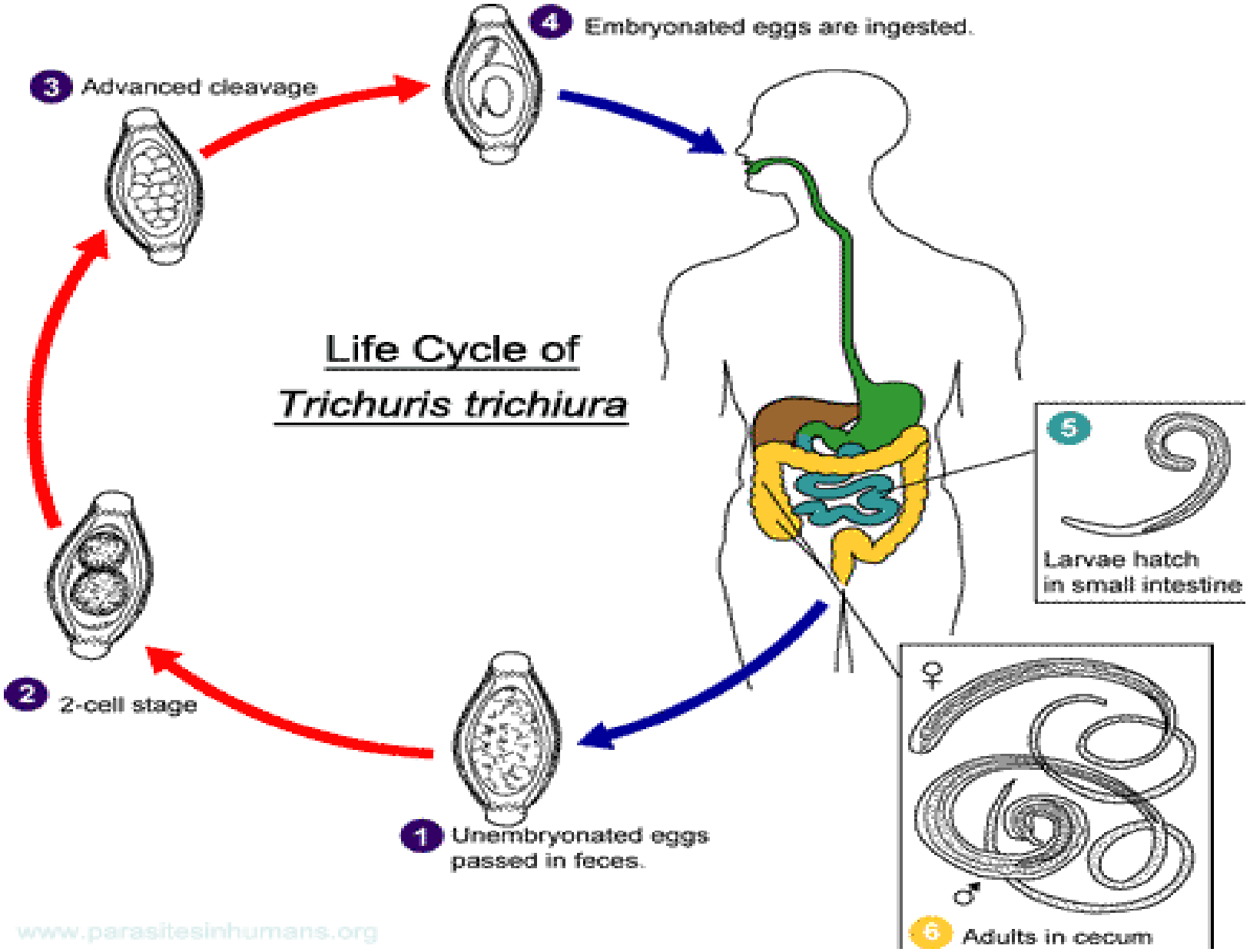
-eggs in stool.

-larvae in sputum.

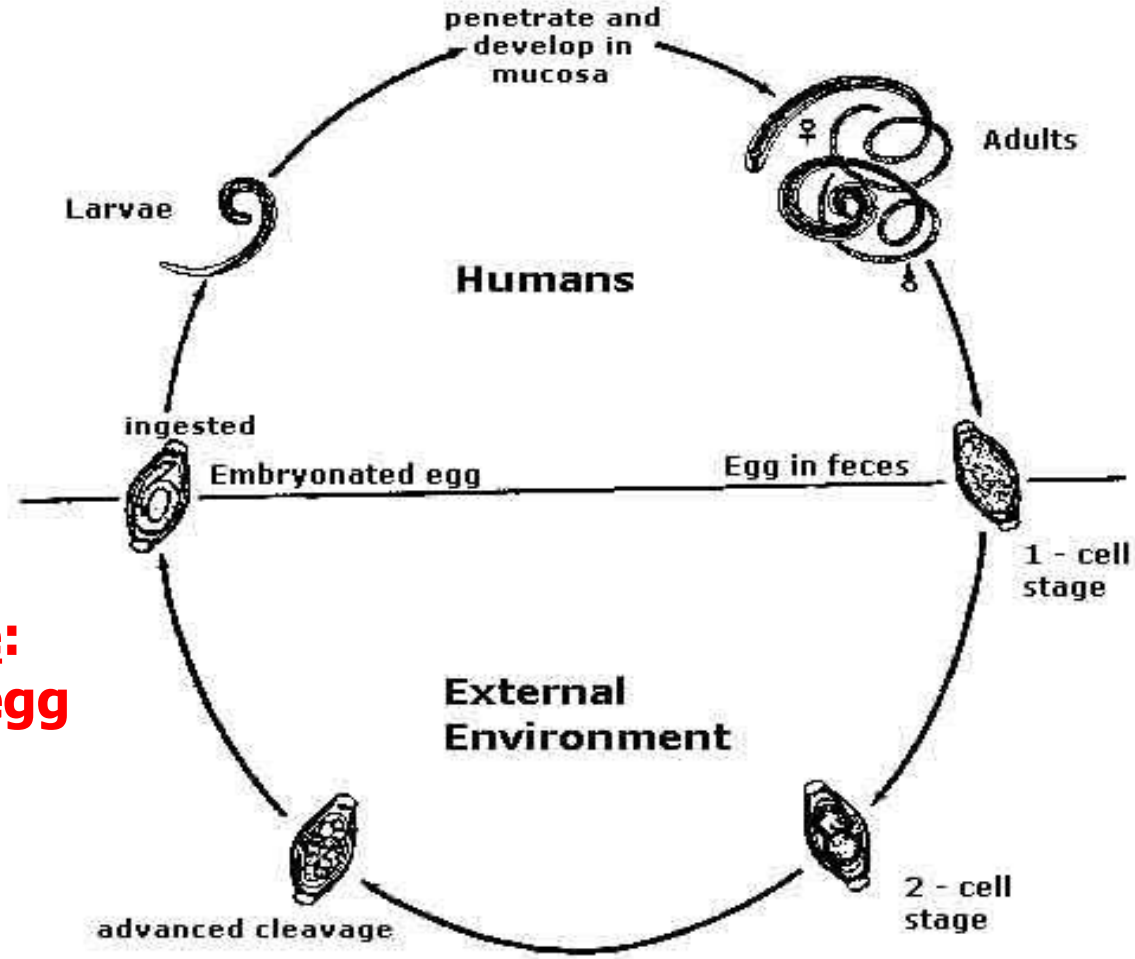
-adult may pass with stool.

Treatment: Albendazole or Mebendazole

2-Trichuris trichiura (Whipworm)


Life Cycle of
Trichuris trichiura
1 Unembryonated eggs passed in feces.
2 2-cell stage
3 Advanced cleavage
4 Embryonated eggs are ingested.
5 Larvae hatch in small intestine
6 Adults in cecum
♀
♂
www.parasitesinhumans.org

Trichuris trichiura



Infective stage: embryonated egg

Diagnostic stage: egg in stool

Trichuris trichiura (whipworm)

World wide, common in poor sanitation

- It coexists with *Ascaris* because of similar requirements (the eggs needs 3 weeks in the soil to be embryonated which is the infective stage).
- 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 prolapse in children is a common complication.

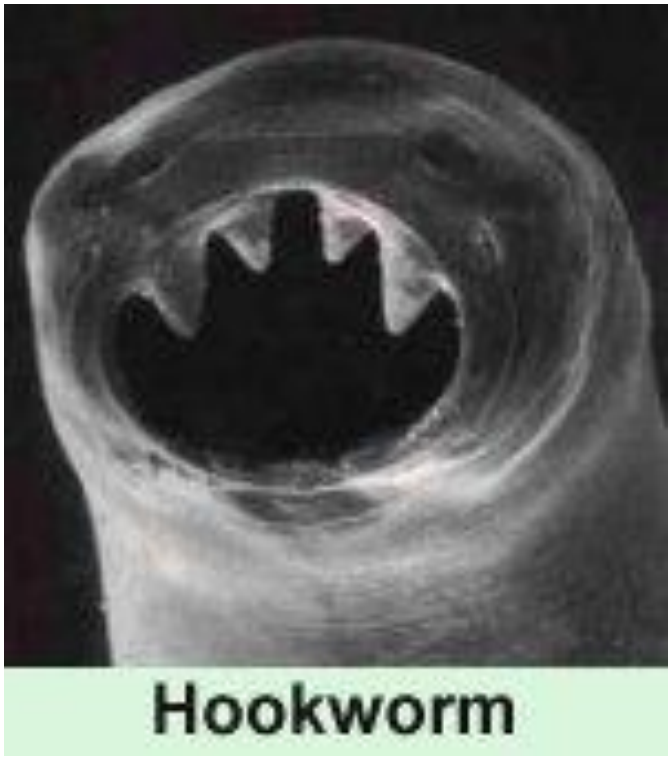
Trichuris trichiura (Whipworm)

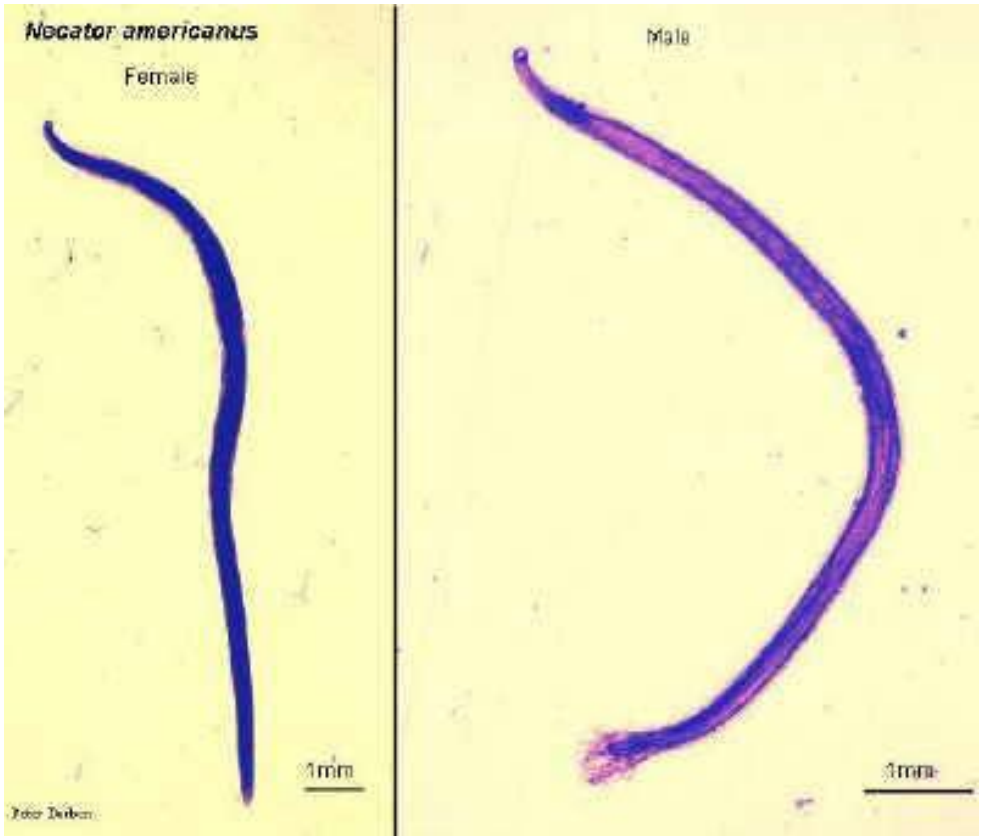
- **Diagnosis:** egg in stool characterized by its barrel shape with mucoid plugs at each pole.

- **Treatment**: Albendazole.

Hook worms

Ancylostoma dudenale & Necator americanus

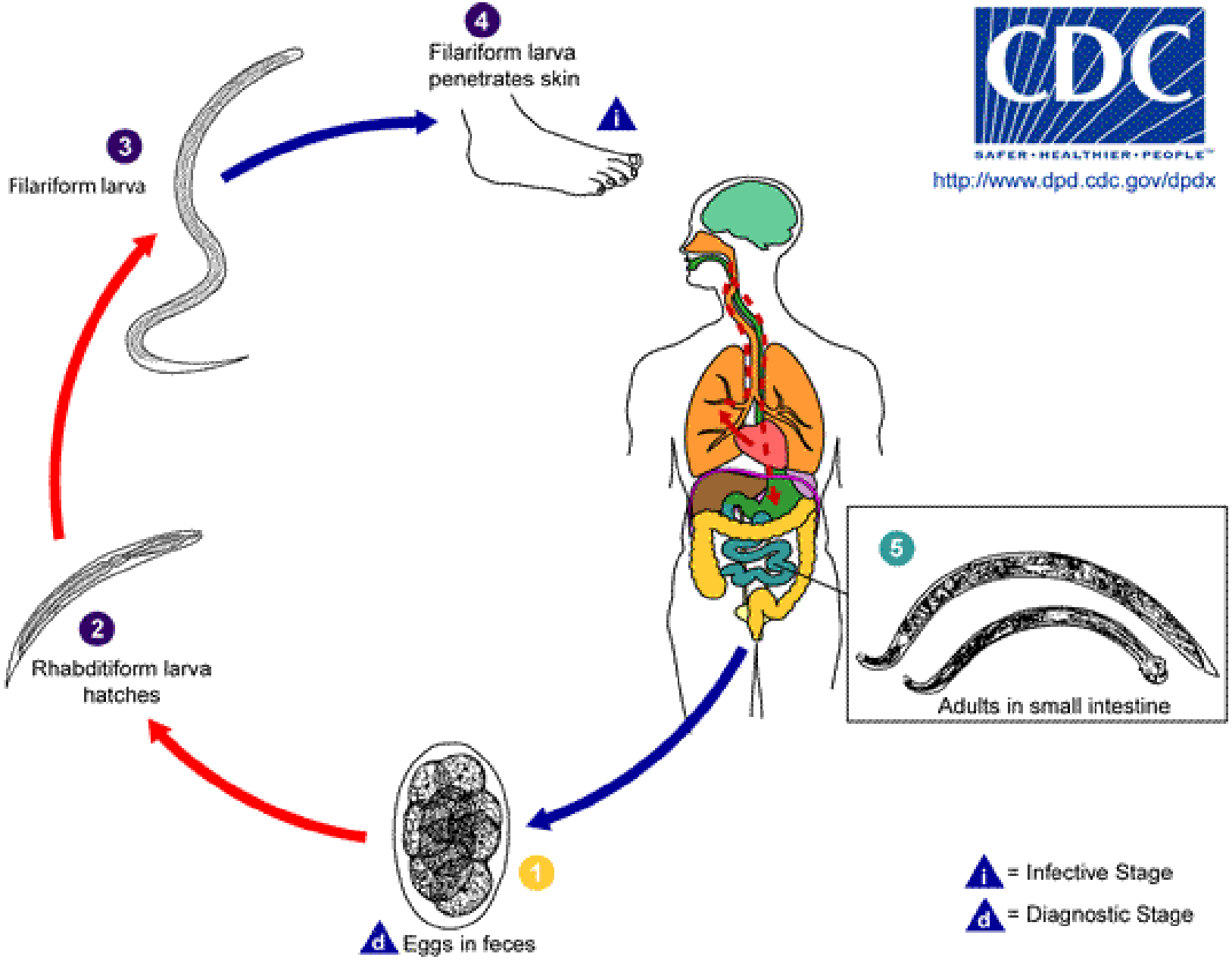




Its buccal capsule (mouth) lined with hard hooks, triangular **cutting plates** and **anticoagulant glands**.

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*



Life cycle of Hook worms

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 sever 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 **sever anemia** = microcytic hypochromic anemia.

Hook worms

Diagnosis and treatment

- **<u>Diagnosis</u>:**

-Eggs in stools;

-occult blood (+)

Treatment: Albendazol, Mebendazole

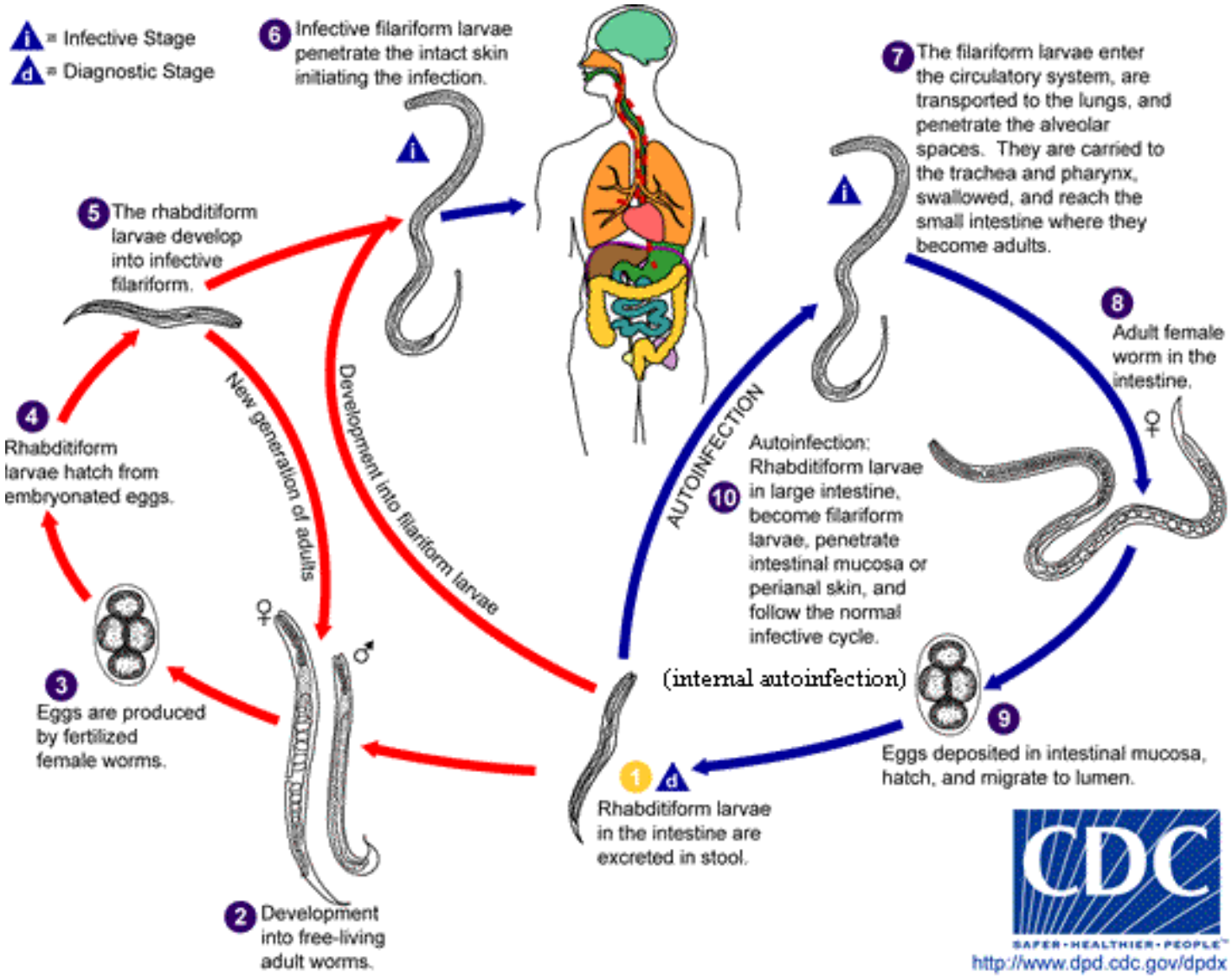
Strongyloides stercoralis

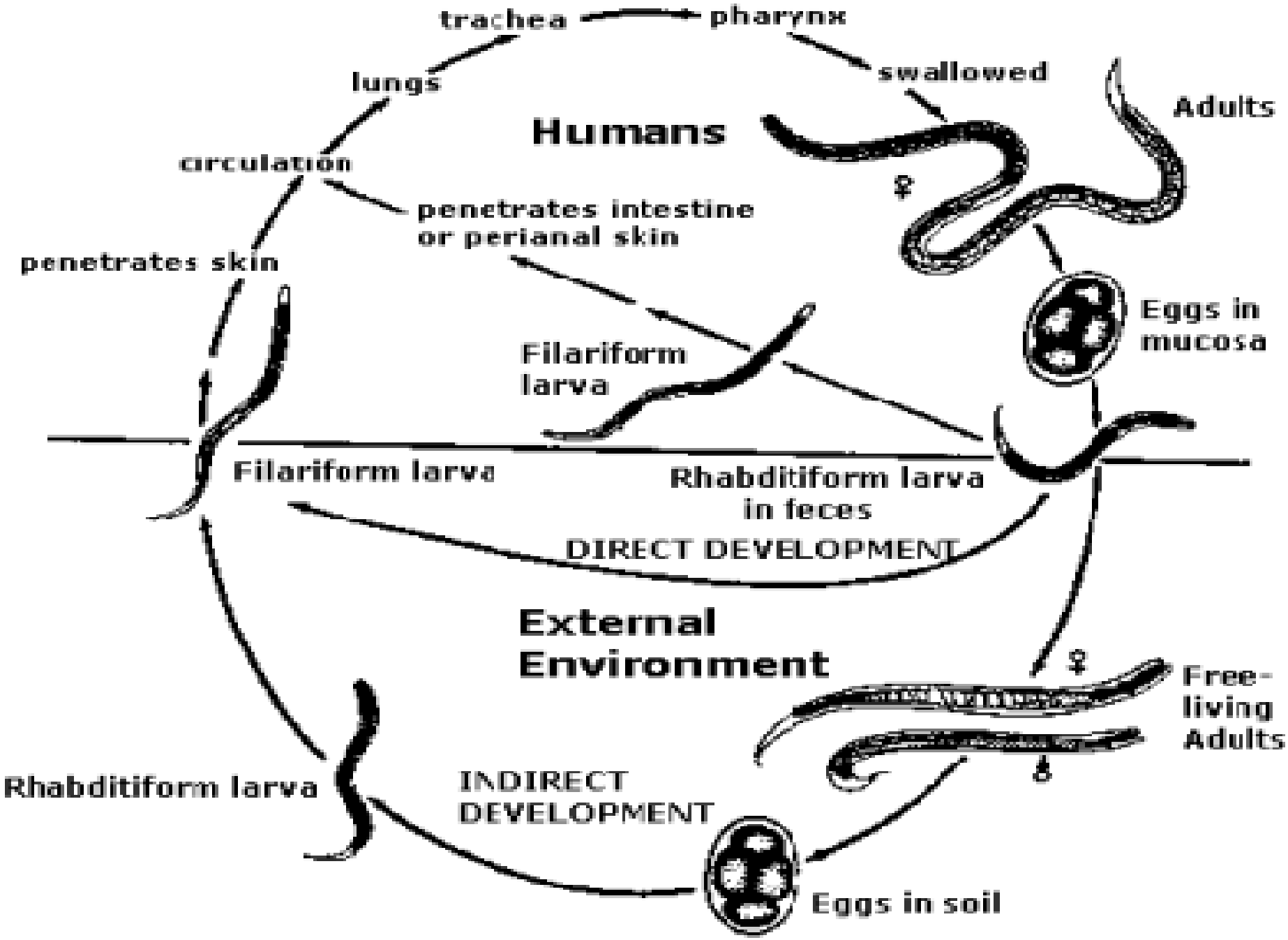
- Widely distributed in tropical area at Asia, Africa & South America
- Fatal dissemination in **immuno-compromised host.**
- It is **smallest** pathogenic nematodes ± **2.5**mm.
- adult live membrane of duodenum, jejunum rarely mucous membrane of bronchus
- **Autoinfection** is very important criteria

Strongyloides stercoralis life cycle

- The parasite shows 3 different modes of development:
- **1-<u>Direct development</u>:** The rhabditiform larva pass from stool and become directly a Filariform larva if the environment of the soil is suitable.
- **2-<u>Indirect development</u>:** In external environment Rh. larva becomes free living adults, produce eggs, rhabditiform larva and Filariform larva (Infective stage).
- **3-<u>AUTOINFECTION:</u>**
  - 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




trachea
pharynx
lungs
swallowed
Adults
Humans
circulation
penetrates intestine
or perianal skin
penetrates skin
Eggs in
mucosa
Filariform
larva
Filariform larva
Rhabditiform larva
in feces
DIRECT DEVELOPMENT
External
Environment
Free-
living
Adults
Rhabditiform larva
INDIRECT
DEVELOPMENT
Eggs in soil

Strongyloides stercoralis
Pathology and clinical picture

- **Cuteneous** 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

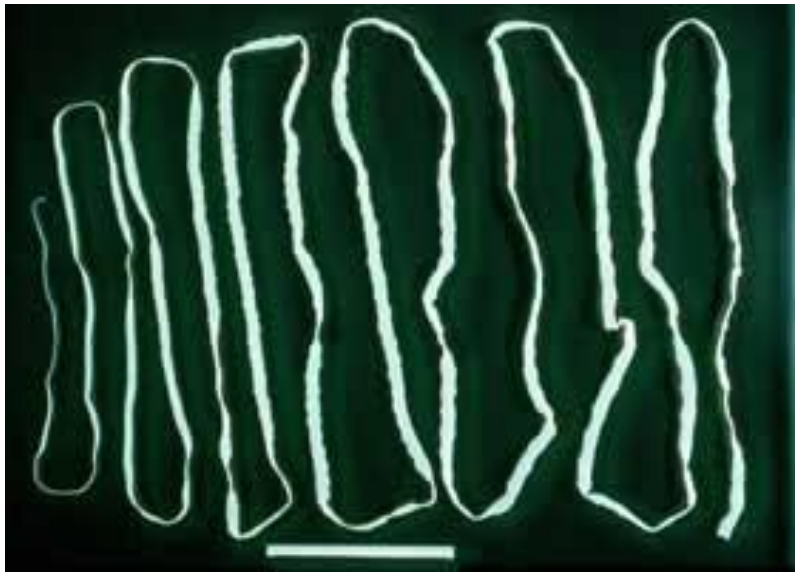
-Duodenal aspirate

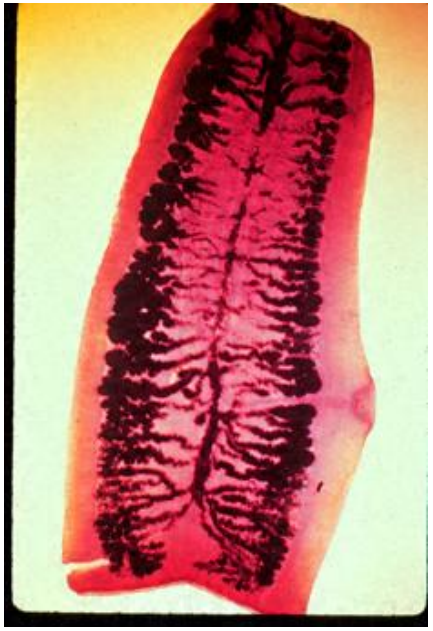
Treatment

Albandazole,
Mebendazole

Common Tapeworm Infections

TAPEWORM	DISEASE	TRANSMISSION OF INFECTION	LOCATION OF ADULT IN HUMANS	LOCATION OF LARVA IN HUMANS	CLINICAL PICTURE	LAB. DIAGNOSIS
Taenia saginata	taeniasis	ingestion of larva in undercooked beef	Small Intestine	not present	vague digestive disturbances	eggs or proglottids in stools
Taenia solium- ADULT	taeniasis	ingestion of larva in undercooked pork	Small Intestine	not present	vague digestive disturbances	eggs or proglottids in stools
Taenia solium- LARVA (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
Hymenolepis nana	hymenolepiais	ingestion of egg	Small Intestine	Intestinal Villi	Enteritis diarrhoea	**eggs in stools**
Echinochoccus granulosus	hydatid disease	ingestion of egg	not present	Liver, lungs, Bones etc	depending on locality	X-ray, CT, US Serology Hydatid sand



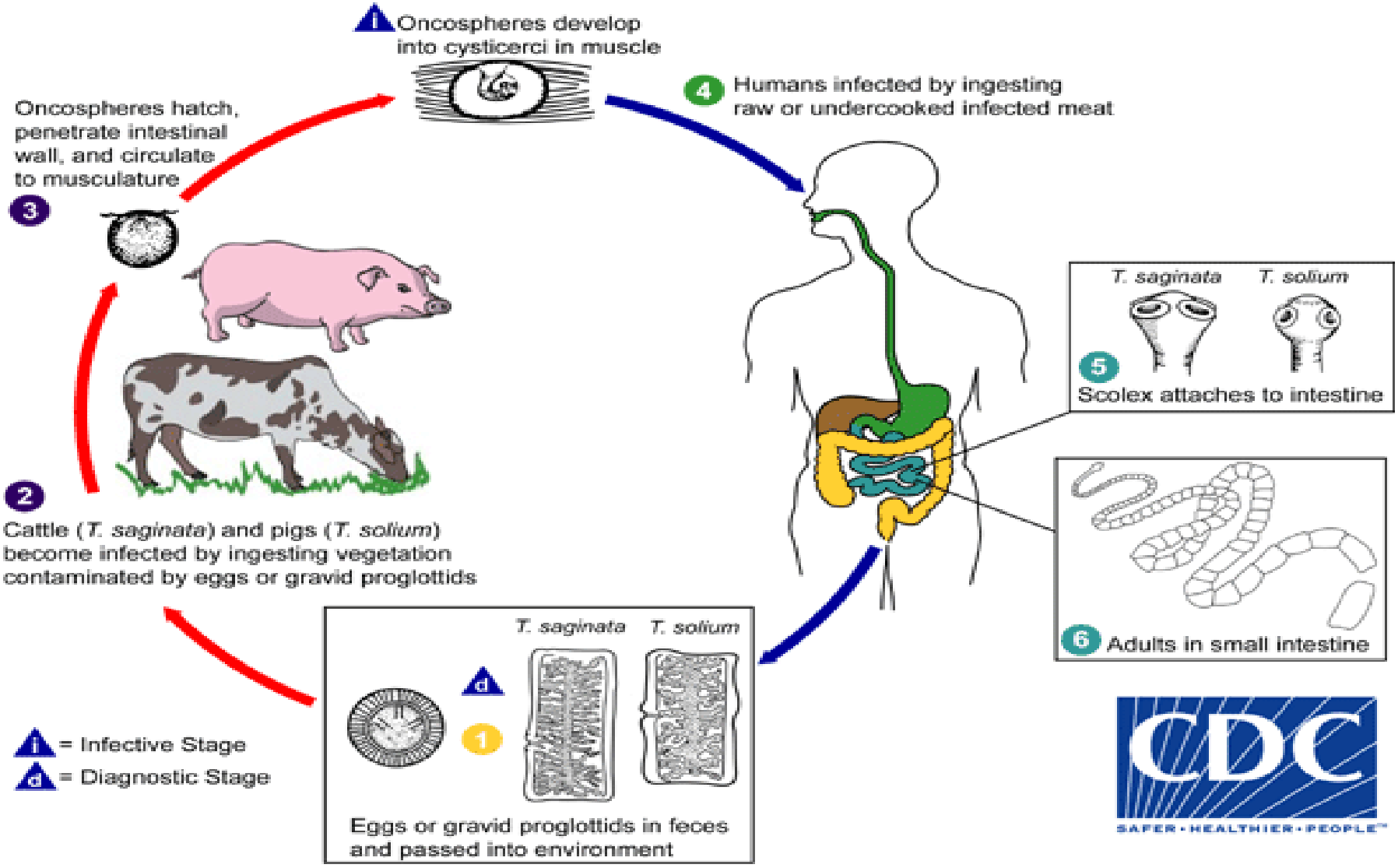


Taenia saginata

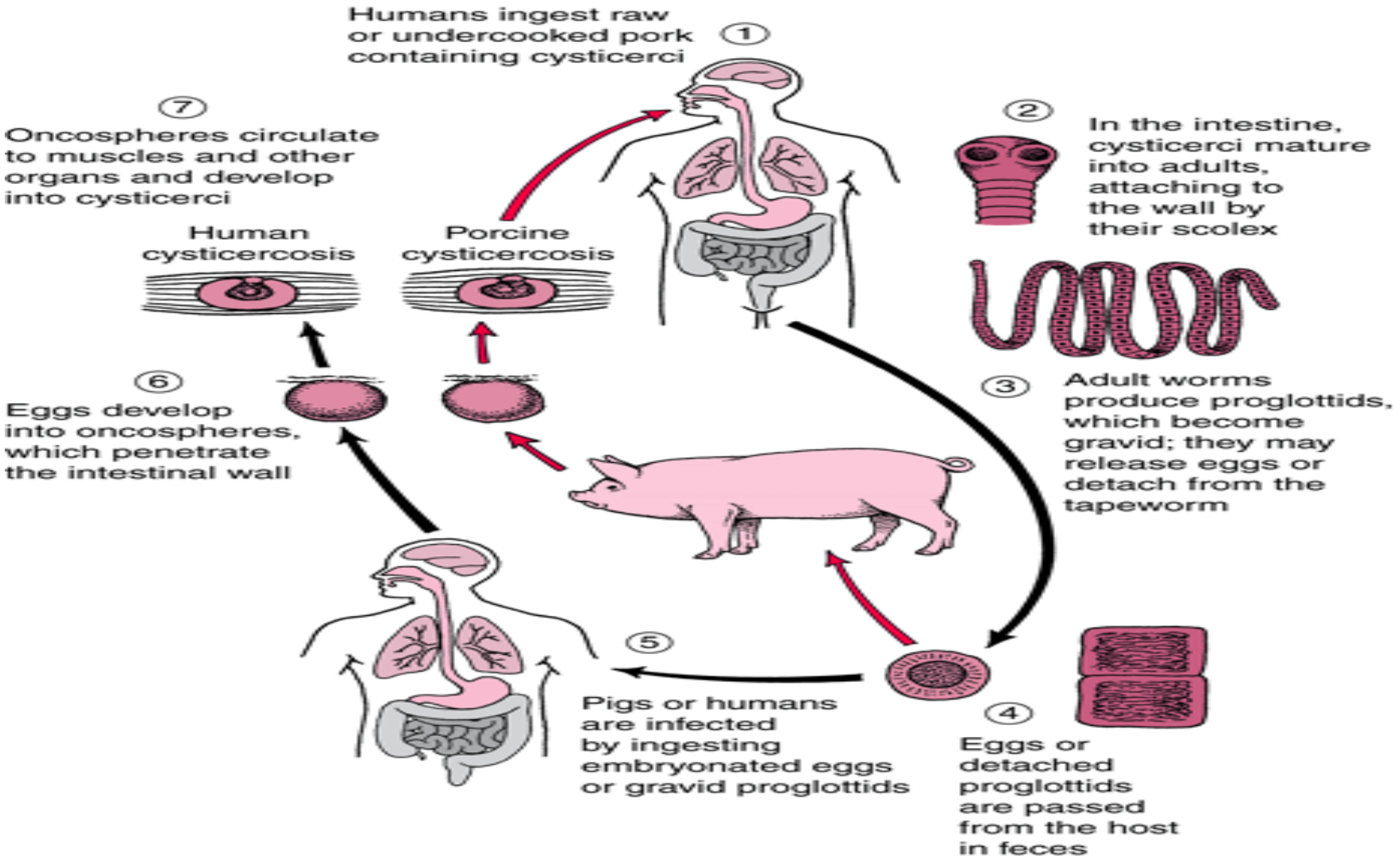
Taenia saginata

- 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*



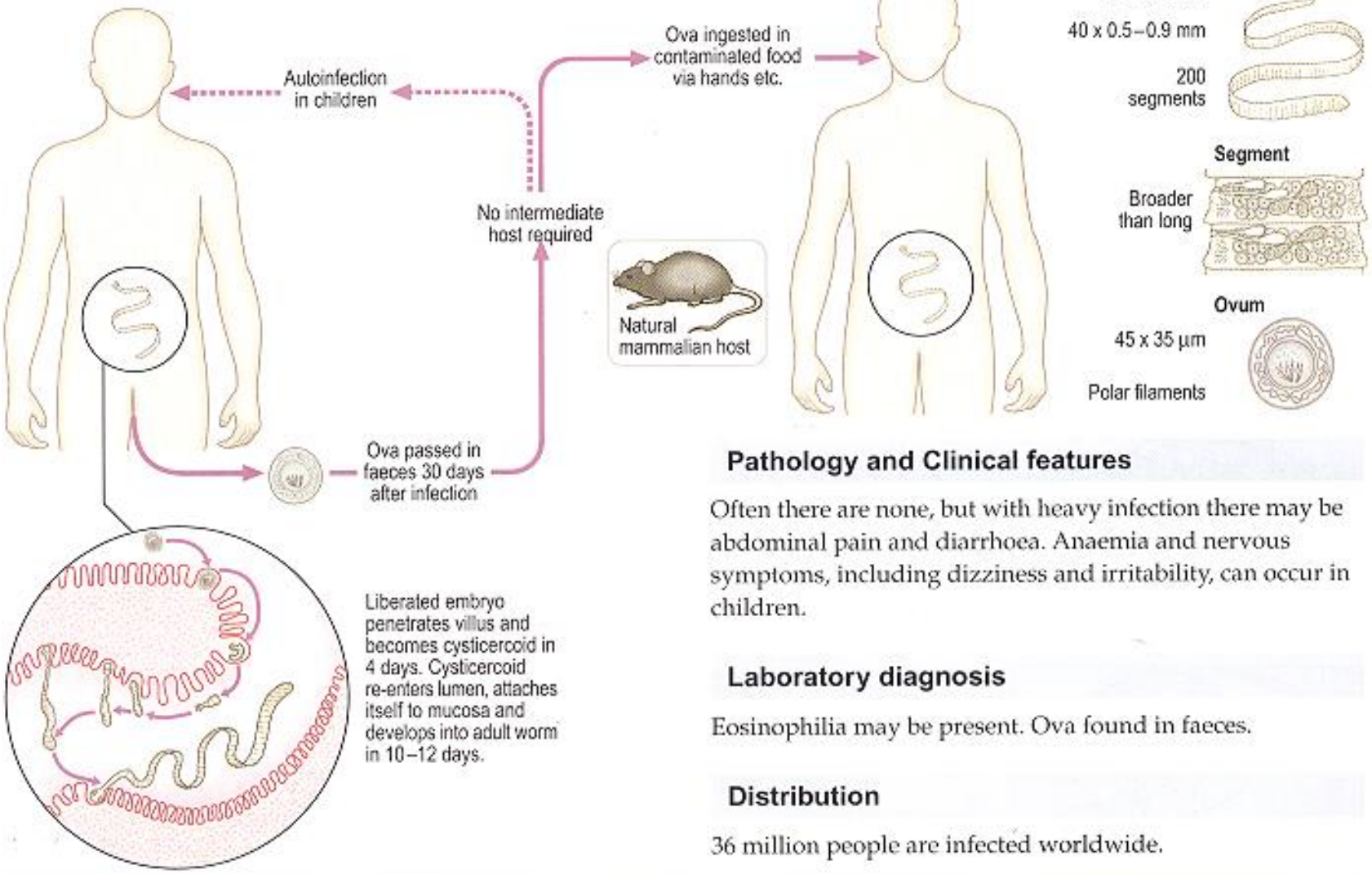
Taenia solium



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

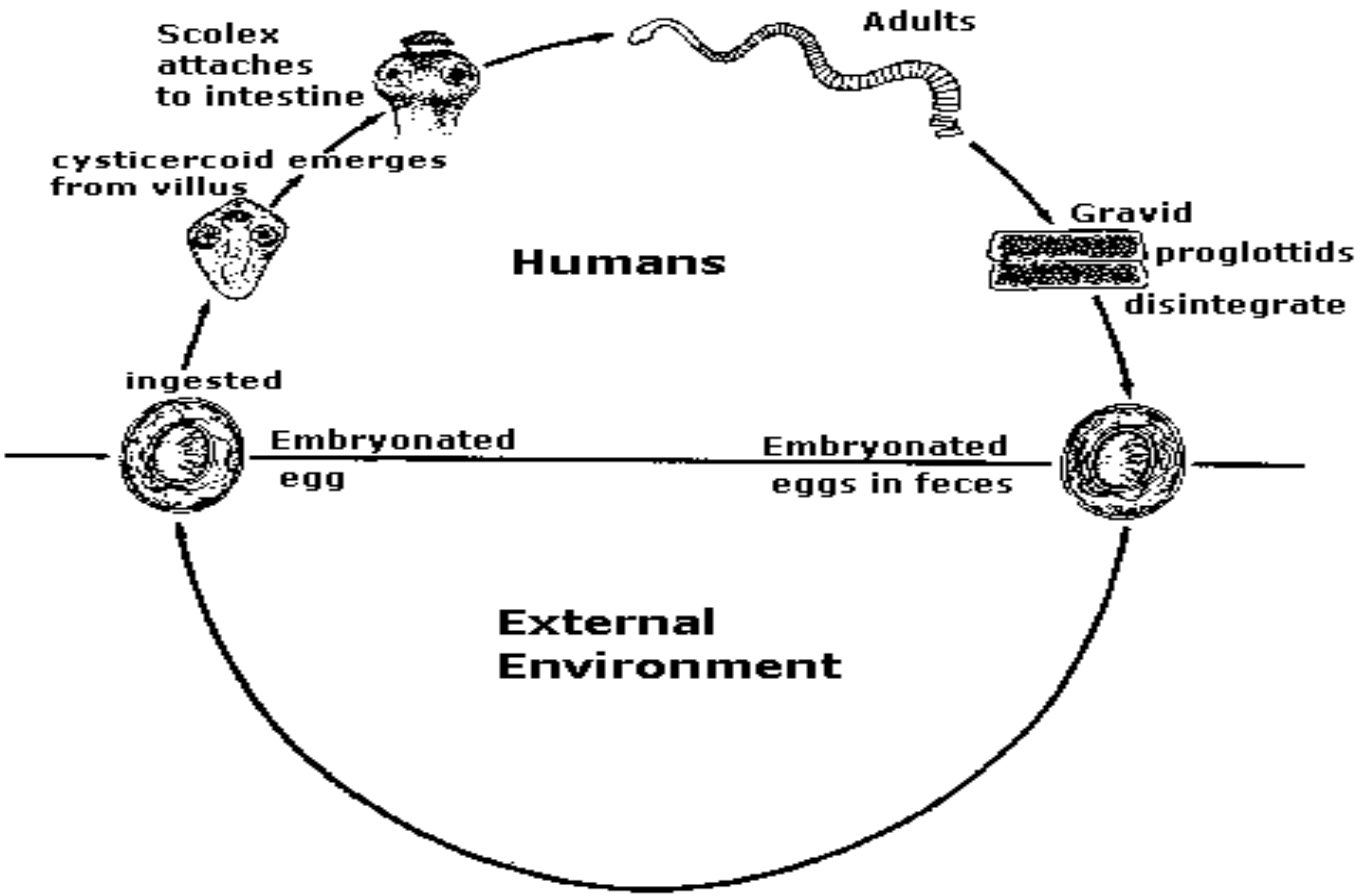
Eosinophilia may be present. Ova found in faeces.

Distribution

36 million people are infected worldwide.

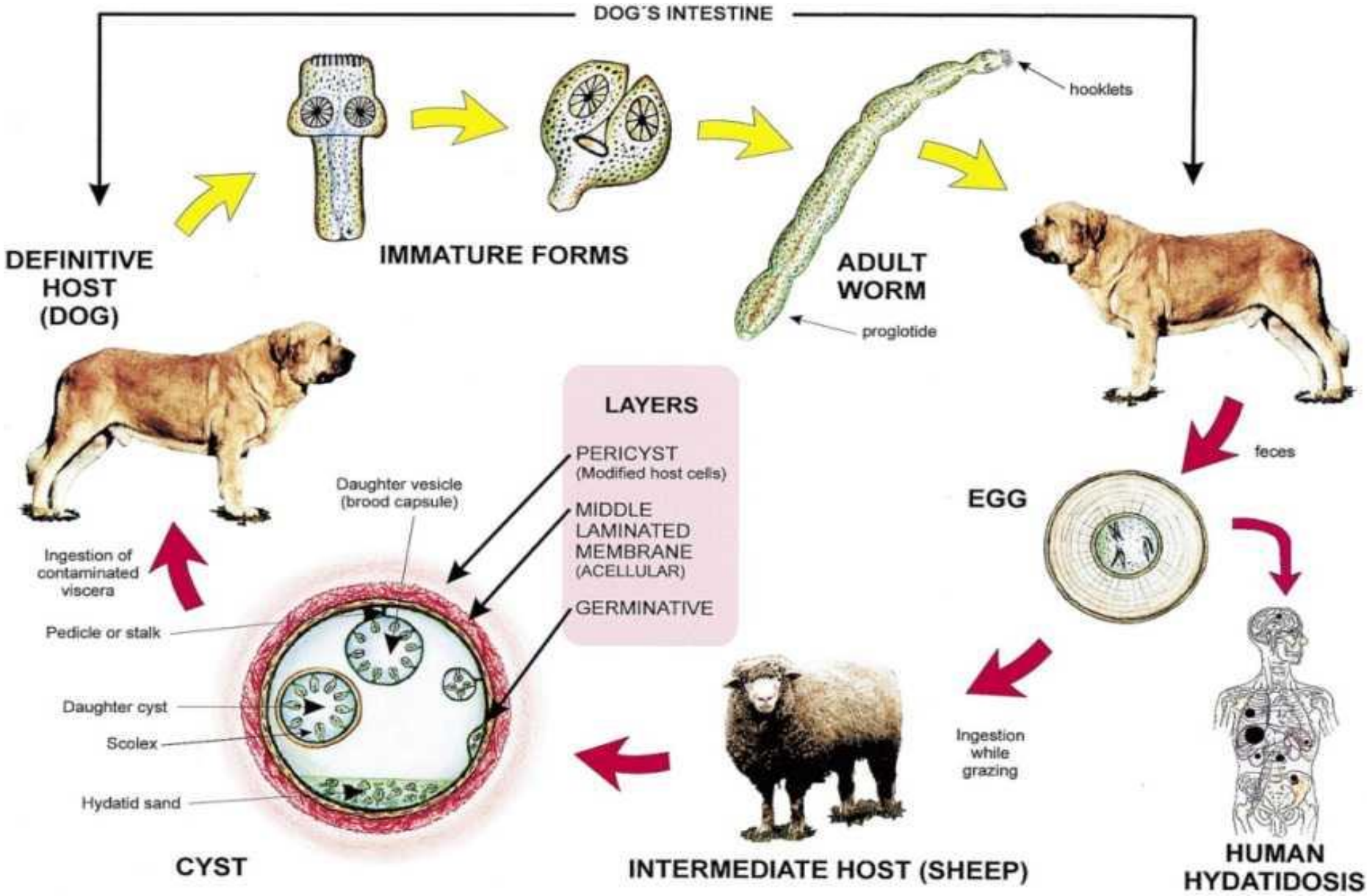
Hymenolepis diminuta (rat tape worm)

Hymenolepis nana

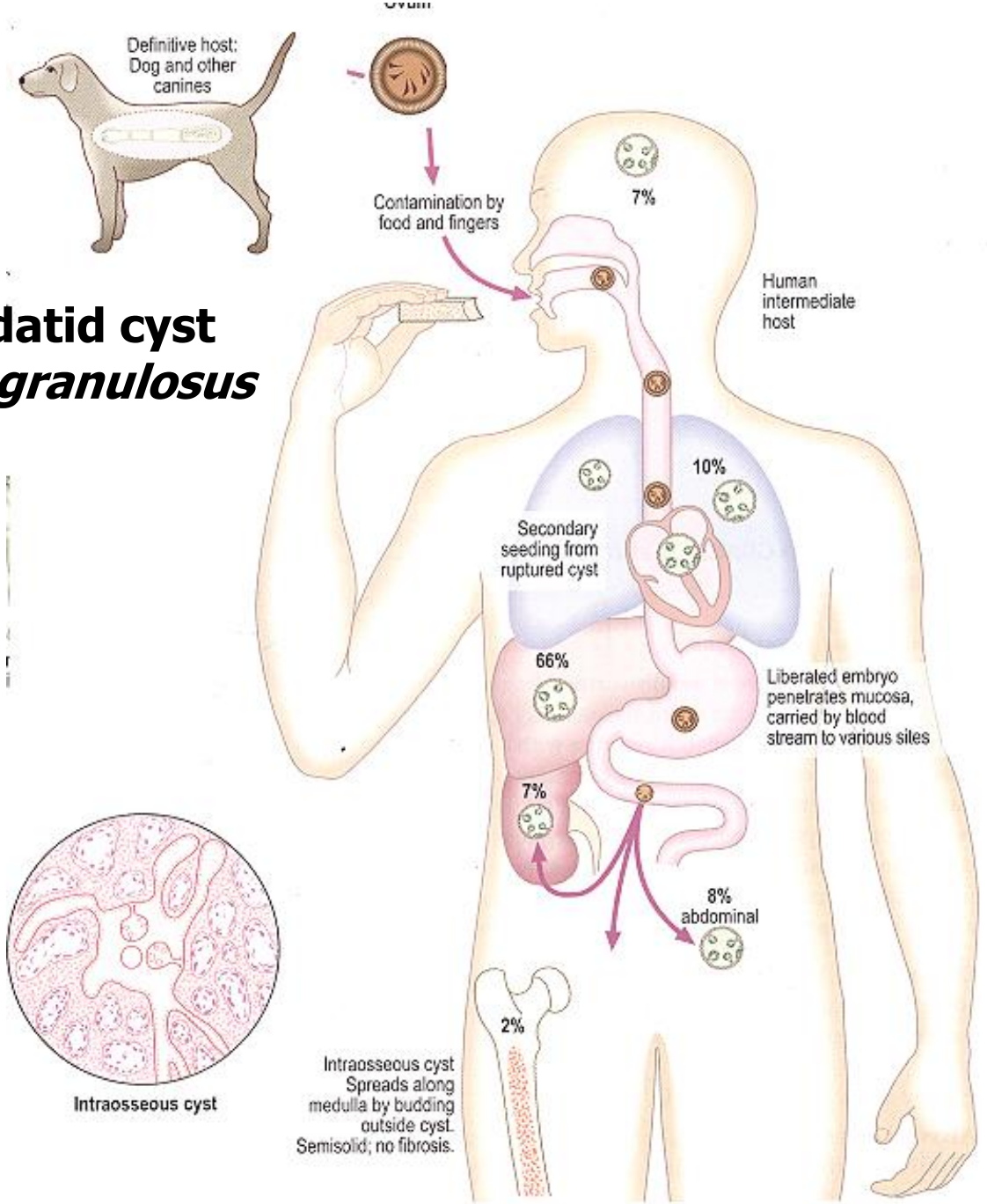


Hymenolepis nana

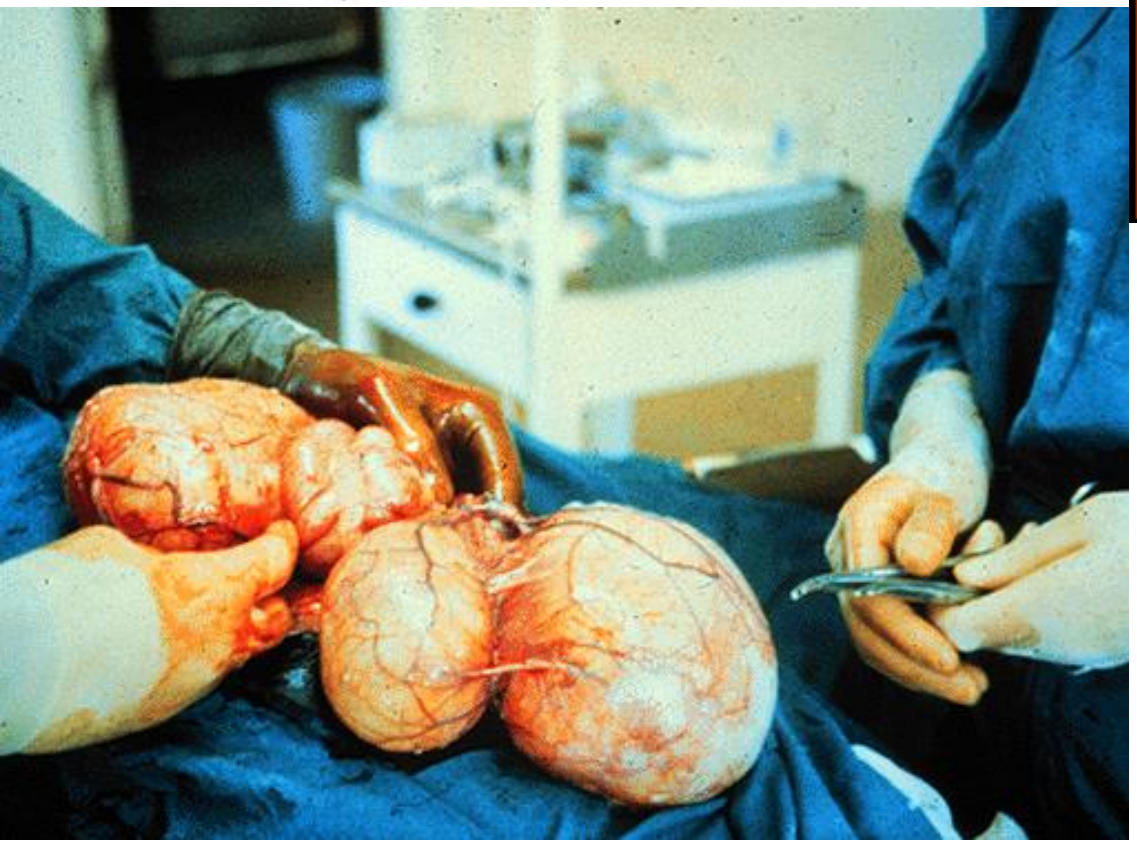
Echinococcus granulousus

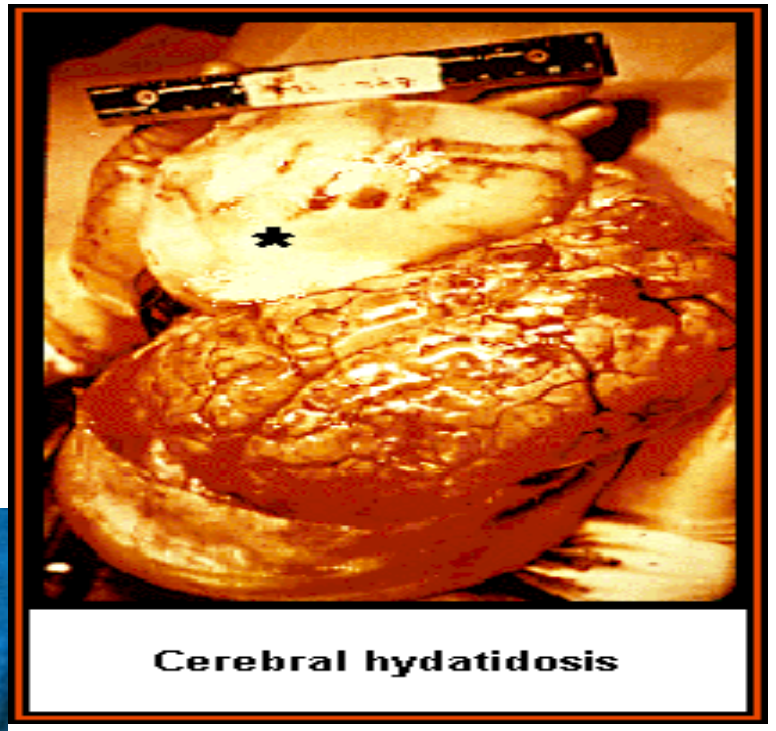


Location of hydatid cyst
Echinococcus granulosus

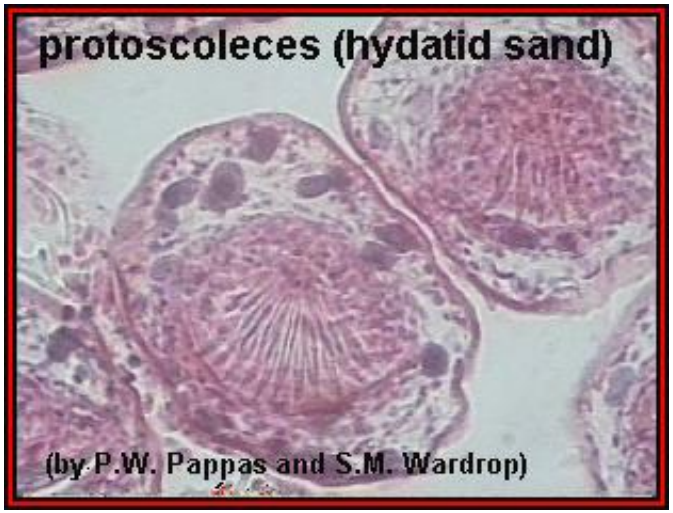


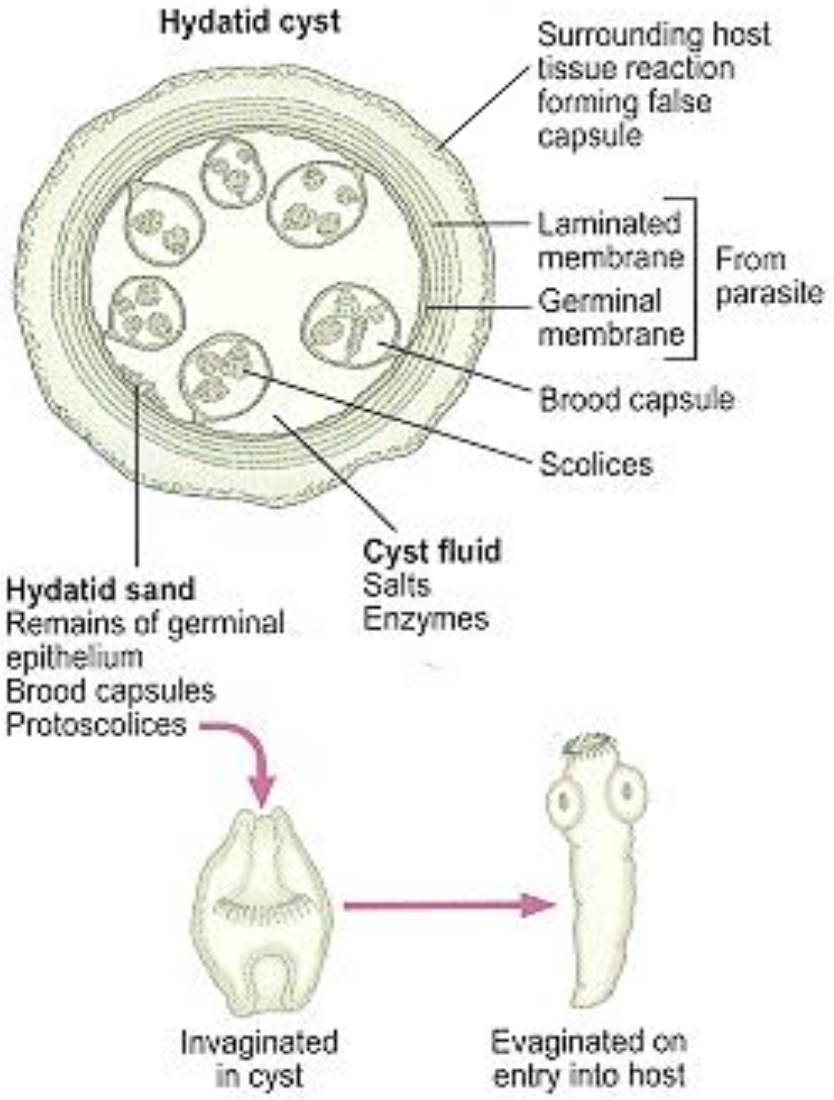
Hydatid cyst





Cerebral hydatidosis





Hydatid 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, cysticersosis):
  - Depends on clinical condition: Surgical and/or Albendazole