Intestinal Helminths
DR MONA BADR

PROTOZOA	HELMINTHS
Unicellular Single cell for all functions	Multicellular Specialized cells
1:Aoebae: 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
4. We have both :
5. A- INTESTINAL NEMATODES
6. B-TISSUE NEMATODES

COMMON INTESTINAL Nematodes 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*** *****

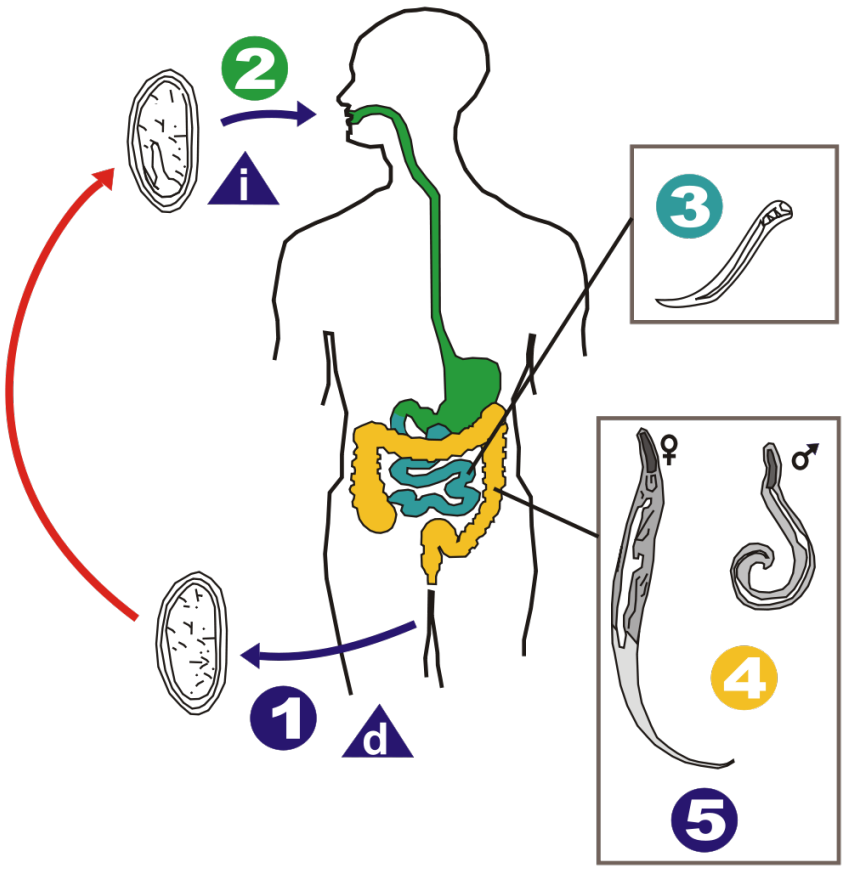
6. :

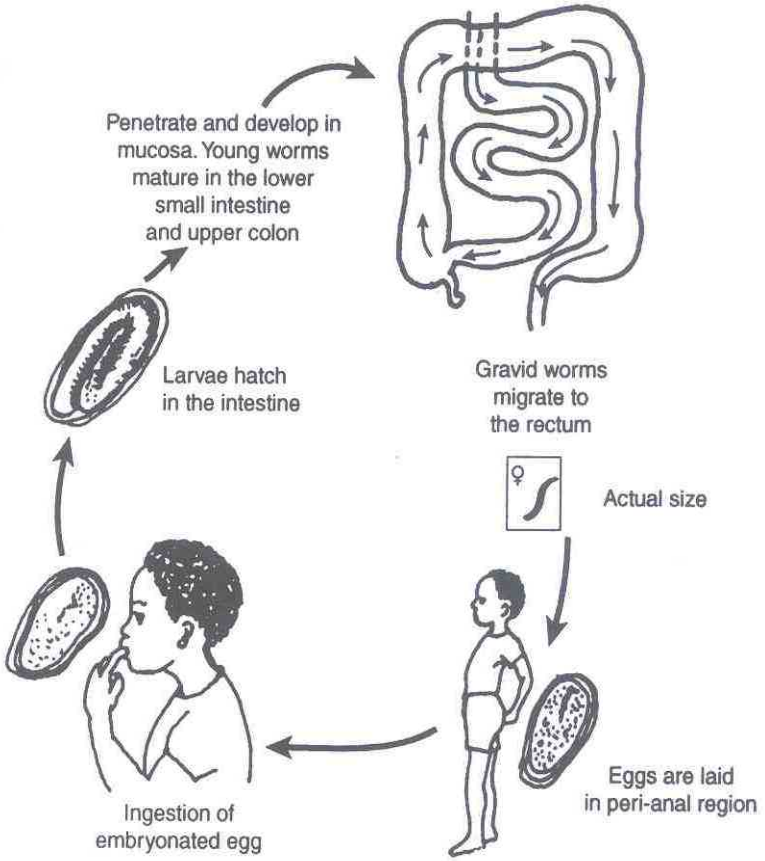
1-Enterobius vermicularis (THREAD WORM)

ENTEROBIAIS

- Found all over the world but more common in temperate regions ,infects only human.
- Children are more often evolved than adults , it tends to occur in groups living together such as families , army camps or nursery.
- Adult worms live in the ***large intestine*** ,are mainly located in ***lumen of cecum*** and the female migrate to rectum to deposits 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.

Enterobius vermicularis





Enterobius vermicularis

- **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 :

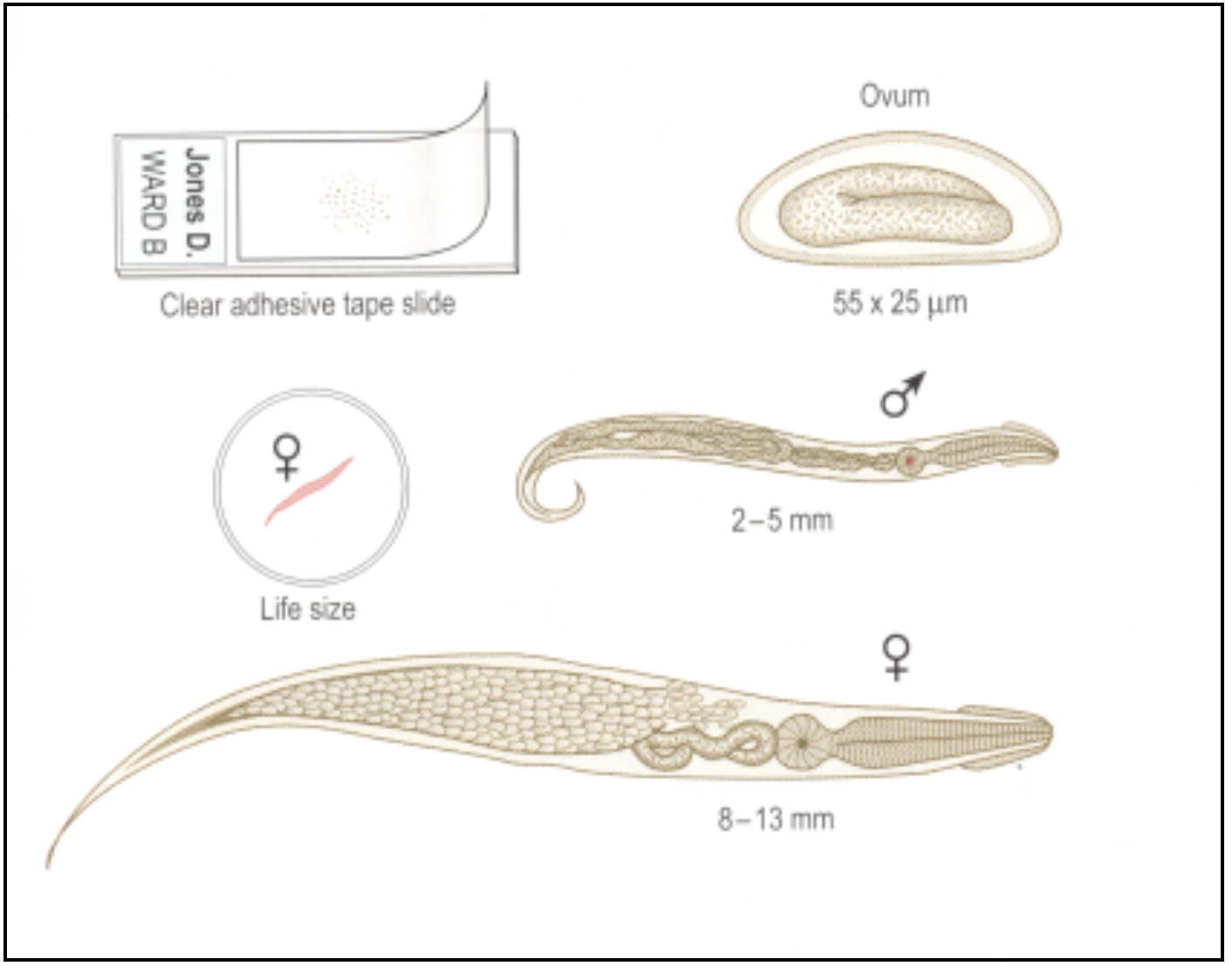
Unlike other intestinal Nematodes, the eggs are not usually found in feces .The best method is to look for them around the anus by taking an anal swab or by using ***CELLULOSE ADHESIVE TAPE***, the examination should be done before defecation or bathing.

Treatment

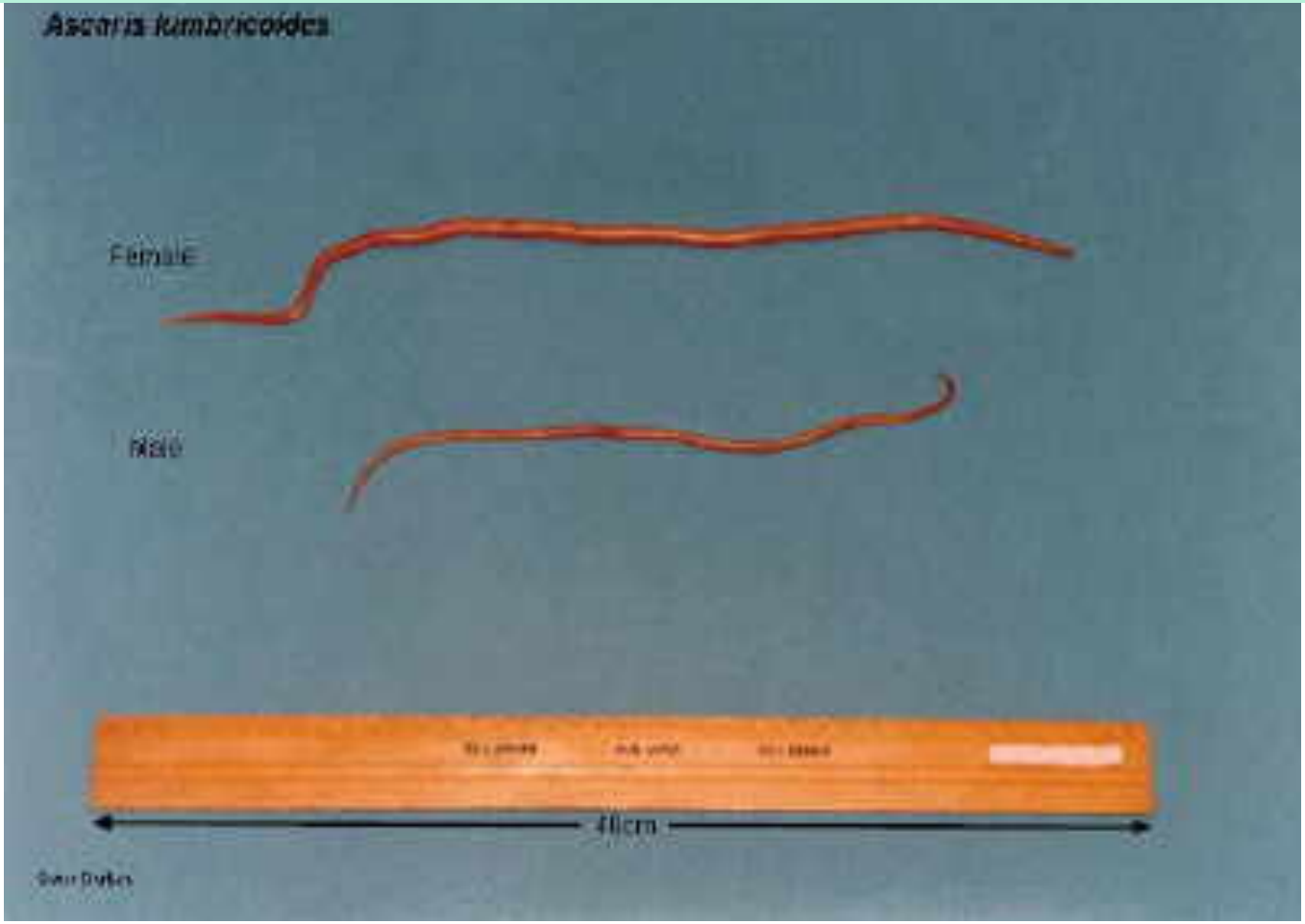
Albandazole , Mebendazole

for whole family

Enterobius vermicularis (Oxyuris)



Ascaris lumbricoides (roundworm)

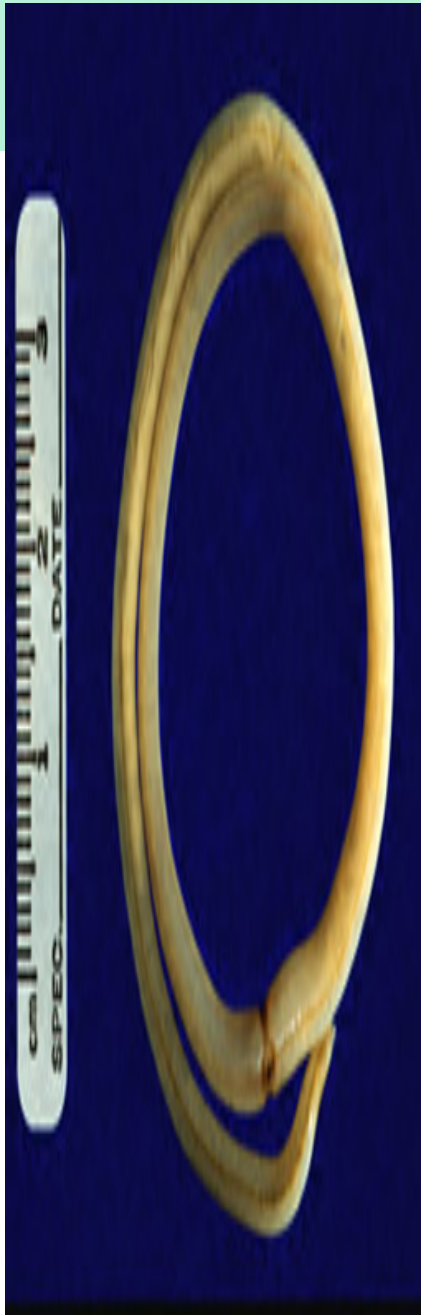


Ascaris lumbricoides (roundworm)

The commonest human helminthes infection all over the world, ***HUMAN*** is the only definitive host.

The largest intestinal NEMATODE of human , which is normally located in **the small intestine.**

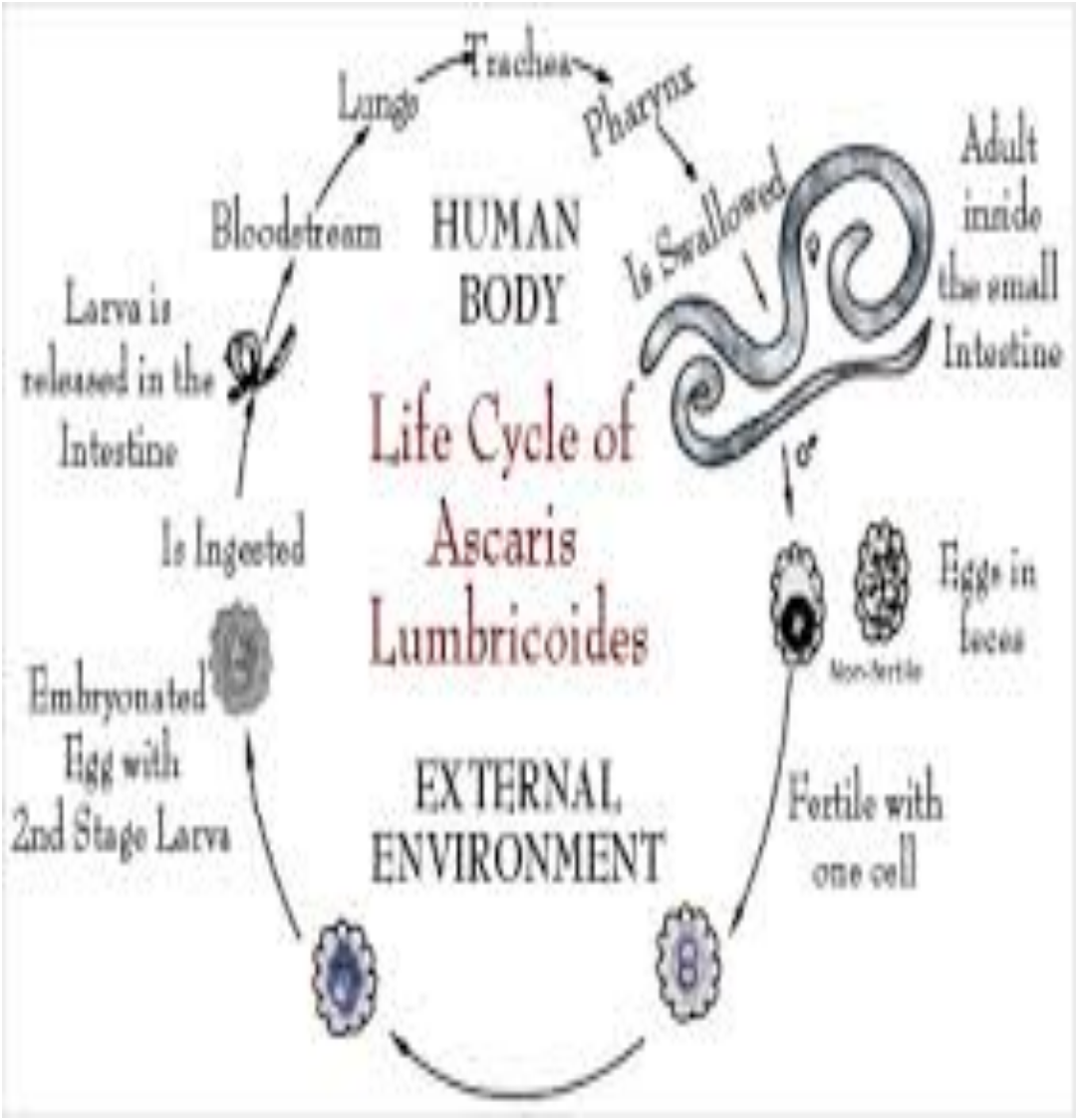
- Found in **jejunum** and upper part of **ileum.**
- Female **± 20** cm longer than male **± 10 cm**
- Feed on semi digested food.



Ascaris lumbricoides (roundworm)

Infective stage is embryonated egg

Diagnostic stage is unfertilized egg

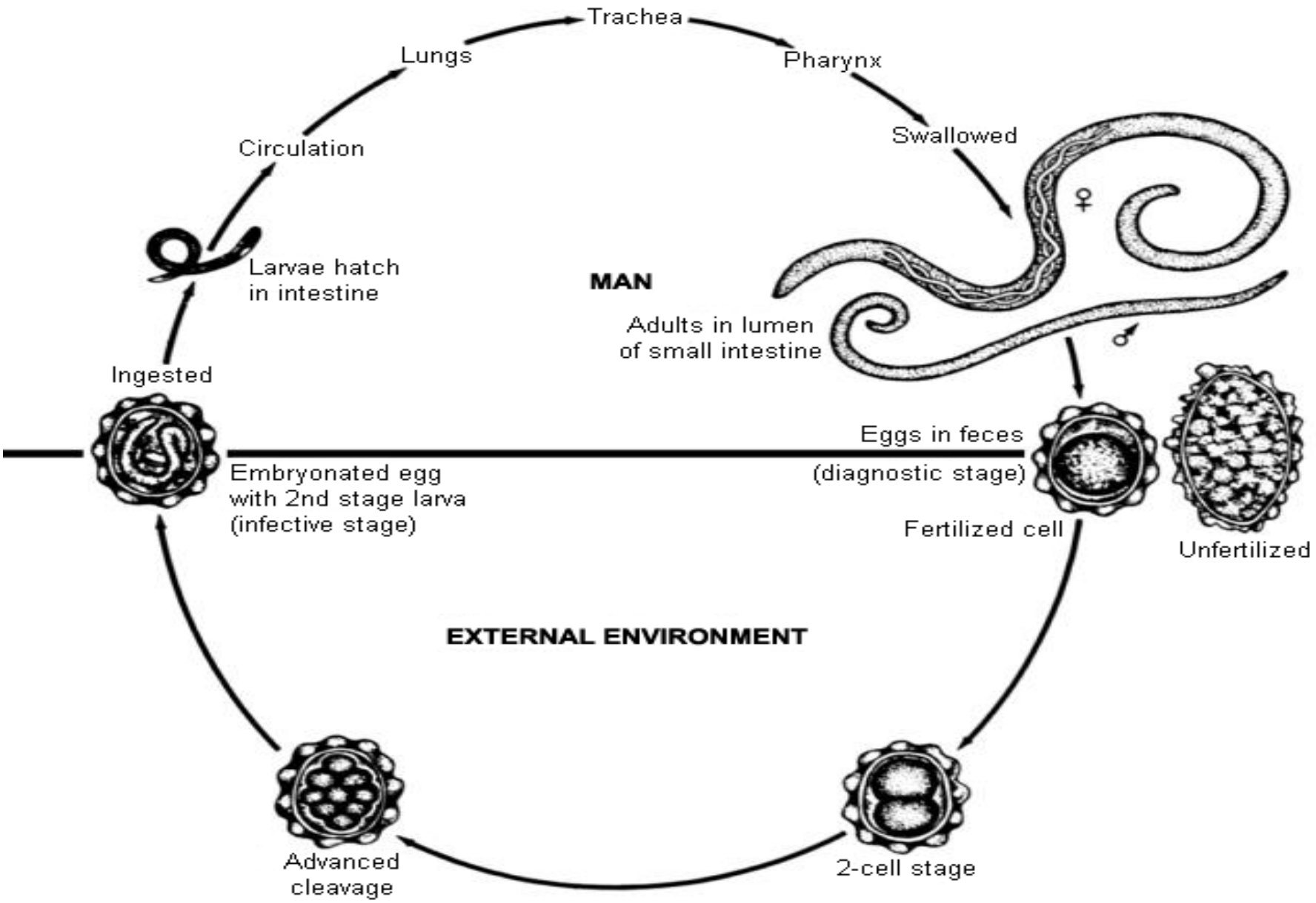


It infect only human when man ingest an **fertilized egg** contaminated with food or water, egg shell is dissolved by digestive juices and a **Larva** penetrate the wall of the **duodenum** to the portal circulation for (3dayes) and then from right heart into the pulmonary circulation and stay in the **alveoli** ,where it grow and molts for (3weeks), then **Larva** crawl up bronchi, trachea,larynex and pharynx and be **coughed up** , then swallowed ,returned to the **small intestine** where it mature to adults male &female ,fertilization take place producing eggs which pass in stool.

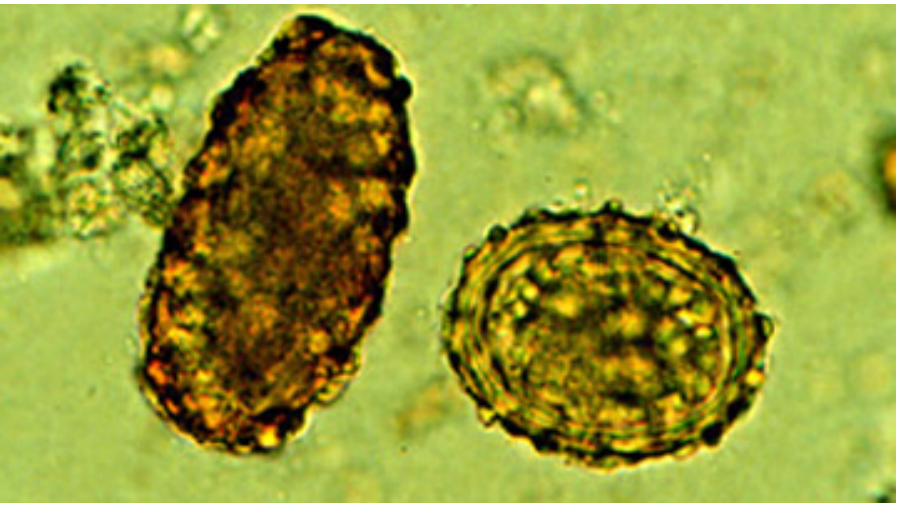
Pathogenicity

- ***1-Migrating LARVA :***
- ***Ascaris pneumonia (Loeffler"s syndrome) , 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 egg (embryonated

Ascaris larva emerging from egg

Ascaris lumbricoides (roundworm)

Pathology:

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

  Light infection : asymptomatic.

  Heavy infection : intestinal obstruction

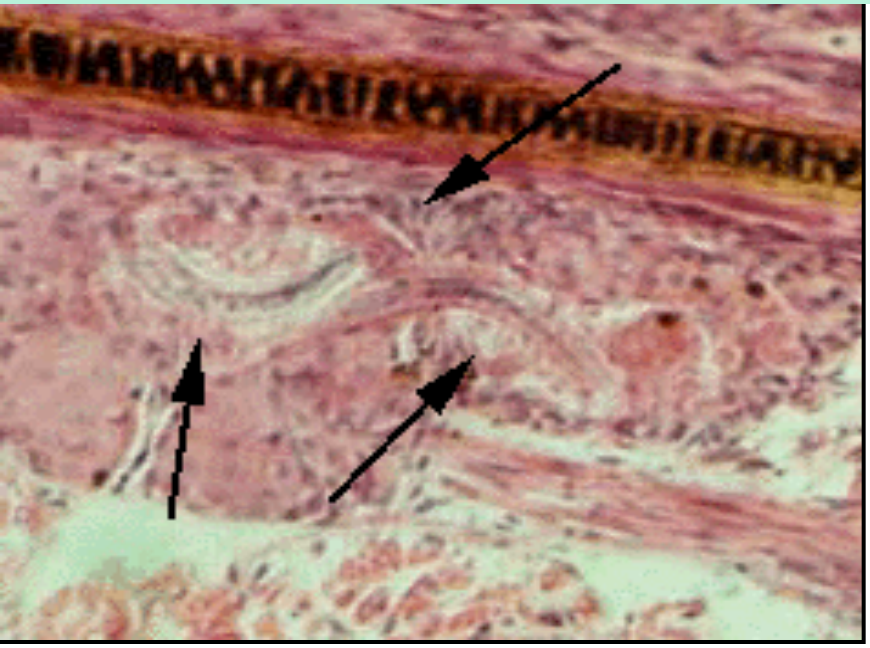
  Migrating adult : to bile duct -jaundice

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

  Pneumonitis and broncho-spasm, cough with bloody sputum

  Eosinophilia, urticaria

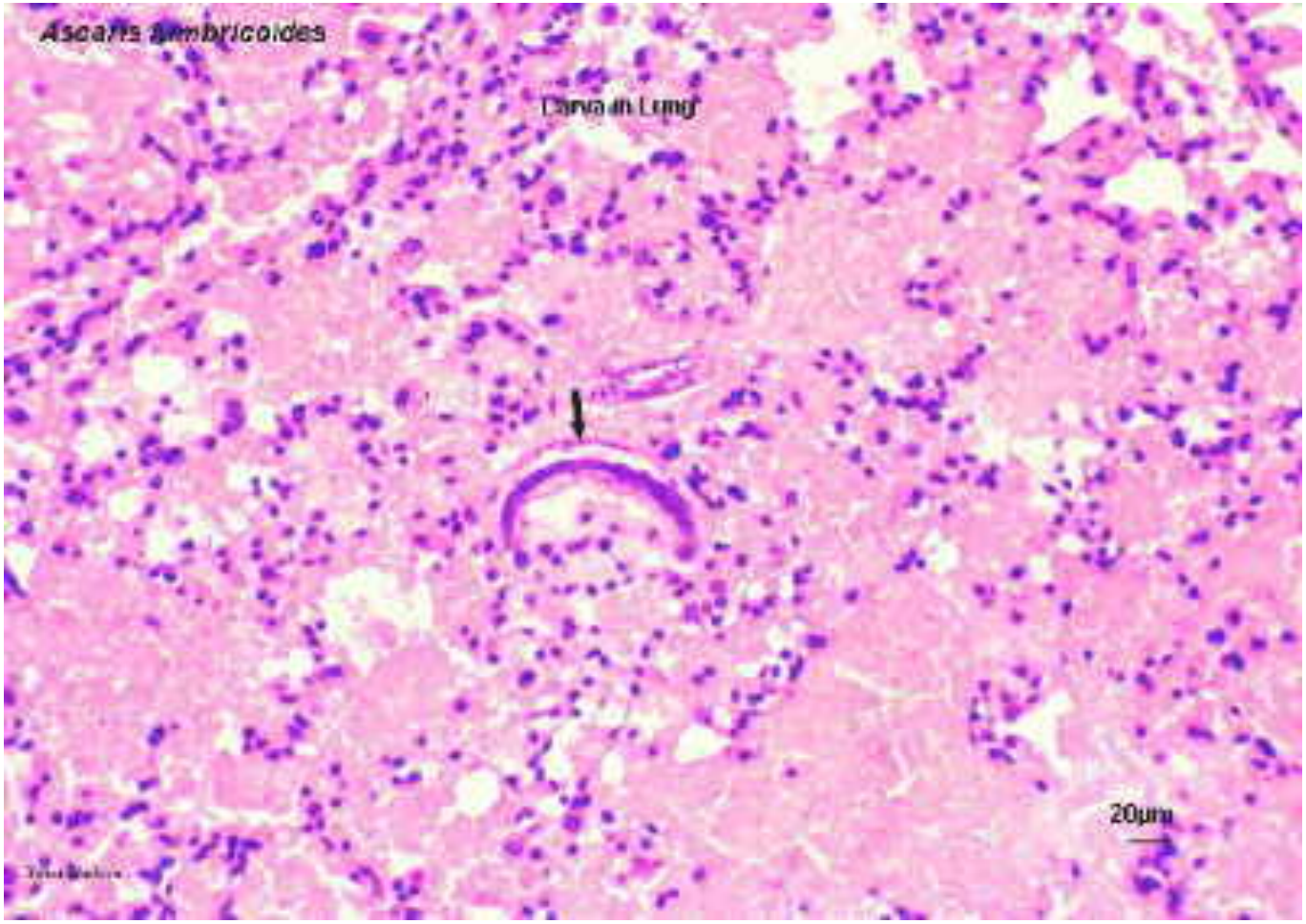
Ascaris lumbricoides (roundworm)



Loeffler`s syndrome: Larvae in lung

pnuomonia, cough ,bloody sputum

Ascaris lumbricoides (roundworm)



Ascaris larva in lung

Ascaris lumbricoides (roundworm)

Diagnosis:

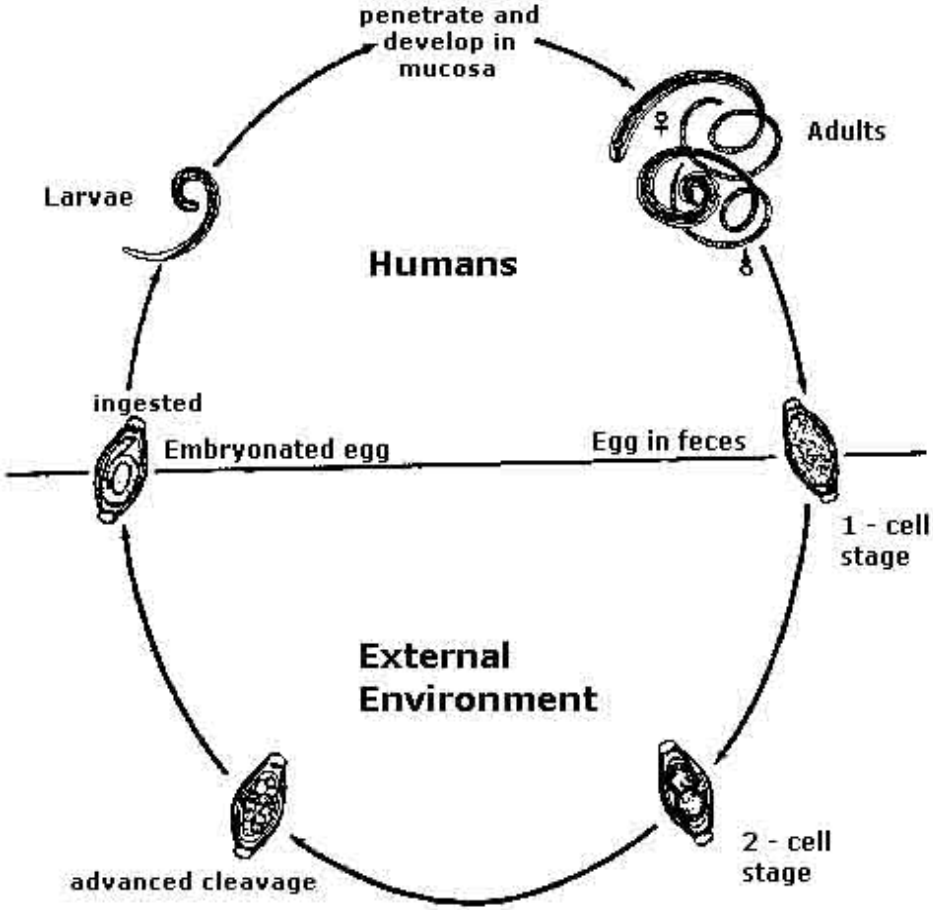
-eggs in stool.

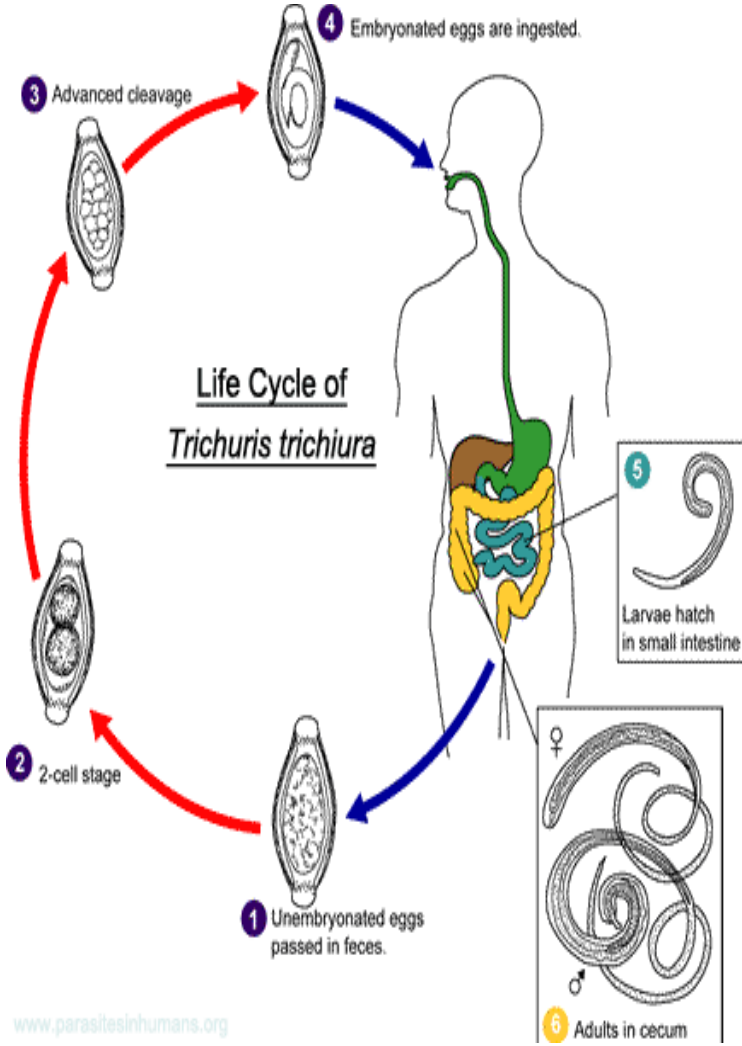
-larvae in sputum.

-adult may pass with stool.

Treatment: **Albendazole , Mebendazole**

2-Trichuris trichiura (Whipworm)





Diagnostic stage is egg in stool

Infective stage is embryonated egg

Infect human only, 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 and symptoms:

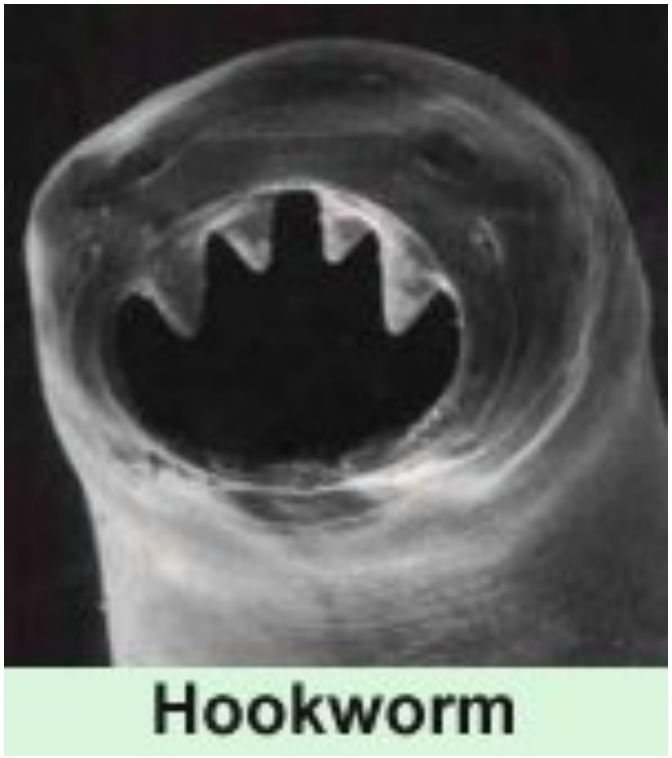
- **light infection** : asymptomatic
- **heavy infection** :abdominal pain ,bloody diarrhea. **Rectal prolapsed** in children is a common complication.

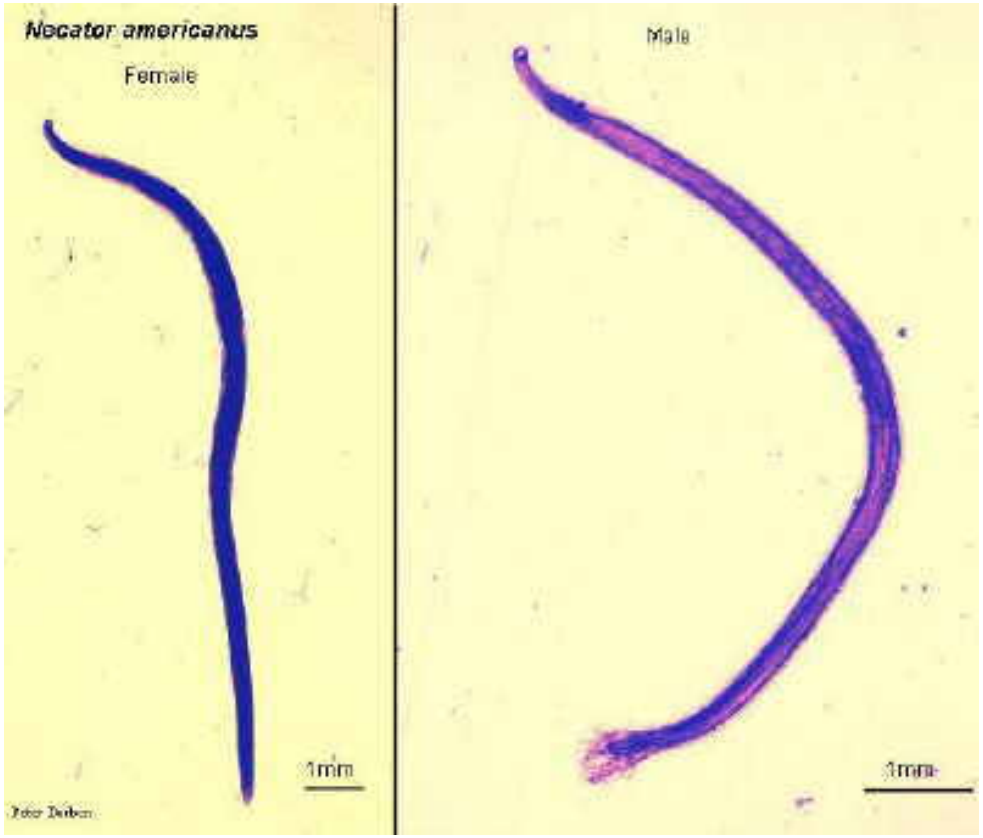
Diagnosis: egg in stool characterized by its barrel shape with mucoid plugs at each pole

Treatment :Albendazole.

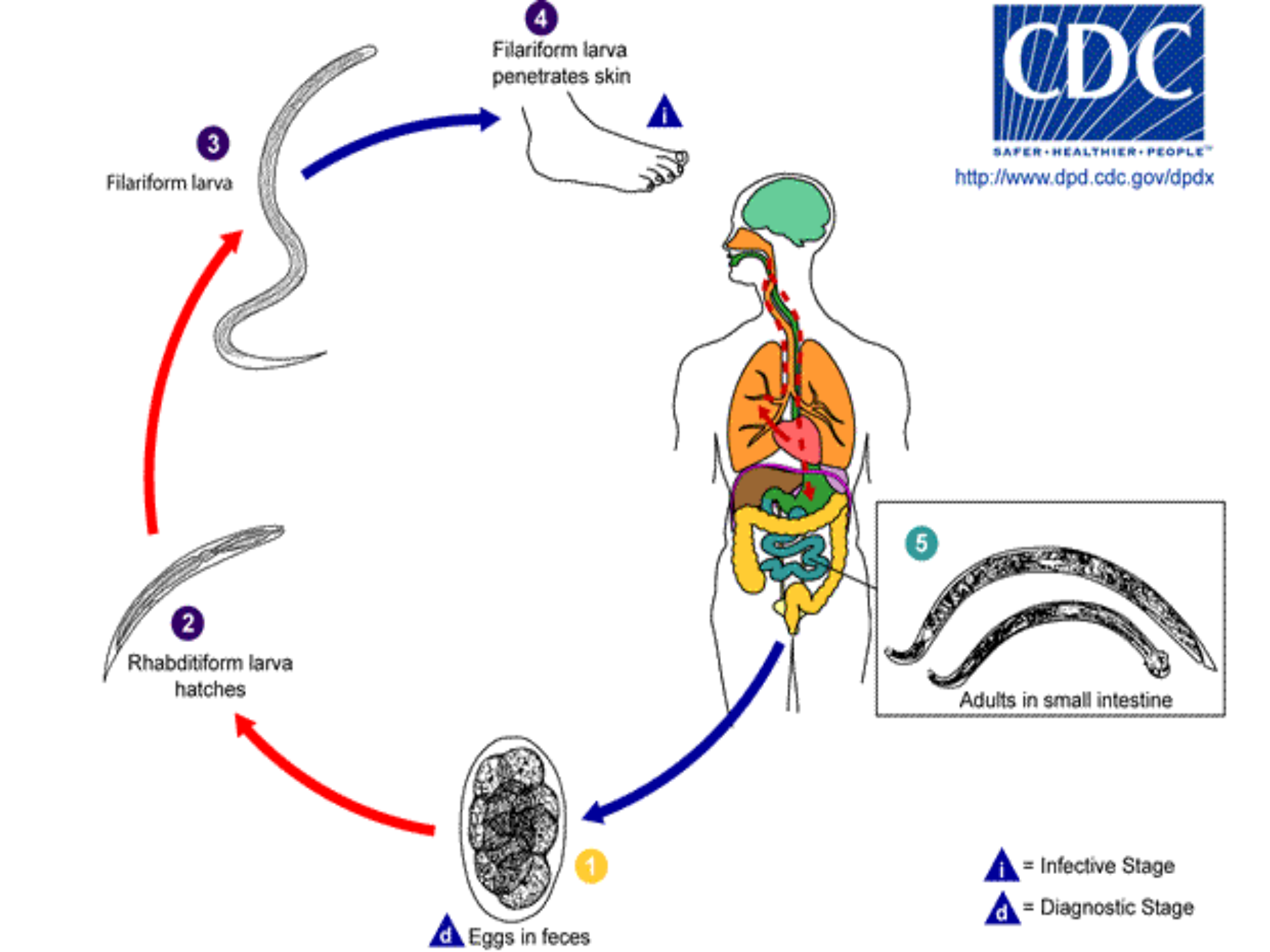
Hook worms

Ancylostoma dudenale &Necator americanus





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


4
Filariform larva
penetrates skin
i
3
Filariform larva
2
Rhabditiform larva
hatches
1
d
Eggs in feces
5
Adults in small intestine
CDC
SAFER · HEALTHIER · PEOPLE™
http://www.dpd.cdc.gov/dpdx
i = Infective Stage
d = Diagnostic Stage

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 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 hypo chromic anemia** .

Hook worms

Diagnosis and treatment

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

Treatment: Albendazol, Mebendazole

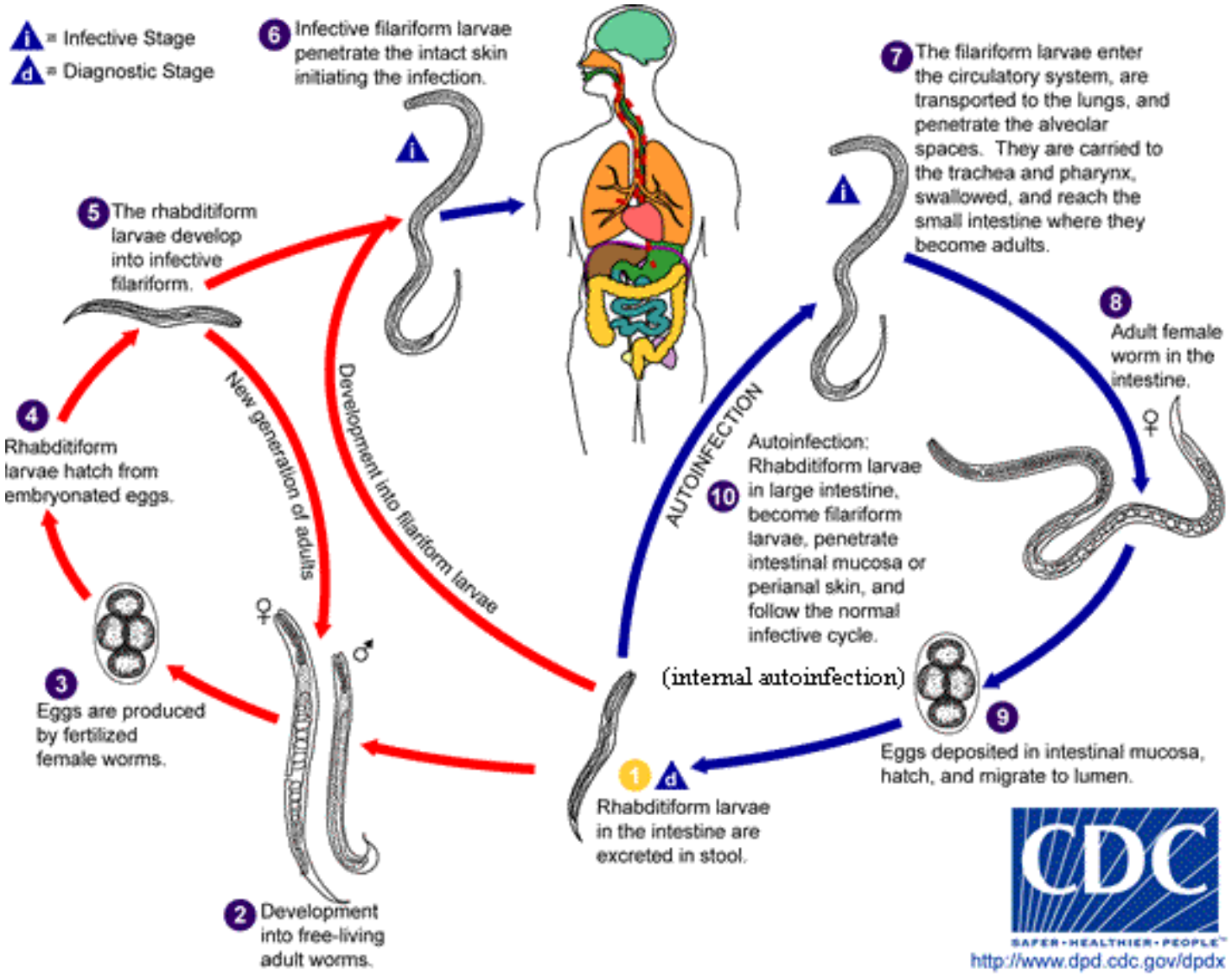
Strongyloides stercoralis

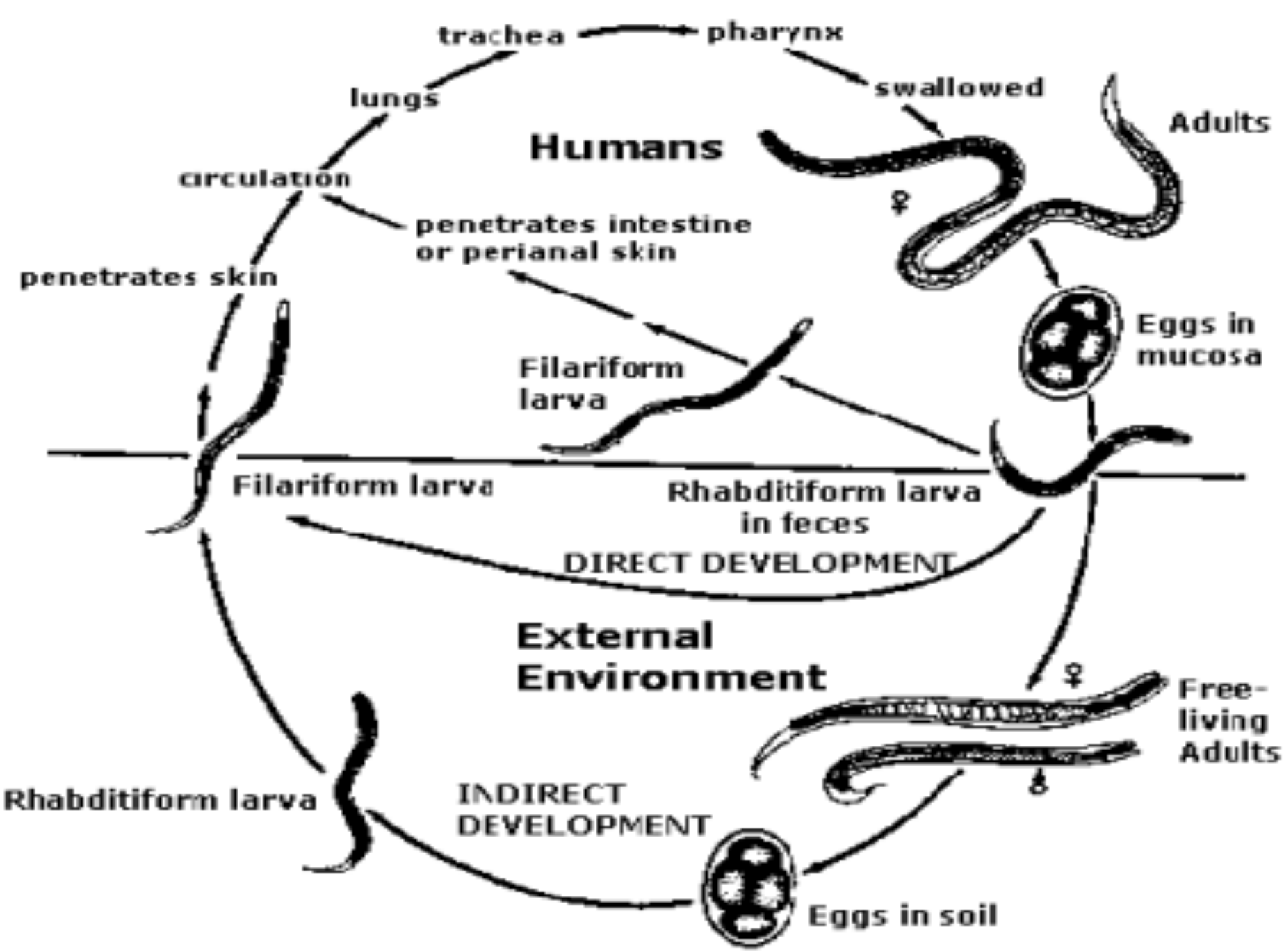
- Widely distributed in tropical area at Asia, Africa & South America .
- fatal dissemination in **immuno-compromised host.**
- It is **smallest** pathogenic nematodes ± **2.5**mm.
- adult live **in mucous** membrane of duodenum jejunum rarely mucous membrane of bronchus.
- ***AUTOINFECTION IS VERY IMPORTANT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

Strongyloides stercoralis life cycle

- The parasite shows 3 different modes of development:
- **1-Direct development:** The rhabiditiform 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 ,rhabiditiform larva and Filariform larva(Infective stage).
- **3-AUTOINFECTION:** mainly in immunocompromised patients
  - **Internal** :when the rhabiditiform 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
Humans
Adults
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, bloody 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:

NO EGG IN DIAGNOSIS

rhabditiform larv diagnostic stage

-Stool examination

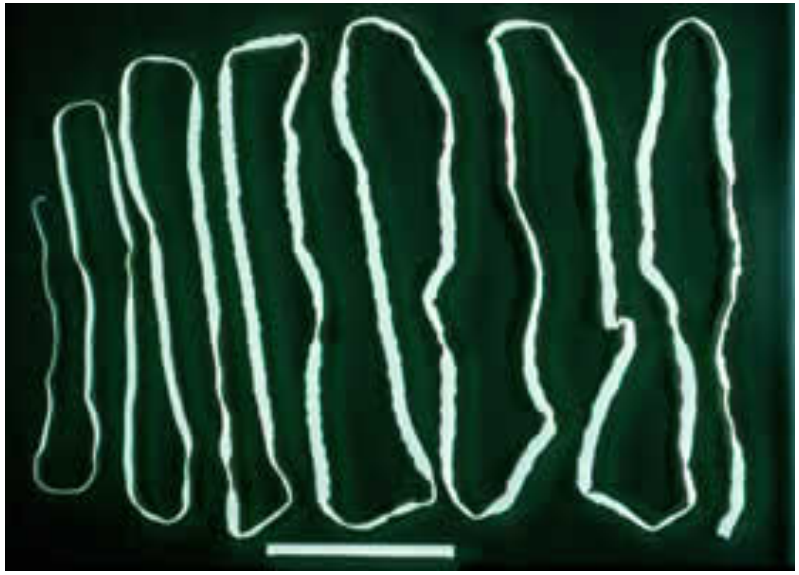
-Duodenal aspirate

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 disturbance	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 stool**s**
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



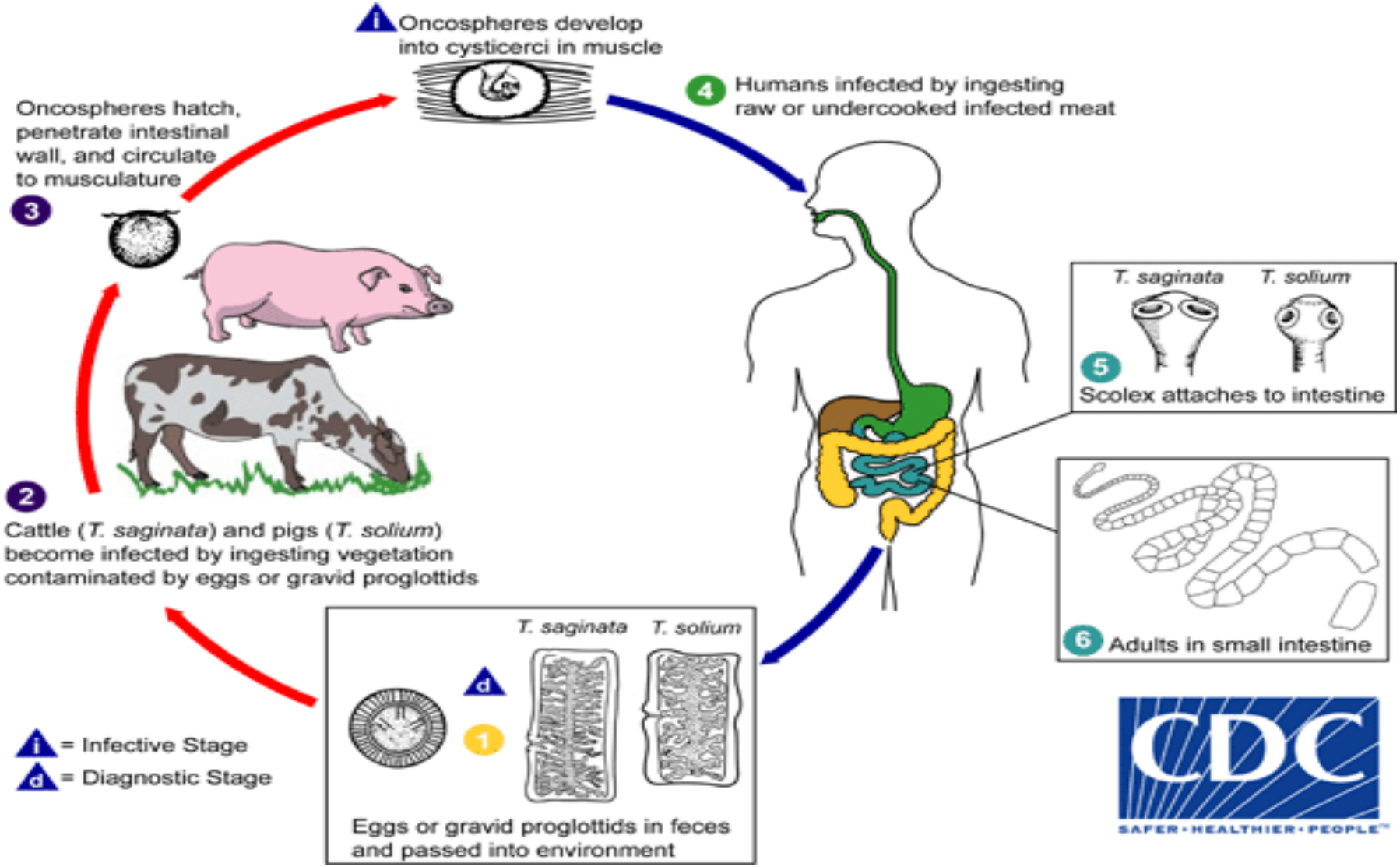
Taenia saginata

Taenia saginata

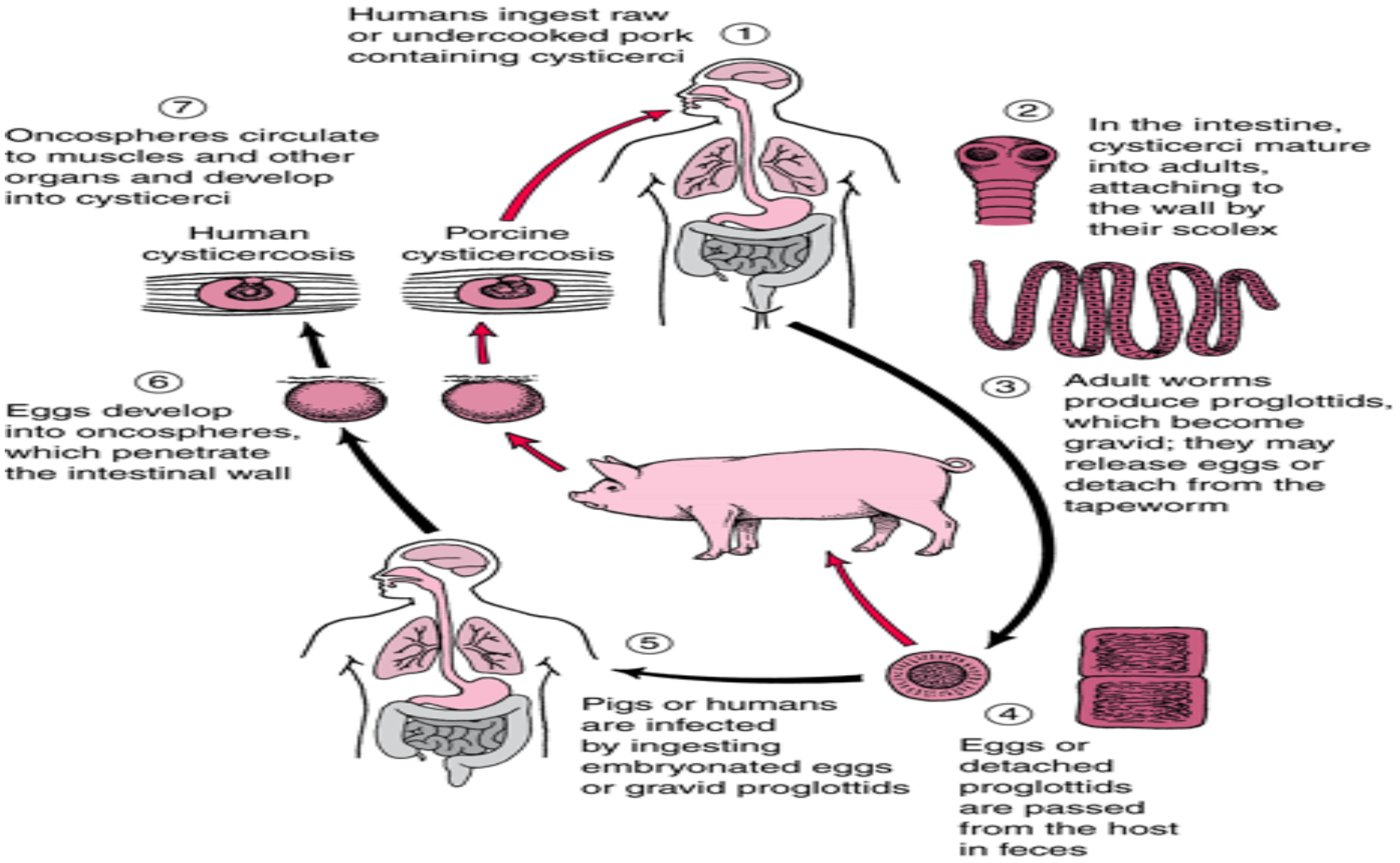
- Is an obligatory parasite of man ,the adult worm live in the **SMALL INTESTINE** .
- **CATTLE** become infected by ingesting grass contaminated with **eggs or gravid segments** which passed from human faeces. In the cattle the onchosphere hatches out go to circulation and transformed to cysticercus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



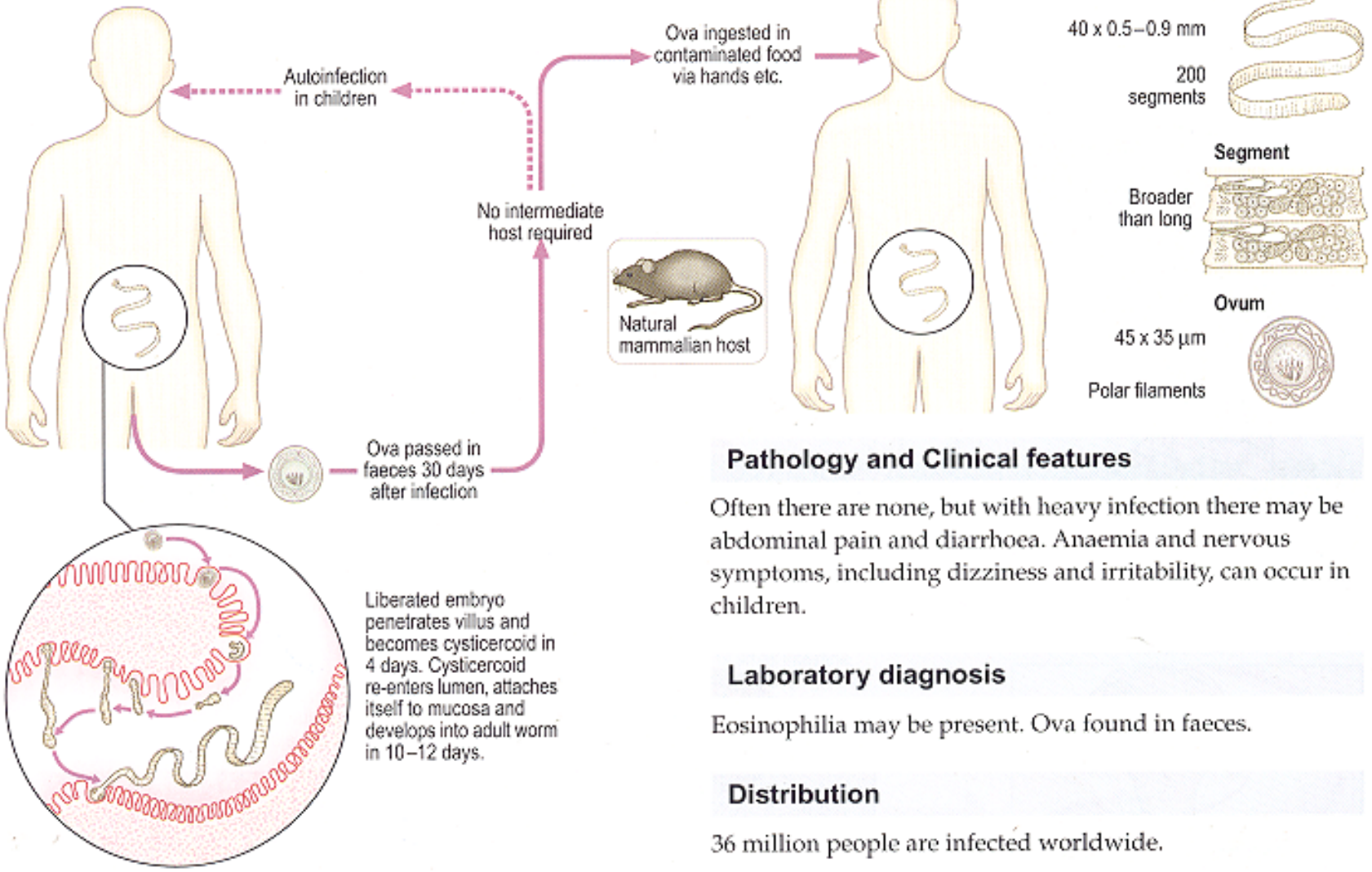
Taenia Solium



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

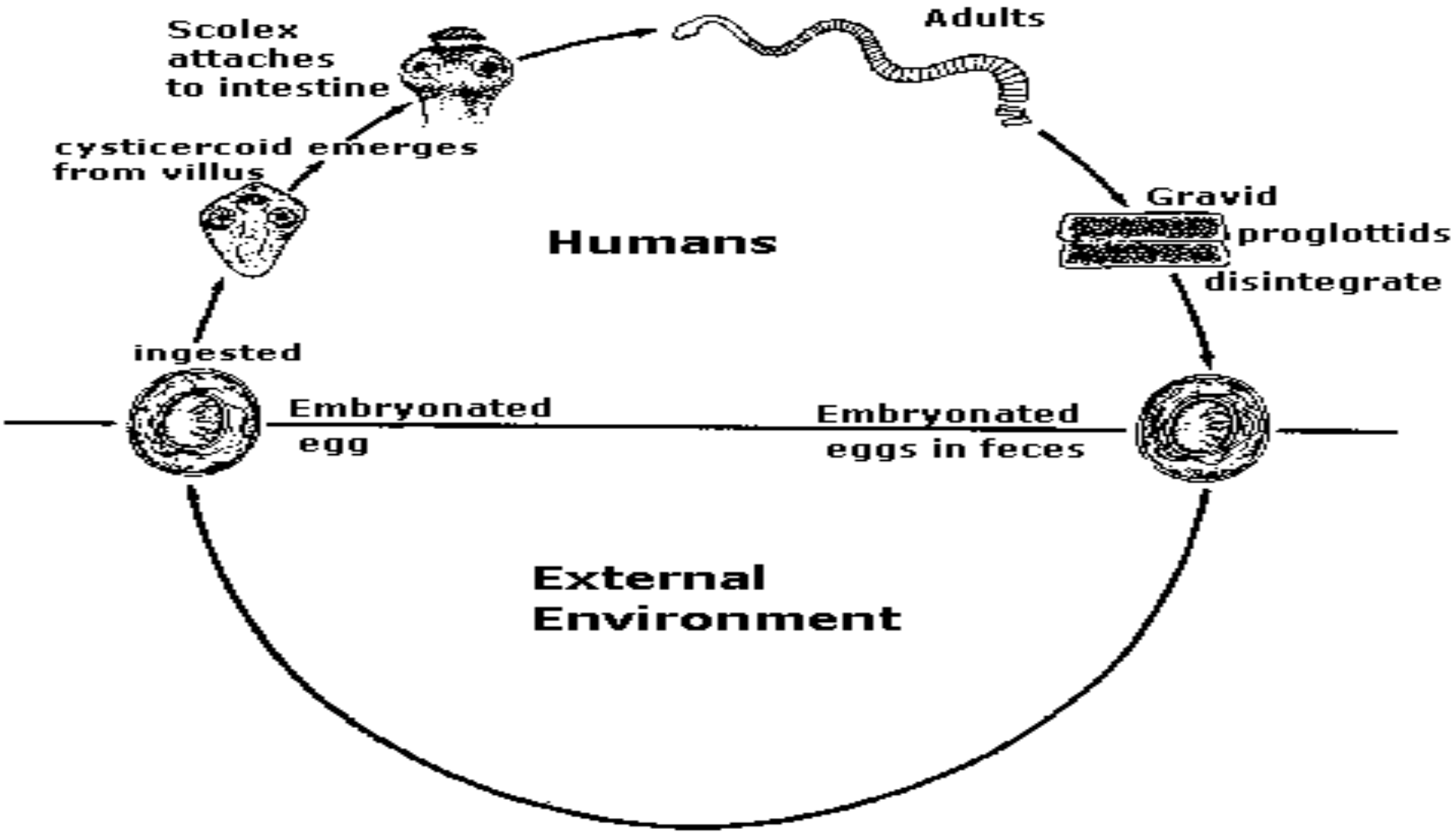
Eosinophilia may be present. Ova found in faeces.

Distribution

36 million people are infected worldwide.

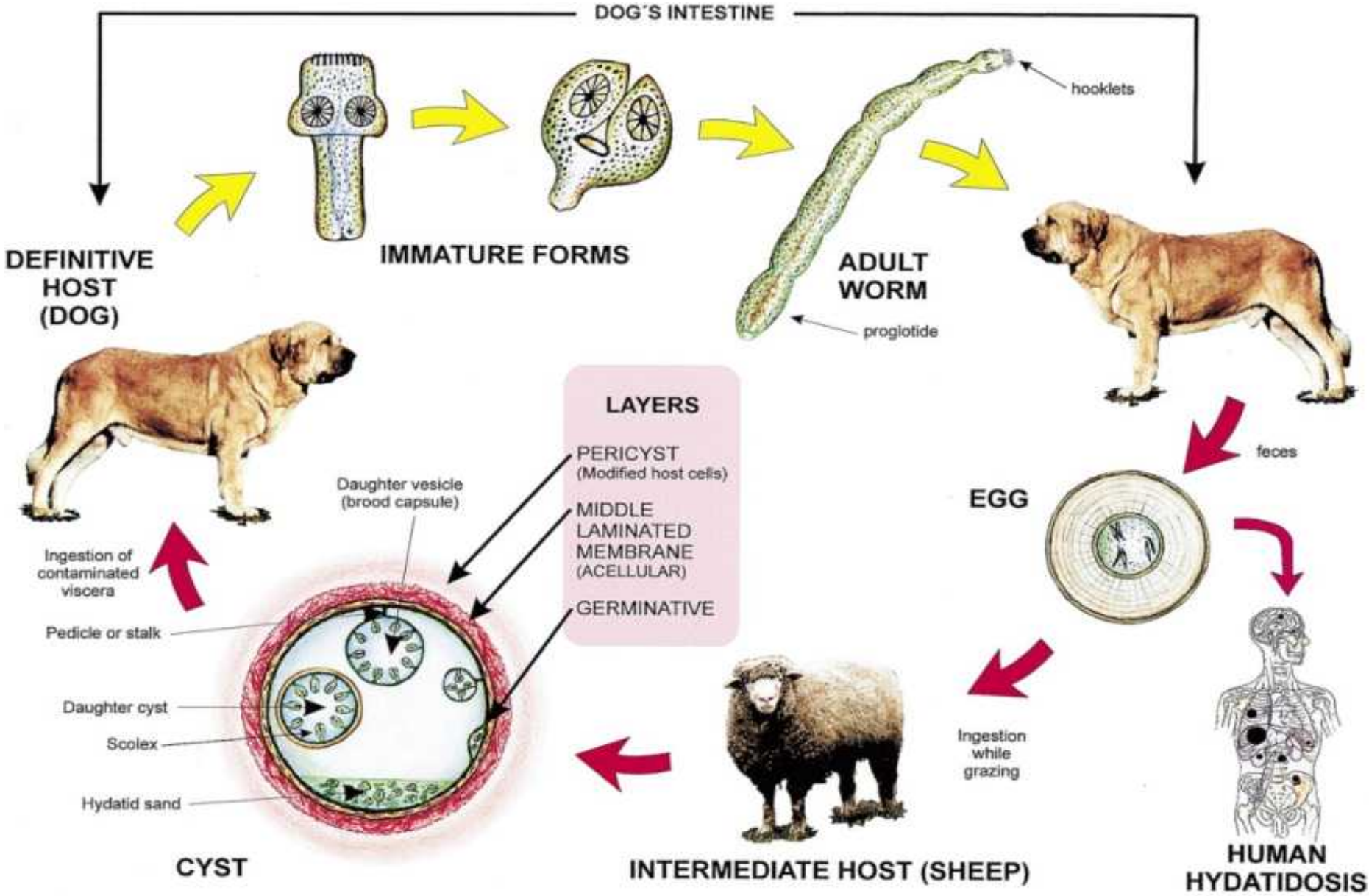
Hymenolepis diminuta (rat tape worm)

Hymenolepis nana



Hymenolepis nana

Echinococcus granulousus



E. granulosus requires two host types, a ***definitive host*** and an ***intermediate host***.

The definitive host of this parasite are **dogs**

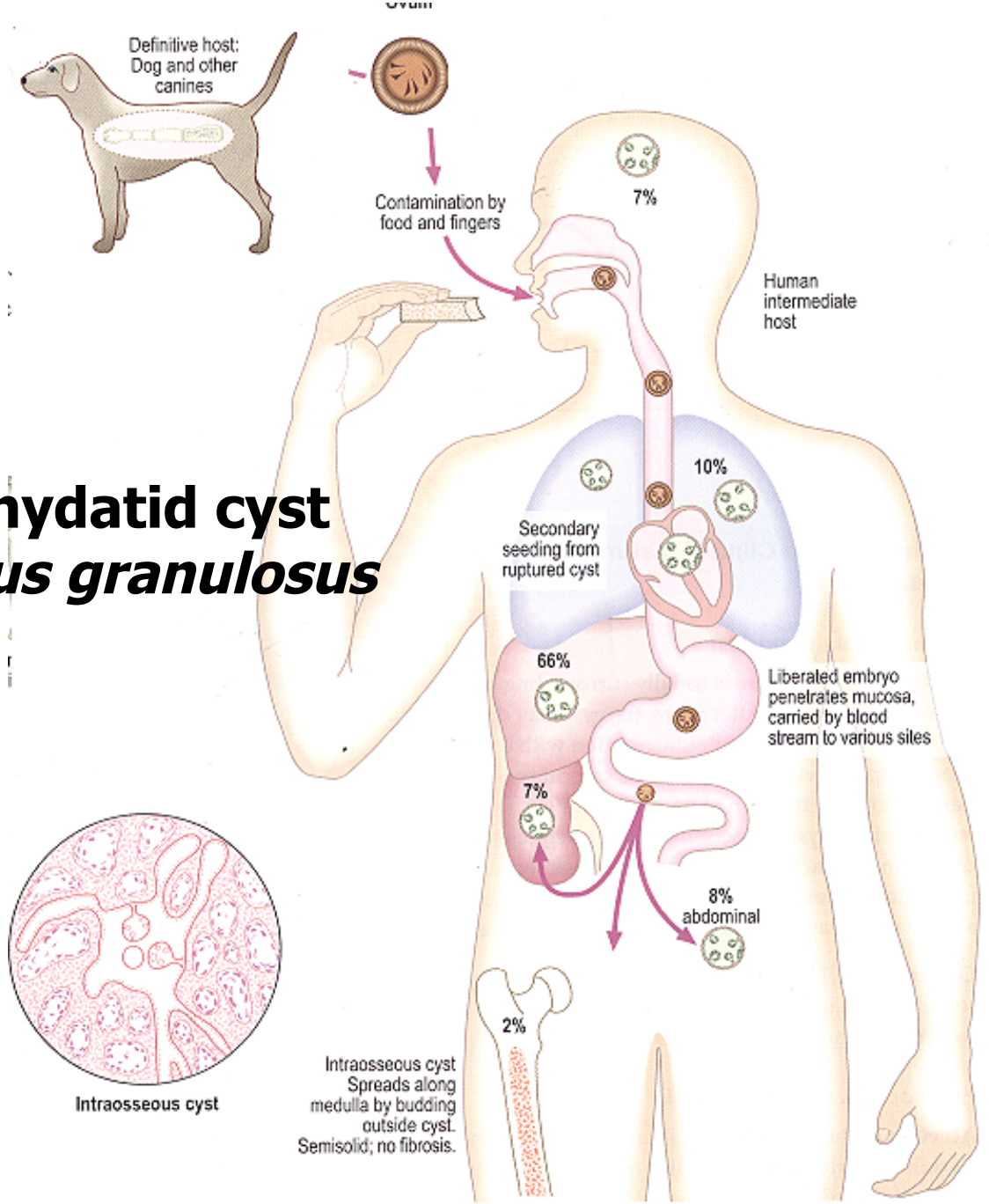
The intermediate host are most commonly **sheep, cattle, pigs, goats**, and **camels** and also **Humans** .

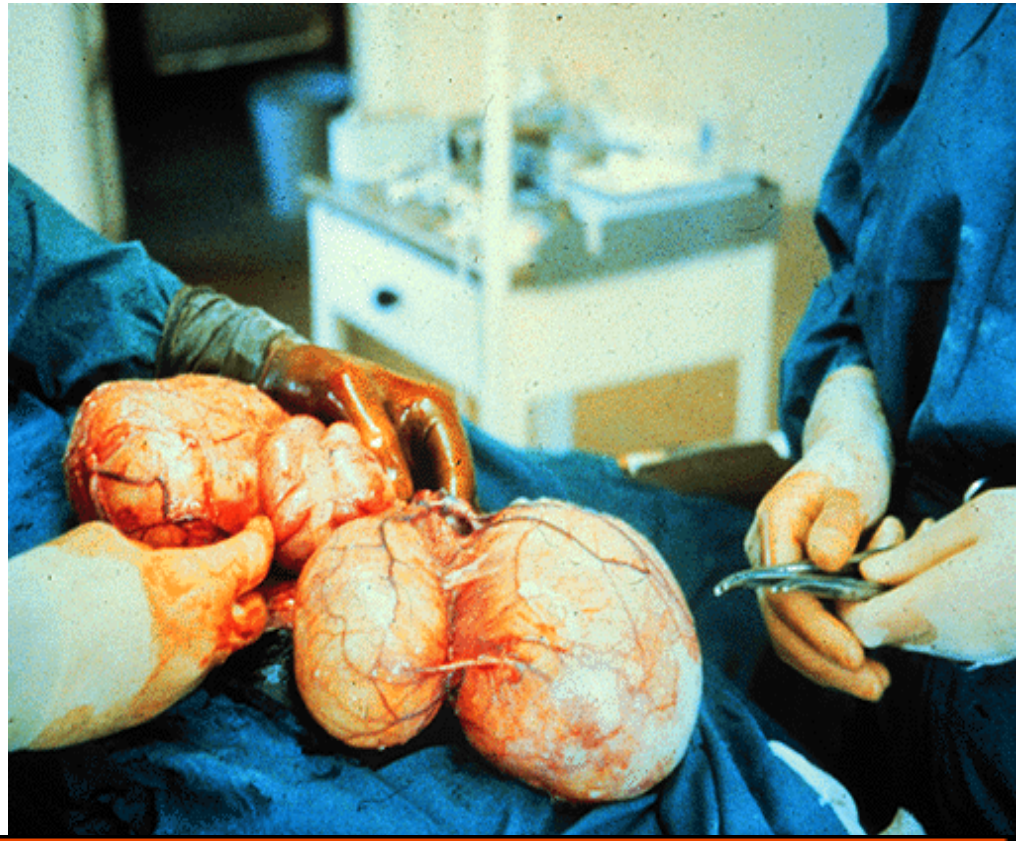
E. Granulosus cyct is ingested and attaches to the mucosa of the intestines in the **definitive host** and there the parasite will grow into the adult stages

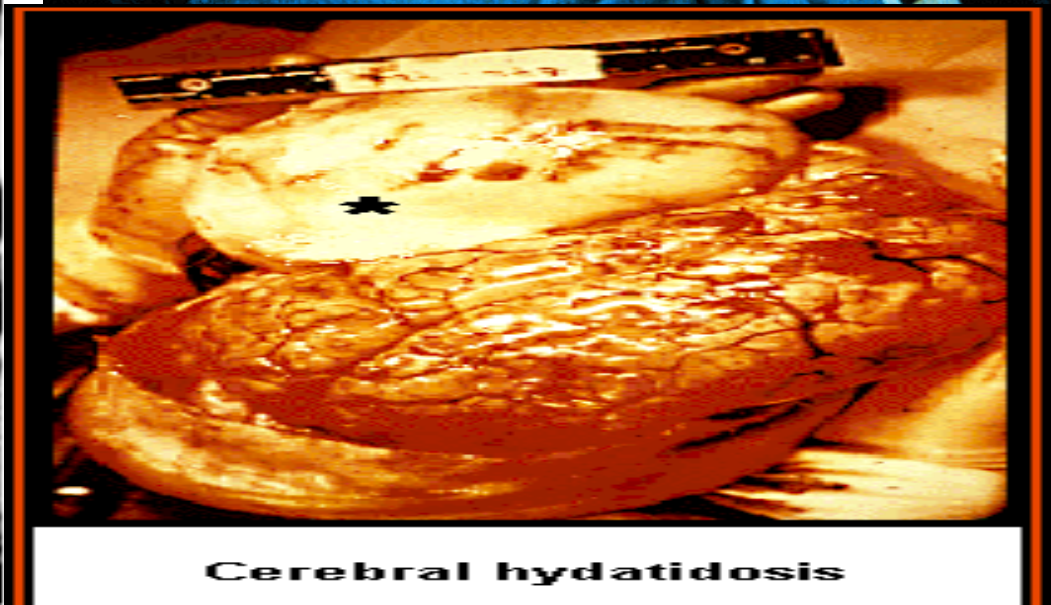
DOG become infected by eating sheep,cattle muscle having hydated cyct which become in the intestine of the DOG as an adult and start releasing eggs witch excreted in the feces

Human become infected 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

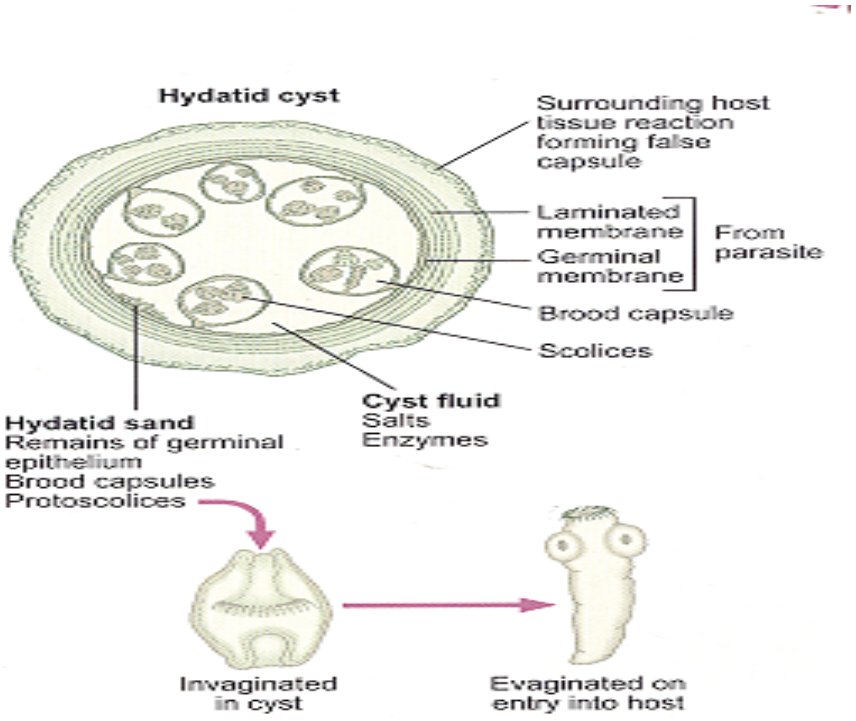


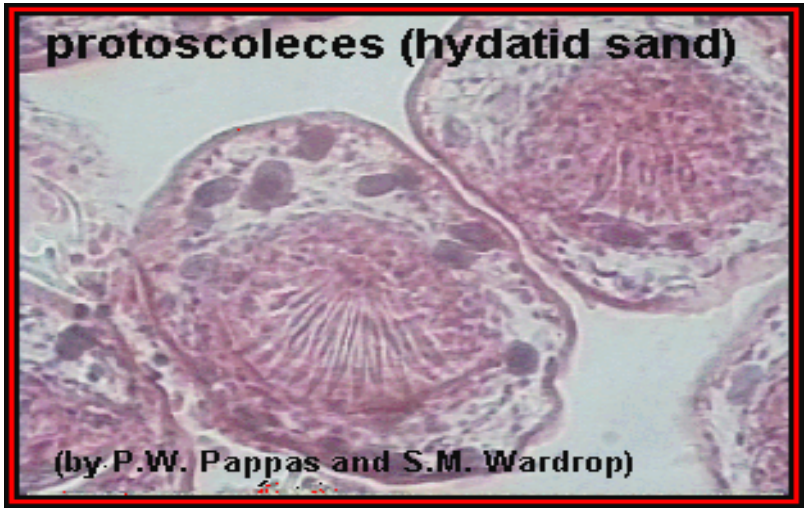




Cerebral hydatidosis

hydatid cyst, which may reach larg size , has 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

- **Radiological examination**: computed tomography (CT), magnetic resonance imaging (MRI) revealed a cystic swelling with smooth outline.
- **Serological examination**: to detect specific antibodies ELIZA,CFT.
- **Casoni`s test:** it is an intradermal test used to detect immediate hypersensitivity in hydatid disease.
- **Microscopical examination:**
- Hydatid fluid may be withdrawn by the fine needle aspiration and examined under the microscope for scolices or hooklets.**THIS IS DANGEROUS PROCEDURE.**

Treatment of HYDATID CYST

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