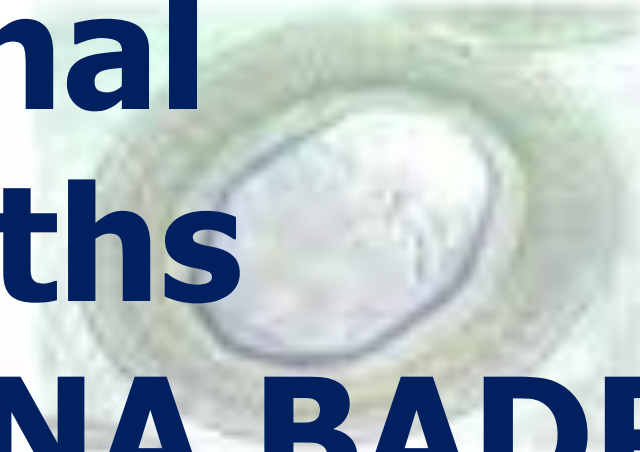




# Intestinal Helminths DR MONA BADR



# CLASSIFICATION OF PARASITES

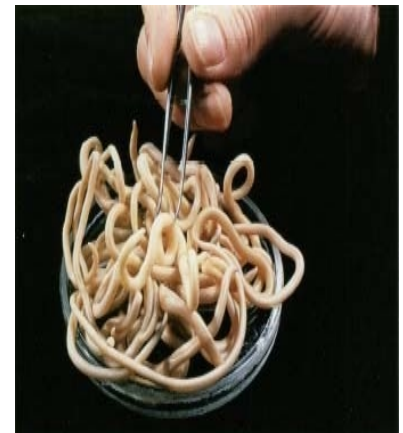
PROTOZOA	HELMINTHS
Unicellular Single cell for all functions	Multicellular Specialized cells
1:Aeobae: move by pseudopodia. 2:Flagellates: move by flagella. 3:Ciliates: move by cilia 4:Apicomplexa(Sporozoa) tissue parasites	<u>Round worms (Nematodes):</u> - elongated, cylindrical, unsegmented. <u>Flat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

# Nematodes : General features

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

- **Intestinal nematodes**
- Tissue nematodes



# Nematodes: common intestinal infections

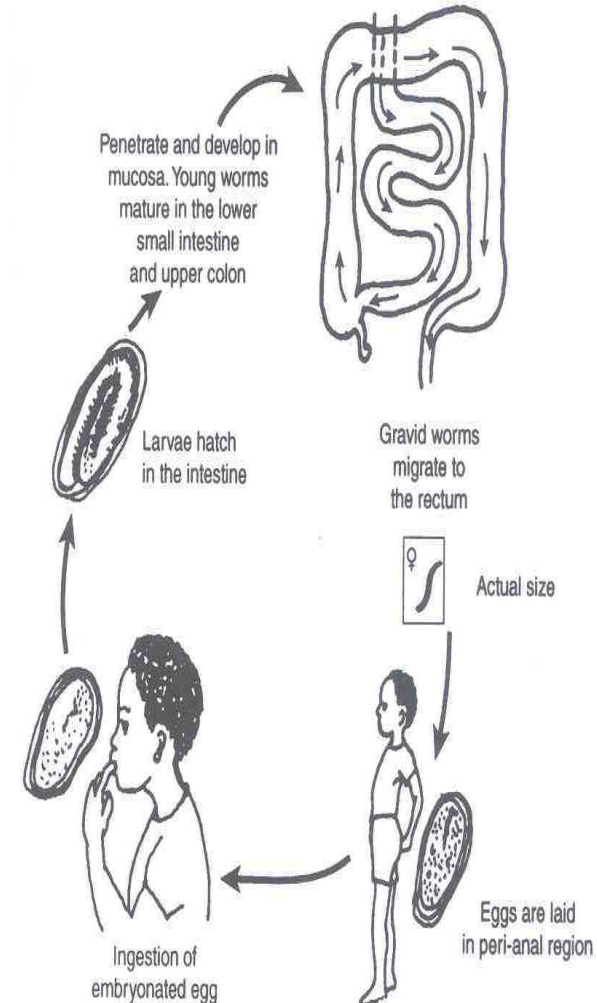
1. *Enterobius (Oxyuris) vermicularis*  
(Pinworm, seatworm, threadworm)
2. *Trichuris trichiura* (whipworm)
3. *Ascaris lumbricoides* (roundworm)
4. *Ancylostoma duodenale* & *Necator americanus*  
(hookworms)
5. *Strongyloides stercoralis*

# 1-Enterobius vermicularis

# (THREAD WORM)

## (Common names :Pin worm, seat worm, (

- Found all over the world but more common in temperate regions. *المناخ المعتدل*
- 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 located **in lumen of cecum** and the female migrate to rectum to deposits her eggs on peri-anal area.
- 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 (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 vulvovaginitis, salpingiti,also adult worm can lodged in the lumen of appendix cause appendicitis.



# Enterobius vermicularis

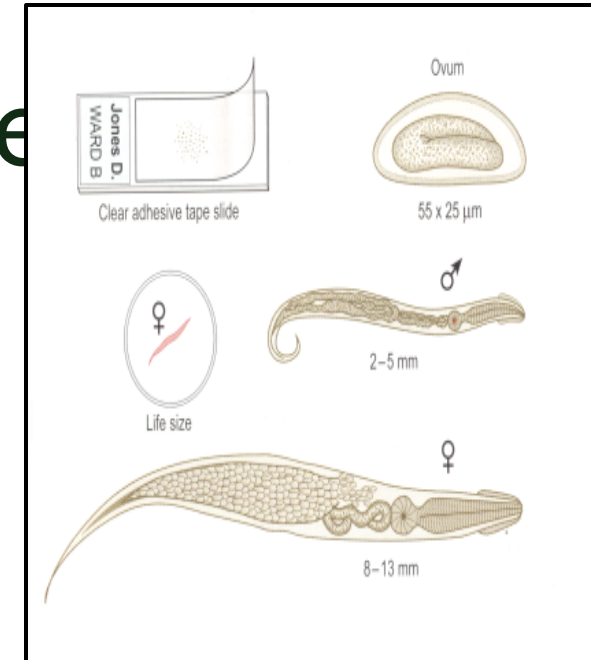
(Oxyuris)

## 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 , Me

for whole family

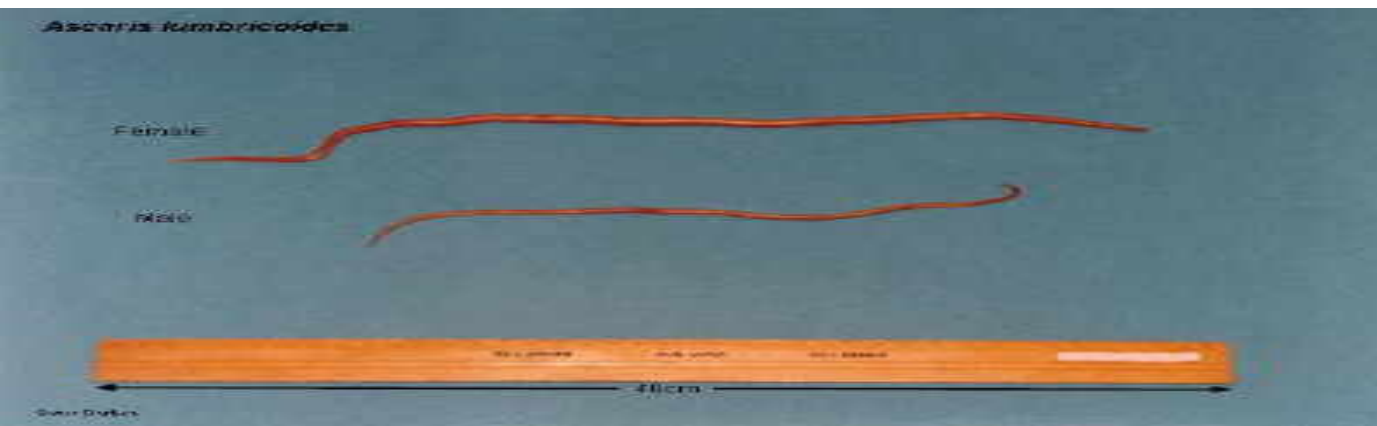


# *Ascaris lumbricoides* (roundworm)

The commonest human helminthes infection all over the world.

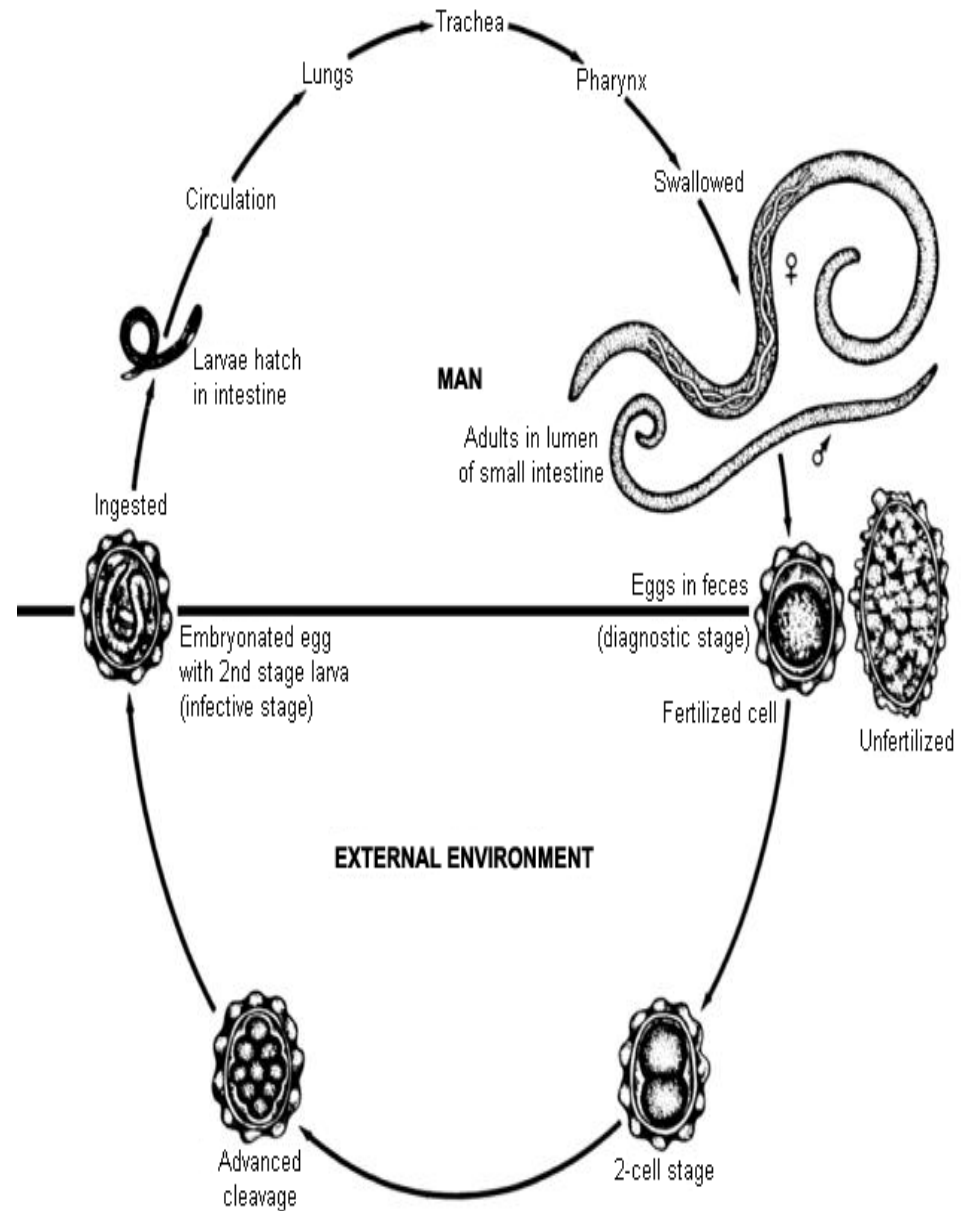
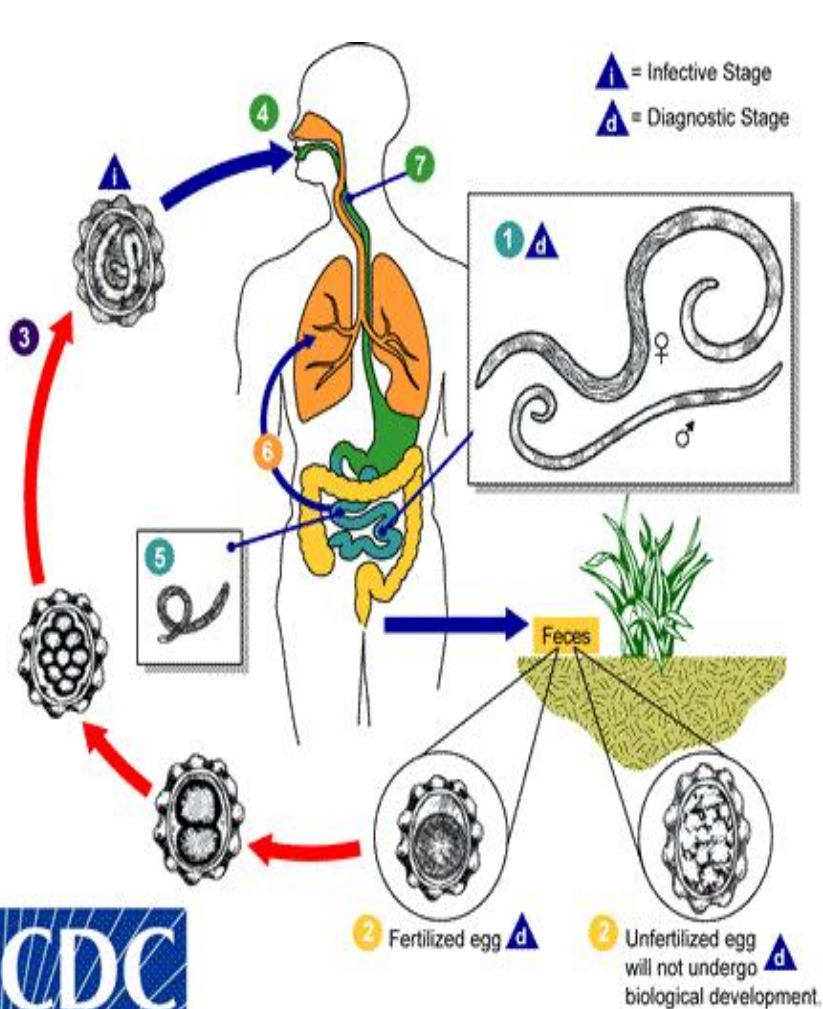
The large round worm which is normally located in the small intestine.

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





# Ascaris Lumbricoidis Life Cycle



# Life cycle of Ascais Lumbricoides

Ascaris parasite infect the human after ingestion of food or water contaminated with Embryonated egg ( **infective stage**) which pass to the duodenum and then 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 fertilized and unfertilized eggs (diagnostic stage) which pass in stool.

# Ascaris eggs



**Diagnostic stage pass in the stool**

(embryonated egg infective stage enter the body with food contaminated in the soil)



Ascaris larva emerging from egg hatch from small intestine to circulation go to the lungs causing LOEFFLER'S SYNDROM



# *Ascaris lumbricoides* (roundworm)

## Pathology:

- 1-Adult worm:

Light infection : asymptomatic.

Heavy infection : intestinal obstruction

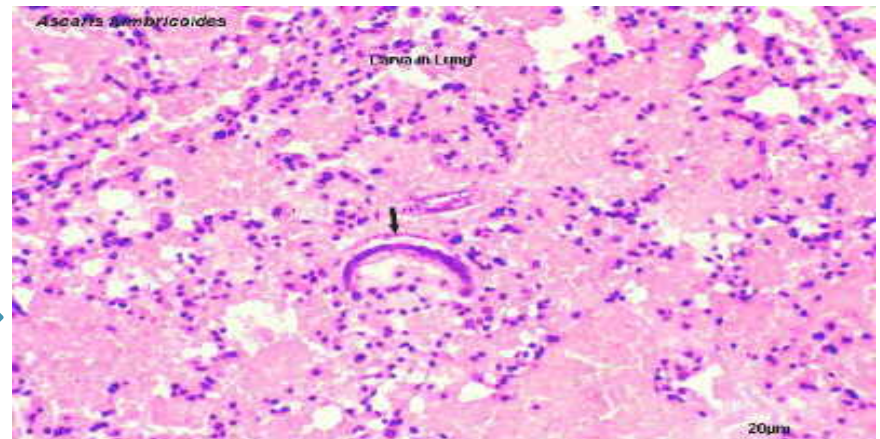
Migrating adult : to bile duct -jaundice

- 2-Larvae: Loeffler`s syndrome

Pneumonitis and bronchospasm, cough with bloody sputum

Eosinophilia, urticaria

Ascaris larva in lung



# *Ascaris lumbricoides* (roundworm)

## Diagnosis:

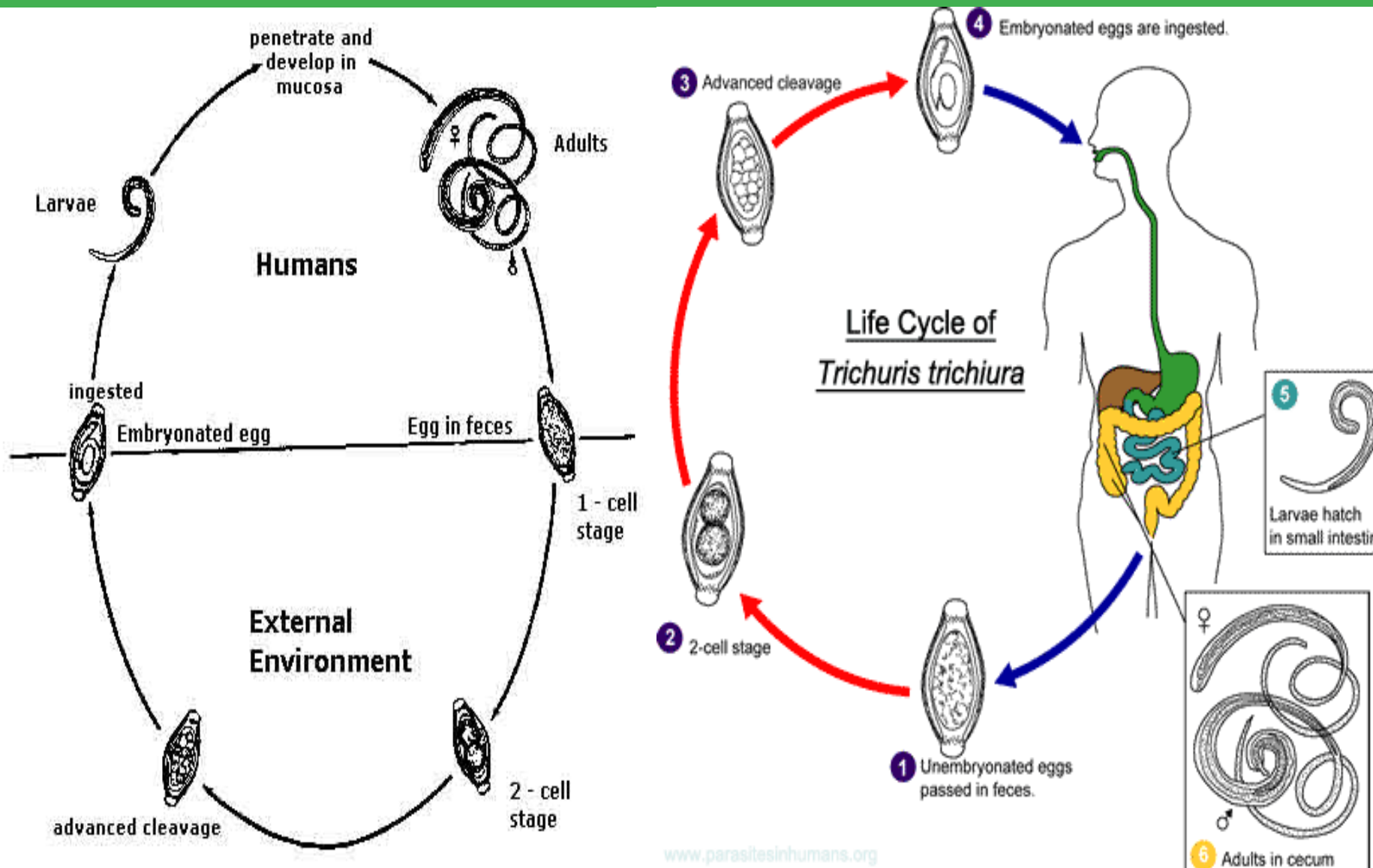
- eggs in stool (fertilized or unfertilized).
- larvae in sputum.
- adult may pass with stool.



Treatment:

**Albendazole , Mebendazole**

# 2-Trichuris trichiura (Whipworm)



# *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.



# *Trichuris trichiura* (Whipworm)

## Pathology

- light infection : asymptomatic
- heavy infection :. Rectal prolapsed in children is a common complication.

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



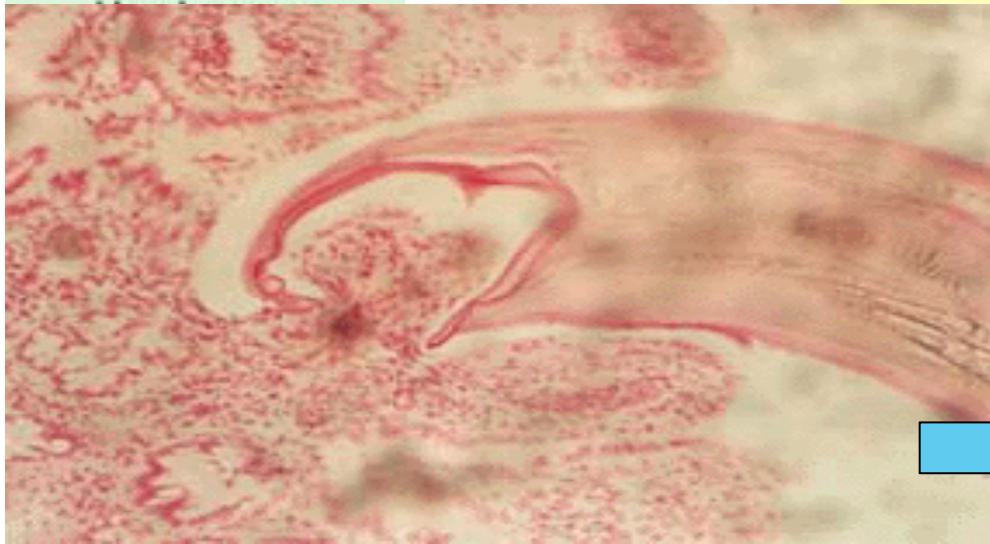
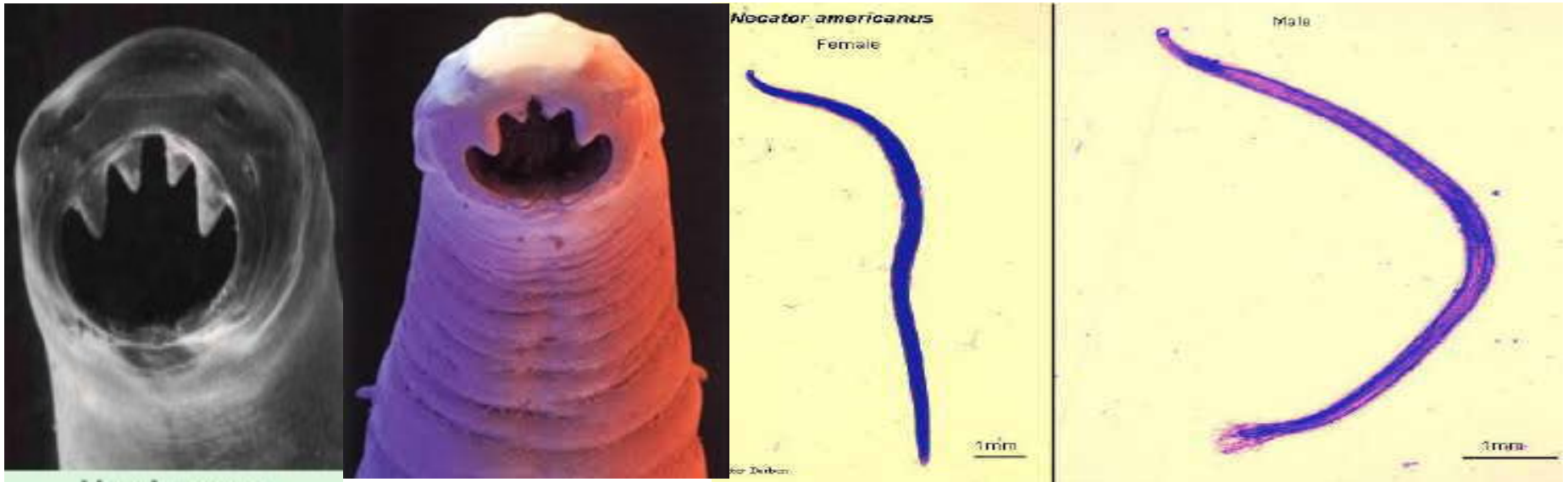
**Treatment : Albendazole.**





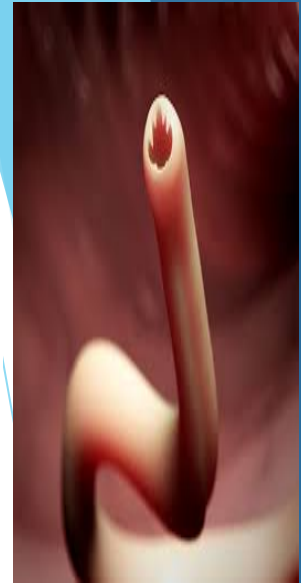
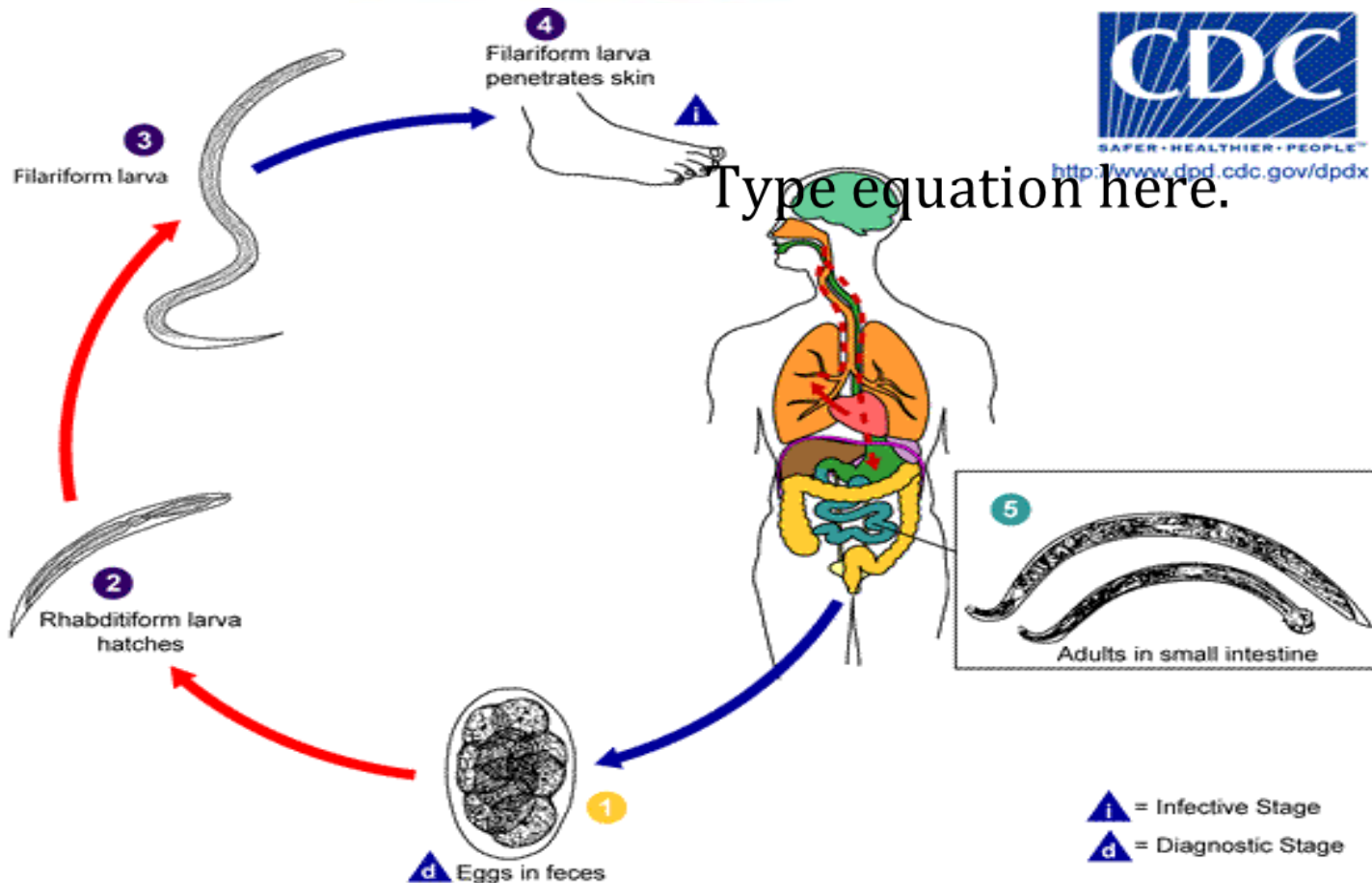
# Hook worms

## *Ancylostoma duodenale* & *Necator americanus*



Buccal cavity attached to intestinal m

# Life cycle of HOOK WORM (Ancylostoma Duodenale & Nector Americanus)



- Infective stage is **FILARIFORM LARVA** penetrate the skin cause itching and dermatitis then larva go to the circulation ( lungs causes slight pneumonitis and bronchitis ) larva then swallowed and go to **small intestine** ,they attach to the mucous membrane where they mature into **adult** and the **female** starts laying **eggs** to be passed in stool( **not infective** ).
- The eggs need to be in soil for about one week to become **FILARIFORM LARVA** INFECTIVE STAGE.

# Hook worms

## *Ancylostoma duodenale* & *Necator americanus*

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

# 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  $\pm 2.5$ mm.
- adult live in mucous membrane of duodenum jejunum rarely mucous membrane of bronchus.
- **AUTOINFECTION IS VERY IMPORTANT CRITERIA** .

# Strongyloides stercoralis life cycle

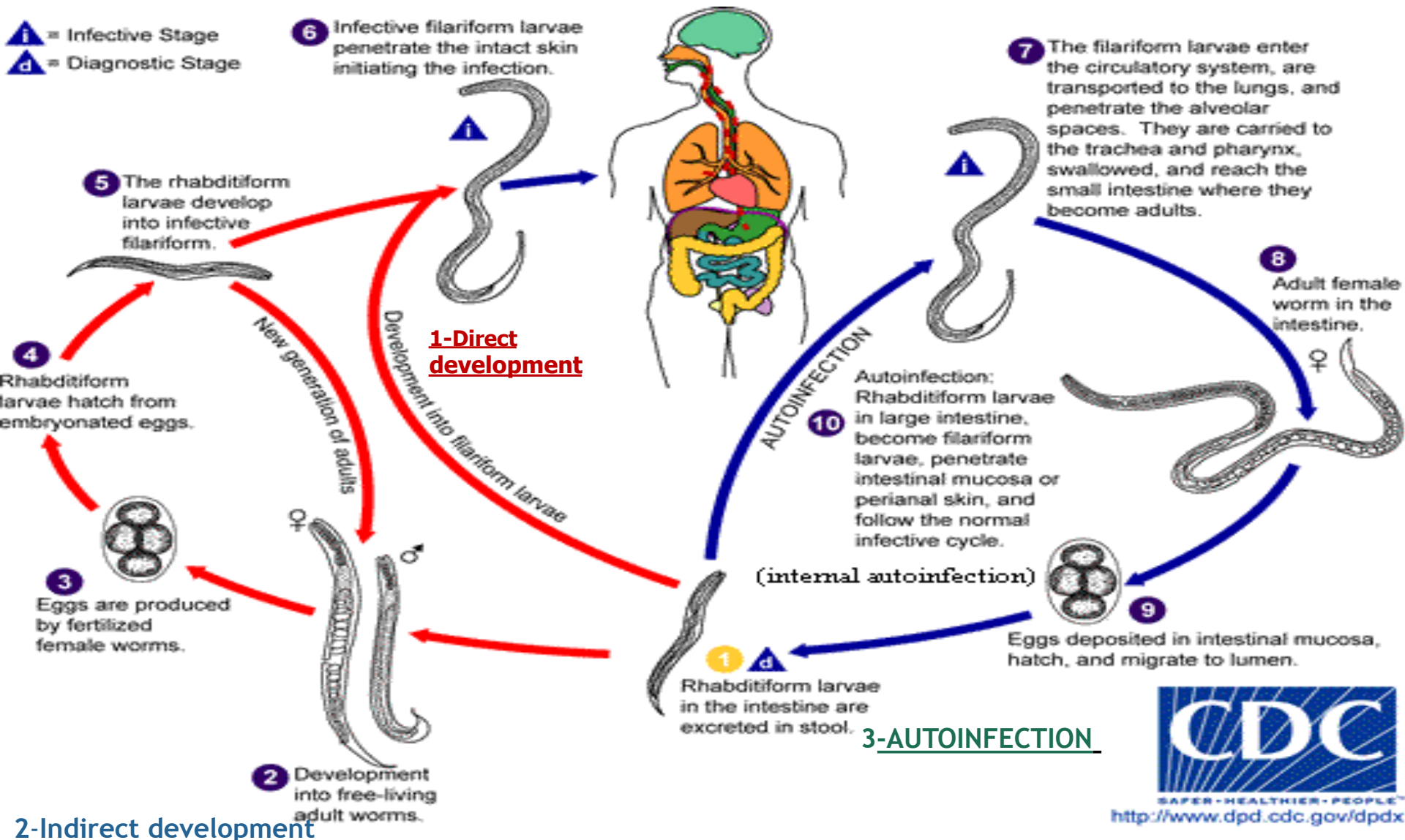
- The parasite shows 3 different modes of development:
- **1-Direct development:** The **rhabditiform** larva pass from stool and become directly a **Filariform** larva if the environment of the soil is suitable .
- **2-Indirect development :** in external environment Rh. larva becomes free living adults,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

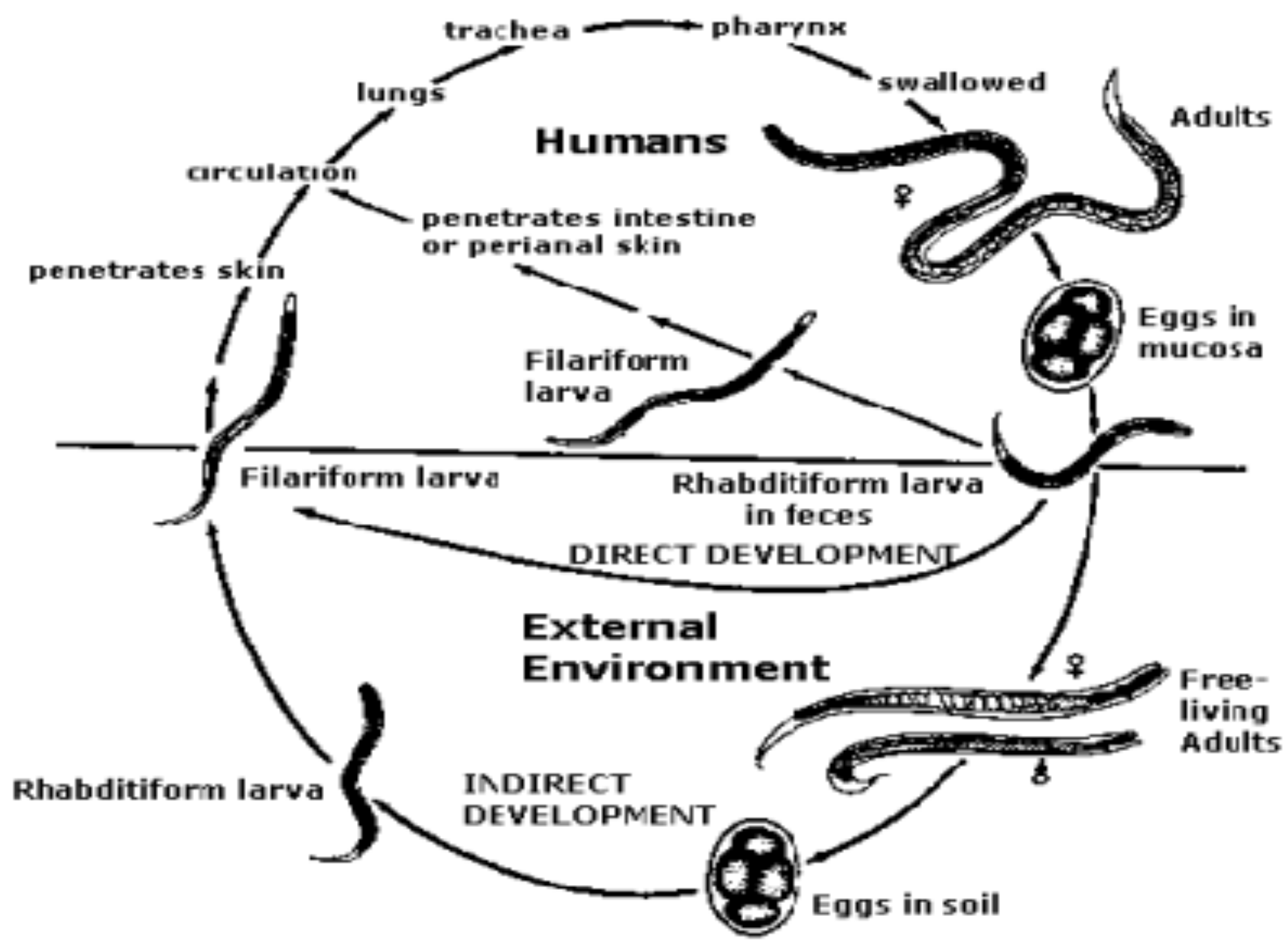


# Strongyloides stercoralis life cycle

- 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 peri-anal 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 –granulomatous changes –necrosis– perforation ,peritonitis ,death.



# Strongyloides stercoralis

## Diagnosis:

rhabditiform larvae  
diagnostic stage in:

- Stool examination
- Duodenal aspirate



**Treatment:** Albendazole,  
Mebendazole



# Common intestinal Nematodes

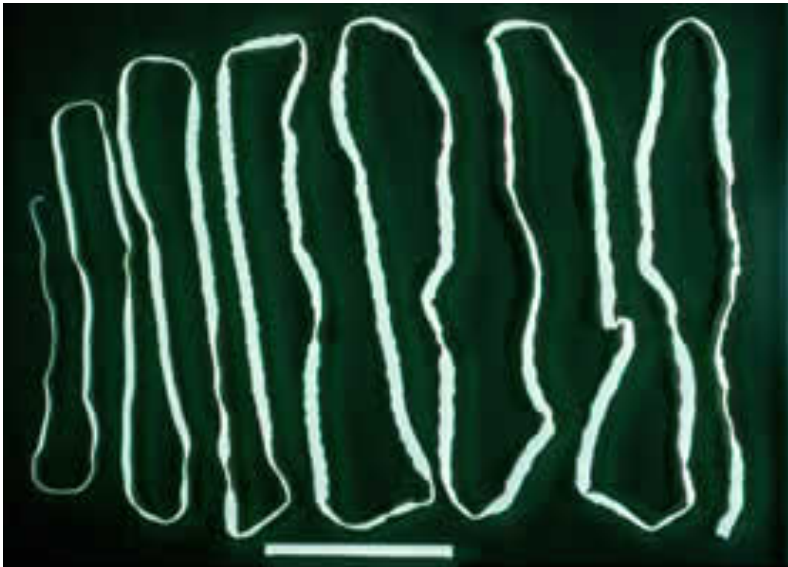
Name	Transmission	Location of adult in human	Infective stage	Diagnostic stage	Clinical picture
1-Enterobius vermicularis	Swallowing the eggs, <b>Autoinfection</b>	Large intestine cecum	eggs	Adult pass in anus at midnight Cellulose adhesive tape we detect adult worm	1- pruritus ani during night 2-perisistant itching 3-inflammation around the anus.*****
2-Ascaris lumbricoids	Swallowing of <b>Emberionated egg</b>	Small intestine duodenum	<b>Embryonated eggs</b> food contaminated	<b>1-Fertilized &amp;unfertilized eggs in stool</b> 2-Adult worm in stool 3-Larva in sputum.	<b>Asymptomatic</b> <b>Intestinal obstruction</b> <b>in heavy infection</b> <b>pneumonitis &amp;bloody</b> <b>sputum*****.</b>
3-Trichuris trichura	Swallowing of <b>Embryonatsd eggs</b>	Large intestine	<b>Emberyonated eggs</b>	<b>Unembryonated eggs</b>	Asymptomtatic in light infection Rectal prolapse in children *****

# Common intestinal Nematodes

Name	Transmission	Location of adult in human	Infective stage	Diagnostic stage	Clinical picture
4-Hook worm Ancylostom Dudenalle& Nector Amiricanus	Larval penetration of skin	Small intestine	Filariform larva	Eggs in stool	Itching & pruritis at sight of entry. Cough and blood in the sputum at larval migration stage. Loss of blood <b>MICROCYTIC HYPOCHROMIC ANEAMIA*****</b>
5-Strogyloids Stercoralis	Larval penetration of skin <b>AUTOINFECTION</b>	Small intestine	Filariform Larva	Rhabditiform Larva	Pruritus at the site of larval penetration. Inflammation in the small intestine. <u>Disseminated strongyloidiasis and AUTOINFECTION</u> : in patient with <b>immunodeficiency</b> , uncontrolled diarrhea – granulomatous changes –necrosis– perforation ,peritoniti s ,death

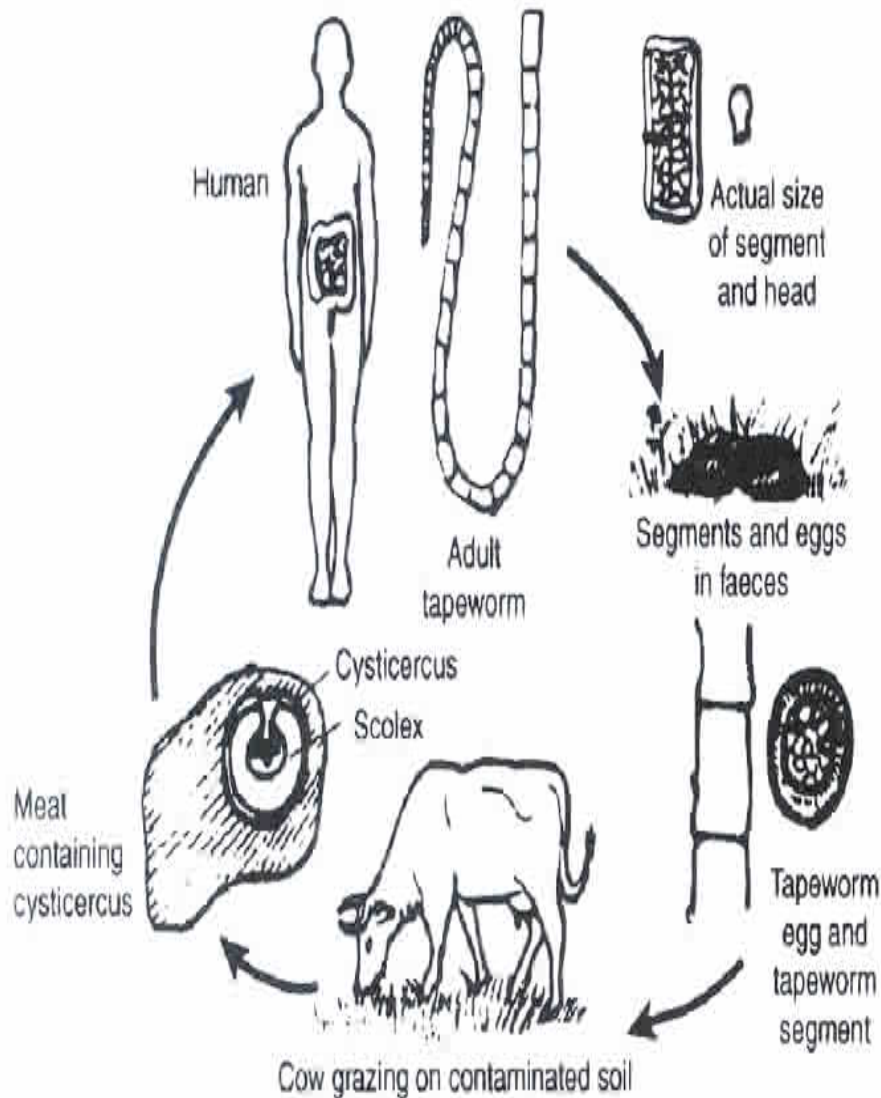
## Cestodes tape like segmented parasite

- 1- *Taenia saginata*
- 2- *Taenia solium*
- 3- *Echinococcus granulosus*



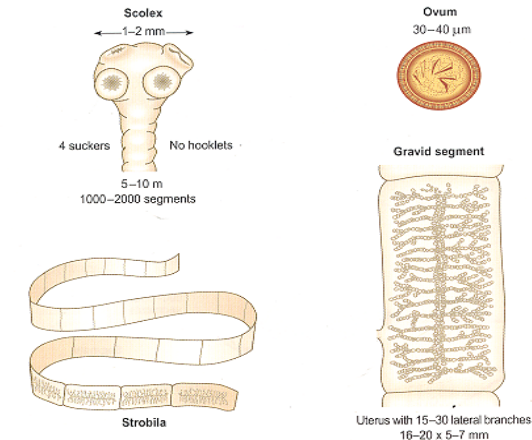
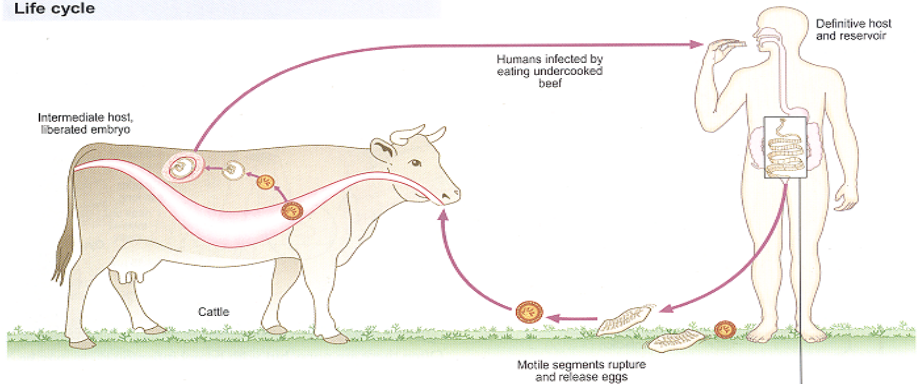


# Taenia saginata life cycle



## *Taenia saginata* (beef tape worm)

### Life cycle



### Pathology and Clinical features

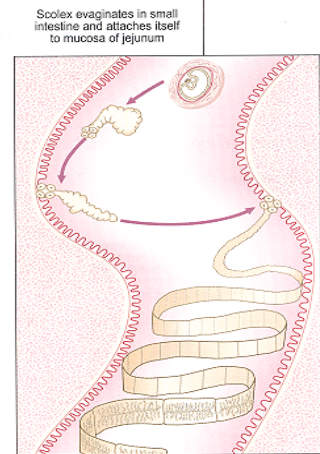
Usually there is no pathology as *Cysticercus bovis* is unknown in humans. Occasionally there is vague alimentary upset.

### Laboratory diagnosis

Gravid segments, ova and scolex can be found in faeces. Uterine branches of the mature segments may be seen in a crush preparation between two glass slides, or by Indian ink preparation, as in *T. solium*. Ova are also found on the perianal skin (on clear adhesive tape slides).

### Distribution

*Taenia saginata* is found in beef-eating areas, especially in the tropics.



Maturation time 9-10 weeks.  
Life span up to 25 years

## 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 diarrhea.

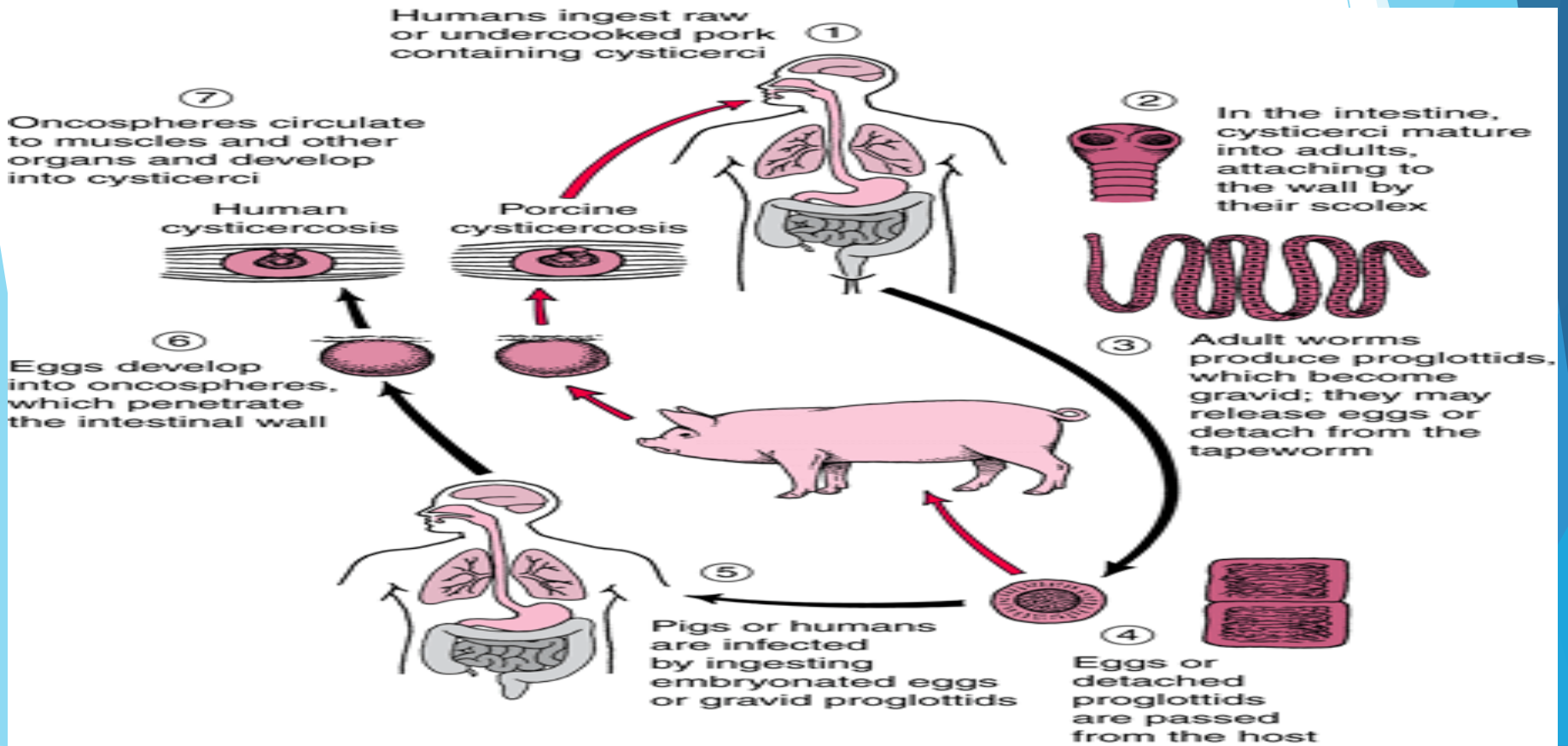


# Life cycle of Taenia solium

Man can be infected by 2 ways either eating eggs or eating under cooked pork

**Eating egg will lead to cyst in various part of his body (cysticercosis) in eye, brain can be very dangerous.**

Eating undercooked pork will have adult worm in the small intestine





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

of this parasite are **dogs**

commonly **sheep, cattle, pigs, goats, and camels** and also **Humans**

The **definitive host**

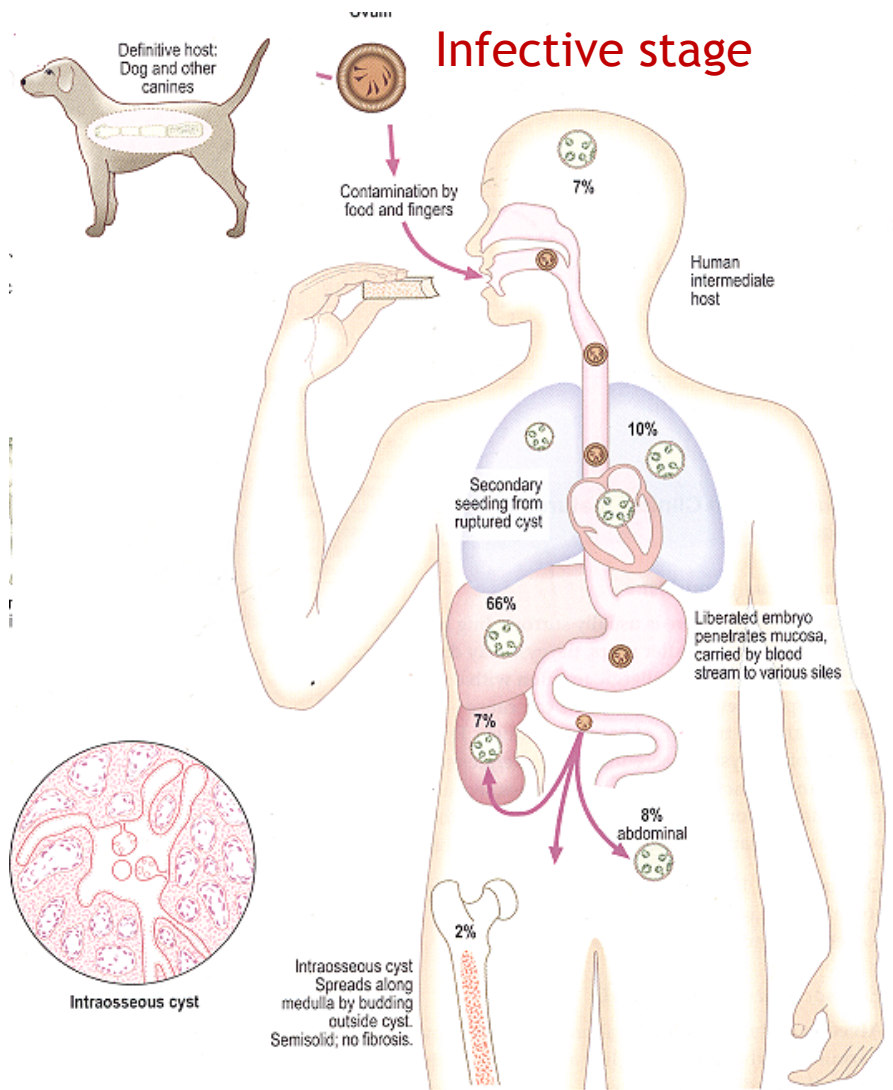
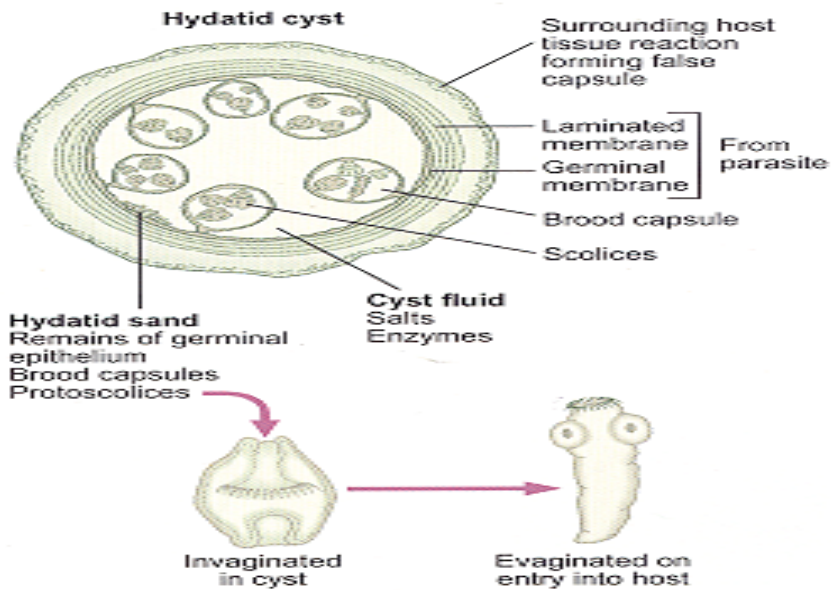
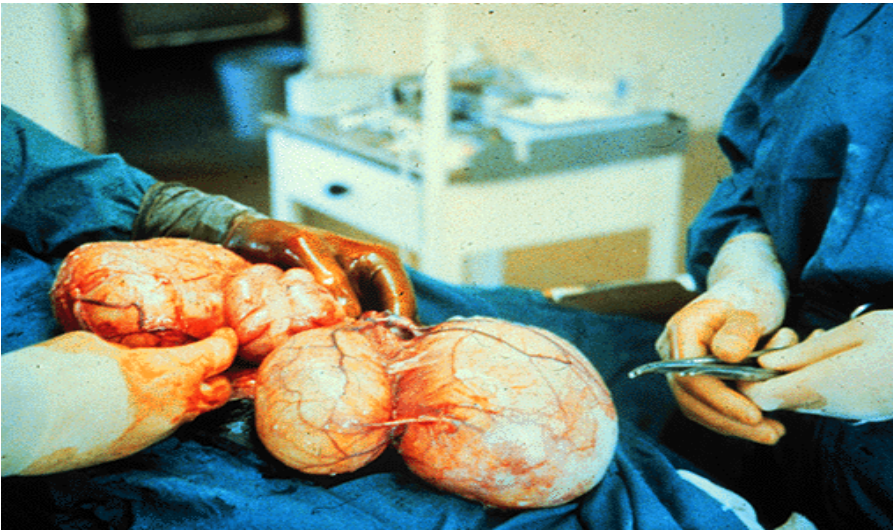
The **intermediate host** are most

*E. Granulosus* cyst 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 cyst which become in the intestine of the **DOG** as an adult and start releasing **eggs** witch excreted in the faces

**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.

# Hydatid cyst



## Location of hydatid cyst Echinococcus granulosus

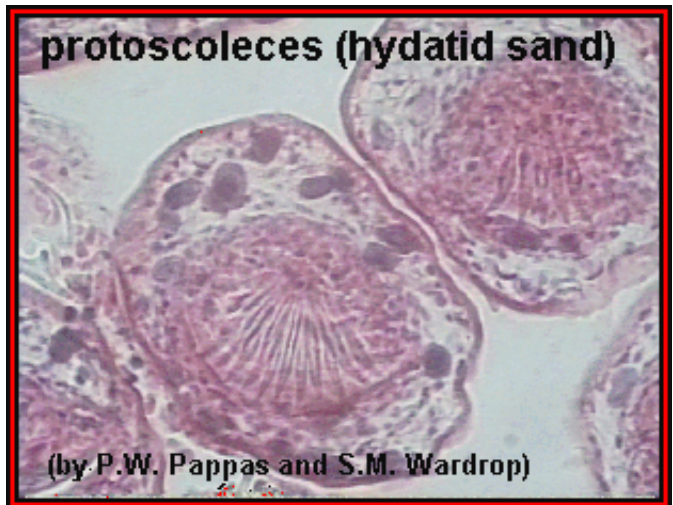
# Hydatid cyst



Cerebral hydatidosis

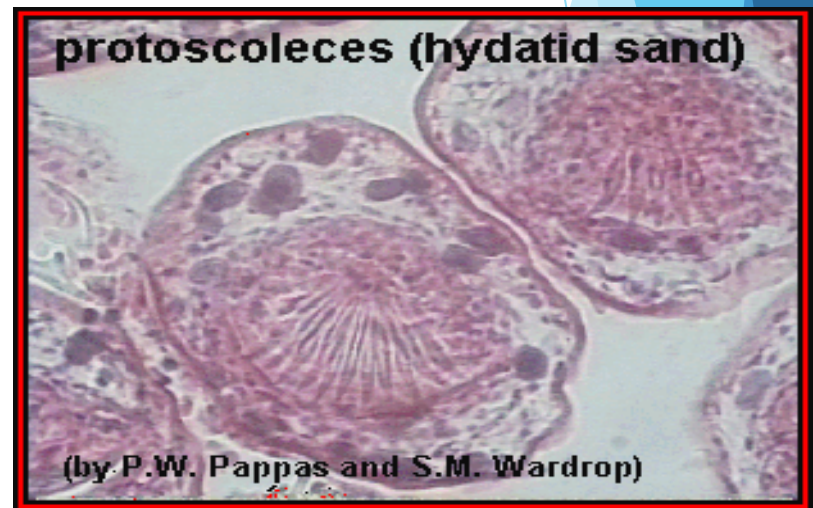
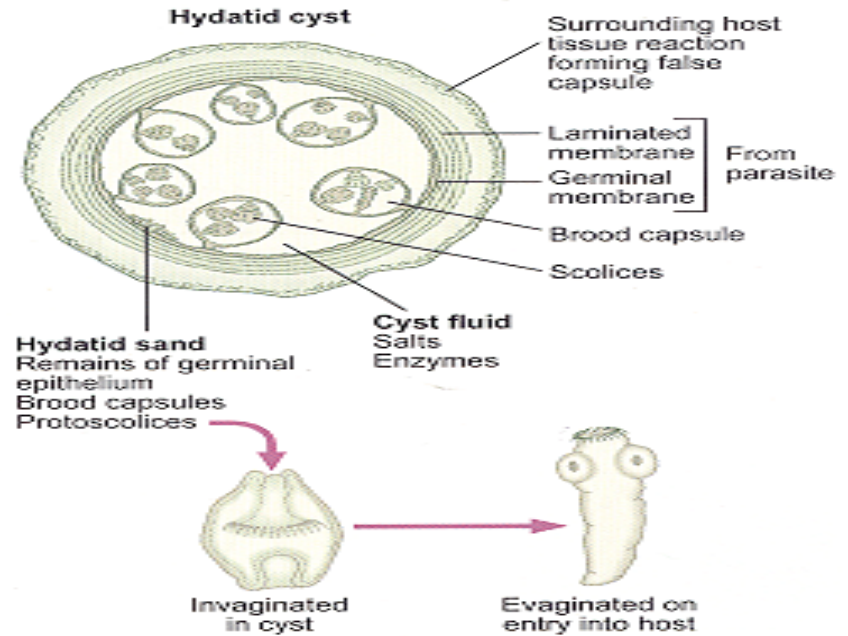


protoscoleces (hydatid sand)



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

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

- 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 , cysticercosis):

Depends on clinical condition : Surgical and/or Albendazole

# Common Tapeworm Infections

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

