

# **Intestinal Helminths DR MONA BADR**

# CLASSIFICATION OF PARASITES

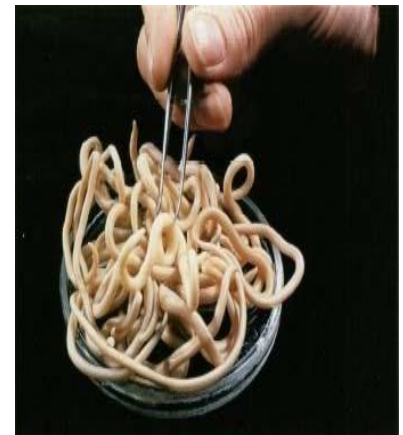
PROTOZOA	HELMINTHS
<p>Unicellular Single cell for all functions</p>	<p>Multicellular Specialized cells</p>
<p>1:Aoebae: move by pseudopodia. 2:Flagellates: move by flagella. 3:Ciliates: move by cilia 4:Apicomplexa(Sporozoa) tissue parasites</p>	<p><u>Round worms (Nematodes):</u> - elongated, cylindrical,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

# 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

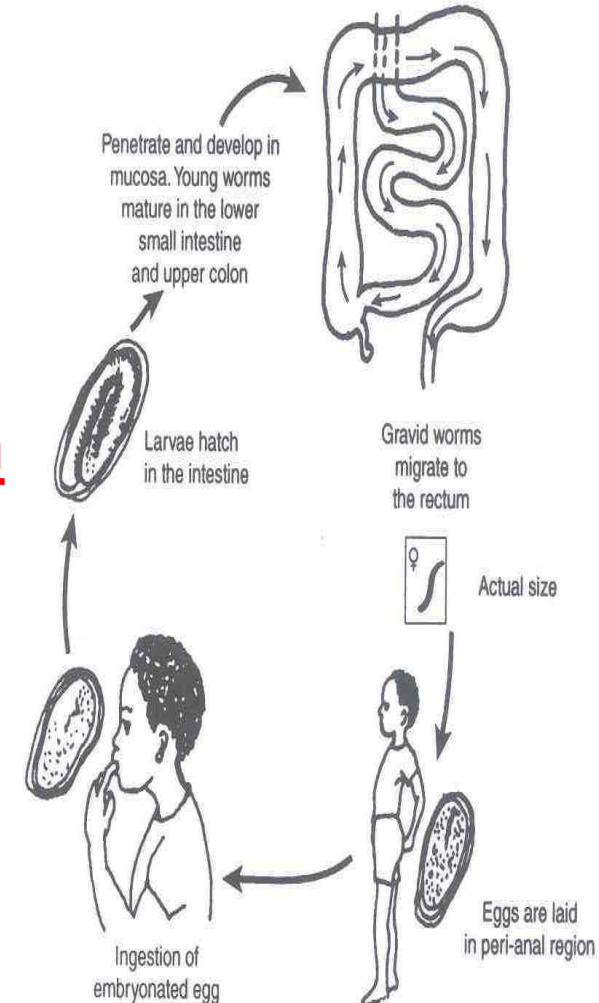
1. *Enterobius (Oxyuris) vermicularis*  
(Pinworm, seatworm, threadworm)
2. *Trichuris trichiura* (whipworm)
3. *Ascaris lumbricoides* (roundworm)
4. *Ancylostoma duodenale* & *Necator americanus*  
(hookworms)
5. *Strongyloides stercoralis*

# 1-Enterobius vermicularis

# (THREAD WORM)

(Common names :Pin worm, seat worm, )

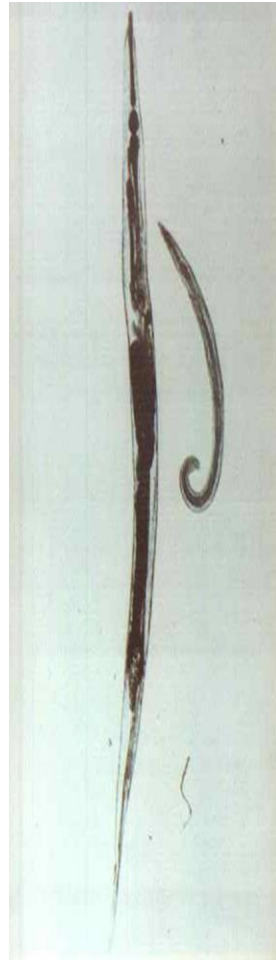
- ▶ Found all over the world but more common in temperate regions. **المناخ المعتدل**
- ▶ Children are more often evolved than adults , it tends to occur in groups living together such as families , army camps or nursery.
- ▶ Adult worms are located **in lumen of cecum** and the female migrate to rectum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



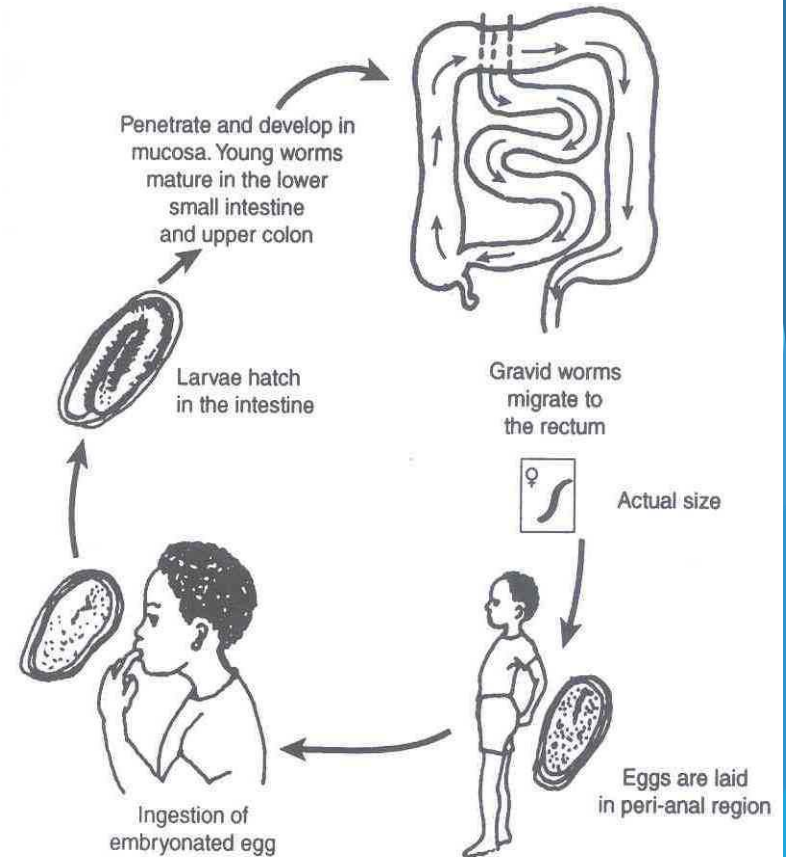
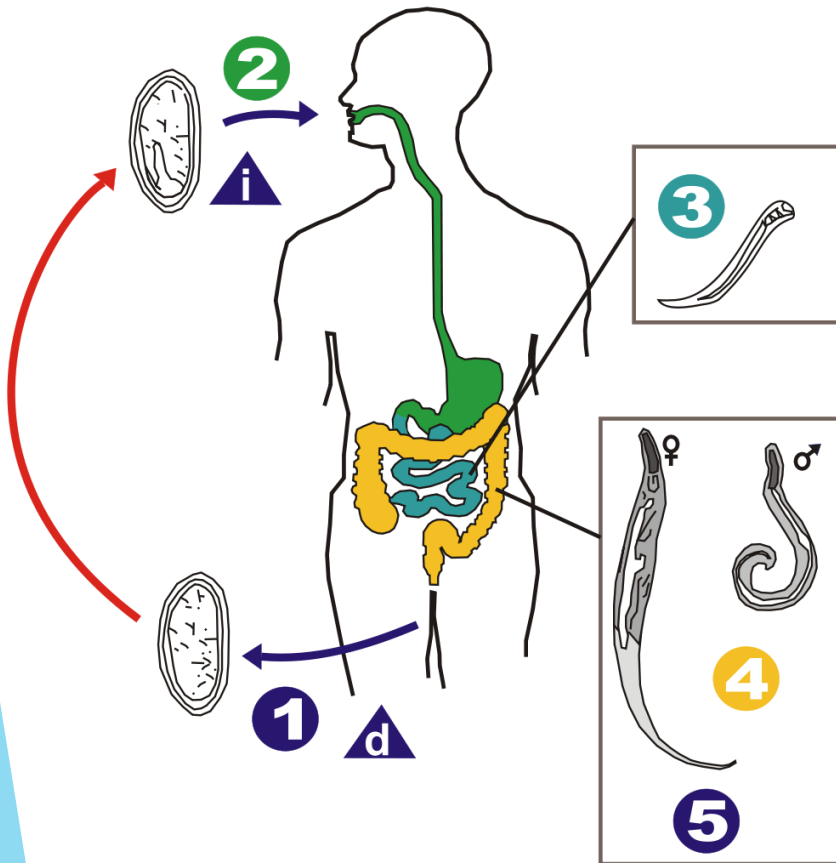
# Enterobius vermicularis (Oxyuris)

## Pathology

- ▶ Some 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 perianal region.
- ▶ Infected children may suffer from emotional disturbance ,insomnia ,anorexia , loss of weight and loss of concentration and enuresis.
- ▶ Ectopic infection(fallopian tubes infection) occurs in women if the adult female parasite invade vulva and vagina result in vulvovaginitis, salpingitis, also adult worm can lodged in the lumen of appendix cause appendicitis.



# Enterobius vermicularis

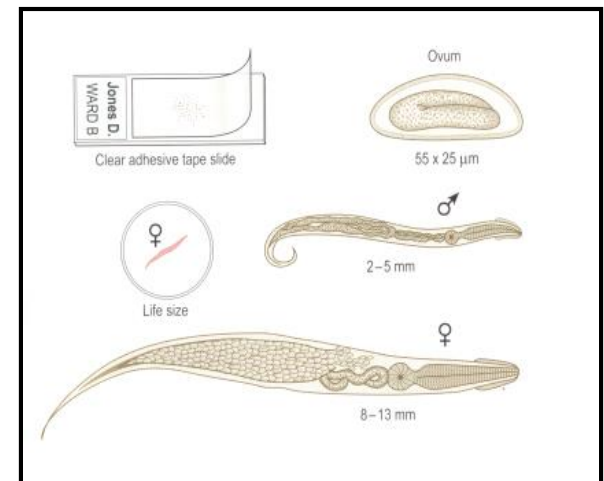


# Enterobius vermicularis (Oxyuris)

## 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** Albendazole , Mebendazole  
for whole family





# *Ascaris lumbricoides* (roundworm)

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

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*

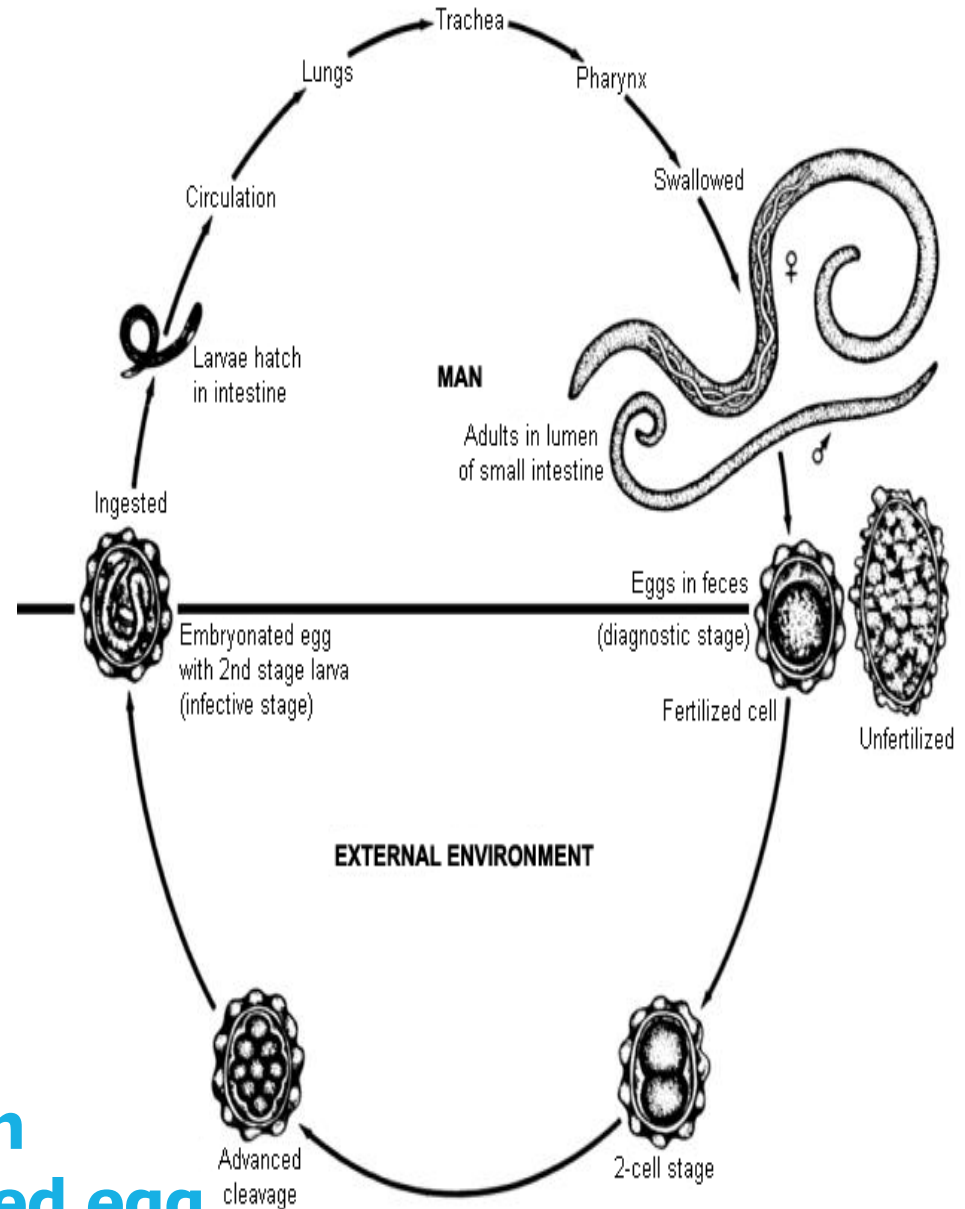
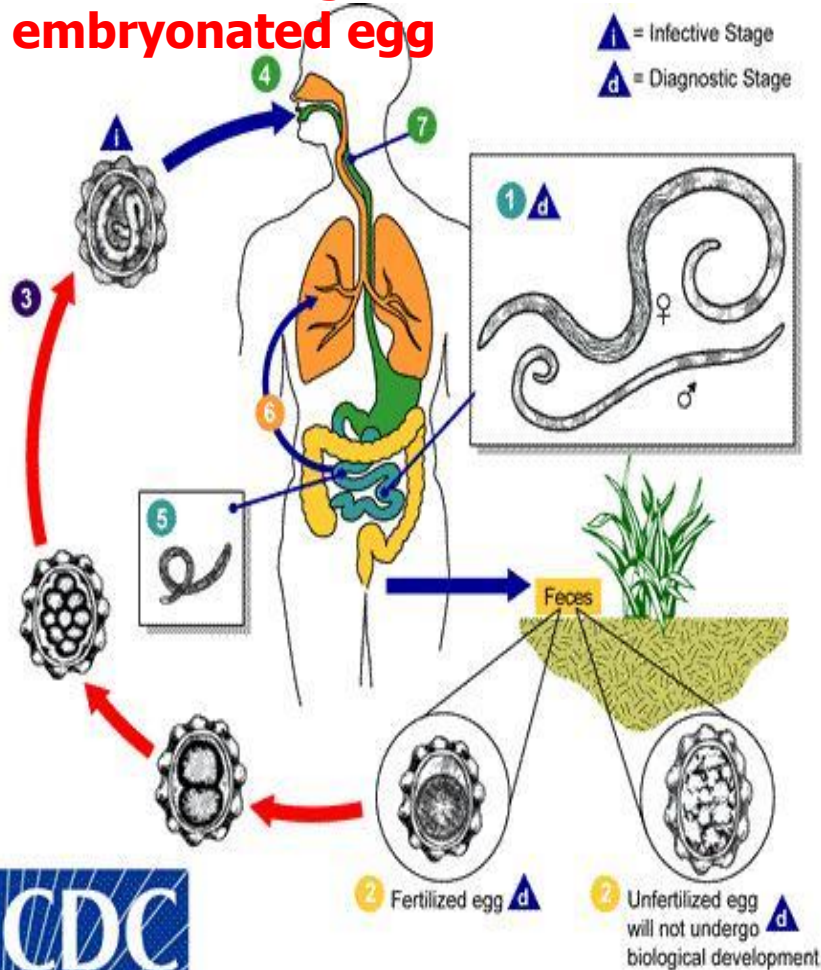
Female

Male



# Ascaris Lumbricoidis Life Cycle

**Infective stage is embryonated egg**



**Diagnostic stage both fertilized & unfertilized egg**



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

# Life cycle of Ascais Lumbricoides

It infect human only \*\*\*\* when man ingest an Embryonated egg (infective stage) 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 (3days) 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 ,larynx and pharynx and be coughed up , then swallowed ,returned to the small intestine where it mature to adults male & female ,fertilization take place producing **fertilized eggs & unfertilized eggs (diagnostic stage)** which pass in stool.

These eggs has to be in the soil for three weeks to become an **embryonated eggs (infective stage)** .

## Ascaris eggs



**Diagnostic stage pass in the stool fertilized & unfertilized eggs**

**(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.

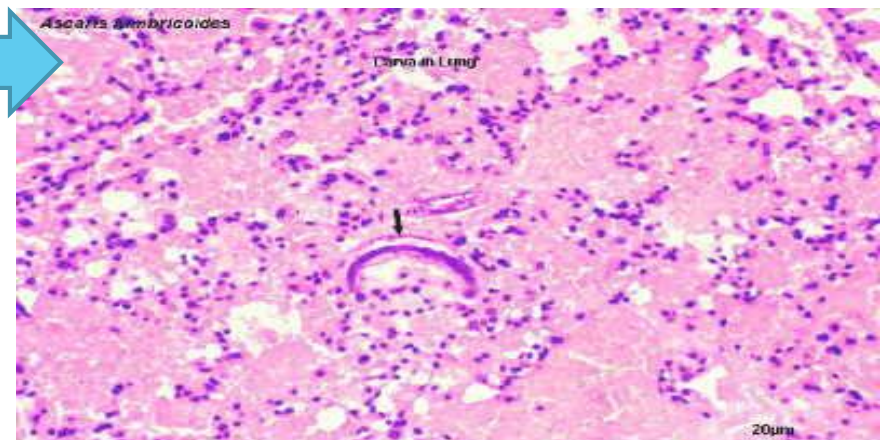
Heavy infection : intestinal obstruction

Migrating adult : to bile duct -jaundice

▶ 2-Larvae: Loeffler`s syndrome

Pneumonitis and bronchospasm, cough with bloody sputum

Ascaris larva in lung



Eosinophilia, urticaria

# *Ascaris lumbricoides* (roundworm)

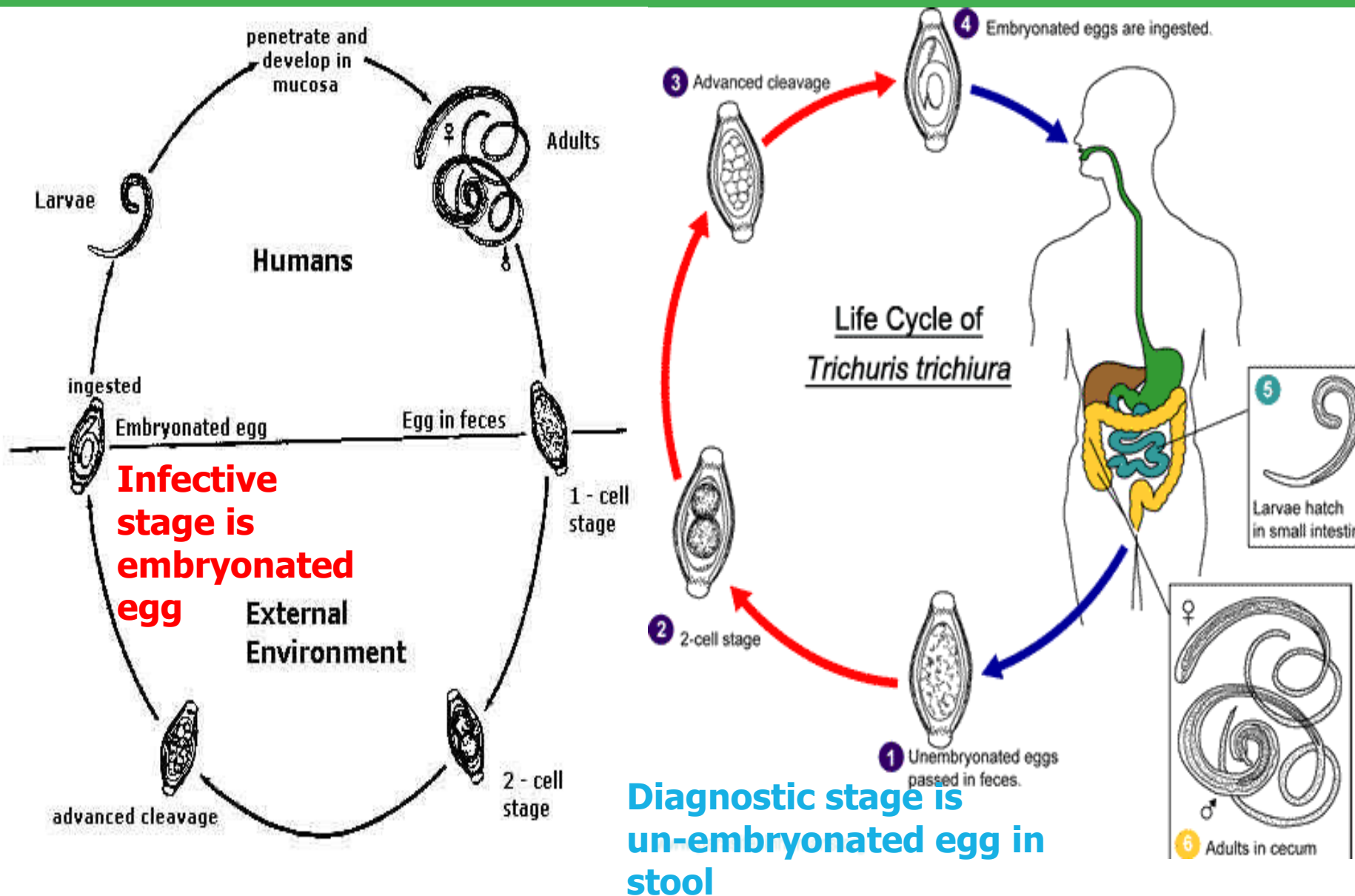
## Diagnosis:

- 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

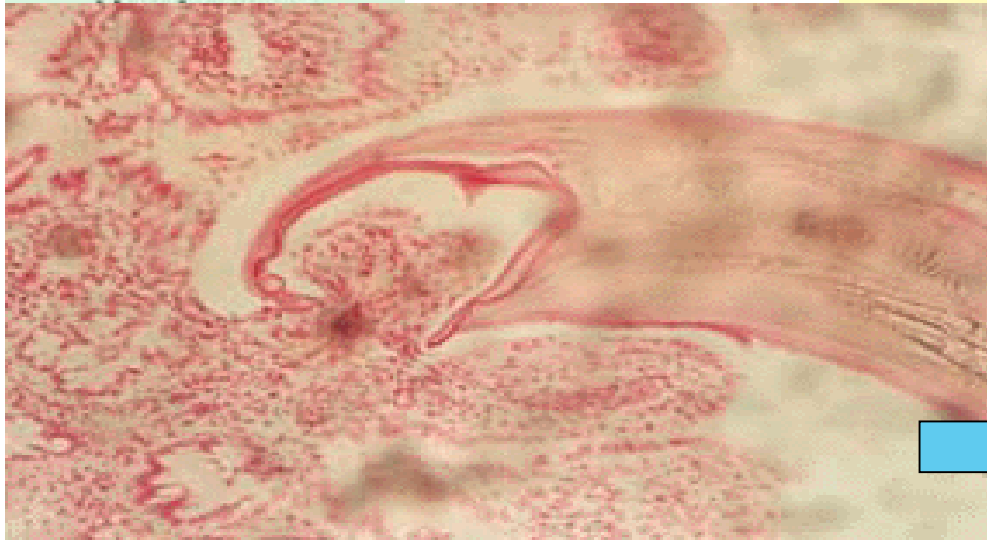
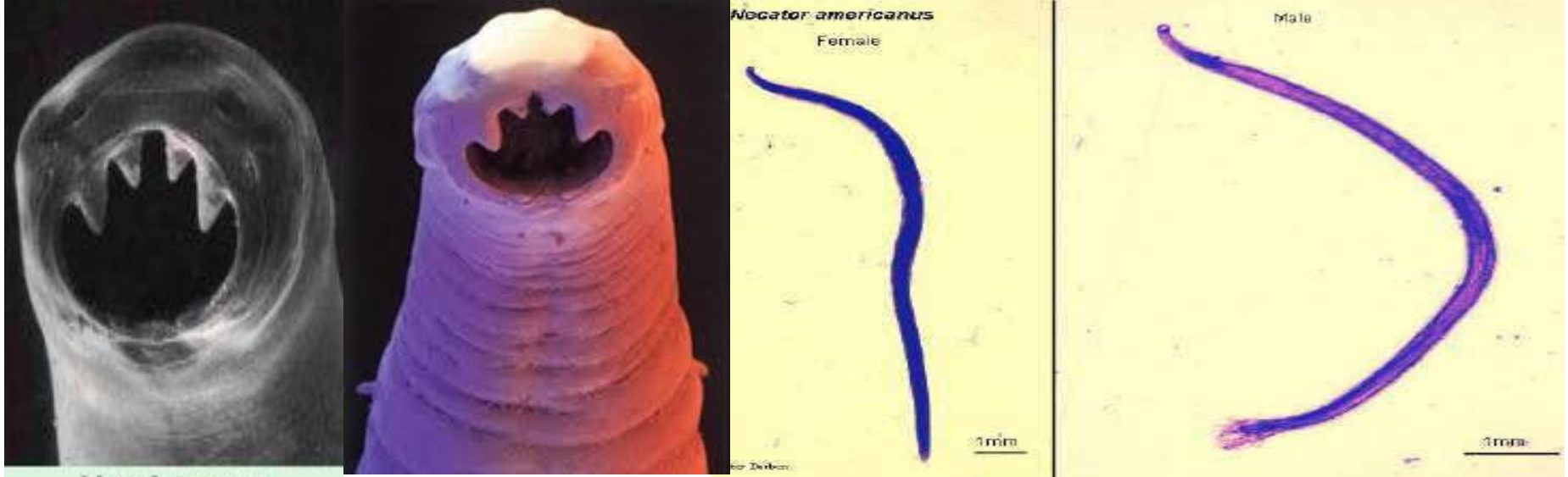


**Treatment** : Albendazole.



# Hook worms

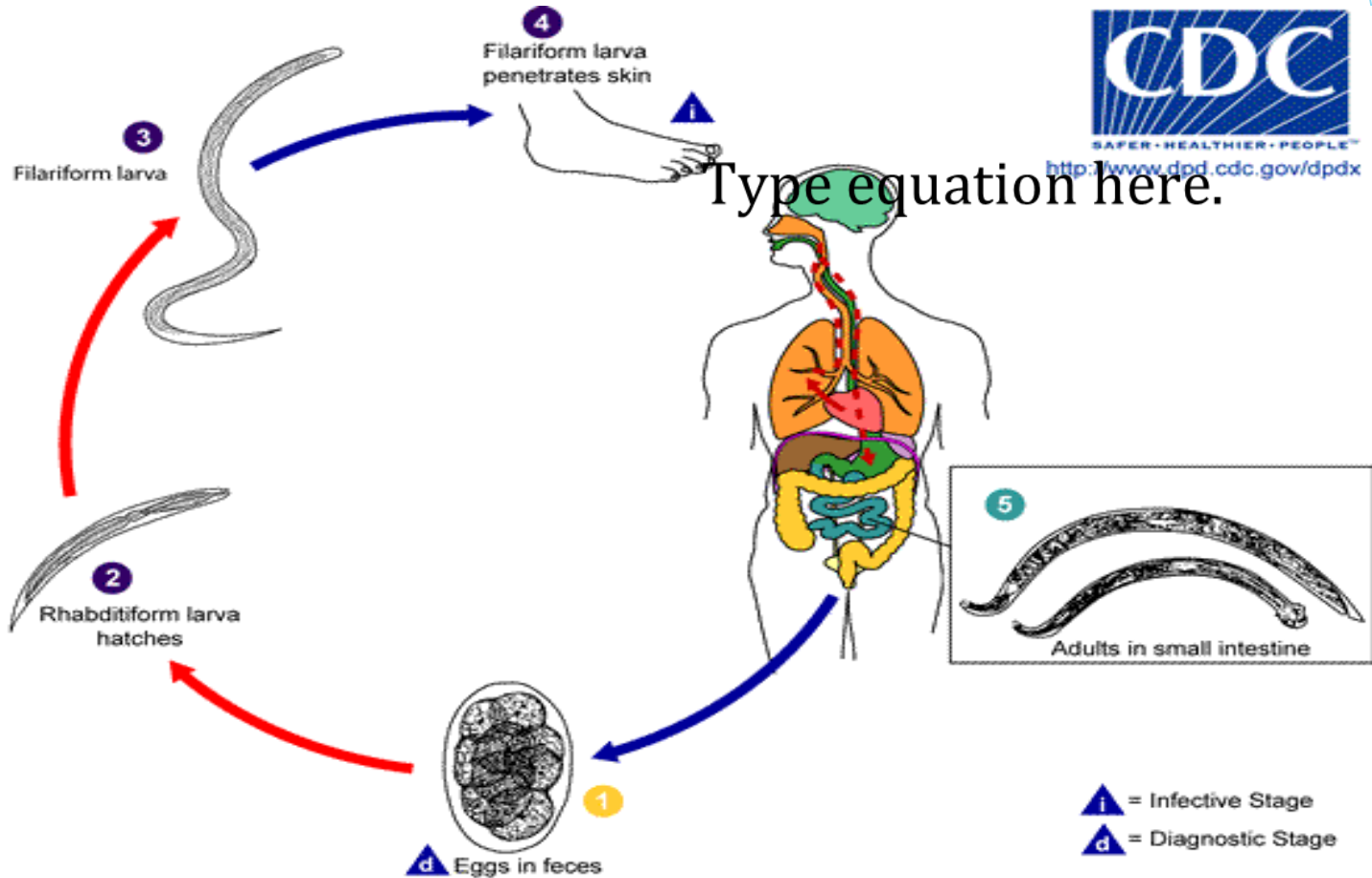
## *Ancylostoma duodenale* & *Necator americanus*



Buccal cavity attached to intestinal mucosa, Its buccal capsule (mouth) lined with hard hooks, triangular **cutting plates** and **anticoagulant glands**.



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



Type equation here.

# 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.

# 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.**



# 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-proteinemia, 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**



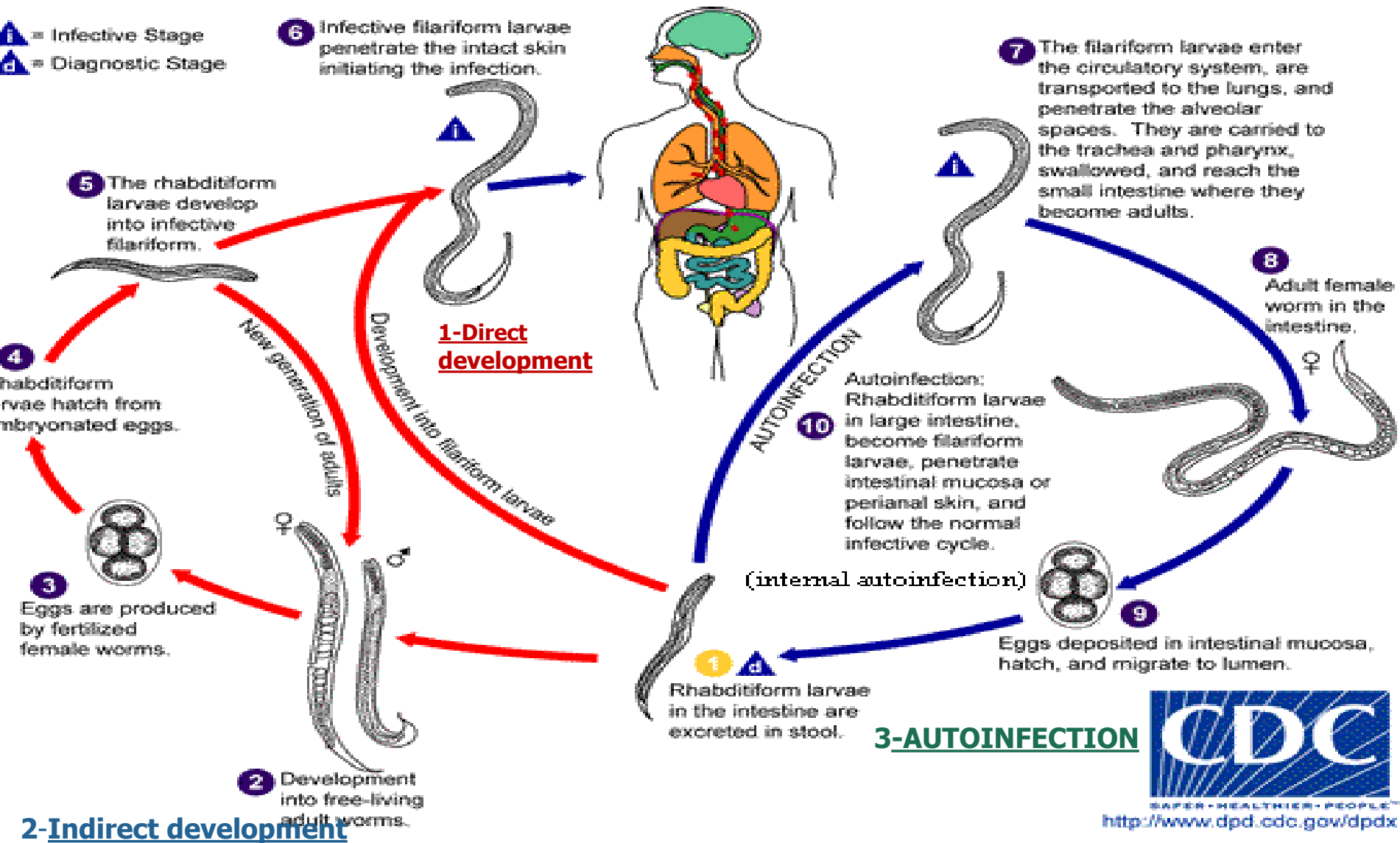
# Strongyloides stercoralis

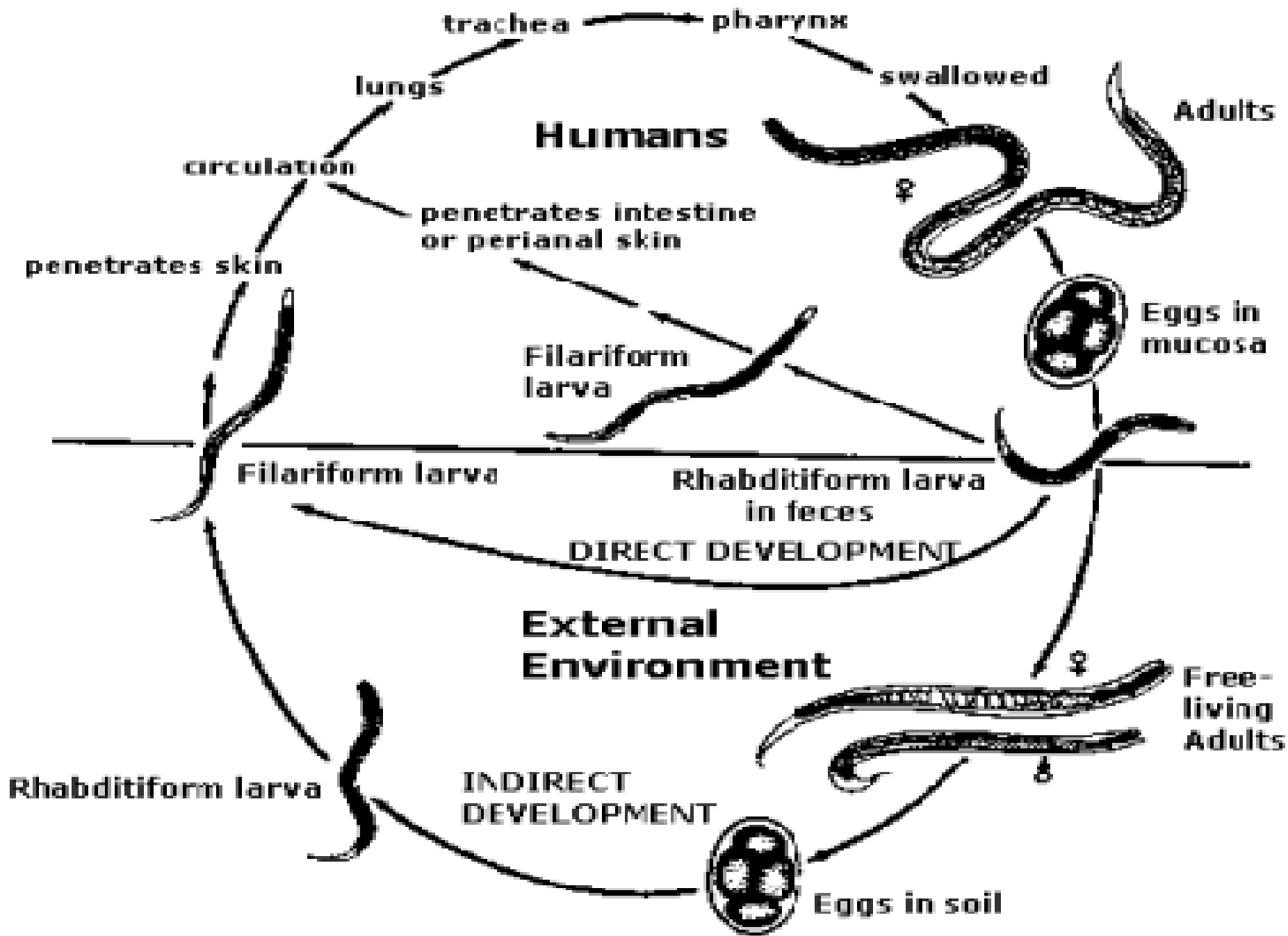
- ▶ Widely distributed in tropical area at Asia, Africa & South America .
- ▶ fatal dissemination in **immuno-compromised host**.
- ▶ It is smallest pathogenic nematodes  $\pm 2.5\text{mm}$ .
- ▶ adult live in mucous membrane of duodenum jejunum rarely mucous membrane of bronchus.
- ▶ **AUTOINFECTION 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-autoinfection\*\*\*\*** :when the rhabditiform larva become a filariform larva in the intestine and penetrate the intestine
  - ▶ **External-autoinfection** : 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 –granulomatous changes –necrosis–perforation  
,peritonitis ,death.



# Strongyloides stercoralis

## Diagnosis:

rhabditiform larvae  
diagnostic stage in:

- Stool examination
- Duodenal aspirate



**Treatment:** Albendazole,  
Mebendazole



Name	Transmission Infective stage	Location of adult in human	Diagnostic stage	Clinical picture
1- Enterobius vermicularis	Swallowing the eggs, <b>external Autoinfection</b>	Large intestine cecum	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. <b>*****</b>
2-Ascaris lumbricoids	Swallowing of <b>Embryonated egg</b>	Small intestine duodenum	<b>1-Fertilized &amp;unfertilized eggs in stool</b> 2-Adult worm in stool 3-Larva in sputum.	Asymptomatic but can cause Intestinal obstruction in heavy infection pneumonitis &bloody sputum <b>***** in larval stage.</b>
3-Trichuris trichura	Swallowing of <b>Embryonated eggs</b>	Large intestine	<b>Un-embryonated eggs</b>	Asymptomatic in light infection Rectal prolapse in children

Name	Transmission	Location of adult in human	Infective stage	Diagnostic stage	Clinical picture
<p><b>4-Hook worm</b>  <b>Ancylostom Dudenale &amp; Nector Americanus</b></p>	<p><b>Larval penetration of skin</b>  <b>Filariform larva the infective stage.</b></p>	<p>Small intestine</p>	<p><b>Filariform larva</b></p>	<p><b>Eggs in stool</b></p>	<p>Itching &amp; pruritis at sight of entry.  Cough and blood in the sputum at larval migration stage.  Loss of blood  <b>MICROCYTIC HYPOCHROMIC ANEMIA****</b>  <b>*****</b></p>



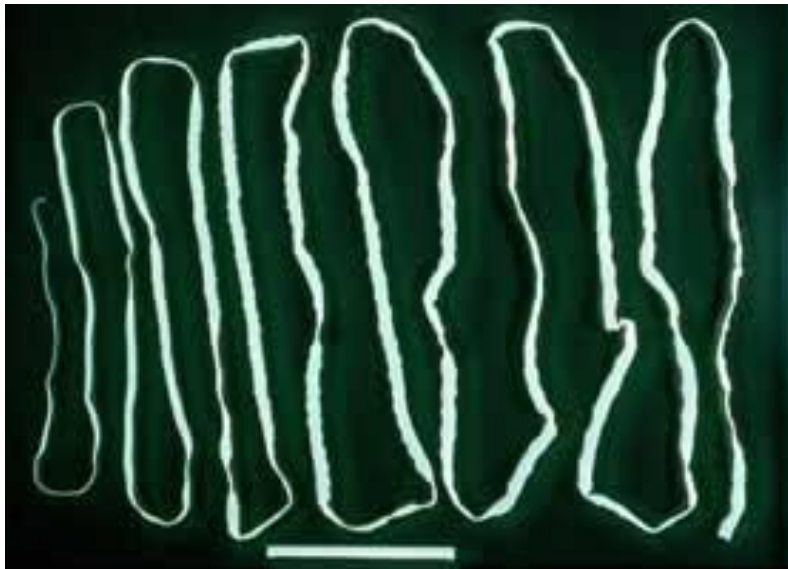
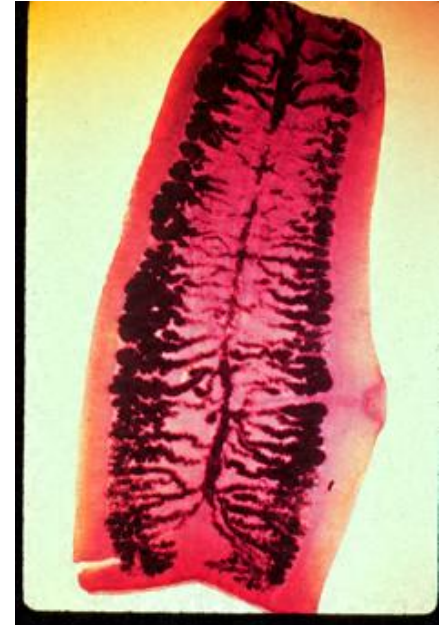
Name	transmission	Location of the adult in human	Infective stage	Diagnostic stage	Clinical picture
5-Strongyloids Stercoralis	Larval penetration of skin or internal and external <b>AUTOINFECTION</b>	Small intestine	Filariform Larva	Rhabditiform Larva	Pruritus at the site of larval penetration. Inflammation in the small intestine. <u>external autoinfection</u> & <u>INTERNAL ***** AUTOINFECTION</u> <u>Disseminated strongyloidiasis</u> ; in patient with <b>immunodeficiency</b> , uncontrolled diarrhea – granulomatous changes – necrosis – perforation , peritonitis , death

## Cestodes tape like segmented parasite

1- *Taenia saginata*

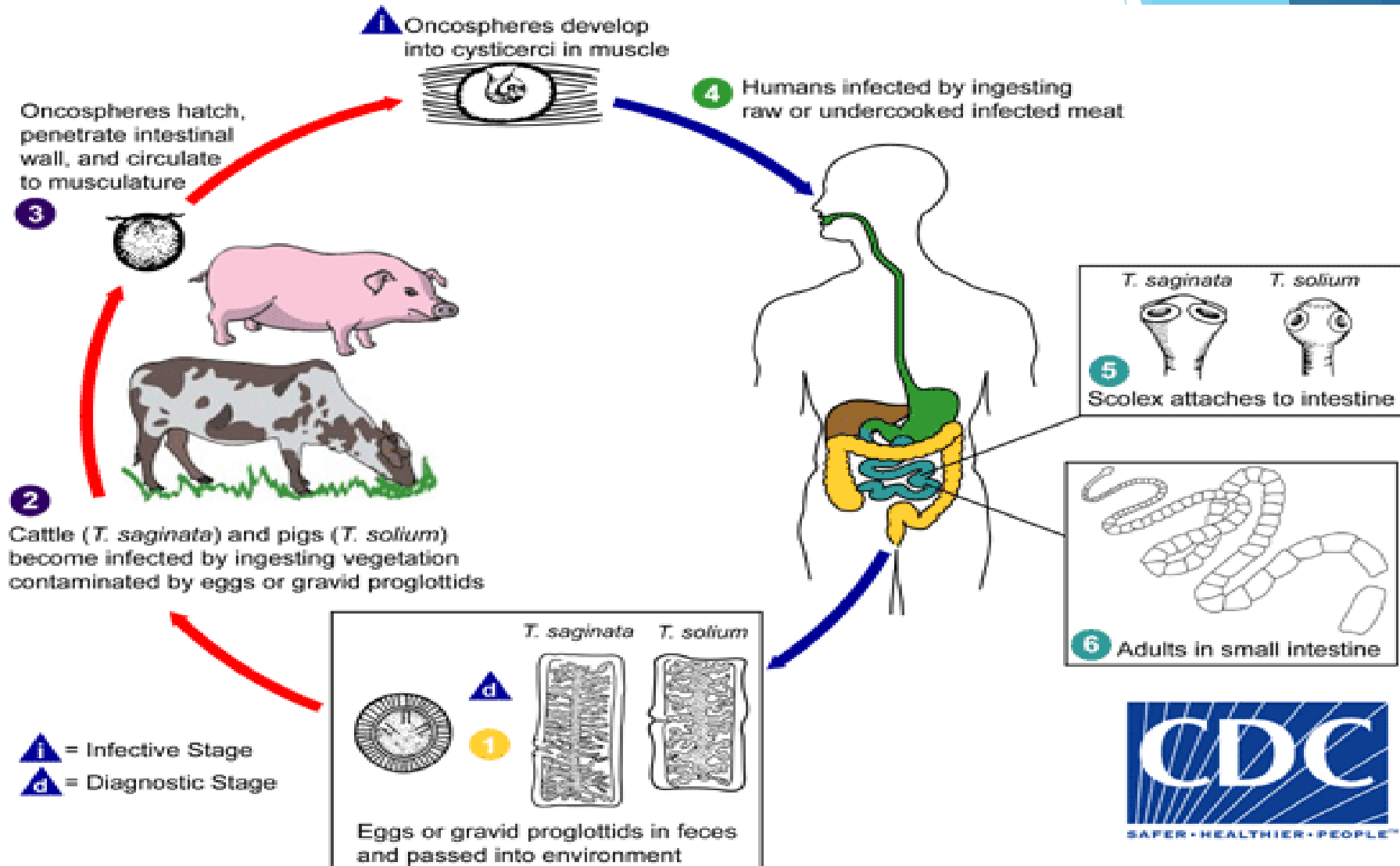
2- *Taenia solium*

3- *Echinococcus granulosus*



# Life cycle of

## *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 feces. 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 segments** to the environment.
- ▶ The majority of cases are Asymptomatic ,some patients have vague intestinal discomfort ,vomiting and diarrhea.

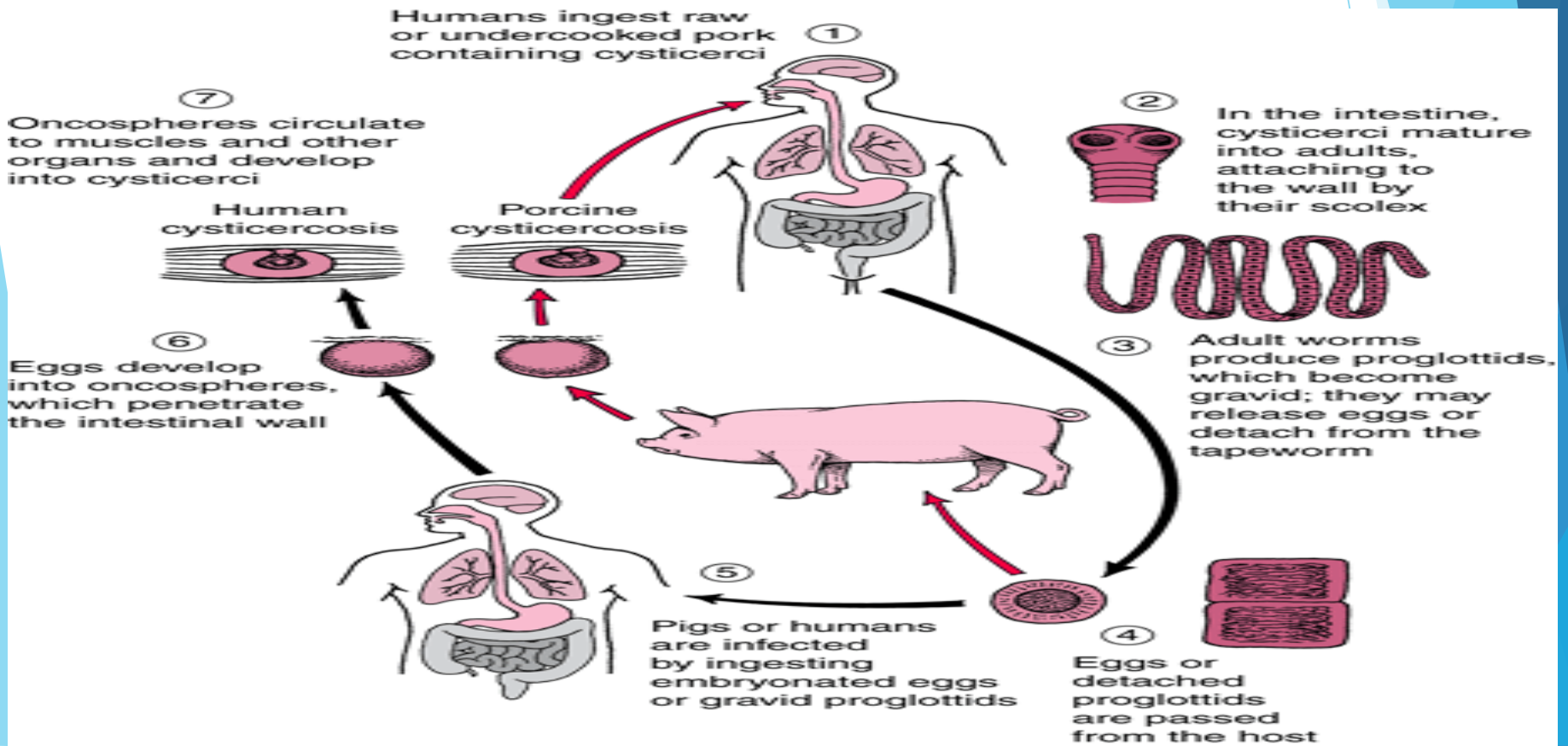
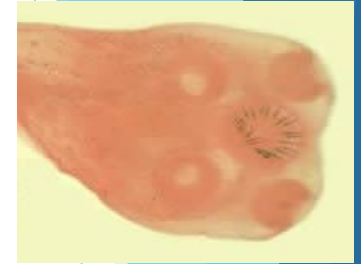


# Life cycle of Taenia solium

Man can be infected by 2 ways either eating **eggs** or eating under cooked pork contain **cystocercus**.

**Eating egg will develop cyst in various part in the body(cysticercosis) in eye ,brain can be very dangerous.**

**Eating undercooked pork will develop an adult worm in the small intestine of the man.**



# Clinical finding & Laboratory diagnosis

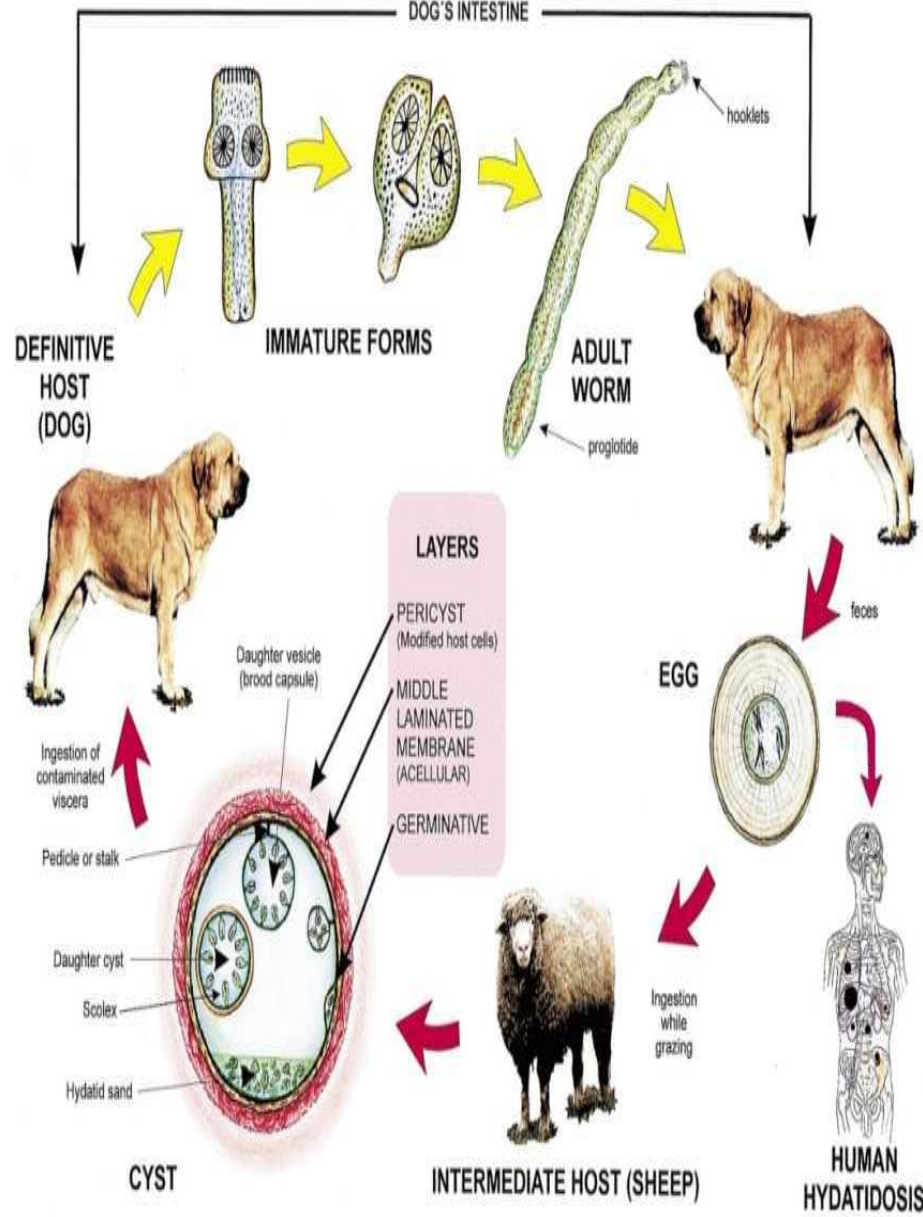
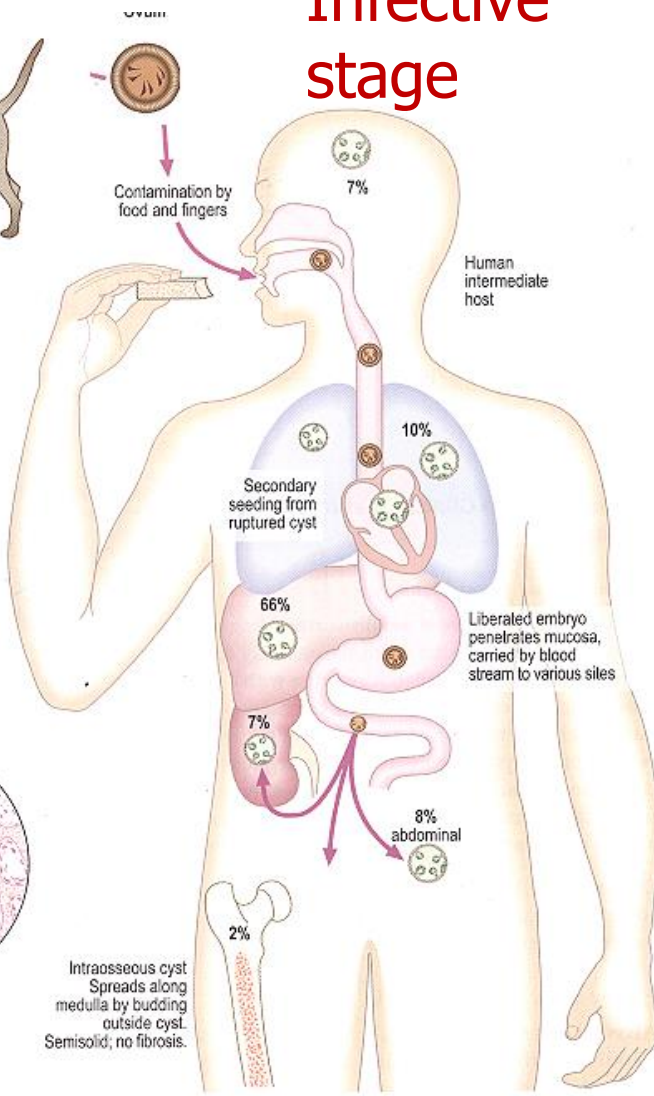
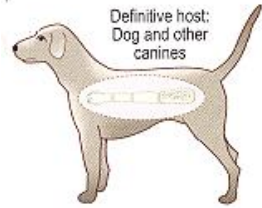
## 1-Clinical findings

- ▶ *Taenia saginata* (beef tapeworm) : most patient with adult *T.saginata* in the small intestine are asymptomatic, but some has malaise and some abdominal cramps.
- ▶ *Taenia solium* (pig tapeworm): Cysticercus of *Taenia solium* in brain ,eyes and skin
- ▶ Can be very dangerous according to its location .

## 2-Laboratory diagnosis:

- ▶ *Taenia* infection is usually diagnosed by finding the typical segments (proglottids) and eggs in feces.
- ▶ Clinical diagnosis of *Taenia solium* by C.T scan of the brain or abdomen according to the position of cysticerci in the human body.
- ▶ **TEATMENT** :single dose of Praziquantel is usually successful in *T.saginata* but *T.solium* some time needs surgical intervention.

# Infective stage



# Life cycle of *Echinococcus granulosus*

*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* 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 which 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 liver\*\*\* & lung**

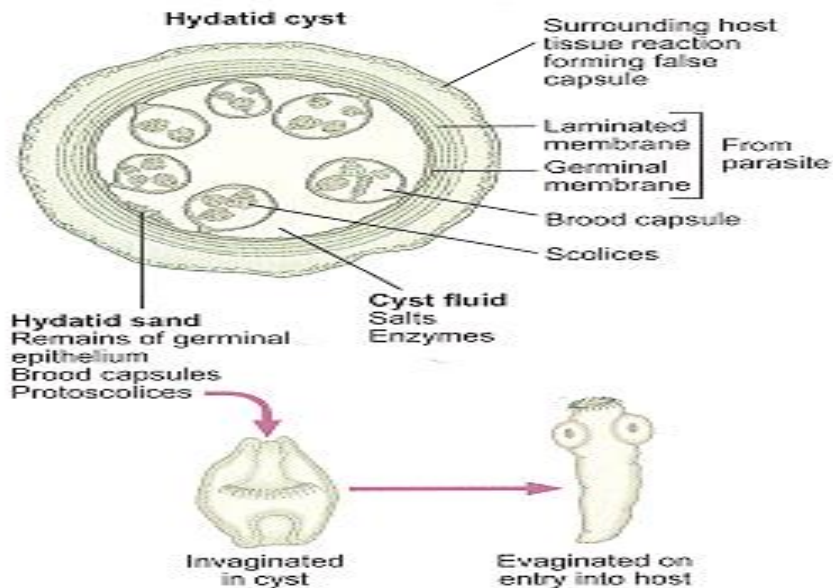
**and brain** are most commonly affected. One serious complication of hydatid cyst disease is the risk of anaphylactic shock, following rupture of the cyst.



# Hydatid cyst in the liver

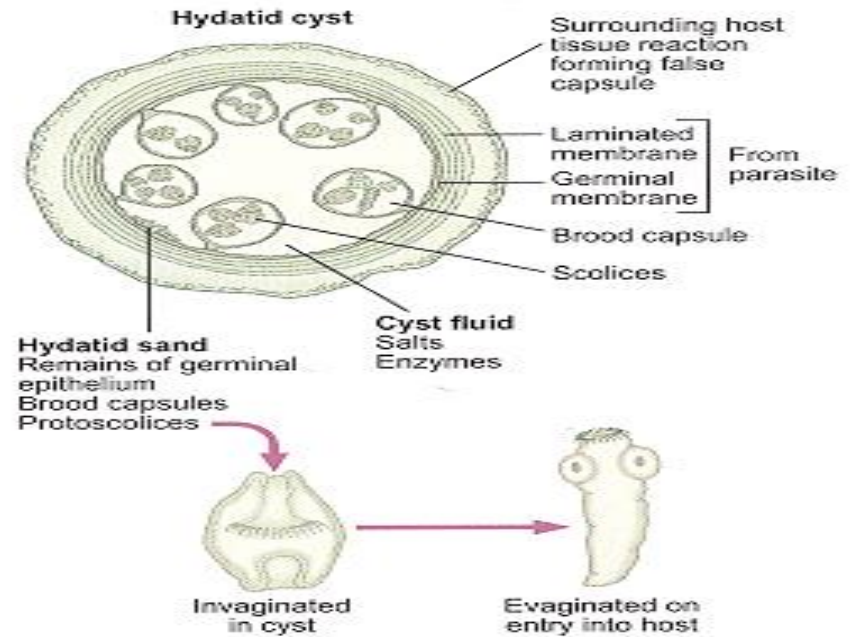


Cerebral hydatidosis



**Location of hydatid cyst**  
*Echinococcus granulosus*  
**Liver, brain and lung.**

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 **fluid inside the cyst can cause anaphylactic shock if the cyst ruptures.**



# 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 ELISA, 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
<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 disturbance	eggs or proglottids in stools
<i>Taenia solium</i> - <u>LARVA</u> (cysticercus cellulosae)	Cysticercosis	ingestion of egg	not present (except in Double infection ,small intestine)	sub-cutaneous muscles brain,eyes	<b>depending on locality: from none to epilepsy</b>	X - ray,CT,MRI Serology
<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

