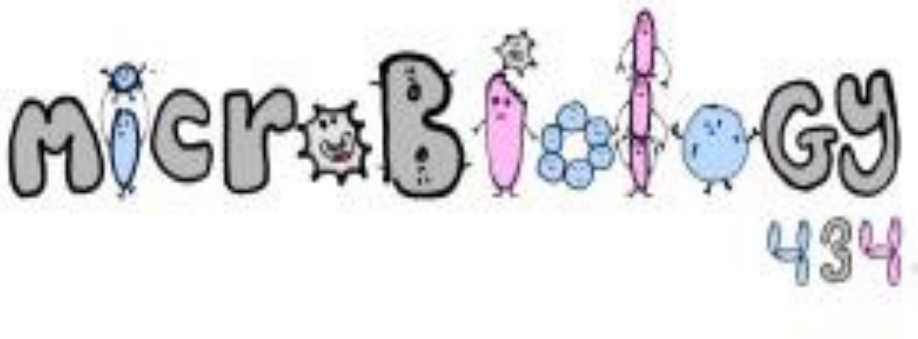
INTESTINAL HELMINTHS



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HELMINTHS

Multicellular

Types:

Worm	Round Worms [Nematodes]	Flat worms	
Description	❖ Elongated, cylindrical, unsegmented – tapering at the ends ❖ Its size < 1 -100 cm. long ❖ male is smaller than female ❖ Located: Intestinal & Tissue nematodes	❖ Trematodes: leaf-like unsegmented	❖ Cestodes: tape-like, segmented.
Treatment	Albandazole , Mebendazole	• Intestinal stages: Praziquantel • Tissue stages: (Hydatid , cysticersosis) • Depends on clinical condition: Surgical and/or Albendazole	

Round worms (Nematodes)

Enterobius vermicularis (Oxyuris)

Common names:- Pin worm, seat worm, thread worm

Features:-

1. Found all over the world (more common in temperate regions)
2. Children > adults
3. Occurs in groups of people living together
4. It can be seen by naked eye as white thread ± 1cm
5. Male is smaller than female (with coiled end)
6. adult are located in **lumen of cecum and appendix**
7. female migrate to rectum to deposit her eggs on the anus and perianal
8. Autoinfection (contamination of the finger safter itching) or directly [human to human]

Pathology:-

✓ **Majority (asymptomatic)**

Clinical presentation

Main clinical presentation:	Ectopic enterobiasis in infected *adult female*:	Children:
pruritus ani [prisistant itching at night→inflammation → 2ry perianal infection	❖ Valvovaginitis ❖ Salpingitis ❖ lodged in appendix cause appendeicitis	1- emotional disturbance 2- insomnia 3- anorexia 4- loss of weight and concentration 5- enuresis.

Forms and diagnosis

Forms:

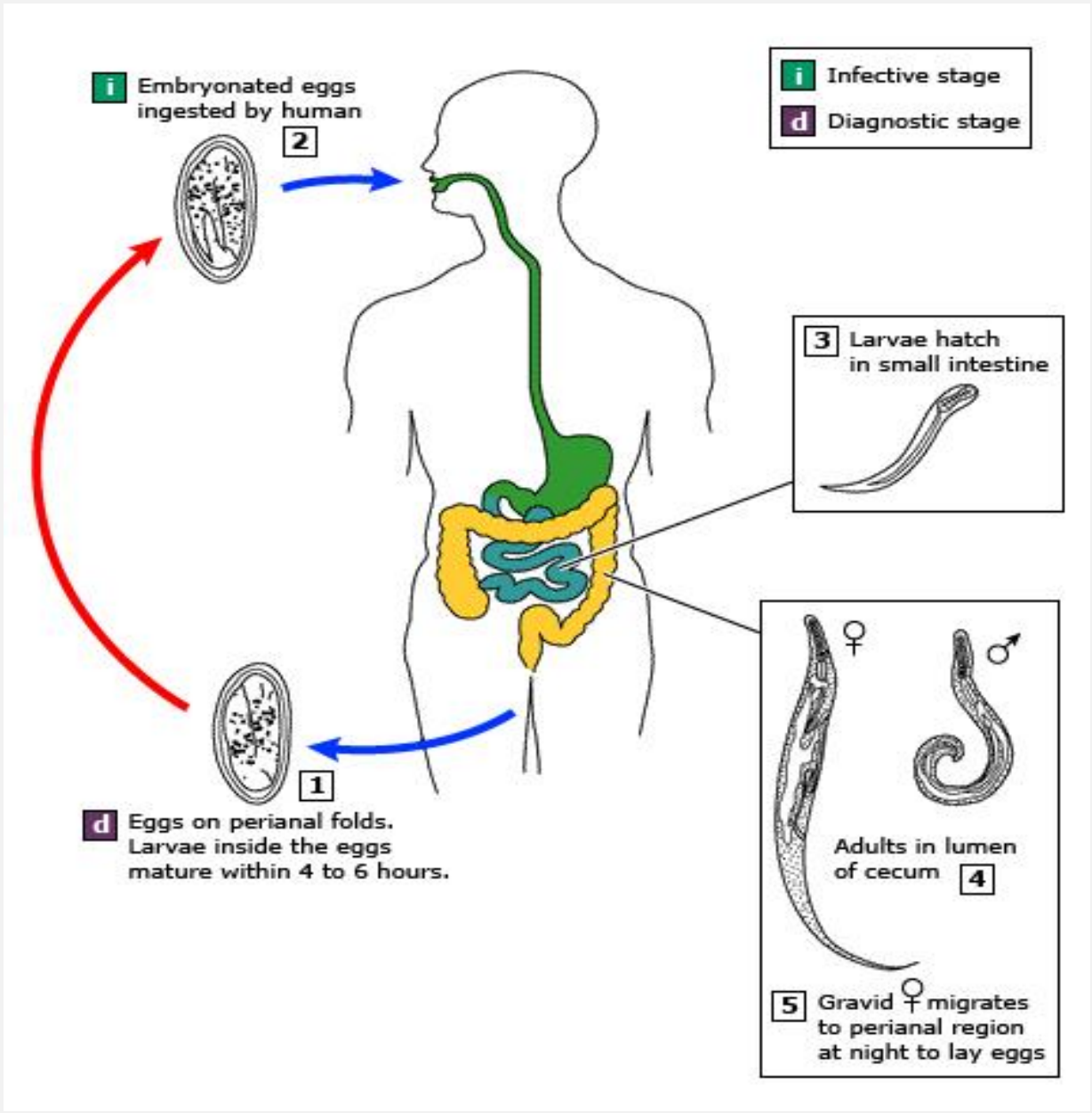
- ☒ Infective: egg
- ☒ Diagnosis : egg

Diagnosis:

AN ANAL SWAB OR CELLULOSE ADHESIVE TAPE

N.B:

- ❾ the eggs are not usually found in faeces
- ❾ should be done before defecation or bathing.



LIFE CYCLE

eggs ingested from contaminated surfaces → mature into adults in the large intestine [cecum & appendex] → Fertilization → females migrate out of rectum → lay eggs in perianal [10,000] at night → perianal itchiness → Autoinfection OR Contaminate other human

Ascaris lumbricoides(Roundworm)

Common names:- Roundworm

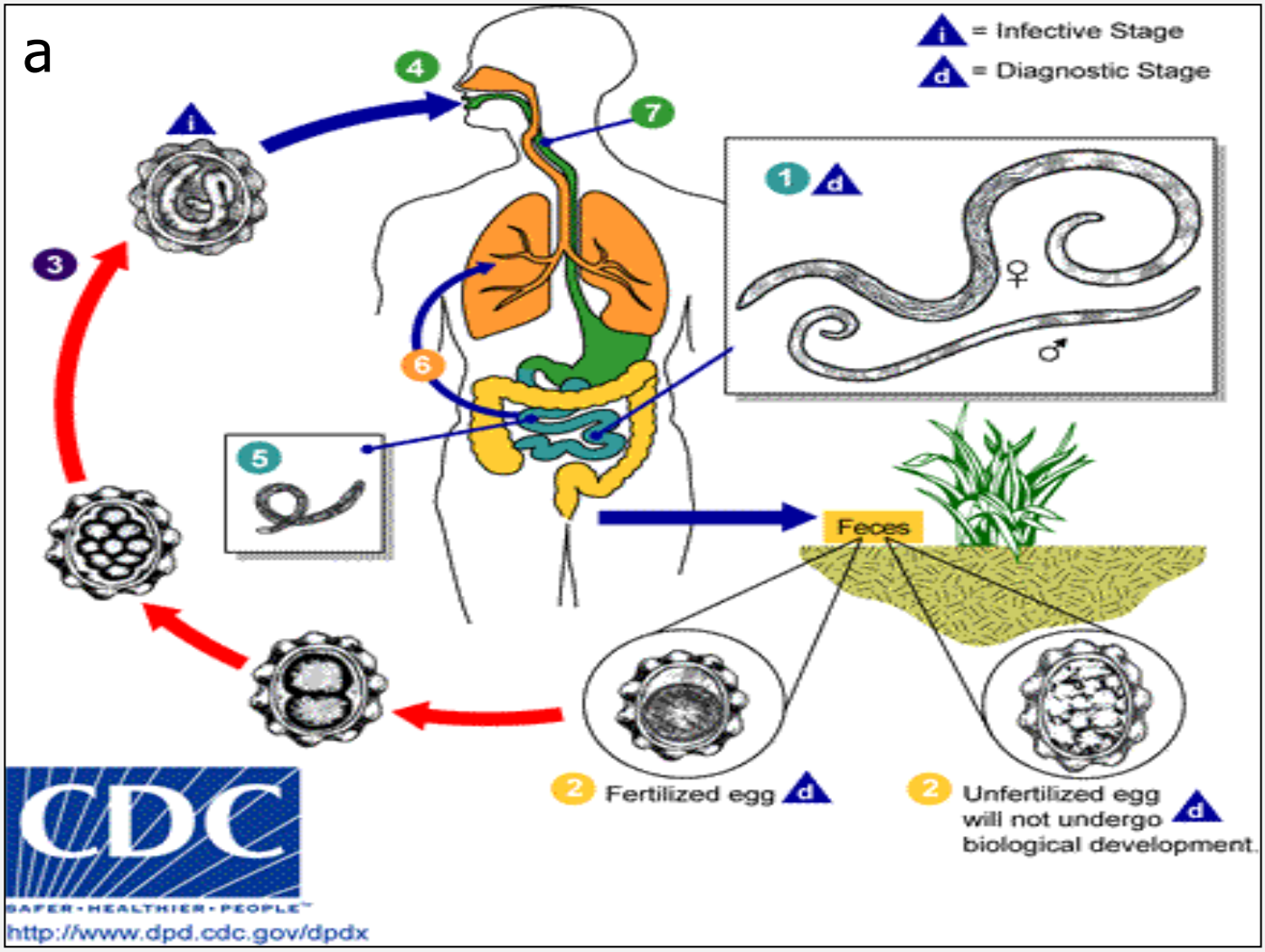
Features:-

1- The **commonest** human helminthes infection.
2- Found **in jejunum and upper part of ileum [small intestines]**.
3- Female ± 20 cm longer than male ± 10 cm
4- Feed on semi digested food. (can cause malnutrition)

Pathology:-

- ✓ **Adult worm**: [consume hosts proteins & vitamins → malnutrition]
  - **Light infection** : asymptomatic.
  - **Heavy infection** : intestinal or bile duct obstruction
  - **Migrating adult** : to bile duct-jaundice
- ✓ **Larvae: (Loeffler`s syndrome)** [goes to other organs – may cause granuloma]
  - **Pneumonitis and bronchospasm**
  - **cough with bloody sputum**
  - **Eosinophilia, urticaria**

Forms and diagnosis	
Forms: ☒ **Infective:** **embryonated egg** ☒ **Diagnosis :** **fertilized egg**	**Diagnosis** ❾ **eggs in stool.** ❾ **larvae in sputum.** ❾ **adult may pass with stool.**

Life cycle of round worm

- Adult worms live in the lumen of the small intestine.
- A female produces eggs => which are passed with the feces
  - Unfertilized eggs may be ingested but are not infective.
  - Fertile eggs embryonate and become infective after days or weeks depending on the environmental conditions (in soil) → ingested as infective form
- After infective eggs are swallowed →the eggs hatch and give larva
  - Larva invade the intestinal mucosa→ are carried via the portal, then systemic circulation to the lungs → penetrate the alveolar walls, ascend the bronchial tree to the throat,
  - stay in the small intestine→they develop into adult worms . Then repeat the cycle again

Trichuris trichiura (Whipworm)

Common name:-whipworm

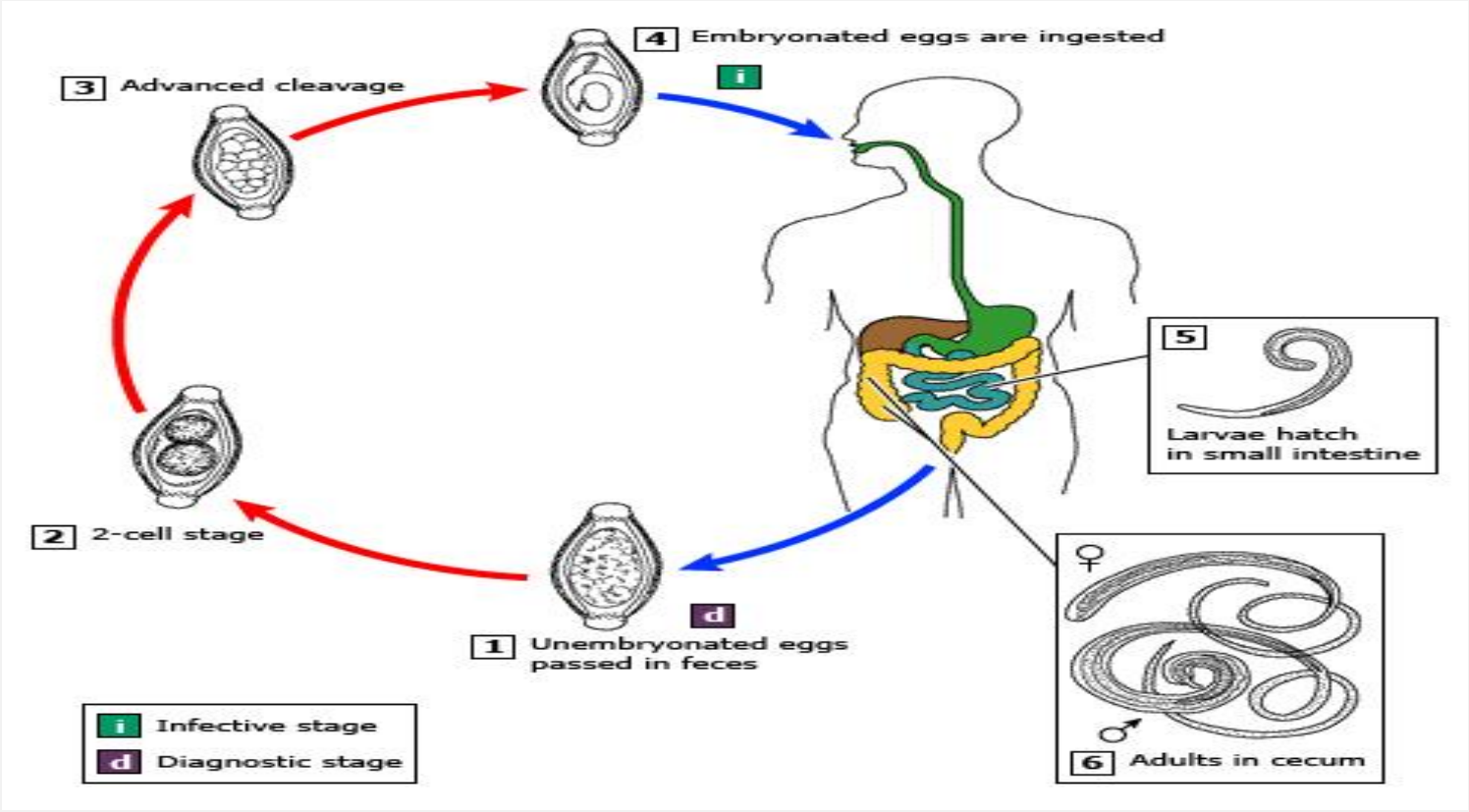
Features:-

1- Worldwide ,common in poor sanitation.
2- It coexists with **Ascaris** because of similar requirement [soil]
3- Adult live in large intestine especially **caecum and appendix**
4- Male and female worm have narrow anterior portion
(to penetrate the intestinal mucosa)

Pathology:-

- ✓ **light infection**: **asymptomatic**
- ✓ **heavy infection**: [whole colon is affected]
  - ☒ abdominal pain
  - ☒ bloody diarrhea
  - ☒ **Rectal prolapse in children is a common complication**

Forms and diagnosis		
Forms: ☒ **Infective: embryonated egg** ☒ **Diagnosis : fertilized egg in stool**	**Diagnosis:** ❾ **eggs in stool.**	**Shape under microscope:** • **barrel shape** • **mucoid plugs at each pole (American football shape)**



Life cycle of whip worm

- The **unembryonated** eggs are passed with the stool
- In the soil, the eggs become **embryonated** and infective in 3-5 weeks
- After ingestion (soil-contaminated hands or food), the eggs hatch in the small intestine, and release larvae (maturation in human take 3 months)
- mature and establish themselves as adults in the colon [life span → 1-3 Years]
- The females begin to oviposit 60 to 70 days after infection.

Ancylostoma dudenale & Necator americanus

Common name: **Hook worm**

Feature:-

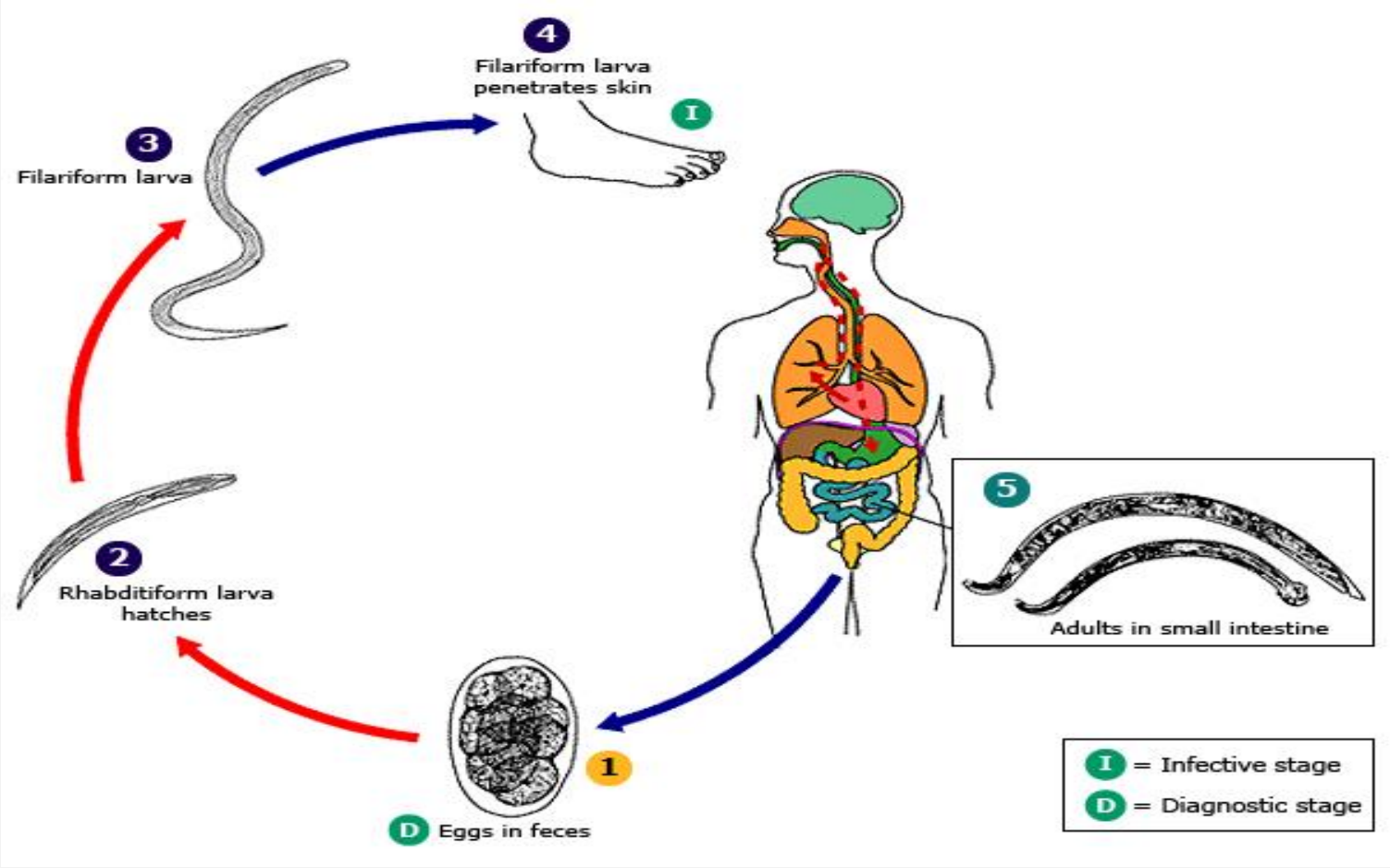
1. **A common cause of anemia**.
2. Found in **small intestine mainly jejunum**.
3. Its buccal capsule (mouth) lined with hard hooks cutting plates and anticoagulant glands.

Pathology& clinical picture:-

- ✓ **Larvae:**
  - ❖ **At the site of entry of larvae** (ground itch + urticaria).
  - ❖ **Migration phase:**
    - cough with bloody sputum
    - pneumonia, eosinophilia [like Ascaris]
- ✓ **adult worm:**
  - **low worm burden:** no symptoms.
  - **Moderate to heavy burden:**
    - Epigastric pain, vomiting , hemorrhagic enteritis.
    - Protein loss: hypoproteinaemia→edema.
    - Anemia: due to withdrawal of blood by parasites
    - hemorrhage from punctured sites lead to **severe iron deficiency anemia.**

Forms and diagnosis	
Forms: ☒ **Infective:** **Filariform Larva** ☒ **Diagnosis:** **egg**	**Diagnosis:** ❾ **egg in stool.** ❾ **Positive occult blood**

Hookworm



Life cycle of whip-worm

- Filariform Larva in the soil penetrate the skin
- go to the circulation (heart → lungs→respiratory tree→esophagus) then go to small intestine
- attach to the mucous membrane where they mature into adult (maturation in human 35 days) → the attachment results in it sucking the blood → sever iron deficiency anemia
- female starts laying eggs to be passed in stool (not infective)
- in soil (maturation in the soil 7-8 days)→ Rhabiditiform larva→ Filariform Larva [infective stage]

Strongyloides stercoralis

Features:

1. Widely distributed in tropical region [endemic]
2. In immunocompenats → **asymptomatic** eosinophilia
3. fatal in **immuno-compromised** host. [cause septic shock]
4. It is **smallest** pathogenic nematodes (± **2.5**mm).
5. adult live **in mucous** membrane **of duodenum jejunum** and bronchus (rarely)

Pathology and clinical picture:

- ✓ **Cuteneous :**
  - **little reaction on penetration**
  - **sever dermatitis at perianal region (external autoinfection).**
- ✓ **Migration phase: (as hookworm)**
  - **cough with bloody sputum**
  - **pneumonia, eosinophilia**
- ✓ **Intestinal:**
  - **inflammation of upper intestinal mucosa**
  - **diarrhea, upper abdominal pain colicky**
- ✓ **Disseminated strongyloidiasis: (in immuno-compromised)**

uncontrolled diarrhea –granulomatous changes→necrosis→perforation→peritonitis→death.

Forms and diagnosis

Forms:

☒ **Infective: Filariform Larva**

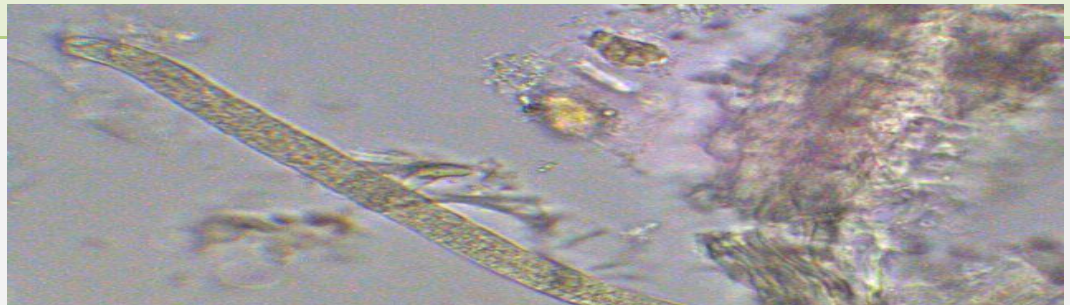
☒ **Diagnosis : rhabditiform larva**

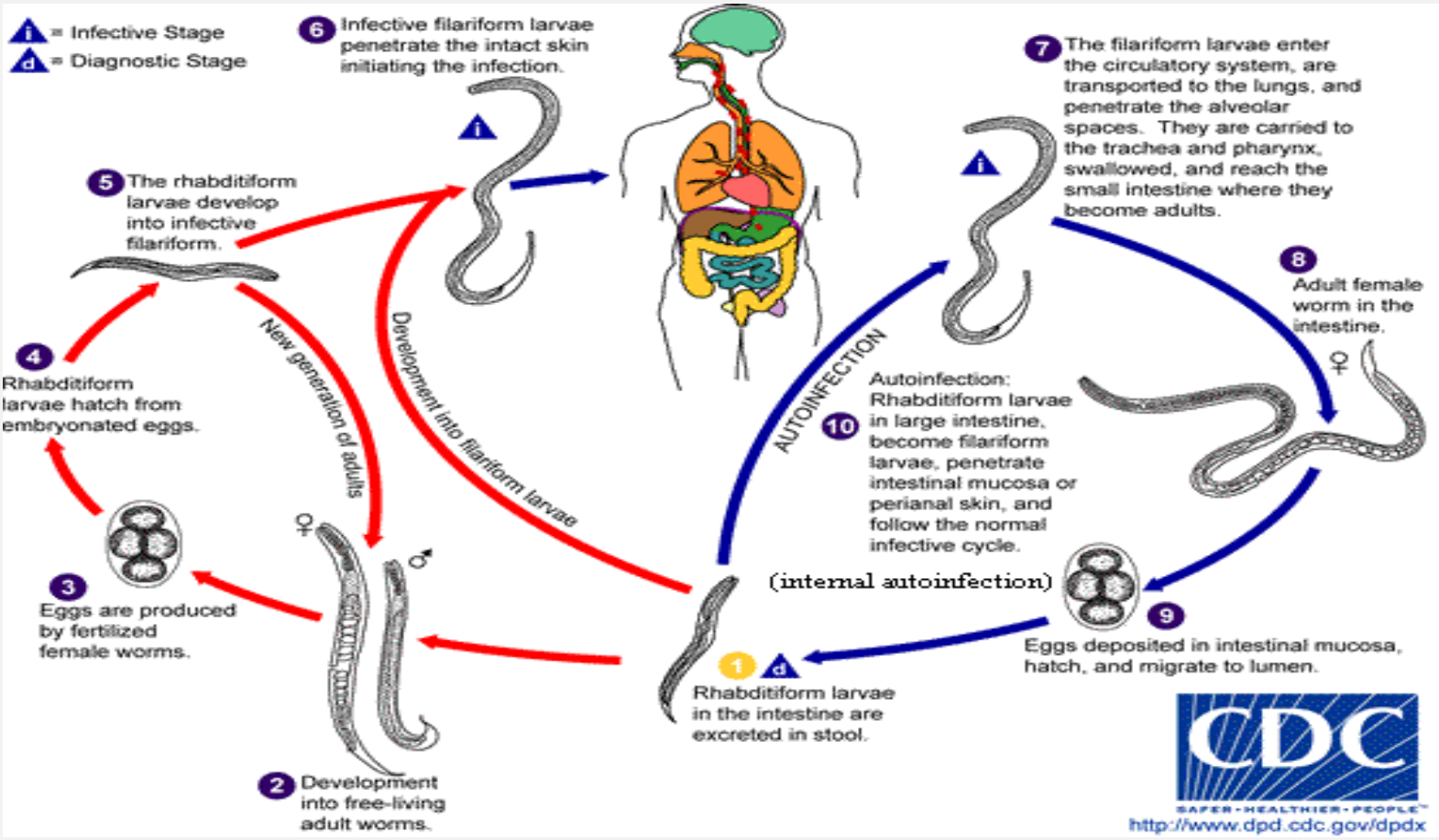
Diagnosis:

❾ **Stool examination**

❾ **Duodenal aspirate**

❾ **reaspiratory fluid aspirate**





Life cycle of Strongyloides stercoralis

Direct development:	Indirect development New generation of adult	AUTOINFECTION
○ The Rhabditiform Larva Pass From Stool ○ Become Directly A Filariform Larva ○ Penetrate Intact Skin Initiate Infection	*In External Environment (In The Soil):* ♦ *Rhabditiform Larva Becomes Free Living Adults* ♦ *Produce Eggs* ♦ *Rhabditiform Larva →Filariform Larva*	Internal: • The Rhabditiform Larva Become A Filariform Larva In The Intestine • Penetrate The Intestine External : • Fecal Contamination Of Skin Rhabditiform Larva • Filariform Penetrates The Skin

Mainly in immunocompromised patients

Flat-worms

Taenia Saginata (beef tape wrom) and Taenia solium (Pork tape wrom)

Common name :- beef tape wrom, Pork tape wrom

Features:-

1. one worm is enough to cause an infection
2. Length : many meters. (5-10 meters)
3. Attaches to the **small intestine** by 4 suckers (no hooks) and lives there
4. **more frequent in the brain and muscle (larva of Pork tape wrom)**
5. in small intestine (adult form of both)

***Pathology*, *clinical presentation* and distribution**	
Taenia Saginata (beef tape wrom): ✓ majority Asymptomatic ✓ can just cause vague alimentary upset ✓ found in beef-eating area (tropic)	**Taenia solium (Pork tape wrom):** ✓ Larva (cysticercosis): (can occur in any site) ○ brain: ▪ inflammation→fibrosis→calcification ▪ focal CNS syndromes (epilepsy) ○ muscles ✓ adult: majority Asymptomatic (just mild irritation in intestine) ✓ is endemic in pig-rearing area

Forms and diagnosis

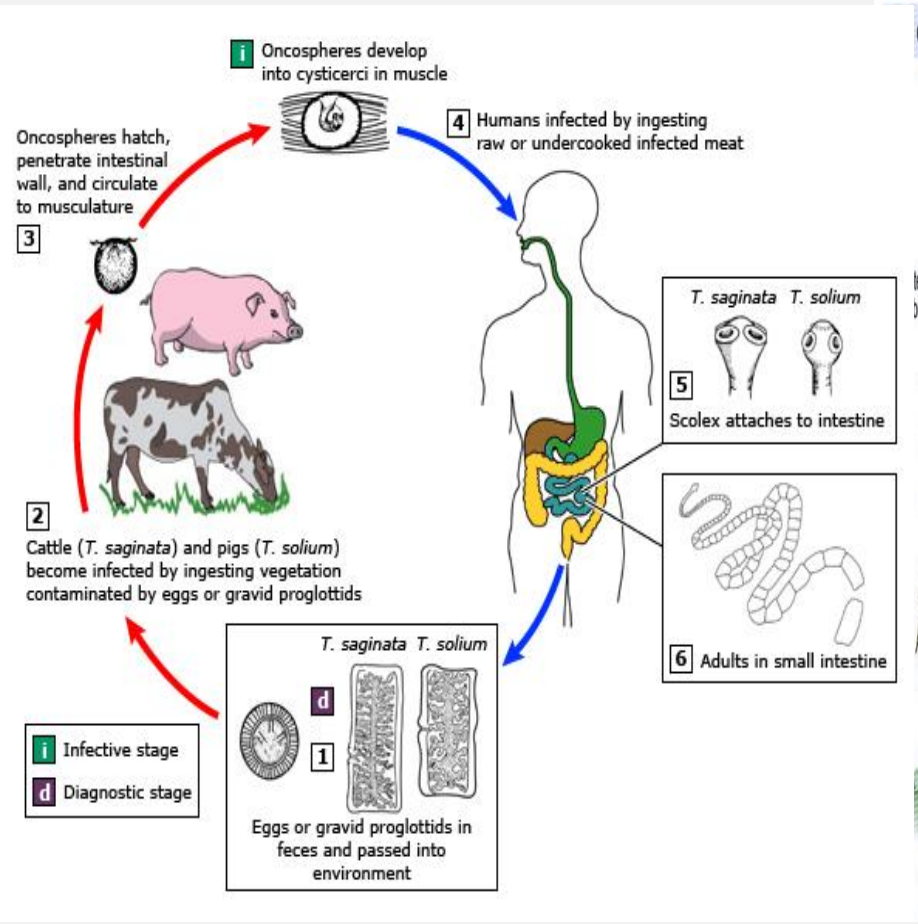
Taenia Saginata (beef tape wrom):

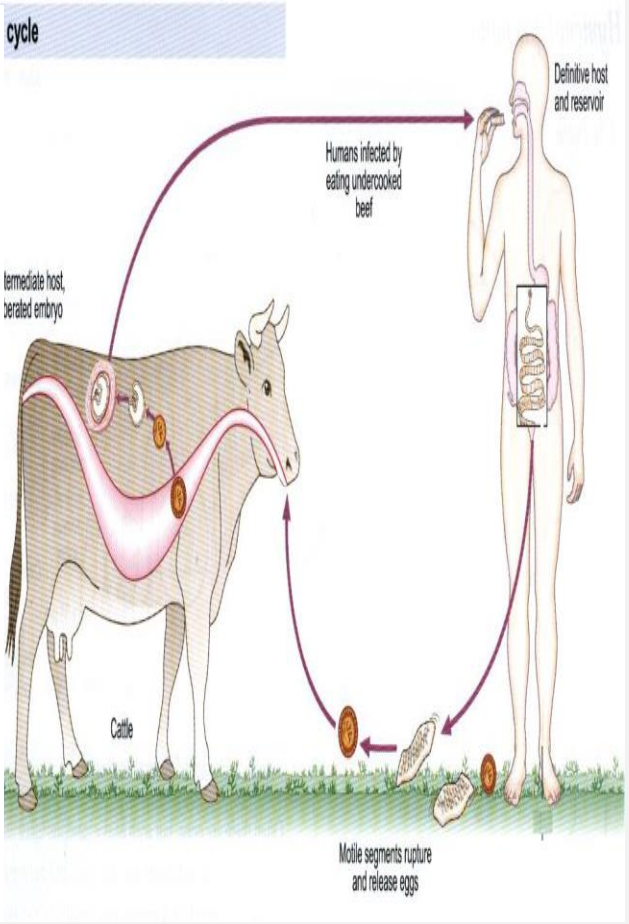
- ❖ forms:
  - ○ infective: CYSTICERCUS bovis
  - ○ diagnostic: gravid segment, ova, scolex
- ❖ diagnosis:
  - ○ a crush or Indian ink preparation for faeces (uterine of mature segment)
  - ○ clear adhesive tape slide (ova in perianal)

Taenia solium (Pork tape wrom):

- ❖ forms:
  - ○ infective: CYSTICERCUS celluloasae
  - ○ diagnostic: gravid segment, ova, scolex, larva
- ❖ diagnosis:
  - ○ larva: biopsy, serology (ELISA,IFAT),CT or MRI brain
  - ○ other forms (just as beef tape wrom)

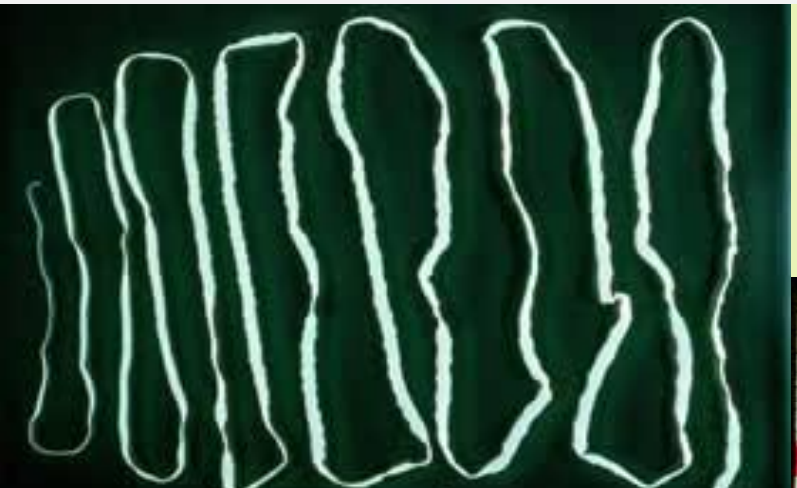
The diagnosis is generally established by identifying eggs or proglottids in the stool of the only host (human).

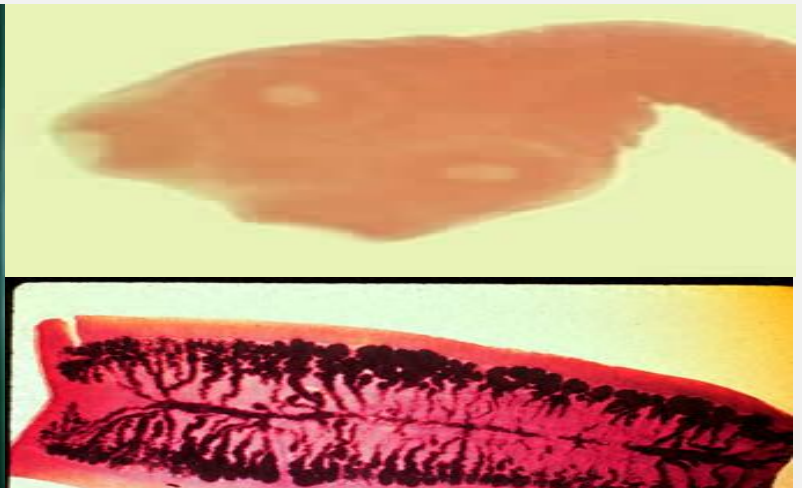




- Animal (Cow Or Pig) Become Infected By Ingesting Grass Contaminated With Eggs Or Gravid Segments Which Passed From Human Faces
- In The Cattle Go To Circulation And Transformed To **Cysticercus** Stage In The Muscle Known As **Cysticercus (**Bovis Or Celluloasae) .
- Man Become Infected By Eating Undercooked Beef, The Adult Worm Lives In Small Intestine → Passing Eggs And Gravid Segments To The Environment Through Faeces.

N.B:- Taenia Solium Can Enter Human Body As Ova Form (beside undercooked meat)





Hymenolepis nana (dwarf worm)

Common name :- dwarf worm

Features:-

1. transmission of infection: ingestion of egg or autoinfection in children
2. site in **small intestine** through:-
   a. embryo penetrates villus (from lumen)
   b. become cysticercoid (in 4 days)
   c. re-enter lumen and attaches to mucosa
   d. become adult in (12 days)

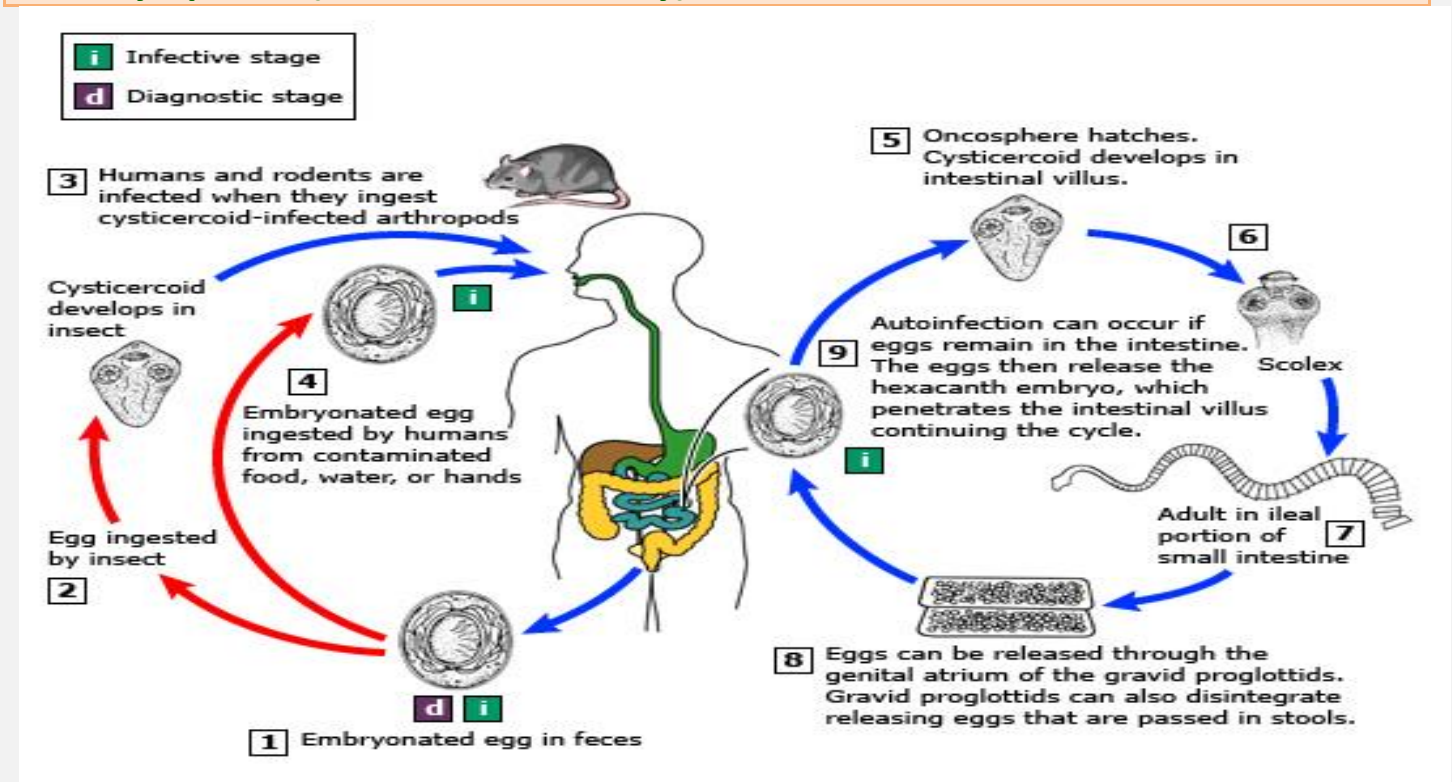
Pathology, clinical features and diagnosis

Pathology:

- ✓ **light infection: asymptomatic**
- ✓ **heavy infection: abdominal pain, diarrhea, anemia, nervous symptoms (dizziness, irritability)**

Diagnosis:

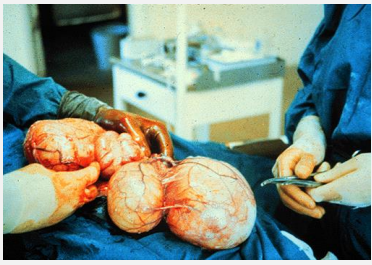
- ❖ **ova found in feces**
- ❖ **eosinophilia may be present**



LIFE CYCLE: eggs are ingested → penetrate the intestinal villus and develop into cysticercoid rupture of the villus→the cysticercoids return to the intestinal lumen→ attach to the intestinal mucosa and develop into adults→in the ileal portion of the small intestine producing gravid proglottids (has both sex) . Eggs are passed in the stool

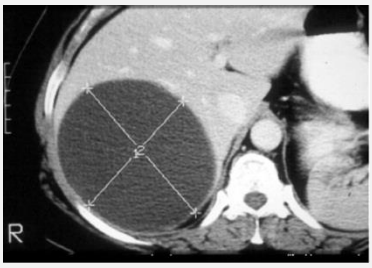
AUTOINFECTION: which penetrates the villus continuing the infective cycle without passage through the external environment

Echinochoccus granulosus



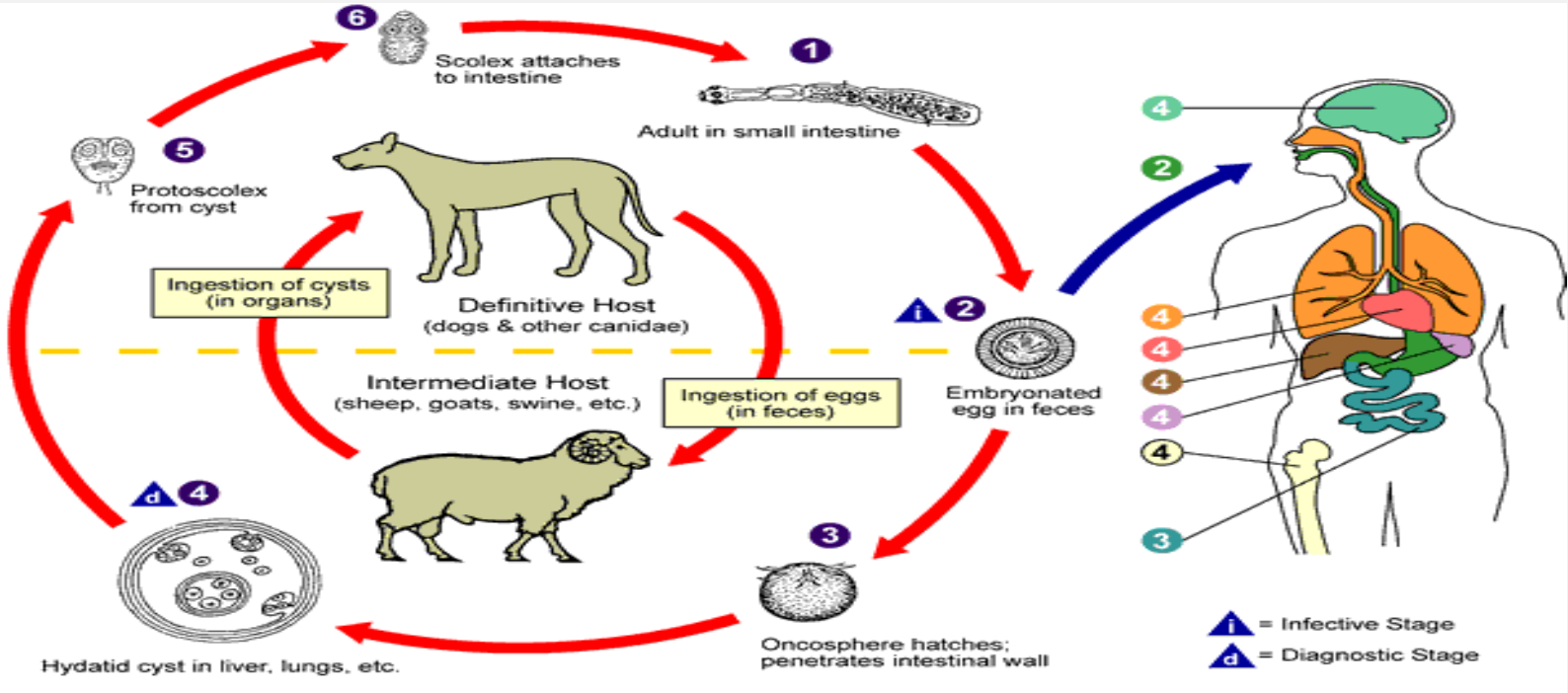
Disease:- echinococcosis or hydatid cyst disease

Features:-



1- rout of infection is ingestion of egg
2- egg hatches in small intestine
3- larva penetrate intestine and go to **(LIVER, LUNG,BRAIN)**
4- adult found in small intestine
5- The most important and common site of the hydatid is the liver

Pathology, forms and diganosis		
Pathology: ✓ **organ dysfunction:** ✓ **liver → enlarged cyst (may rupture)**	**Forms:** ❖ **infective: Embryonated egg** ❖ **Diagnostic: Hydatid cysts**	**Diagnosis:** ❖ **Imaging: CT and MRI** ❖ **Microscopy: Hyadtid sand** ❖ **Serologic tests to detect specific antibodies**



Life cycle of Echinococcus granulosus

eggs found in dog feces → humans ingest eggs → eggs hatch into larvae in small intestine → larvae penetrate intestinal wall and travel to other tissues → form hydatid cysts in liver, lung, or brain

Summary (Nematodes)

Type	Infective stage	Diagnostic stage	Live in
Enterobius vermicularis	Embryonated eggs with larva inside	Eggs around anus opening	Caecum and appendix
Ascaris lumbricoides	Embryonated eggs with larva inside	Eggs in stool or larvae in sputum	Jejunum and upper part of ileum
Trichuris trichiura	Embryonated eggs with larva inside	Eggs in stool	Caecum and appendix . Severe cases the whole length of large intestine is affected
Hook worms	Filariform larvae	Eggs in stool	jejunum
Strongyloides stercoralis	Filariform larvae	Rhabditiform larvae	Adult lives in mucus membrane of duodenum and jejunum

- Ascaris lumbricoides infection is the commonest human helminthes infection.
- First three nematodes are transmitted by fecal-oral route.
- Always in nematodes female is longer than male.

Summary (Cestodes)

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 disturbanc	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

Q-1 Which of the following intestinal Nematodes causes Loeffler`s syndrome?

A. Enterobius (Oxyuris)

B. Trichuris trichiura

C. Ascaris lumbricoides

D. Strongyloides stercoralis

Q-2 Regarding the examination of a stool sample Trichuris trichiura was identified due to the characteristic egg shape which is ?

A. Oval

B. Transparent with lobules

C. Barrel shaped

Q-3 Which of the following intestinal Nematodes causes anemia ?

A. Enterobius (Oxyuris)

B. Trichuris trichiura

C. Hook worms

D. Strongyloides stercoralis

Q-4 Which of the following intestinal Nematodes is the smallest pathogenic nematode?

A. Enterobius (Oxyuris)

B. Trichuris trichiura

C. Hook worms

D. Strongyloides stercoralis

Q-5 The most common site of the hydatid cyst is ?

A. Spleen B. Lung C. Bone D. Liver