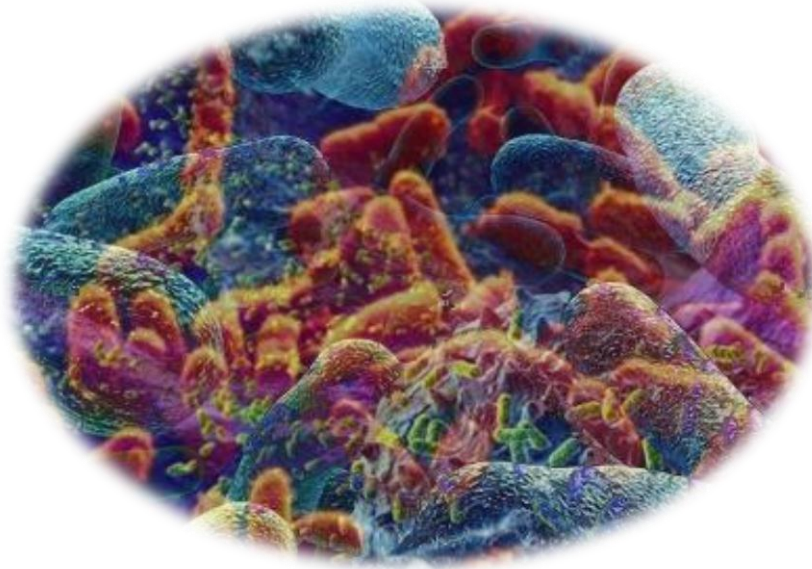


431
Microbiology Team

Intestinal Helminthes

GIT & HAEMATOLOGY BLOCK



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

Intestinal Helminthes:

Nematodes: General features:

1. Elongated worm, cylindrical, **unsegmented** and tapering at both ends.
2. Variable in size, measure less than 1 cm to about 100cm.
3. Sex separate and male is smaller than female.
4. Found in 2 locations in the body, in the **intestine** called (Intestinal nematode) & in the **tissue** called (Tissue nematodes).

Nematodes

- 1- *Enterobius (Oxyuris) vermicularis*(Pinworm,seatworm,threadworm)
- 2- *TrichurisTrichiura*(whipworm)
- 3- *Ascarislumbricoides*(roundworm)
- 4- *Ancylostomaduodenale*(*found in the old world "Asia, Africa & Europe"*)&*Necatoramericanus*(*found in the new word "south&north America)* (it is difficult to differentiate between these 2 so, we called them together **hookworms**)
- 5- *Strongyloidesstercoralis*

1-Enterobius vermicularis (Oxyuris):

- (Common Names: Pin worm, seat worm, thread worm)

- 1- Found all over the world.
- 2- Adult in lumen of cecum and appendix from which adult female migrate to rectum.
- 3- It can be seen by naked eye as white thread \pm 1cm.
- 4- Male is smaller than female \pm 0.5cm, with coiled end.



Life cycle:

Adult female and male live in the intestinal lumen → Deposits eggs in the perianal skin (diagnostic) → external environment → scratching the perianal area → stick in the fingers → swallowed (so, rout of transmission is fecal-oral rout).

Pathology:

- Majority of infections are asymptomatic & the main clinical presentation is **Pruritus** “sever itching” anus & perianal excoriation.
- ☑ Ectopic enterobiasis occurs in female when invade vulva and vagina result in **valvovaginitis**
- Usually accompanied by insomnia, anorexia, loss of weight and concentration (**Complications**)
- Diagnosis is done by **Adhesive Tape** (Scotch Tape).
- Treated by **Albendazole**, Mebendazole

2-*Ascaris lumbricoides* (roundworm):

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



Life cycle:

Adult male & female live in the intestinal lumen → Adult female deposit **eggs in the stool** (Diagnostic) → swallow the eggs (so, route of transmission is **fecal-oral route**) → larvae hatch inside the body → systemic circulation → **lungs & heart** (in the lung causing **Loeffler's syndrome** and you will find eggs in the sputum) → intestine → become adult → repeat the cycle.

Pathology:

• Adult worm:

In **Light infection** it will be asymptomatic but in **Heavy infection** there might be **intestinal obstruction**. The Adult might migrate to bile duct → **Jaundice**

- **Larvae: Loeffler's syndrome** (a disease like **Pneumonia**, there will be **cough with bloody sputum** **Eosinophilia**, **urticaria**).

Diagnosis & Treatment:

- Eggs in stool.
- Larvae in sputum.
- Adult may pass with stool.
- Treated by **Albendazole**, **Mebendazole**.

3- *Trichuris trichiura* (Whipworm):

- Worldwide, common in poor sanitation.
- **It coexists with Ascaris because of similar requirement.**
- Adult live in large intestine especially cecum and appendix
- in heavy infection the whole length of large intestine affected.
- Male and female worm have narrow anterior portion penetrate the intestinal mucosa



Life cycle:

Adult live in intestinal lumen → female adult deposit **eggs in stool** (Diagnostic) → rout of transmission: **fecal-oral rout** → inside the body → become larvae → adult.

Pathology:

Light infection → asymptomatic.

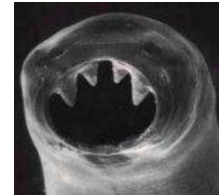
Heavy infection → abdominal pain, bloody diarrhea. **Rectal prolapsed** in children is a common complication.

Diagnosis & Treatment:

- Egg in stool characterized by its barrel shape with mucoid plugs at each pole.
- Treated by Albendazole

4-Hook worms (*Ancylostomaduodenale* & *Necator americanus*):

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



Life cycle:

Adult male and female live in the intestinal lumen → adult female deposit **eggs with stool** (Diagnostic) → external environment → **penetrate skin** (especially between the toes), rout of transmission is skin **penetration** → systemic circulation → lung & heart → intestine.

Pathology:

1- larvae:

- At the site of entry of larvae (ground itch).
- Migration phase:
 - Cough with bloody sputum pneumonia, eosinophilia, and urticaria.

2- 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 and hemorrhage from punctured sites lead to **severe anemia** (microcytic hypo-chromic.)

Diagnosis & Treatment:

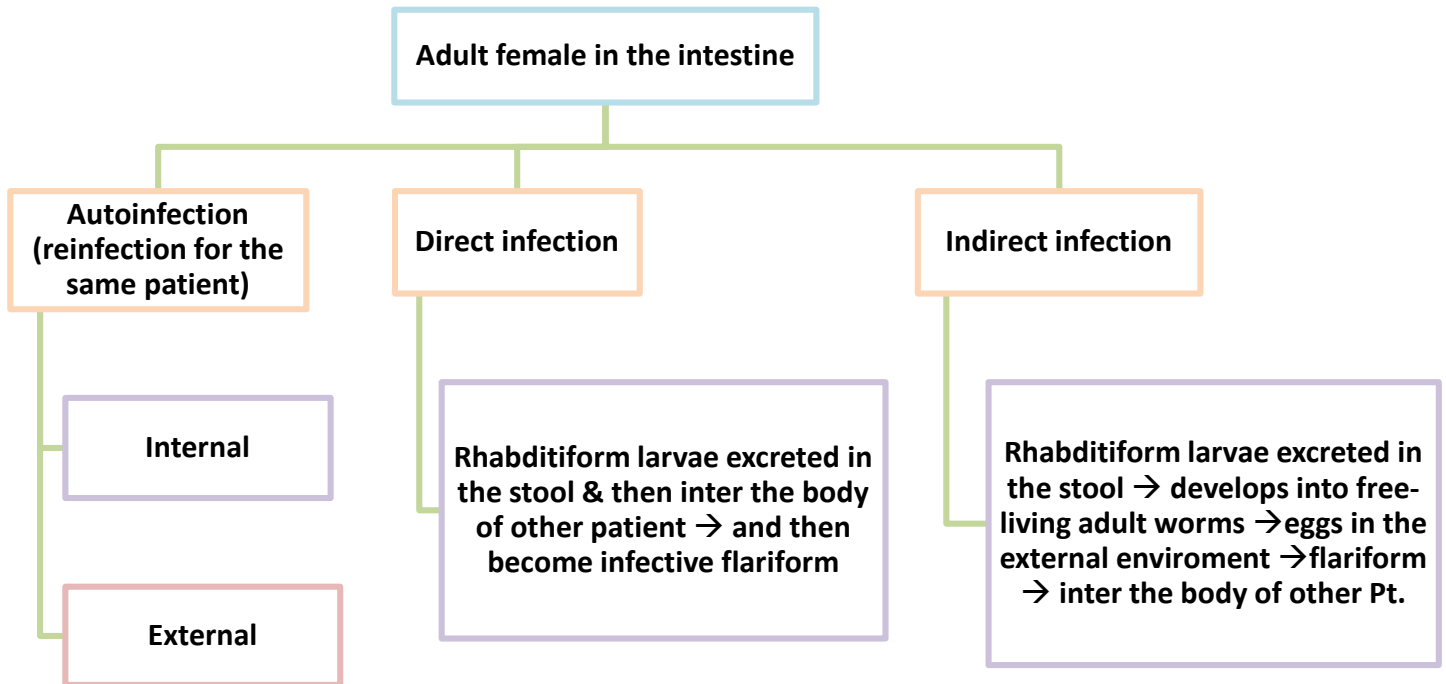
- Eggs in stools & occult blood (+).

* A fecal occult blood test is used to examine stool for traces of blood that cannot be seen with the naked eye. This test can detect bleeding from almost anywhere in the digestive tract.

- Treated by **Albendazole**, Mebendazole.

5-Strongyloidesstercoralis:

- Widely distributed in tropical region worldwide.
- Fatal opportunistic in **Immuno-compromised** host causing **internal autoinfection**
- It is **smallest** pathogenic nematodes ($\pm 2.5\text{mm.}$)
- Adult live in **mucous** membrane of duodenum jejunum rarely mucous membrane of bronchus



* **Rhabditiform larva**: early developmental larval stages (first and second), **Filariform larva**: infective third-stage larva

Life Cycle:

- Autoinfection \rightarrow internal infection \rightarrow Rhabditiform larvae in large intestine \rightarrow Flariform larvae \rightarrow penetrate intestinal mucosa.
- Autoinfection \rightarrow external infection \rightarrow Rhabditiform larvae goes to the external environment \rightarrow become Flariform larvae \rightarrow penetrate perianal skin.

Pathology:

- Cutaneous** little reaction on penetration, sever dermatitis at perianal region in case of external autoinfection.
- Migration**: same as hook worms.
- Intestinal**: inflammation of upper intestinal mucosa, diarrhea, upper abdominal pain clocky in nature.
- Disseminated strongyloidiasis**: in patient with **immunodeficiency**, uncontrolled diarrhea, granulomatous changes, necrosis, perforation, peritonitis, **death**.

Diagnosis & Treatment:

-**Rhabditiform larvae diagnostic stage in:**

1- Stool examination

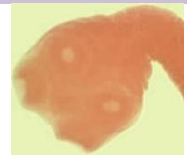
2- Duodenal aspirate

- Treated by **Albendazole**, Mebendazole

Tapeworm	Disease	Transmission Of Infection	Location Of Adult In Humans	Location Of Larva In Humans	Clinical Picture	Lab Diagnosis
Taeniasaginata	taeniasis	ingestion of larva in undercooked beef	Small Intestine	not present	vague digestive disturbances	eggs or proglottids in stools
Taeniasolium-Adult	taeniasis	ingestion of larva in undercooked pork	Small Intestine	not present	vague digestive disturbances	eggs or proglottids in stools
Taeniasolium-LARVA	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	hymenolepiasis	ingestion of egg	Small Intestine	Intestinal Villi	Enteritis diarrhea	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

1-Taenia saginata

Adult deposit eggs with stool in the external environment → eaten by the cow → the larvae hatch → live in the muscles of the cow → **human get infected by eating uncooked beef.**



2- Taenia solium

The same life cycle of the Taenia saginata **but human get infected by eating pork.**



3-Hymenolepis nana

Eggs passed in the stool:

-Autoinfecton in children OR eggs ingested in contaminated food

* **the rout of transmission is fecal-oral rout.**

4-Echinochoccus granulosus

- Forming Hydatid cyst in many parts of the body “brain, lung ...etc” but **the most common site is the liver. “VERY IMPORTANT”**

Treatment of Tapeworms:

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

Summary

- 1- Hook worms transmitted by skin penetration.
- 2- Diagnosis of *Enterobius Vermicularis* is done by adhesion tape (scotch tape) & the main clinical presentation is pruritus ani.
- 3- Diagnosis of *Ascaris Lumbricoides* is done by seeing eggs in the stool and the main complication is Loeffle's syndrome. It can also be diagnosed by detecting larvae in sputum.
- 4- Diagnosis of *Trichuris Trichiura* is done by seeing eggs in the stool and the main complication is **rectal prolapse** in children.
- 5- *Trichuris Trichiura* usually coexists with *Ascaris lumbricoides*
- 6- Hook worm is a common cause of anemia.
- 7- *Strongyloides* infect Immuno-compromised Pt causing internal autoinfection & it is the most severe one and could lead to death. The diagnosis is done by seeing Rhabditiform larvae in stool & duodenal aspirate.
- 8- All the nematodes are treated by Albendazole.
- 9- *Taenia saginata* & *solium* are transmitted by ingestion of uncooked beef (*Saginata*) or pork (*Solium*).
- 10- *Echinococcus granulosus* forming **Hydatid cyst** mainly in the liver.
- 11- Adult of *Taenia solium* is causing taeniasis by ingestion of larvae in uncooked pork.
- 12- Larvae of *Taenia solium* are causing *Cysticercosis* by ingestion of egg in uncooked pork