



Lecture – 4

Intestinal Helminthes

Microbiology Team - 430



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PROTOZOA	HELMINTHS
<ul style="list-style-type: none"> - Unicellular - Single cell for all functions 	<ul style="list-style-type: none"> - Multicellular - Specialized cells
<ul style="list-style-type: none"> 1- Amoebae: move by pseudopodia. 2- Flagellates: move by flagella. 3- Ciliates: move by cilia 4- Apicomplexa(Sporozoa) tissue parasites 	<ul style="list-style-type: none"> A- Round worms (Nematodes): <ul style="list-style-type: none"> - Elongated, cylindrical, unsegmented. B- Flat worms : <ul style="list-style-type: none"> - 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. Found in 2 locations in the body, in the **intestine** called (Intestinal nematode) & in the **tissue** called (Tissue nematodes).

Intestinal Helminthes:

Nematodes

- 1- *Enterobius (Oxyuris) vermicularis* (**Pinworm**, seatworm, threadworm)
- 2- *Trichuris Trichiura* (whipworm)
- 3- *Ascaris lumbricoides* (roundworm)
- 4- *Ancylostoma duodenale* (*found in the old world*) & *Necator americanus* (*found in the new world*) (it is difficult to differentiate between these 2 so, we called them together **hookworms**)
- 5- *Strongyloides stercoralis*

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 ani** & 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

Ascaris lumbricoides (roundworm):

- The **commonest human helminthes infection**.
 - Found in **jejunum** and upper part of **ileum**.
 - Female **± 20 cm** longer than male **± 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, rout of transmission is fecal-oral rout**) → larvae hatch inside the body → systemic circulation → **lungs & heart(in the lung causing Loeffle'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. However in **Heavy infection** there might be intestinal obstruction. The Adult might migrate to bile duct → Jaundice
- **Larvae: Loffler's syndrome** (a disease which is 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.

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 the stool (Diagnostic) → fecal-oral rout (rout of transmission) → inside the body → become larvae → adult.

Pathology:

- Light infection → asymptomatic. However, 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

Hook worms (*Ancylostoma duodenale* & *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) (so, 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.)

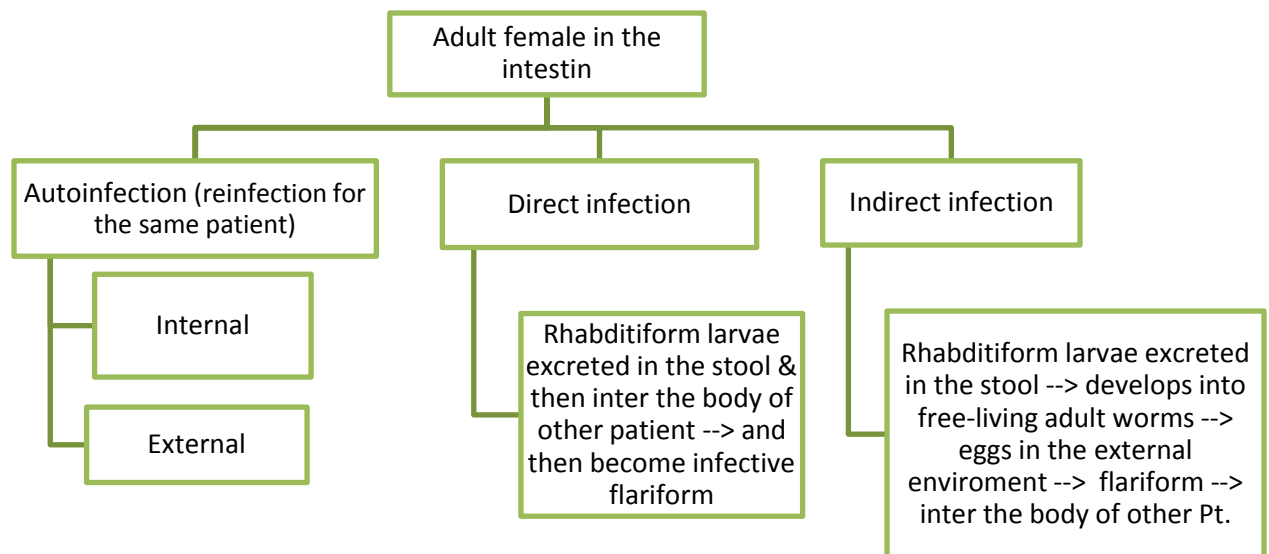
Diagnosis & Treatment:

- Eggs in stools & occult blood (+).
- Treated by **Albendazole**, **Mebendazole**.

Strongyloides stercoralis:

- 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 m.m.of bronchus

Life Cycle:



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

Pathology

- **Cutaneous** little reaction on penetration, severe dermatitis at perianal region in case of external autoinfection.
- **Migration:** same as hook worms.
- **Intestinal:** inflammation of upper intestinal mucosa, diarrhea, upper abdominal pain colicky 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

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 disturbances	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 disturbances	eggs or proglottids in stools
<i>Taenia solium</i>- <u>LARVA</u>	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
<i>Hymenolepis nana</i>	hymenolepiasis	ingestion of egg	Small Intestine	Intestinal Villi	Enteritis diarrhea	eggs in stools

<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
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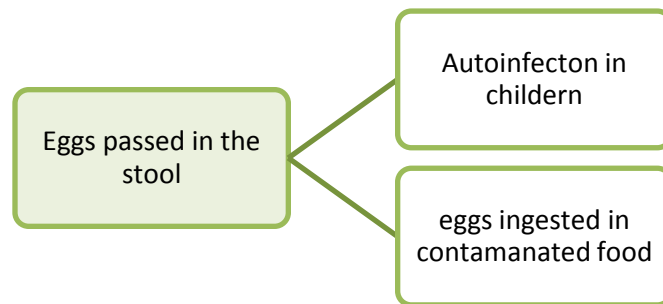
Taenia saginata

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.**

Taenia solium

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

Hymenolepis nana



So, the rout of transmission is fecal-oral rout.

Echinococcus granulosus

- **Forming Hydatid cyst mainly in the liver.**

Summary

- 1- *Enterobius Vermicularis*, *Ascaris Lumberical* & *Trichuris Trichiura* are transmitted by **fecal-oral rout**.
- 2- **Hook worms** transmitted by **skin penetration**.
- 3- **Diagnosis of Enterobius Vermicularis** is done by **adhesion tape (scotch tape)** & the main **clinical presentation** is **pruritus ani**.
- 4- The **diagnosis of Ascaris Luberical** is done by **seeing eggs in the stool** and the **main complication** is **Loeffle's syndrome**.
- 5- **Diagnosis of Trichuris Trichiura** is done by **seeing eggs in the stool** and the **main complication** is **rectal prolapsed** in **children**.
- 6- *Trichuris Trichiura* usually **coexists** with *Ascaris Lumberical*
- 7- **Hook worm** is the common cause of **anemia**.
- 8- *Strongyloides* infect **Immuno-compromised Pt** causing **internal autoinfection** & it is the most sever one and could lead to death. **The diagnosis** is done by **seeing Rhabditiform larvae in stool& duodenal aspirate**.
- 9- All the **nematodes** are treated by **Albendazole**.
- 10- *Taenia saginata* & *solium* are transmitted **by ingestion of uncooked beef or pork**.
- 11- *Hymenolepis nana* transmitted by **fecal-oral rout**.
- 12- *Echinochoccus granulosus* **forming Hydatid cyst** mainly in the **liver**.
- 13- **Adult of Taenia solium** is causing **taeniasis** by ingestion of **larvae** in uncooked pork.
- 14- **Larvae of Taenia solium** are causing **Cysticercosis** by ingestion of **egg** in uncooked pork.