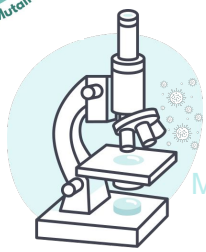


TEAM443
MICROBIOLOGY

Intestinal helminthes

Dr. Mona & Ibrahim

Objectives

NO objectives were found

For better understanding:

Part 1 (7:14 min): https://youtu.be/O1qf3R3zMB0?si=LCXBJasKE4i3eThe
0:00-2:22 (introduction and recap)
2:22-3:38 (Enterobius Vermicularis)
3:38-5:08 (Ascaris Lumbricoides)
5:08-6:48 (Ancylostoma & Necator americanus)

Part 2 (5:59 min): https://youtu.be/tJ55DKaUWj0?si=ZPnAWaP-FUQnpslG
0:00-0:55 (recap and introduction)
0:55-2:30 (Strongyloides stercolaris)
3:56-4:53 (Trichuris Trichiura)

Part 3 (7:29 min): https://youtu.be/M7rqKQWdk8o?si=SjznwPM2emmAjOEG
0:00-1:48(introduction)
1:49-3:18 (Taenia saginata&solium)
3:50-4:30 (Echinococcus granulosus)

Special thanks to Sultan Albaqami

Any future corrections will be in the editing file, so please check it frequently

Color Index:
Main text
Important
Doctor Notes
Males slide
Females slide
Extra

Introduction to Parasitology

Definition

the study of the invertebrate animals and the diseases they cause.

Human parasites' family tree

Parasites are classified as:

Protozoa "NEXT lecture"

- **Complexity:** Single-celled.
- **Onset of symptoms:** days-weeks
- **Diagnostic forms:** Cysts & trophozoites
- **Elevated immune cells:** Neutrophils

Helminths (Metazoa) "THIS lecture"

- **Complexity:** Multi-cellular
- **Onset of symptoms:** >1 month
- **Diagnostic forms:** Eggs / Larvae
- **Elevated immune cells:** Eosinophils

Flatworms (Platyhelminthes)

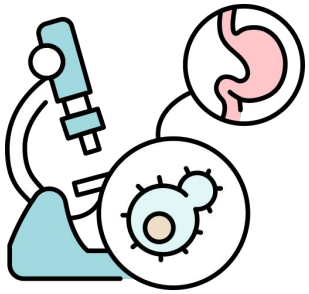
Cestodes

1. Taenia saginata
2. Taenia solium
3. Echinococcus granulosus

Trematodes

Roundworms (Nematodes)

1. Enterobius (Oxyuris) vermicularis (pinworm)
2. Trichuris trichiura (whipworm)
3. Ascaris lumbricoides (roundworm)
4. Ancylostoma duodenale & Necator americanus (hookworm)
5. Strongyloides stercoralis



Introduction to Parasitology

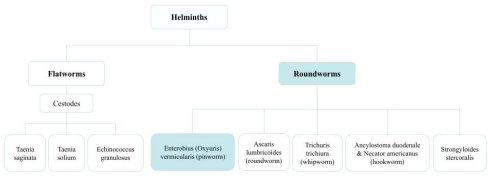
Important Terminology	
Vectors	Are living transmitters (e.g. a fly) of disease and my be: ○ **Mechanical**: transport parasite but there is no development of parasite in the vector ○ **Biological**: some stages of life cycle occur
Life cycle	○ **Life cycle:** Is the process of a parasite's growth, development & reproduction, which proceeds in one or more different hosts depending on the species of parasites. ○ **Direct life cycle:** When parasite requires only one host to complete its life cycle. ○ **Indirect life cycle:**When two or more hosts are required to complete its life cycle ○ **Infectious stage**: the stage in the life cycle of an endoparasite in which it can initiate infection to its host e.g., cysts in protozoan ○ **Diagnostic stage**: e.g. trophozoite in protozoan infections, eggs/worm in helminth infection
Others	○ **Obligatory**: They are always in contact with host and cannot survive without them ○ **Free living:** They can live independently of their host, partially on soil. ○ **Definitive host:** It is the host in which the sexual reproduction (adult) takes place or most highly developed form exists (usually humans) ○ **Intermediate host:** It is the host in which asexual reproduction takes place. ○ **Reservoir:** This is an animal host which serves as the source from which other animal are infected. ○ **Gravid worms:** Carrying eggs. ○ **Embryonated egg "Larvated egg":** A nematode egg with a developed larva inside it. Most nematode eggs leave the host in the morula stage and develop in the environment to the embryonated stage (the stage just before hatching).A few nematode eggs are embryonated at the time they leave the host. ○ **Unembryonated egg:** Egg without an embryo, due to a lack of fertilization or to zygotic lethality ○ **Larva migrans:** Means that the larvae (يرقة) living in their abnormal hosts in which they can not grow into adults but can wander everywhere and cause the local and systemic pathological lesions of the hosts. ○ **Zoonosis**: refers to animal's diseases. which can be transmitted to humans. ○ **Sporozoite:** a motile spore-like stage in the life cycle of some parasitic sporozoans ○ **Trophozoites:**a growing stage in the life cycle of some sporozoan parasites, when they are absorbing nutrients from the host. ○ **Cysts:** a stage in the life cycle of certain parasites, during which they are enveloped in a protective wall, facilitates their survival during unfavorable environmental conditions. ○ **Oocyst (كيسة بيض):** a cyst containing a zygote formed by a parasitic protozoan

Introduction

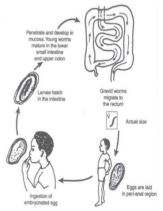
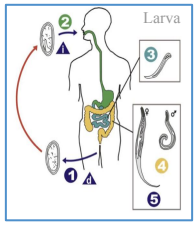
Classifications of Parasites		
Class	**Protozoa**	**Helminths**
Features	○ Unicellular ○ Single cell for all functions No sexual stage, replicate by binary fission	○ Multicellular ○ Specialized cells -They are like human, have systems: Respiratory, Reproductive.. -As long as there is reproductive system so there will be sexual stage in their life cycle
Types	**1. Amoebae:** move by pseudopodia **2. Flagellates:** move by flagella **3. Ciliates:** move by cilia **4. Apicomplexa** (Sporozoa) tissue parasites	**1. Roundworms (Nematodes):** - Elongated, cylindrical, unsegmented **2. Flat worms** - **Trematodes:** leaf-like, unsegmented - **Cestodes:** tape-like,segmented ○ Mnemonic: trematodes = tree = leaf like Cestodes = cm = tape

Nematodes (الديدان الخيطية)		
General Features	**Location in the human body**	**Common intestinal infections**
○ Elongated worm ○ Cylindrical ○ Un-segmented ○ Tapering at both ends ○ Variable in size (measure < 1cm to about 100cm) ○ Sex separate ○ Male is smaller than female	○ Intestinal nematodes ○ Tissue nematodes	○ Enterobius (Oxyuris) vermicularis (pinworm, seatworm, Threadworm) ○ Trichuris trichiura (whipworm) ○ Ascaris lumbricoides (roundworm) ○ Ancylostoma duodenale & Necator americanus (hookworms) ○ Strongyloides stercoralis

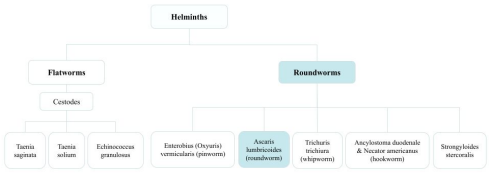
Enterobius Vermicularis (Oxyuris)



Threadworm, Pinworm, Seatworm (الدودة الدبوسية الخيطية)

General Information	○ Found all over the world but more common in temperate regions المناخ المعتدل ○ ★Children are more often evolved than adults cuz they don't wash their hands well , it tends to occur in groups living together such as families, army camps or nursery, and in ↓ hygiene. ○ Adult worms are mainly located in lumen of cecum and the female migrate to rectum to deposits her eggs on peri-anal area. ○ Direct human to human infections 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 ± 1cm. ○ Male is smaller than female ± 0.5 cm, with coiled end. 
Life Cycle {1}	○ Fecal oral route ○ Diagnostic stage: Un-embryonated eggs ○ Infective stage: Embryonated egg ○ Needs a few hours after the egg is released to become infective ○ What causes the disease: adult worms  
Pathology	○ Some / Most of infections are asymptomatic ○ Main clinical presentation ★★*(anal itching) Nocturnal* 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. There will be white substance in the anal area. ○ Ectopic infection -enterobiasis- (fallopian tubes infection) because the vagina near to anal canal & it's rare but can happened in severe cases occurs in women if the adult female parasite invade vulva & vagina result in vulvovaginitis, salpingitis ○ Also, adult worm can lodged in the lumen of appendix cause appendicitis. ○ Infected children may suffer from: - Emotional disturbance - Insomnia - Anorexia - Loss of weight - Loss of concentration - Enuresis
Diagnosis	○ Unlike other intestinal Nematodes, the eggs are not usually found in feces the only nematode that not diagnosed by stool examination ○ 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 .

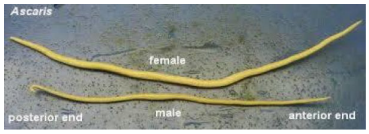
Ascaris Lumbricoides



Roundworm (دودة الاسكارس الاسطوانية)

General Information

- The commonest human helminthes infection all over the world.
- Human is the only definitive host* Where the sexual stage occur
- The large roundworm is normally located in the small intestine.
- Found in jejunum & upper part of ileum.
- Female: ± 20 cm longer than male Male ± 10 cm
- Feed on semi digested food can lead to malabsorption & malnutrition



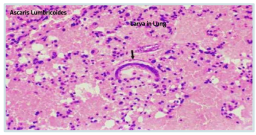
Female Slides

Life Cycle {2}
pictures below

- It infect human only, when man ingest food or water contaminated with *Embryonated egg (infective stage)* → egg shell is dissolved by digestive juices → Larva penetrate the wall of the duodenum → portal circulation for (3 days) → right heart → pulmonary circulation and stay in the alveoli ,where it grow and molts for (3 weeks) → 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 3 weeks to become an *embryonated eggs (infective stage)*

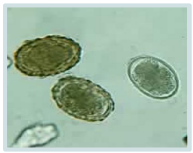
Pathology

- Adult worm: (small intestine)
  1. Light infection : asymptomatic
  2. Heavy infection : ★intestinal obstruction & can lead to death
  3. Migrating adult : to bile duct - jaundice
- Larvae will lead to ★Loeffler's syndrome which is pneumonitis & bronchospasm, cough with bloody sputum, eosinophilia, and urticaria


Ascaris larva in lung

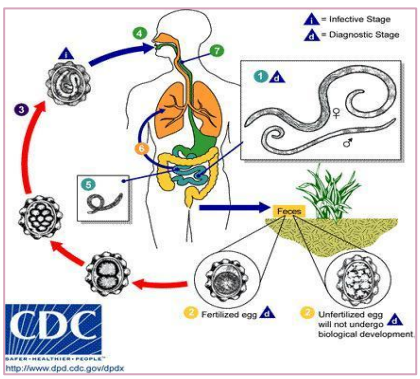
Diagnosis

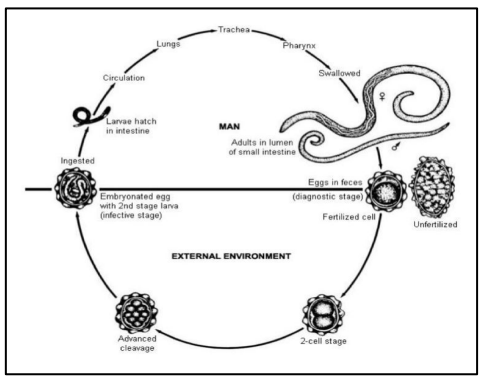
- Diagnostic stage: un-embryonated egg
- Eggs in stool (fertilized or unfertilized)
- Larvae in sputum
- Adult may pass with stool

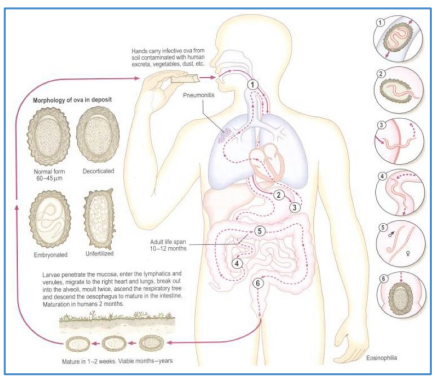


Treatment

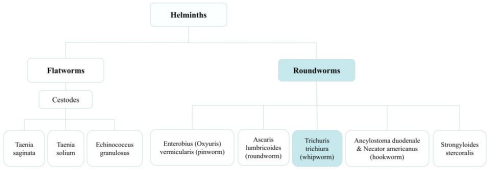
Albendazole , Mebendazole







Trichuris trichiura



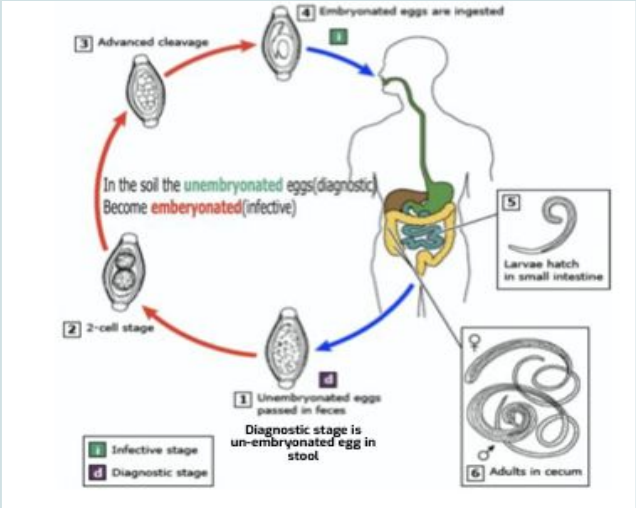
Whipworm (السوطية)

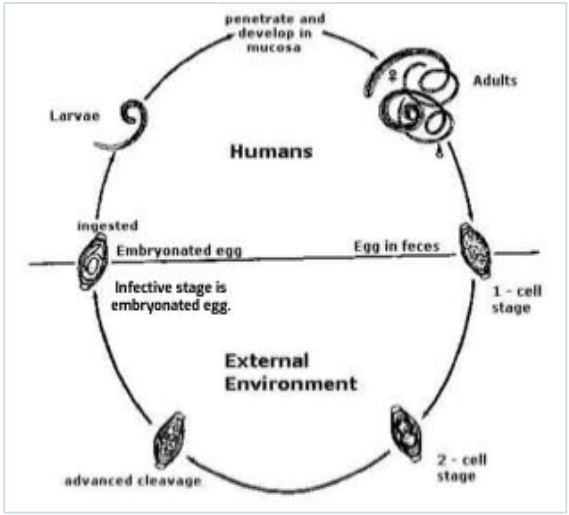
General Information

- World wide, common in poor sanitation.
- It coexists with Ascaris because of similar requirement (the eggs needs 3 weeks in the soil to be embryonated which is the infective stage).
- Adult live in large intestine especially caecum & 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

- Infective stage: embryonated eggs





Pathology

- Light infection : asymptomatic
- Heavy infection : ★ rectal prolapse in children is a common complication, abdominal pain, bloody diarrhea.

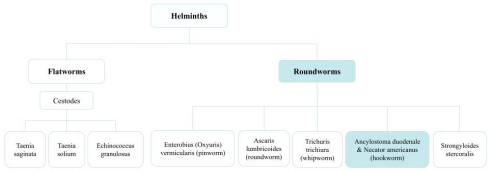
Diagnosis

- Diagnostic stage: un-embryonated egg in stool characterized by its barrel shape with mucoid plugs at each pole.

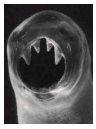
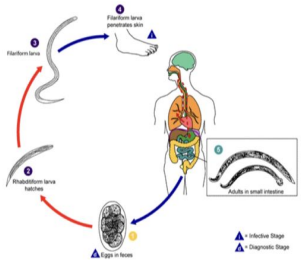
Treatment

Albendazole

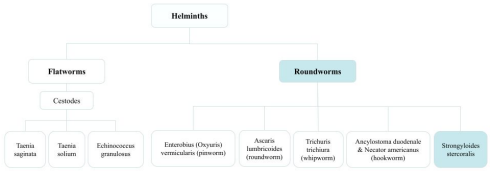
Ancylostoma duodenale & Necator americanus



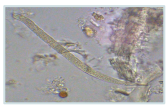
Hookworm (الخطافية، مصاص الدماء)

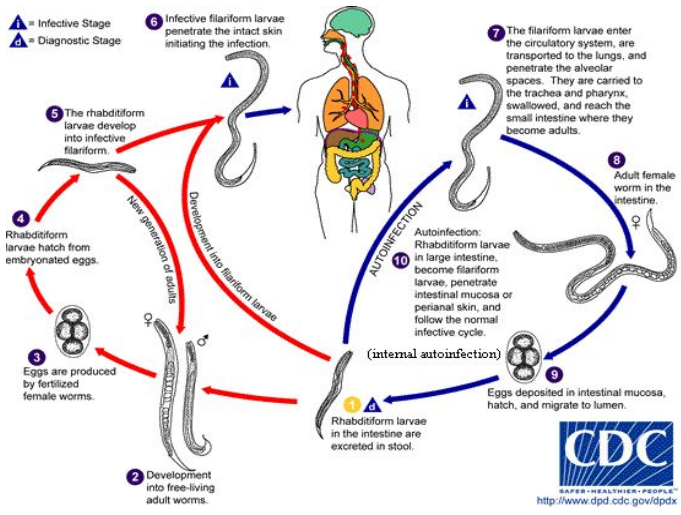
General Information	○ Buccal cavity attached to intestinal mucosa, Its buccal capsule (mouth) lined with hard hooks, triangular cutting plates and anticoagulant glands. 
Life Cycle {3}	○ Infective stage: FILARIFORM LARVA which penetrate the skin cause itching & dermatitis → larva go to the circulation (lungs causes slight pneumonitis & 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) ○ Filariform Larvae (infective stage) invasion of the skin can produce a skin disease called cutaneous larva migrans (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/day which pass out in feces (diagnostic stage). so i can diagnose from egg but the infection is after becoming a larva The eggs need to be in soil for about one week to become FILARIFORM LARVA INFECTIVE STAGE. 
Pathology / Clinical picture	○ There are no specific symptoms or signs of hookworm infection. But they give rise to a combination of: 1. Intestinal inflammation 2. progressive ★iron-deficiency **anemia** 3. protein deficiency ○ **Larvae:** 1. At the site of entry larvae intense itching (ground itch) and dermatitis 2. Migration phase: - Cough with bloody sputum - Pneumonitis & bronchitis but less severe than Ascaris, eosinophilia urticaria. ○ **Adult worm:** 1. Low worm burden (infection): no symptoms 2. 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 hypochromic anemia
Diagnosis	○ eggs in stools ○ Occult blood (+)
Treatment	Albendazole , Mebendazole .

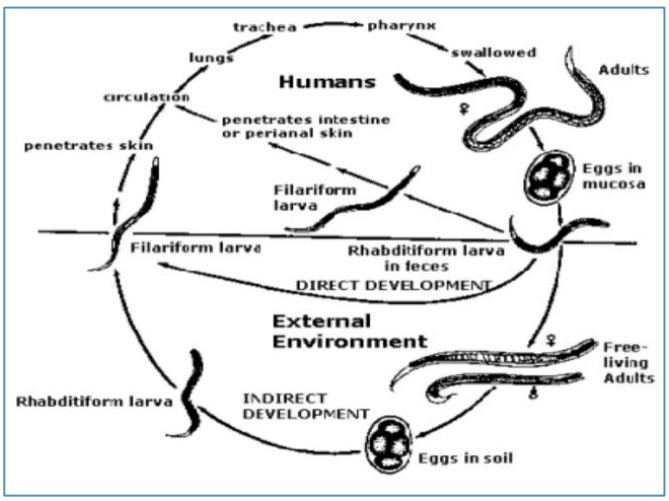
Strongyloides Stercoralis



(أسطوانية برازية)

General Information	○ Widely distributed in tropical area at Asia, Africa & South America . ○ Fatal very serious dissemination in ★immunocompromised host. the internal will be faster the external ○ It is smallest pathogenic nematodes ± 2.5mm. ○ Adult live in mucous membrane of duodenum, jejunum rarely mucous membrane of bronchus ★ **Internal** (most imp one) & external **Autoinfection** is a very important criteria.
Life Cycle pictures below	◎ 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. (directly from diagnostic stage to infective stage) 2. **Indirect / External development**: in external environment rhabditiform larva becomes free living adults, produce eggs, rhabditiform larvae and Filariform larva (Infective stage) penetrate the skin 3. **Autoinfection:** mainly in immunocompromised patient ▸ ★Internal★-Autoinfection: when the rhabditiform larva become a filariform larva in the intestinal mucosa or perianal area and penetrate the intestine ▸ External-Autoinfection: fecal contamination of skin Rhabditiform larva → Filariform penetrates the skin.
Pathology / Clinical picture	○ **Cutaneous**: little reaction on penetration. Severe 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   
Diagnosis	**Rhabditiform larvae (diagnostic stage)** in: The only parasite that exit to the soil as embryo "larva", the rest are eggs in soil ○ Stool examination ○ Duodenal aspira 
Treatment	Albendazole, Mebendazole .

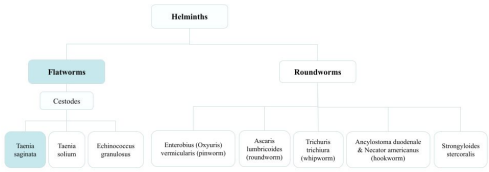




Summary of Common intestinal Nematodes

Name	Transmission infective stage	Location in adult human	Diagnostic stage	Clinical picture
Enterobius vermicularis	Swallowing the eggs, external Autoinfection	Large intestine **Caecum**	Adult pass in anus at midnight → **Cellulose adhesive tape** we detect adult worm	1. pruritus ani during night 2. persistent itching 3. inflammation around anus
Ascaris lumbricoides	Swallowing of **Embryonated egg**	Small intestine **Duodenum**	1. fertilized & unfertilized eggs in the stool 2. adult worm in the stool 3. larva in the sputum	Asymptomatic but can cause intestinal obstruction in heavy infection pneumonitis & bloody sputum **in larva stage**
Trichuris trichiura	Swallowing of Embryonated egg	Large intestine	Un-embryonated eggs	- Asymptomatic in light infection - Rectal prolapse in children
Hookworm Ancylostoma duodenale & necator americanus	- Larva penetration of the skin - Filariform larva the infective stage	Small intestine	Egg in the stool	- Itching & pruritus at sight of entry. - Cough & blood in the sputum at larval migration stage. - Loss of blood MICROCYTIC HYPOCHROMIC ANEMIA
Strongyloides Stercoral	- Larva penetration of the skin filariform larva the infective stage - **Autoinfection**	Small intestine	Rhabditiform Larva	- Pruritus at the site of larval penetration - Inflammation in the small intestine - **Autoinfection** in patient with **immunodeficiency** - uncontrolled diarrhea, granulomatous changes, necrosis, perforation, peritonitis, death

Cestodes worms

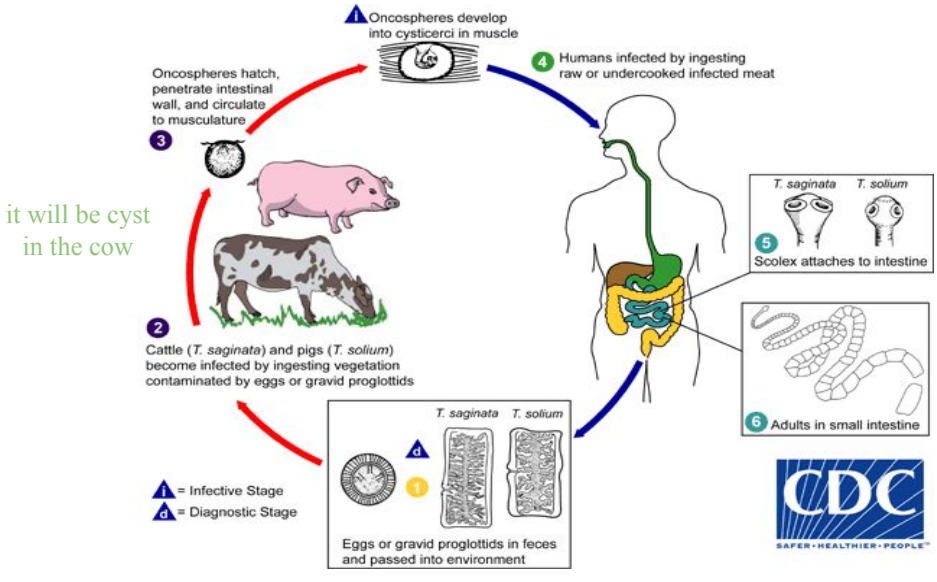


Cestodes tape like segmented parasite
If you cut them in the middle they will continue to live

- Taenia saginata (from cow)
- Taenia solium (from pig)
- Echinococcus granulosus

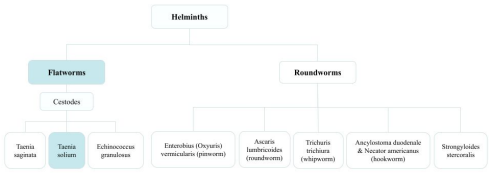
Taenia Saginata (Beef tapeworm)

General Information	○ Found in the muscles of animals ○ Is an obligatory parasite of mans, the adult worm lives in the **small intestine** ○ Definitive host: Human ○ Intermediate host: cattle ○ Infective stage: cyst 
Life Cycle picture below	○ Cattle become infected by ingesting grass contaminated with eggs or gravid segments which passed from human faeces → In the cattle, the oncosphere hatches out go to circulation and transformed to cysticercus stage in the muscle known as **cysticercus bovis** → Man becomes infected by eating under / improperly cooked beef, the adult worm lives in small intestine of man passing eggs & gravid proglottids / segments to the environment. ○ **Briefly**: human pass the eggs in the stool → cattle eat the eggs → turned to cyst in the cattle muscle "intermediate host"→ human eat the beef → the cyst transformed into adult in human body "definitive host"
Clinical findings	The majority of cases with adult T.saginata in the small intestine are Asymptomatic. But, some have vague intestinal discomfort, vomiting, diarrhea, malaise & some abdominal cramps.
Notes	○ In Taenia Saginata infections there is usually only one worm in an infected person ○ Cysticercus Bovis have heat protection which is why it can survive if it is undercooked ○ Infective stage: cyst acquired by ingesting undercooked beef ○ Diagnostic stage: eggs and gravid segments (pieces of the worm) in stool. ○ What if human consumed these eggs? **nothing** will happen as the infective stage for human is the cyst NOT the eggs.



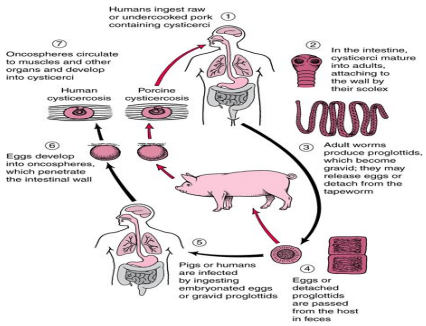
it will be cyst in the cow

Taenia Solium & Hymenolepis nana



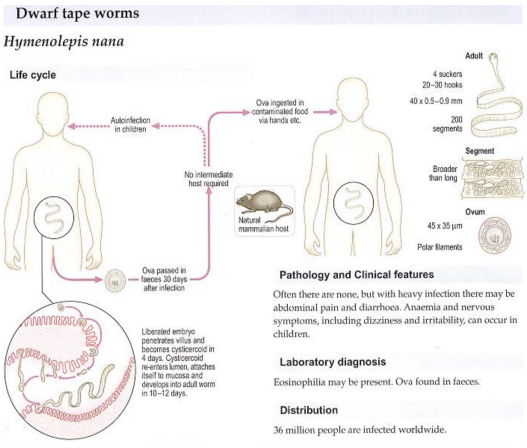
Taenia Solium (Pork tapeworm)

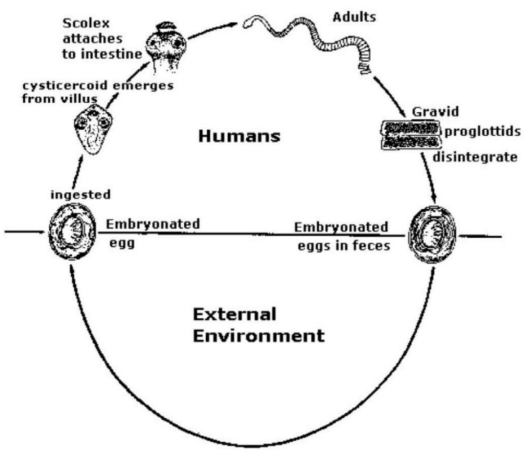
Female Slides

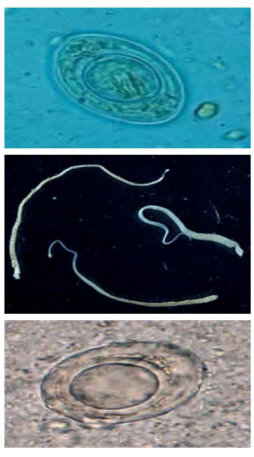
Life cycle	**Man can be infected by 2 ways:** 1. Eating eggs: Patient will develop **cysts** in various part in the body (cysticercosis) in eye, brain can be very dangerous. 2. Eating undercooked pork contain cystocercus: Patient will develop an **adult** worm in the small intestine.  this picture is in both male & female slides
Clinical findings	○ Taenia solium (pig tapeworm): Cysticercus of Taenia solium in brain ,eyes and skin ○ Can be very dangerous according to its location.
Laboratory diagnosis	○ Taenia infection is usually diagnosed by finding the typical segments (proglottids) & 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.
Treatment	Single dose of Praziquantel is usually successful in T.saginata but T.solium some time needs surgical intervention.

Hymenolepis nana (dwarf tapeworm)

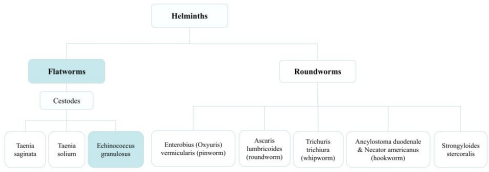
Male Slides







Echinococcus granulosus



= hydatid cysts

Female Slides

Life Cycle
pictures below

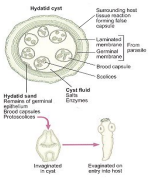
- E. granulosus requires two host types:
  1. Definitive host: Dogs the only parasite that transmitted by dogs
  2. Intermediate host: most commonly sheep, cattle, pigs, goats, camels and also Humans.
- **Dog** (definitive host): become infected by eating sheep's or cattle muscle having hydatid cyst then parasite become an adult in the small intestine of the dog and start releasing eggs witch excreted in the feces of the dog
- **Human** (Intermediate host): 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.

Female Slides

Symptoms

- Vary, depending on the location of the cyst in tissues.
- Although, cysts may form in many areas of the body, **★★liver** followed by lung & brain are most commonly affected.
- One serious complication of hydatid cyst disease is the **risk of anaphylactic shock,** following rupture of the ocyst.


Cerebral hydatidosis

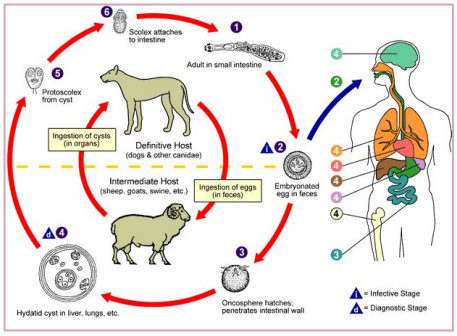


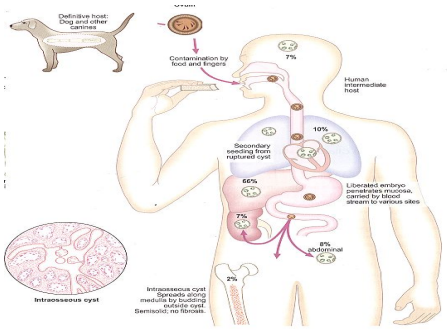
Diagnosis

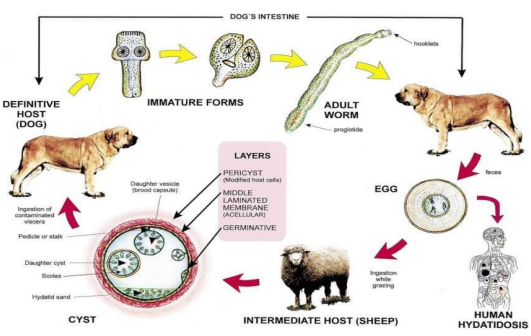
- Radiological examination: computed tomography (CT), magnetic resonance imaging (MRI) revealed a cystic swelling with smooth outline.
- Serological examination / test: to detect specific antibodies ELIZA,CFT.
- **Casoni's test:** it is an intradermal test used to detect immediate hypersensitivity in hydatid disease.
- Microscopical examination: hydatid sand, hydatid fluid may be withdrawn by the fine needle aspiration and examined under the microscope for scolices or hooklets. THIS IS A DANGEROUS PROCEDURE

Treatment

- Intestinal stages: Praziquantel
- Tissue stages (hydatid & cysticercosis): depends on clinical condition: Surgical and/or Albendazole







Summary of Common Tapeworm (Cestodes) Infections

Name	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 disturbances	Eggs or proglottids in stools
Taenia solium ADULT	Taeniasis	Ingestion of larva in undercooked beef	Small Intestine	Not present	Vague digestive disturbances	Eggs or proglottids in stools
Taenia solium LARVA (cysticercus cellulosae)	**Cysticercsis**	Ingestion of egg	Not present (except in Autoinfection on (Double infection), small intestine)	Subcutaneous muscles brain, eyes	**Depending on locality: from none to epilepsy**	X-ray, CT, MRI Serology
Hymenolepis nana in male slides	Hymenole piais	Ingestion of egg	Small intestine	Intestinal villi	Enteritis diarrhoea	**Eggs in stools**
Echinococcus granulosus	Hydatid disease	Ingestion of egg	Not present	**LIVER***,** lungs, Bones etc	Depending on locality	X-ray, CT, US Serology Hydatid sand

Dr Notes

1. **Life cycle of Enterobius Vermicularis (Oxyuris)**

الدوده الكبيره female & male يكونون بال cecum ف female تطلع برا عند ال anal area بالليل وتروح deposit egg وفي نفس الوقت تسوي scratching of anal area فيصير الطفل مو عارف ينام بالليل لان صاير له itching ،

» كيف ممكن انه يعدي نفسه؟ عن طريق itching of anal area وما يغسل يده ثم يحط يده في فمه فبالتالي دخل البيض داخل جسمه مره ثانيه فتسوي autoinfection

» كيف يعدي غيره؟ اول شيء يكون عنده itching of anal area و ما غسل يده ثم ياكل هو وصديقه ويتقاسم التفاحه معه وهكذا عن طريق fecal oral route

2. **Life cycle of ascaris:**
   1. small intestine of human contain male & female Ascaris so when they are fertilization they make an egg
   2. then human pass stool in soil (it must be passed stool in soil for the growth of Ascaris so that's why the rate of incidence of Ascaris decreased cuz human now use the toilet) with an egg and it could be an unfertilized egg will not grow and it will dead **or** fertilized egg
   3. the fertilized egg must stay in the soil for 2-3 weeks for the life cycle to continue growth and become an embryo
   4. so how does ascaris affect the human? the soil contains vegetables like lettuce and it contains embryonated eggs so when the lettuce is not cleaned very well and we eat it the egg will go into our stomach
   5. egg has a shell that protects the embryo from the acidity of the stomach then when it reaches the intestine the shell will dissolve and the larva penetrates the wall of the intestine and go to the bloodstream
   6. then it will go to the lung and stays for 3 weeks to have a good O2
   7. after that when it grows up the human will cough with blood cuz it does not feel comfortable so with the cough some larva will return again to the small intestine and it will be an adult

3. **Life cycle of Hookworm:**

First things the person is barefoot on the farm, so where do the larvae come from? It comes from a person pass stool with the egg, and the egg stays in the soil for about a week to grow into a larva
Then human walk and the larva penetrates the skin and enters the blood, then into the lungs to grow, then the human will cough and enters the intestines and remains there, suck the blood, and passing the egg.

For Anki flashcards

Special thanks to Shaden alhazzani

Extra

Summary

Intestinal Nematodes (Roundworms)

Parasite	Enterobius Vermicularis (Oxyuris)	Ascaris Lumbricoides	Trichuris trichiura	Ancylostoma duodenale & Necator americanus	Strongyloides Stercoralis
Overview	○ Children are more often evolved than adults ○ Location of adult worms: lumen of cecum	Location of adult worms: small intestine	Location of adult worms: large intestine especially caecum	Have anticoagulant glands	Fatal very serious dissemination in ★ immunocompromised host
Trans-mission	○ Fecal oral route ○ External autoinfection occurs by contaminated fingers	Ingest food or water contaminated with Embryonated egg	-	Caused by walking barefoot through areas contaminated with fecal matter	★ Internal & external Autoinfection
Life cycle	-	○ Definitive host: human only ○ Infective stage: embryonated egg ○ Diagnostic stage: fertilized & unfertilized eggs ○ The eggs has to be in the soil for 3 weeks to reach the infective stage	-	○ Infective stage: filariform larva ○ Diagnostic stage: eggs in stool	○ Infective stage: filariform larva ○ Diagnostic stage: rhabditiform larva ○ **Internal Autoinfection** occur when rhabditiform larva become filariform larva in the intestinal
Clinical Picture	Nocturnal pruritus ani, anal itching	○ Adult worm → Heavy infection → intestinal obstruction ○ Larva → loeffer's syndrome	Heavy infection will cause rectal prolapse in children	○ Iron-deficiency anemia ○ protein deficiency	-
Diagnosis	Cellulose adhesive test	-	-	-	-

Intestinal Cestodes (Flatworms)

Parasite	Taenia Saginata (**Beef** tapeworm)	Taenia Solium (**Pork** tapeworm)	Echinococcus granulosus
Overview	Location of adult worms: small intestine	-	-
Trans-mission	**by eating undercooked beef**	**by eating eggs OR undercooked pork**	-
Life cycle	○ Definitive host: human ○ Intermediate host: cattle (cysticercus bovis in the muscle) ○ Infective stage: cyst ONLY	○ Infective stage: 1. by eating eggs → develop cyst inside the body 2. by eating undercooked pork	○ Definitive host: dogs ○ Intermediate host: human
Clinical Picture	-	Patient eating eggs will develop cysts in the body (cysticercosis) in eye, brain and skin	○ **Hydatid cysts** ○ Cysts may form in many areas of the body: ★liver, lung & brain. ○ Risk of anaphylactic shock
Diagnosis	-	-	Casoni's test

MCQs

Q1. Intestinal obstruction is characteristic heavy infection by which parasite:			
A. Enterobius vermicularis	B. Ascaris lumbricoides	C. Strongyloides stercoralis	D. Taenia saginata
Q2. Which of the following cause iron deficiency anemia:			
A. Hookworm	B. Pinworm	C. Roundworm	D. Threadworm
Q3. A 9-year-old child named Emily visits the doctor with complaints of chronic abdominal pain and occasional bloody stools. During the physical examination, the doctor notices the rectal tissue protrudes through the anus. What do you suspects a possible cause of infection?			
A. Strongyloides stercoralis	B. Trichuris trichiura	C. Hookworm	D. Enterobius Vermicularis
Q4. A 40-year-old woman named Lisa presents with chronic fatigue and pale skin. She mentions that she was traveling for tourism and she walked in the seaside barefoot. Also, she's present with intestinal inflammation and iron deficiency anemia. What etiology do you suspect to be the cause?			
A. Strongyloides stercoralis	B. Trichuris trichiura	C. Ascaris lumbricoides	D. Ancylostoma duodenale
Q5. Which of the following organisms is characterized by INTERNAL Autoinfection ?			
A. Trichuris trichiura	B. Ascaris Lumbricoides	C. Strongyloides stercoralis	D. Taenia solium
Q6. What is the most common site of hydatid cyst?			
A. Liver	B. Lung	C. Brain	D. Pancreas
Q7. Loeffler's syndrome is characteristic of which parasite?			
A. Enterobius vermicularis	B. Ascaris lumbricoides	C. Strongyloides stercoralis	D. Taenia saginata
Q8. A 10-year-old child presents with severe itching around the anus, particularly at night. The child's parents mention recent reports of pinworm infection at school. How to confirm the diagnosis?			
A. Enzyme-linked immunosorbent assay	B. Cellulose adhesive tape	C. Polymerase chain reaction	D. Electron microscope
Q9. A 32-year-old male goes with his friends to campaign. after eating the lunch which is undercooked cow meat, he developed vomiting & diarrhea. cysticercus bovis were found on the cow muscle. what do you suspect is the etiology of this case?			
A. Trichuris trichiura	B. Ascaris Lumbricoides	C. Strongyloides stercoralis	D. Taenia Saginata

Answer Key: A1. B A2. A A3. B A4. D A5. C A6. A A7. B A8. B A9. D

TEAM 443
MICROBIOLOGY

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