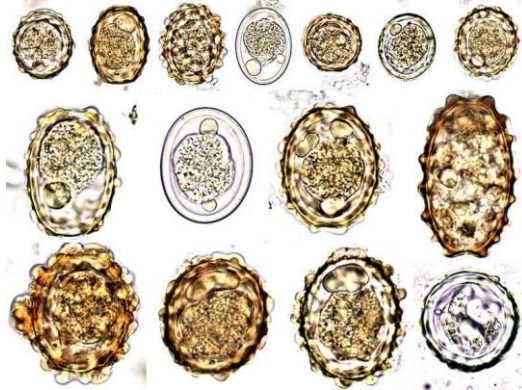
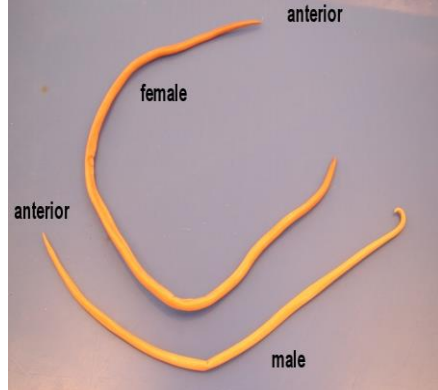

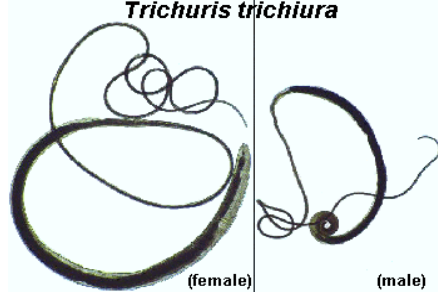

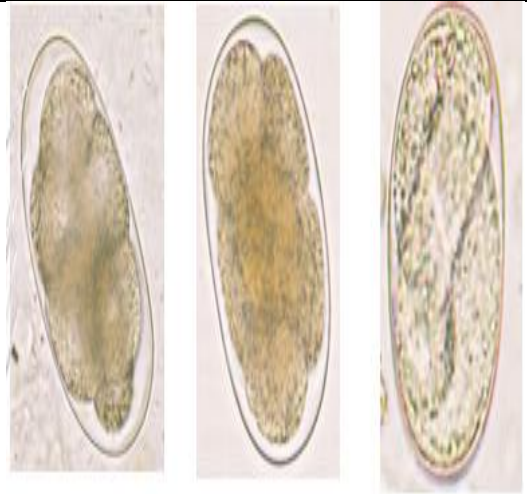
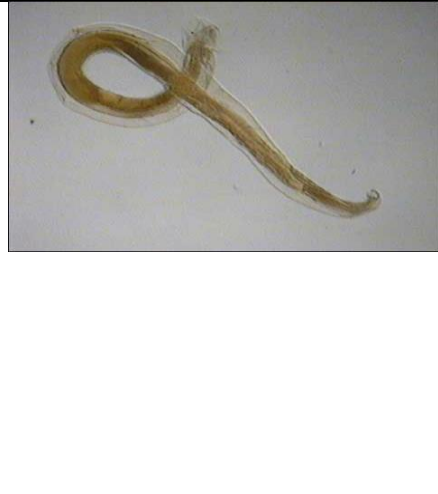

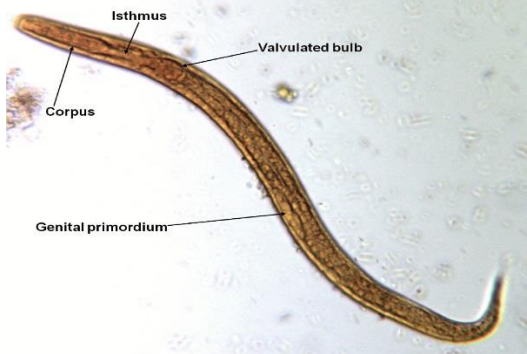





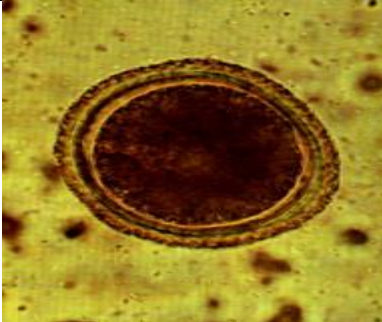
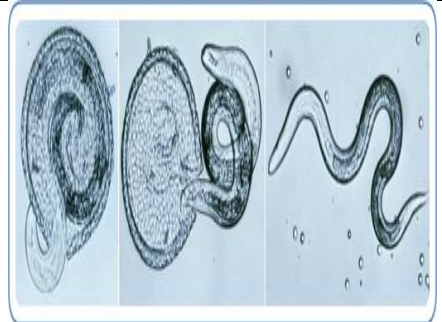





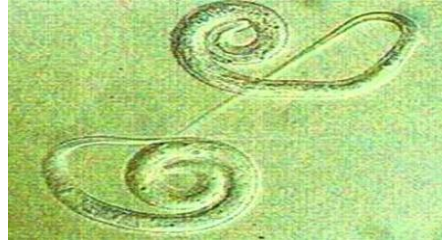
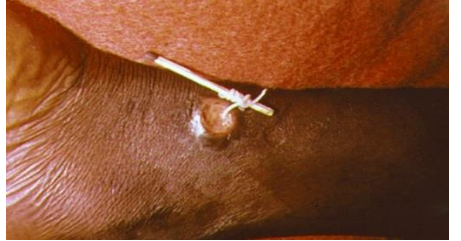


Parasite Identification – Nematodes/Cestodes/Trematodes

Organism	Microscopy (Ova)	Worm	Vector/Reservoir
Nematodes (Round Worms)			
<p><i>Ascaris lumbricoides</i> Diagnosis = stool wet prep in stool</p> <p>Pulmonary infections may present as Loeffler's syndrome GI Biliary obstruction/Ectopic infection (umbilical/hernia fistula, fallopian tubes, bladder, lungs, heart) Treat with Mebendazole + piperazine citrate (via NG tube) for intestinal/biliary obstruction</p>			<p style="text-align: center;">LOEFFLER'S SYNDROME</p> <ul style="list-style-type: none"> • A clinical syndrome characterized by <ul style="list-style-type: none"> • Mild respiratory symptoms • Peripheral blood eosinophilia • Transient, migratory pulmonary infiltrates • Immune hypersensitivity to <i>Ascaris lumbricoides</i> and other parasites • Affects people of all ages • Clinical features <ul style="list-style-type: none"> • The pulmonary manifestations begin approximately 9 to 12 days following ingestion • Low-grade fever • Nonproductive cough • Dyspnea (mild to severe) • Occasional hemoptysis
<p><i>Trichuris trichiura</i> Diagnosis = wet prep for lemon shaped ova in stool Whip like tail embeds into mucosa Heavy infection = iron deficiency/GI signs, chronic colitis with growth retardation/rectal prolapse Treat with Albendazole</p>		<p style="text-align: center;"><i>Trichuris trichiura</i></p> 	
<p><i>Ancylostoma duodenale</i> <i>Necator americanus</i> Human hookworms Diagnosis = wet prep of stool for ova Penetrate via skin when in contact with contaminated soil for >5 minutes (bare feet) 25% of world popn affected</p>			

<p>Vertical transmission – transplacental or during breast feeding Skin rash ‘ground itch’/Löffler’s syndrome/iron deficient anaemia/protein energy malnutrition</p> <p>Treat with Mebendazole</p>			
<p><i>Strongyloides stercoralis</i> Diagnosis = larvae in stool or duodenal aspirate Skin contact with infected soil - 1/3 asymptomatic infection Skin rash/Löffler's syndrome/GI/hyperinfection syndrome – autoinfection in immunocompromised: shock, severe abdominal pain, Gram- meningitis/septicaemia Treat – Tiabendazole (or Albendazole)</p>			
<p><i>Enterobius vermicularis</i> (pin worm) Diagnosis = sellotape slide to collect perianal region – need 3 examinations for 90% detection Ova flattened on one side Screen all family members of infected indiv. Treat - Mebendazole</p>			

<p><i>Ancylostoma braziliense</i> Dog and cat hookworm causing cutaneous larva migrans - Causes erythematous, puritic, serpiginous skin lesion Burrow into skin – live in sandy soil Diagnosis = clinical +/- skin biopsy showing inflammatory infiltrates</p> <p>Treat - oral + topical tiabendazole/oral albendazole (3 – 7 days)/ivermectin single dose</p>			
<p><i>Toxocara canis</i> = visceral larva migrans – fever, hepatomegaly, eosinophilia (usually infects dogs) mostly infects children <6rs, sometimes seizures & ocular invol. Look for exposure to puppies, serology, larvae in tissues Treat - Usually no treatment, albendazole in severe, corticosteroids?</p>			
<p><i>Trichinella (spiralis, native, brotovi, pseudospiralis, nelsoni)</i> Diagnosis = periorbital oedema/myositis/fever + history of ingestion of undercooked meat + antibodies + tests showing eosinophilia, LDH, ESR, CPK Treat - No real treatment, can try albendazole</p>			
<p><i>Dracunculus medinensis</i> (guinea worm) Occurs after drinking contaminated water 1yr later females migrate to subcutaneous tissues of the legs – initially stinging papule on lower leg, vesiculates and ruptures = painful ulcer. Milky fluid contains larvae Treat – Tiabendazole + metronidazole</p>			

Filiariasis

***Wuchereria bancrofti*/Brugia malay/Brugia timori**

Cause filariasis – transmitted by infected mosquito

W. bancrofti – tropics/subtropics = humans only

B. malaya – s&se asia = cats, primates + humans

B. timori – eastern Indonesia

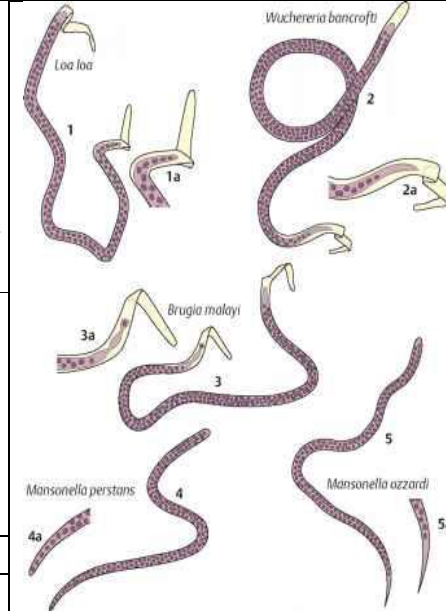
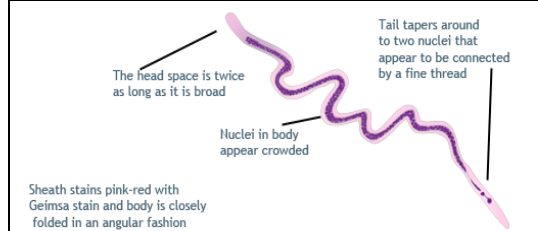
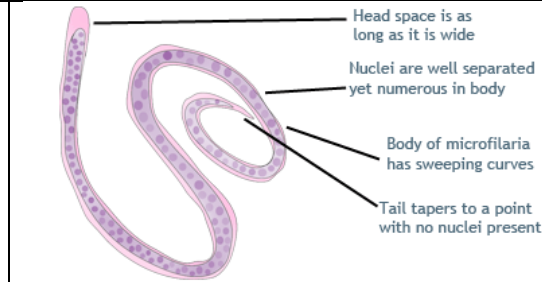
Acute: orchitis/epididymitis/lymphadenitis/fever/headache/backache

Chronic hydrocele/lymphadenopathy – may progress to elephantiasis of the lower limb

Chyluria if lymphatics burst into urinary tract

Diagnosis = microfilariae in peripheral blood (take at midnight)

Treat – DEC/DEC-albendazole/Ivermectin

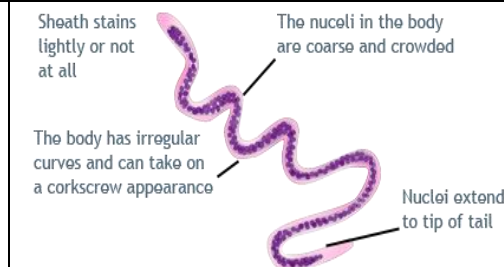


Mosquito vector



Loa Loa

Loiasis – characterised by transient subcutaneous swelling – W&C. Africa – day time blood smear
Calabar swellings – commonly found in joints, can migrate across subconjunctiva causing conjunctivitis – encephalopathy, arthritis, pleural effusion, retinopathy
Treat – DEC-albendazole +/- ivermectin (mass treat in endemic areas)



Tabanid flies (Chrysops species)

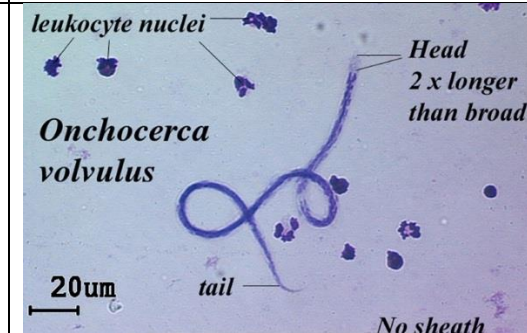


Onchocerca volvulus

Presents – dermatitis, subcutaneous nodules, keratitis, chorioretinitis. W,C,E Africa

Diagnosis = microfilariae in skin snips or corneal/anterior chamber of the eye on slit lamp examination



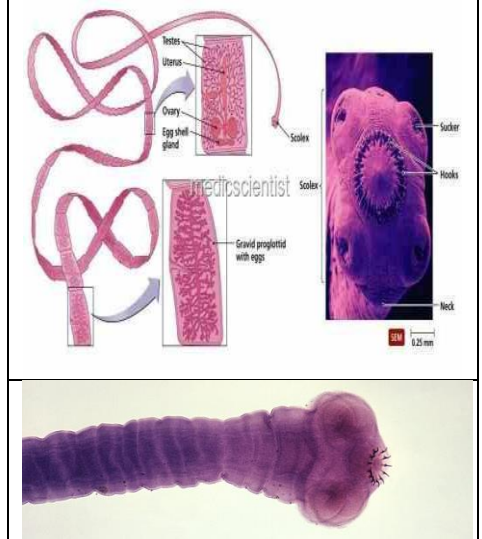
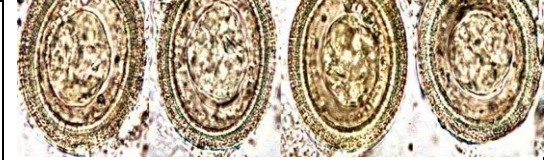


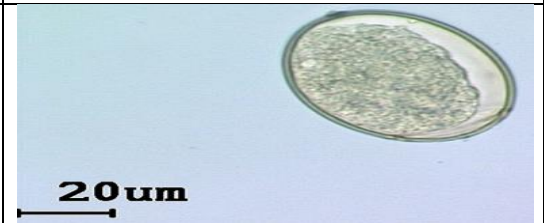
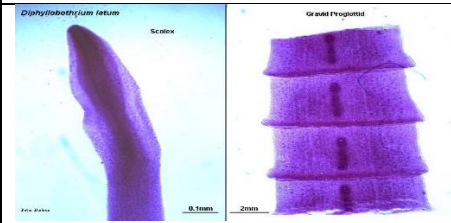
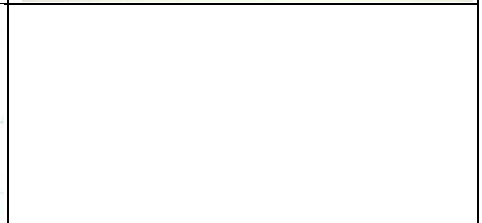
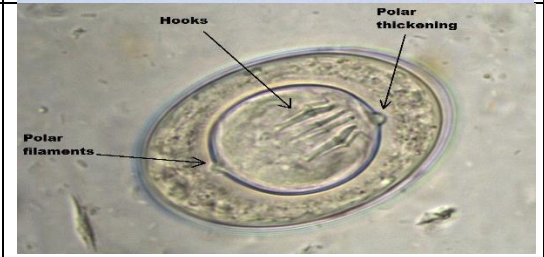
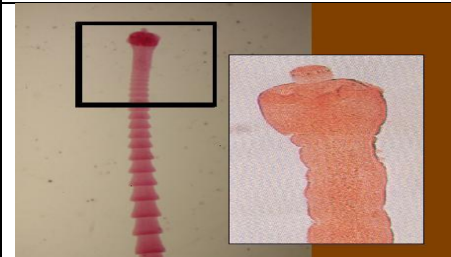
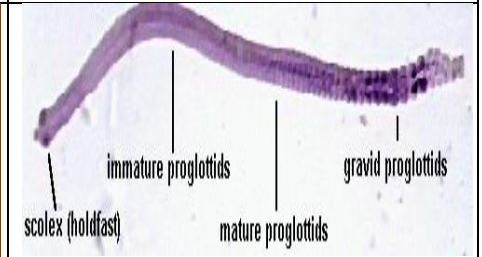
Treat – DEC (severe Mazotti reactions can occur) or Ivermectin (neither kills adult worms) + vector control


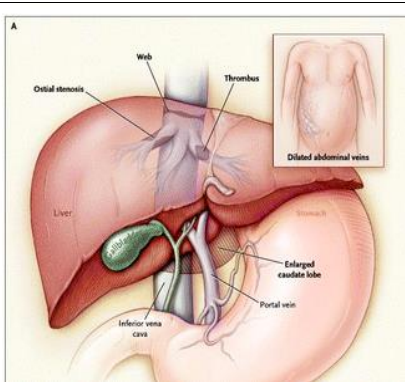
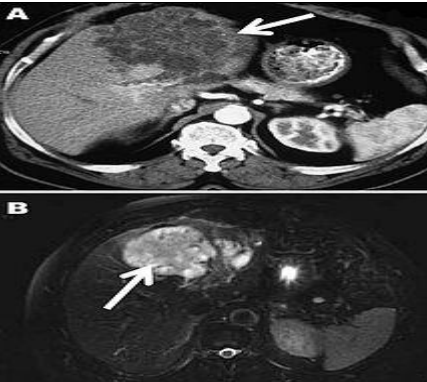
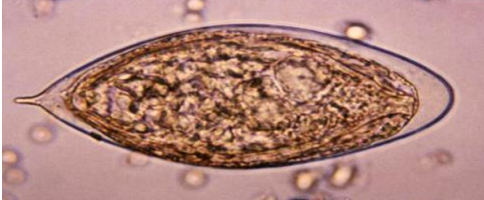

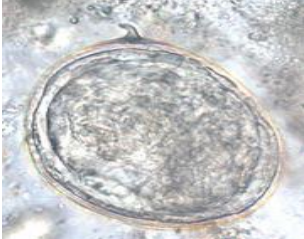

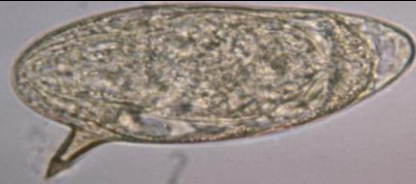

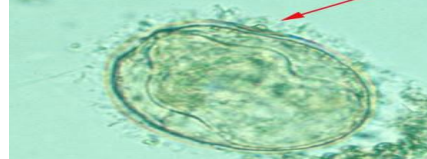


Simulium blackfly

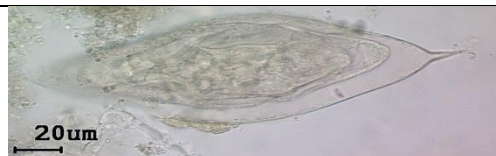


Cestodes (Tapeworms)

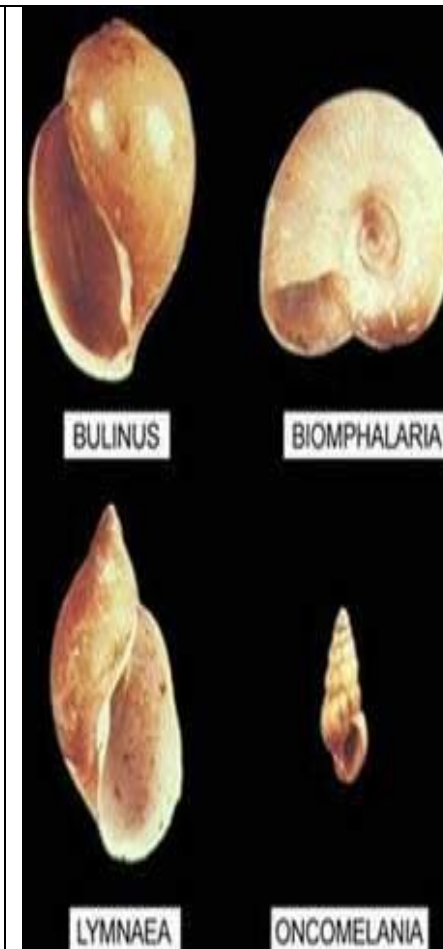
<p><i>Taenia saginata</i> (beef tapeworm) Diagnosis = examination of the proglottids with 15-20 lateral uterine branches Motile proglottids can be seen on perineum/clothing Eggs indistinguishable from <i>T. solium</i></p> <p>Patients usually asymptomatic but some have abdominal cramps/malaise</p> <p>Treatment - Praziquantel</p>			<p><i>Taenia saginata</i> <i>Taenia solium</i></p> 	
<p><i>Taenia solium</i> (pork tapeworm) Diagnosis = examination of the proglottids with 7 - 13 lateral uterine branches + eggs in stool Treat - Praziquantel</p>				
<p><i>Diphyllobothrium latum</i> (fish tapeworm) Clinical: usually asymptomatic, can cause b12 deficiency +/- folate deficiency Diagnosis = examination of the proglottids with central uterus + eggs in stool (Operculum + knob) Treat - praziquantel</p>				
<p><i>Hymenolepis nana</i> (dwarf tapeworm) Only 1 that can be transmitted human – human Heavy infection can be assoc. with GI symptoms Diagnosis = eggs with characteristic double membrane in the stool Treat – praziquantel</p>				

<p>Echinococcus (canine tapeworms)</p> <p>Clinical – inadvertently cause visceral cysts in humans (<i>E. granulosus</i>/<i>E. vogeli</i> = hydatid cysts or <i>E. multilocularis</i> = alveolar cysts)</p> <p><i>E. granulosus</i>: 50-70% hydatid cysts in liver, 20-30% hydatid cysts in lungs – cysts can rupture causing severe allergic reaction</p> <p><i>E. multilocularis</i> = more aggressive, alveolar cysts, invade adjacent tissue & metastasis to distant organs (Budd-Chiari syndrome – hepatic vein obstruction) asymptomatic cysts monitored</p> <p>Treat–surgical resection cyst + albendazole 2yrs</p>	 <p>PAIR – Puncture Aspiration Injection and Re-aspiration is less invasive than surgery</p>		
Trematodes (flukes)			
<p><i>Schistosoma haematobium</i> – live in venous plexus of the urinary bladder (Africa + middle east) eggs in terminal urine 12 – 2pm</p> <p>Swimmers itch/Katayama fever/chronic schistosomiasis/spinal cord lesions</p> <p>Treat - Praziquantel</p>			
<p><i>Schistosoma japonicum</i> – live in portal venous system (far East) Kato smear of faeces</p> <p>Swimmers itch/Katayama fever/chronic schistosomiasis GI symptoms/hepatic schistosomiasis/CNS – 3% infection may present with space occupying lesions/seizures</p> <p>Treat - Praziquantel</p>			
<p><i>Schistosoma mansoni</i> – live in portal vein system (Arabia, Africa, S.america, Carribean)</p> <p>Kato smear of faeces. Clinical as with <i>S. japonicum</i> but with spinal cord lesions instead of CNS. Treat - Praziquantel</p>			
<p><i>Schistosoma mekongi</i> SE Asia</p> <p>Kato smear of faeces. Clinical as with <i>S. japonicum</i> but with no CNS sometimes hepatosplenomegaly. Treat - Praziquantel</p>		<p>Acute schistomsomiasis/Kayayama fever–4-8 wks post infection. Fever, chills, cough, hepatosplenomegaly, lymphagenopathy, peripheral eosinophilia. Symptoms resolve</p>	

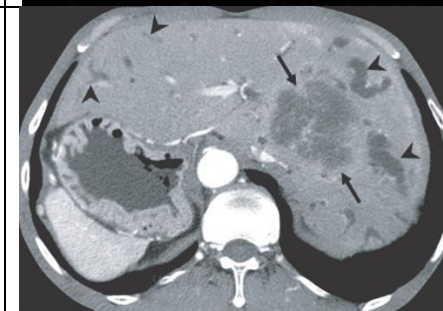
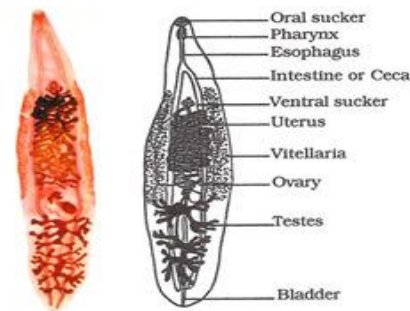
Schistosoma intercalatum W&C Africa
Diamond shaped compared to *S. haematobium*
Kato smear of faeces. Swimmers itch/
Katayama fever/GI. Treat - Praziquantel




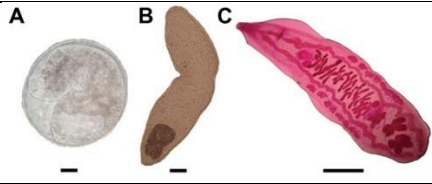



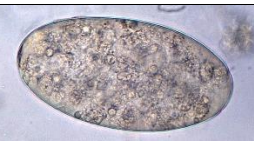

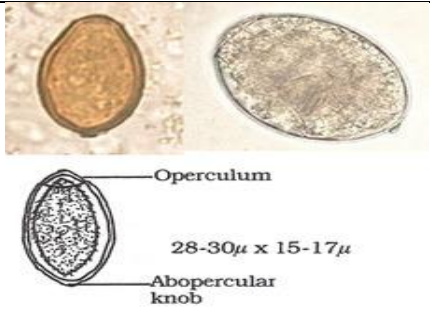
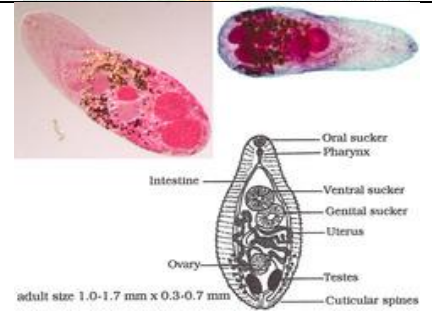



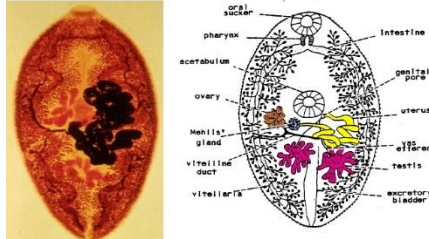


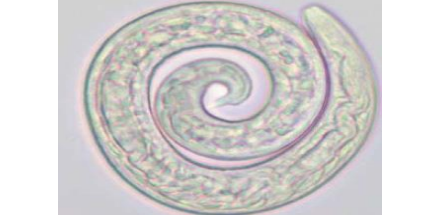

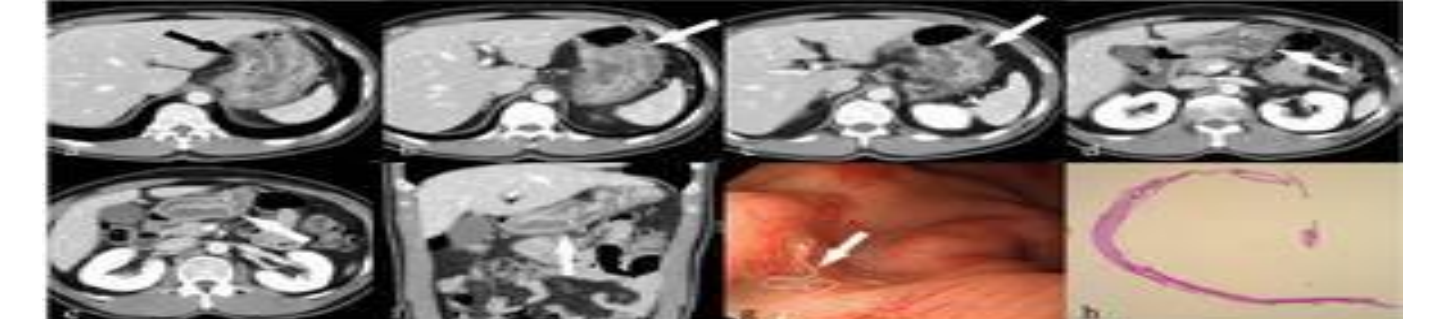
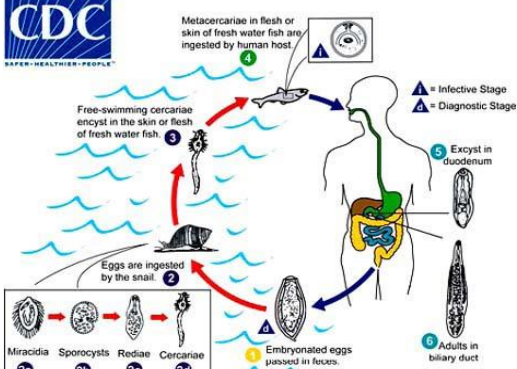
Swimmer itch



Clonorchis sinensis (Chinese/Oriental liver fluke) inhabit distal biliary capillaries.
Humans ingesting raw/undercooked fish
Clinical – heavy infection cholangiohepatitis
(pyogenic liver abscesses? Chronic chlonorchiasis is strongly associated with cholangiocarcinoma, a severe & often fatal form of bile duct cancer.
Diagnosis = operculated eggs in stool
Treat - Praziquantel



<p><i>Opisthorcis felineus</i> (common liver fluke of cats) SE Asia and Eastern Europe</p> <p>Diagnosis = eggs in stool</p> <p>Treat - Praziquantel</p>			
<p><i>Opisthorcis viverrini</i> (common liver fluke of dogs) Thailand</p> <p>is associated with cholangiocarcinoma</p> <p>Diagnosis = eggs in stool</p> <p>Treat - Praziquantel</p>			
<p><i>Fasciola hepatica</i> (liver fluke of sheep and cattle) – leaf shaped fluke – large oval yellow brown operculated eggs. Clinical hepatic phase and the chronic biliary obstruction/cirrhosis</p> <p>Diagnosis - bile/stool Treat - Triclabendazole</p>			
<p><i>Fasciolopsis buski</i> (intestinal fluke)</p> <p>GI symptoms</p> <p>Ova in stool = diagnostic</p> <p>Treat - Praziquantel</p>			
<p><i>Heterophyes heterophyes</i> (intestinal fluke)</p> <p>Consumption of undercooked fish</p> <p>Nile delta/SE Asia/Far East</p> <p>Tiny flukes</p> <p>GI</p> <p>Diagnosis – operculated eggs in stool</p> <p>Treat - Praziquantel</p>			

<p>Paragonimus westermani (lung fluke) W. Africa, Indian subcontinent, Far East, S. America and Central America Inhabit lungs – golden brown operculated eggs – coughed up or passed in faeces (brown sputum) Treat - Praziquantel</p>	 <p>operculum</p> <p>20µm</p> <p>thick shell, asymmetric</p>														
<p>Angiostrongylus cantonensis (rodent parasite) abdominal symptoms or eosinophilic meningitis – syndrome resembles appendicitis with eosinophilia Affects children in Central & S. America Treat – laparotomy DEC + tiabendazole</p>			 <p>Eggs</p> <p>10 µm</p>												
<p>Anisakis Parasite of marine mammals + humans infected when they ingest raw seafood – Netherlands & Japan Causes Anisakiasis usually with small intestine involvement – lower abdominal pain & obstruction. May become chronic with abdominal masses No treatment usually required</p>															
<p>Phocanema Parasite of marine mammals + humans infected when they ingest raw seafood – Netherlands & Japan Causes Anisakiasis usually with GI involvement abdominal pain, nausea & vomiting. May become chronic with abdominal masses No treatment usually required</p>	<div><p>Symptoms of Raw fish infection</p><table><thead><tr><th>Chlororchiasis</th><th>Diphyllobothrium</th></tr></thead><tbody><tr><td>Eyes and skin - Jaundice</td><td>Central - Irritability</td></tr><tr><td>Liver - Enlargement - Tenderness</td><td>Skin - Tingling - Numbness</td></tr><tr><td>Gastrointestinal - Nausea - Diarrhea - Vomiting - Abdominal pain - Loss of appetite</td><td>Heart - Increased heart rate</td></tr><tr><td>Anisakiasis Sudden, severe pain</td><td>Muscular - Weakness</td></tr><tr><td></td><td>Vague abdominal discomfort</td></tr></tbody></table></div>			Chlororchiasis	Diphyllobothrium	Eyes and skin - Jaundice	Central - Irritability	Liver - Enlargement - Tenderness	Skin - Tingling - Numbness	Gastrointestinal - Nausea - Diarrhea - Vomiting - Abdominal pain - Loss of appetite	Heart - Increased heart rate	Anisakiasis Sudden, severe pain	Muscular - Weakness		Vague abdominal discomfort
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	Vague abdominal discomfort														

<p><i>Capillaria philippinensis</i> Ingestion of raw fish Philippines and Thailand GI symptoms Diagnosis – ova/larva in stool Treat – mebendazole or albendazole</p>				
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