


Biomedical Parasitology

TREMATODES

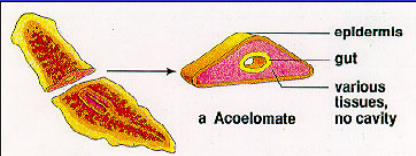


Prof. Peter O'DONOGHUE

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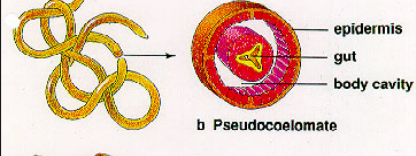
HELMINTHS (worms)

Flatworms



a Acoelomate

Roundworms




b Pseudocoelomate


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Platyhelminths (flatworms)

CESTODES
(tapeworms)



TREMATODES
(flukes)




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Trematodes


Characteristics

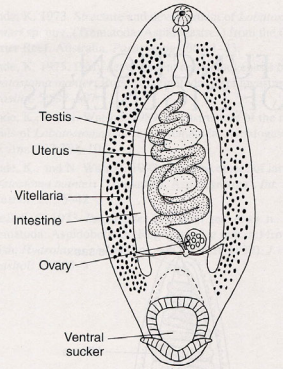
- body 1-50mm, soft, with suckers
- hermaphroditic (male and female organs)
- life-cycle with distinct generations (= di-genea)
 - vertebrates are definitive hosts
 - molluscs are obligate intermediate hosts
- distribution linked to host biology (molluscs abundant in aquatic cf. terrestrial environments, more trematodes in aquatic animals)
- various species of medical and veterinary importance



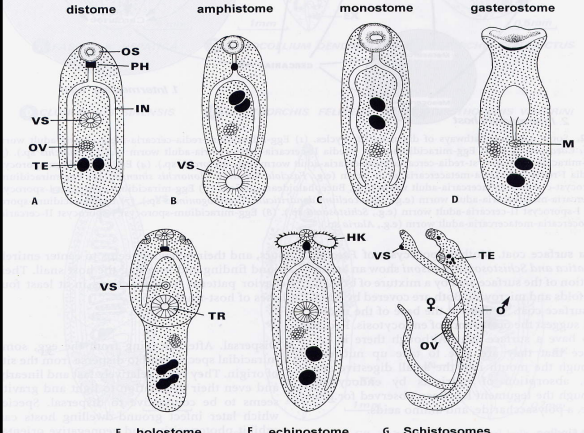
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Typical worm

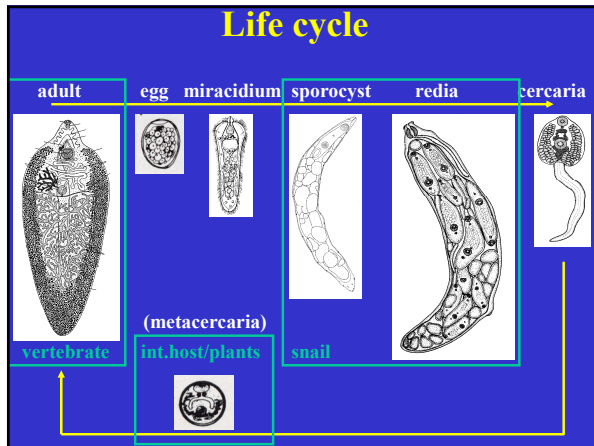




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Eggs

- trematode 'egg' not an ovum but a 'shelled embryo'
- operculum present ('trap-door' at one end)
- egg embryonates to form a miracidium
- egg hatches to release miracidium to water

Microscopic images of trematode eggs, showing their oval shape and the presence of an operculum (a 'trap-door' at one end).

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Miracidium

- released from eggs
- ciliated free-swimming stage
- actively seek snail hosts (chemotaxis)
- penetrate tissues

Microscopic images of a miracidium, showing its ciliated body and tail.

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Sporocyst/Redia

- miracidium penetrates snail, loses cilia, forms sac-like sporocyst
- rediae (embryos) develop asexually and mature to cercariae

Microscopic images showing a miracidium penetrating a snail and forming a sporocyst, and rediae (embryos) developing asexually and maturing to cercariae.

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Cercaria

- released from snails
- free-swimming stages
- some seek vegetation
- most seek hosts
- penetration machines

Microscopic images and diagrams of cercariae, showing their tail and penetration organs.

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Metacercaria

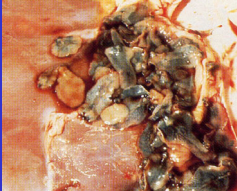
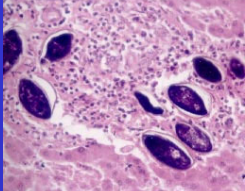
- quiescent stages formed by cercariae of some species
- cercarial tail shed, cyst wall secreted
- encyst on vegetation or encyst within intermediate host tissues

Microscopic images of metacercariae encysted in tissues.

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Pathogenicity

<p>adult stages chronic disease lumen obstruction inflammation fibrosis</p>	<p>eggs acute/chronic disease tissue trauma granuloma formation hypersensitivity</p>
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Classification

DIGenea
heteroxenous, suckers

ANEPITHELIOCYSTIDAE
excretory bladder wall retained

O: STRIGEATIDA
fork-tailed cercaria

Schistosomatidae
Diplostomatidae
Spirochidae
Bucephalidae
Strigeidae
Cyclocoelidae

EPITHELIOCYSTIDAE
new excretory bladder wall formed

O: ECHINOSTOMATIDA
simple-tailed cercaria

Echinostomatidae
Fasciolidae
Gastrodiscidae
Paramphistomatidae

PLAGIORCHIDA
cercaria with oral stylet

Dicrocoelidae
Plagiorchidae
Prothogonidae
Troglotrematidae

OPISTHORCHIDA
without stylet

Opisthorchidae
Heterophyidae


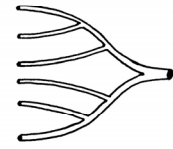

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Trematodes of medical importance

Order	Family	Genus
Echinostomatida	Echinostomatidae	<i>Echinostoma</i>
	Fasciolidae	<i>Fasciolopsis</i> <i>Fasciola</i>
	Opisthorchiida	Opisthorchidae
Plagiorchiida	Troglotrematidae	<i>Paragonimus</i>
Strigeatida	Schistosomatidae	<i>Schistosoma</i>

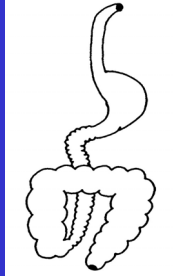
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Trematode infections

<p>gastro-intestinal</p>  <p>intestinal flukes enteritis</p>	<p>vascular</p>  <p>blood flukes inflammation</p>	<p>tissues, organs</p>  <p>liver flukes fibrosis</p>
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ENTERIC TREMATODES



Echinostoma ilocanum

Echinochasmus perfoliatus

Fasciolopsis buski

Heterophyes heterophyes

Metagonimus yokogawai

Gastrodiscoides hominis

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Enteric trematodes

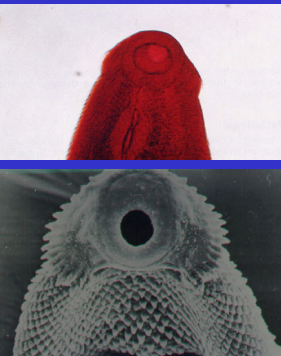
Parasite	Definitive host	Vector	Metacercaria	Locality
<i>Echinostoma</i>	human/dog/rat	snails	clams	Pacific
<i>Fasciolopsis</i>	human/pig/dog	snails	plants	Indochina
<i>Echinochasmus</i>	human/dog/cat	snails	-	Asia
<i>Heterophyes</i>	human/cat/dog	snails	fish	Nile
<i>Metagonimus</i>	human/piscivores	snails	fish	Nile
<i>Gastrodiscoides</i>	human/pig/mouse	snails	pigs	Indochina

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***Echinostoma* spp. (intestinal flukes)**

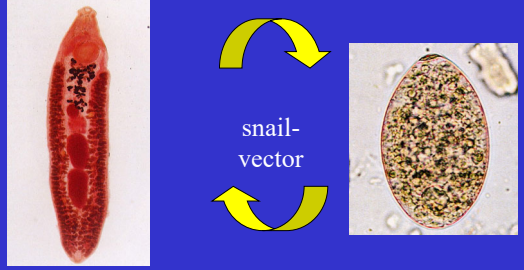
Order: Echinostomatida
Family: Echinostomatidae

- adults with circumoral spiny collar surrounding oral sucker
- metacercariae formed in freshwater molluscs



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***Echinostoma* (intestinal fluke)**



adults <1cm
in small intestines

operculated egg 90x60µm
passed in faeces

E. ilocanum/*E. linoensis* in oriental countries in humans/rats/dogs

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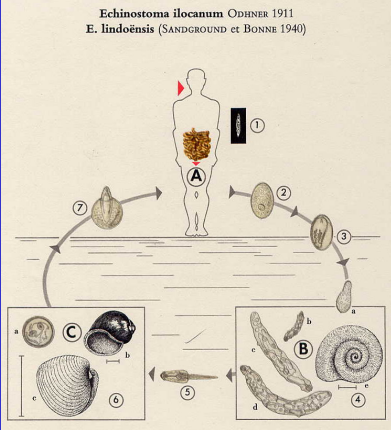
Food-borne transmission

prepatent period
3 weeks

cycle

- eggs voided
- f-I miracidia
- rediae in snails
- f-I cercariae
- metacercariae in freshwater molluscs
- eaten by humans


Echinostoma ilocanum ODHNER 1911
E. linoensis (SANDGROUND et BONNE 1940)



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Pathogenesis

- light infections asymptomatic
- some minor pathology (localized inflammation)
- heavy infections produce catarrhal inflammation
- mild ulceration, abdominal pain, diarrhoea




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***Fasciolopsis* (giant intestinal fluke)**

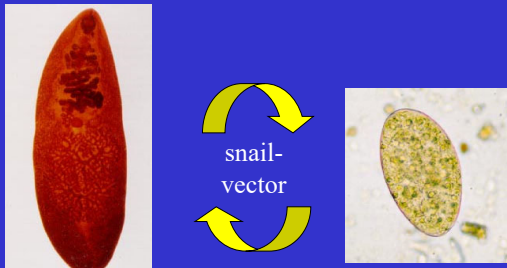
Order: Echinostomatida
Family: Fasciolidae

- large leaf-shaped flukes
- acetabulum (ventral sucker) close to oral sucker
- metacercariae formed on water plants/vegetables



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***Fasciolopsis* (giant intestinal fluke)**



adults 2-7cm
in small intestines

egg 140x80µm
passed in faeces

F. buski in oriental countries in humans/dogs/pigs/rabbits

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Food-borne transmission

prepatent period
9-13 weeks

cycle

- eggs voided
- f-1 miracidium
- sporocysts/rediae in snail
- f-1 cercariae
- metacercariae on freshwater plants (water caltrops, water chestnuts, water bamboo)
- eaten by humans (ingested raw or peeled with teeth)

Fasciolopsis buski ODENER 1902

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Pathogenesis

- light infections confined to duodenum, jejunum
- attachment produces local inflammation, hypersecretion of mucus, haemorrhage, ulceration, possible abscesses
- heavy infections involve stomach and most of intestines
- cause abdominal pain, diarrhoea, bowel obstruction, acute ileus
- toxic/allergic worm metabolites produce general oedema/ascites
- marked eosinophilia, leukocytosis

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Heterophyes/Metagonimus (dwarf flukes)

Order: Opisthorchiida
Family: Heterophyidae

- minute flukes
- in small intestines of humans
- metacercariae formed in freshwater fish

1 cm

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Heterophyes/Metagonimus (dwarf flukes)

adults 1-2mm
in small intestines

eggs 30x15µm
passed in faeces

H. heterophyes/M. yokogawai in Middle East/Asia in many piscivores

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Food-borne transmission

prepatent period
1-2 weeks

cycle

- eggs voided
- f-1 miracidium
- sporocysts/rediae in snail
- f-1 cercariae
- metacercariae in freshwater fish
- eaten by piscivores

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Pathogenesis

- light infections asymptomatic
- adult flukes attach to intestinal wall between villi
- attachment produces mild inflammation and necrosis of mucosa
- causes colicky pains and mucus diarrhoea

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TREATMENT - trematodocides

Intestinal flukes

<i>Echinostoma</i>	praziquantel, albendazole
<i>Fasciolopsis</i>	praziquantel, albendazole
<i>Heterophyes/Metagonimus</i>	albendazole, niclosamide, praziquantel

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Enteric trematodes

Parasite	Definitive host	Vector	Metacercaria	Locality
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