


Biomedical Parasitology

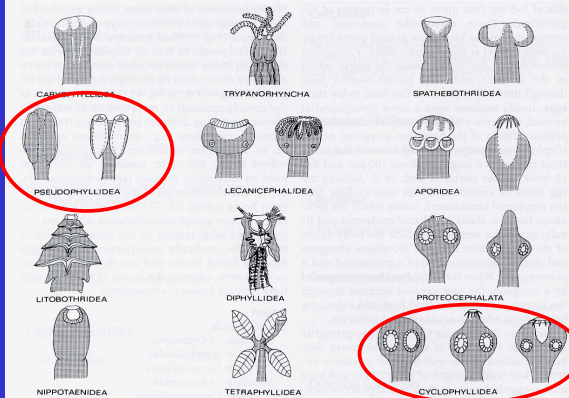
CESTODES



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Cestode Orders



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Cestodes of medical importance

Order	Family	Genus
Pseudophyllidea (aquatic cycles)	Diphyllobothriidae	<i>Diphyllobothrium</i> <i>Spirometra</i>
Cyclophyllidea (terrestrial cycles)	Hymenolepidae	<i>Hymenolepis</i>
	Dipylididae	<i>Dipylidium</i>
	Taeniidae	<i>Taenia</i> <i>Echinococcus</i>

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Order: CYCLOPHYLLIDEA

- terrestrial tapeworms
- two-host life cycles
- egg does not hatch (no coracidium stage)
- adult scolex with four simple suckers
- sometimes an armed (hooked) rostellum

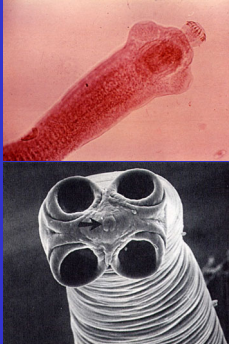


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Hymenolepis/Vampirolepis (dwarf tapeworm)


Order: Cyclophyllidea
Family: Hymenolepidae


- scolex with 4 suckers and single row retractable hooks
- terrestrial 2-host cycle
 - cysticeroid in insect
 - adult in vertebrate
- however, *H. (V.) nana* able to undergo direct infection (only tapeworm which does not require intermediate host)




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Hymenolepis/Vampirolepis spp.





adults 15-40 mm
in small intestine



eggs 45x30 µm
passed in faeces

H. (V.) nana (dwarf tapeworm)
H. diminuta (rat tapeworm)

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Variable transmission

Indirect transmission

- eggs eaten by insect
- oncosphere hatches
- tailed cysticercoid in haemocoel
- insect accidentally ingested

Direct transmission

- oncosphere hatches in human gut
- cysticercoid in villus lymphatics

Hymenolepis nana BLANCHARD 1891

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Pathogenesis

- light infections asymptomatic
- but potential for auto-infection and heavy infections
- enteritis, diarrhoea, vomiting, dizziness
- common in children in institutions

treatment

- anthelmintic (praziquantel/niclosamide)

prevention

- improved hygiene
- disinfection regimes

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Dipylidium (dog tapeworm)

Order: Cyclophyllidea
Family: Dipylididae

- scolex with 4 suckers and spiny protusible rostellum
- thin elongate segments with 2 genital pores
- egg packets
- terrestrial 2-host cycle
 - cysticercoid in insect
 - adult in vertebrate

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Dipylidium caninum (dog tapeworm)

adults 10-70 cm in small intestine

eggs 40x25 μm segments/packets in faeces

dogs usual hosts but human infections are frequent, esp. in children

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Indirect life-cycle

weeks to months

- gravid segments or egg packets passed
- eggs eaten by insect
- oncospheres hatch
- cysticercoid larval in insect tissues
- insect accidentally ingested during grooming, etc

dog flea, dog louse, cat flea, human flea

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Pathogenesis

- light infections asymptomatic
- heavy infections compete with host for food causing reduced weight gain or weight loss
- motile segments may cause perianal pruritis
- also cause chronic inflammation of gut

treatment

- anthelmintic (praziquantel/niclosamide)

prevention


- flea/louse control

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Taenia spp.

Order: Cyclophyllidea
Family: Taeniidae

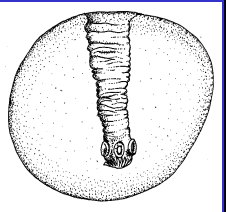
- numerous species
- adult tapeworm in gut of carnivorous animals
- special metacestode (cysticercus) in muscles of prey animals



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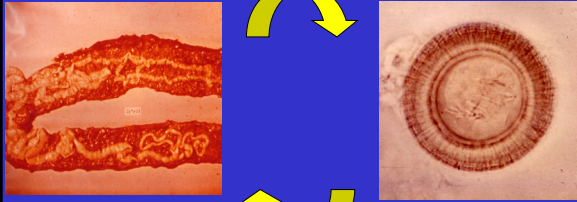
Cysticercus

- special larval stage (metacestode) found only in Taeniidae
- bladder with large fluid-filled cavity
- contains single invaginated scolex
- cysticercus eaten by definitive host
- scolex evaginates, attaches & develops to adult in intestine; bladder is digested



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Taenia saginata/solium (beef/pork tapeworm)



adults 2-8m in small intestines

eggs 30-44 μm passed in faeces

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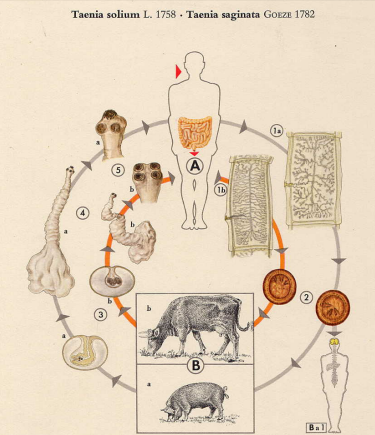
<i>Taenia saginata</i> "beef" tapeworm		<i>Taenia solium</i> "pork" tapeworm
	scolex unarmed	
	proglottid single genital pore	

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Predator-prey transmission

- eggs ingested by intermediate host
- oncosphere penetrate gut
- cysticerci form in tissues
- ingested by definitive host through carnivory (raw or rare meat)

T. solium larva can also form in humans

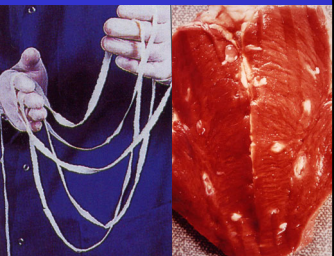


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Pathogenesis – adult tapeworms

- adult beef/pork tapeworms in humans
- light infections asymptomatic
- vague abdominal pains, diarrhoea/constipation
- generalized allergic manifestations (urticaria, pruritis ani, eosinophilia)


- treatment
 - anthelmintic (praziquantel/niclosam)
- prevention
 - meat inspection
 - cook meat



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Pathogenesis – larval stages (*T. solium* only)

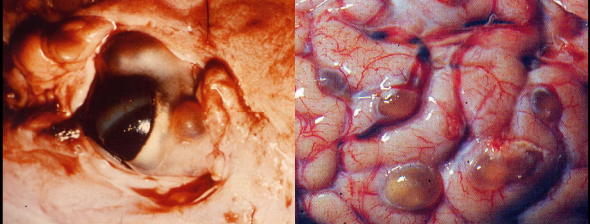
- eggs may hatch in humans (after ingestion/reverse peristalsis)
- oncospheres hatch, penetrate gut
- swept to tissues and form cysticerci (space-occupying lesions)
- especially in skeletal musculature and connective tissue
- cysticerci degenerate and calcify



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Cysticercosis

- severe clinical disease caused by cysticerci in brain or eyes
- cerebral signs, headaches, seizures, coma
- ocular signs, pain, loss of vision




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Echinococcus spp. (hydatid tapeworms)

Order: Cyclophyllidea
Family: Taeniidae

- small tapeworms in dogs
- scolex and 3 proglottids
- armed rostellum
- forms special larval metacestodes (hydatid cysts)




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Hydatid cysts

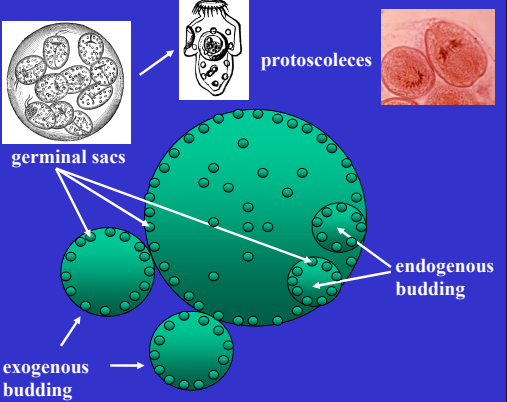
Special larval stages (metacestodes)

- unilocular (*E. granulosus*)
[fluid-filled, germinal endogenous budding]
- polycystic (*E. vogeli*)
[fluid-filled, germinal exogenous budding]
- multilocular/alveolar (*E. multilocularis*)
[no free fluid, germinal exogenous budding]



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Hydatid cysts



germinal sacs

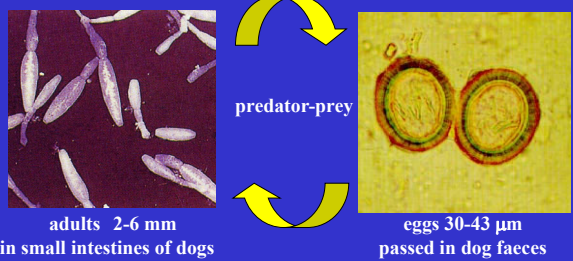
protoscolex

endogenous budding

exogenous budding

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Echinococcus granulosus (hydatid tapeworm)



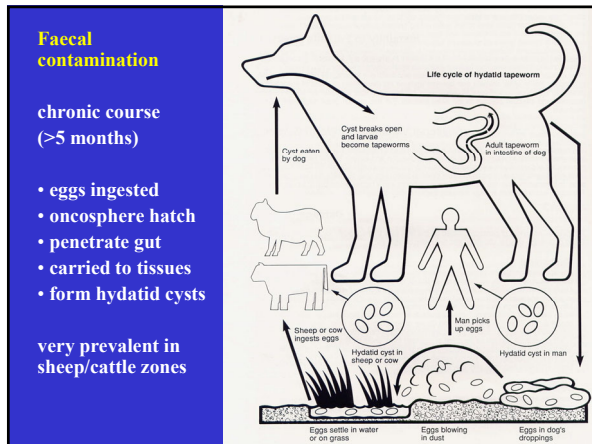
adults 2-6 mm
in small intestines of dogs

eggs 30-43 µm
passed in dog faeces

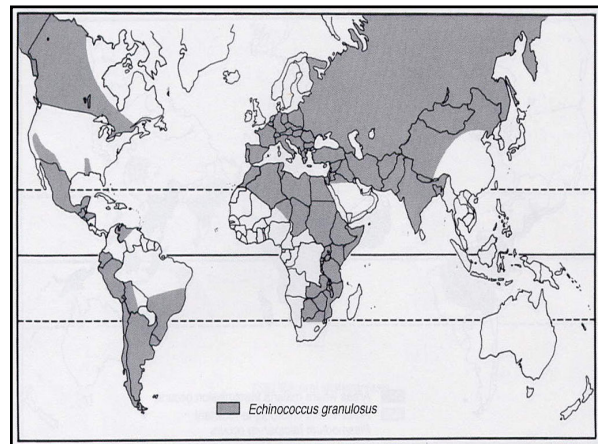
predator-prey

hydatid disease caused by larval metacestodes

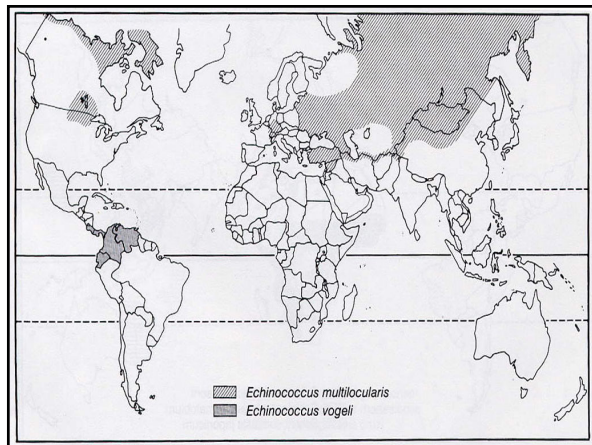
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Pathogenesis

- cysts produce chronic space-occupying lesions
- cause organ enlargement accompanied by various signs (abdominal distention, epilepsy, blindness, etc.)
- acute signs associated with:
 - cyst rupture (peritonitis, pneumothorax)
 - allergic responses to fluid (asthma, anaphylaxis)

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Treatment

- surgical removal (avoid cyst rupture, use scolicide chemicals such as 0.1% cetrimide)
- chemotherapy gives conflicting results

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TREATMENT - cestodocides

	<i>Taenia</i> (tapeworm)	<i>Echinococcus</i> (hydatid)
niclosamide	+	+
praziquantel	+++	+++
mebendazole	+++	++
albendazole	+	+

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Hydatid eradication campaign

New Zealand + Tasmania

- target infections in domestic dogs
- use anthelmintics to purge dogs
- CAUTION: destroy voided faeces
- prevent re-infection
 - delete offal from diet
 - destroy carcasses in field
 - curb hunting behaviour
- shoot wild dogs
 - problems with dingo/macropod sylvatic cycle
- vaccination? (CSIRO success)

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Hydatid cycles

domestic cycle
dog-sheep

sylvatic cycle
dingo-macropod



same
species
same
strains

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Summary – enteric cestodes

	adult	larva
terrestrial cycle (2-host)		
<i>Taenia saginata</i>	human	cysticercus in cattle
<i>Taenia solium</i>	human	cysticercus in pigs
<i>Hymenolepis</i>	human	cysticercoid in insects
<i>Dipylidium</i>	human	cysticercoid in fleas
aquatic cycle (3-host)		
<i>Diphyllobothrium</i>	human	proceroid in copepod, plerocercoid in fish

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Summary – tissue cestodes

	adult	larva
<i>Echinococcus granulosus</i>	canid	hydatid cyst in omnivore
<i>Echinococcus vogeli</i>	bush dog	hydatid cyst in paca/rat
<i>Echinococcus multilocularis</i>	dog/cat	hydatid cyst in rodent
<i>Taenia solium</i>	human	cysticercus in pig/man
<i>Taenia</i> spp. (<i>muliceps</i>)	canid	coenurus in sheep
<i>Spirometra</i> spp.	carnivore	spargana in amphibia/man

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