The Trematodes

BVM&S Parasitology

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Lecture outcomes

- Describe the characteristics of trematodes of veterinary importance in relation to epidemiology, disease and control.
- Describe, the lifecycle of the Trematodes featured in this lecture in relation to epidemiology, disease and control
- Compare and contrast characteristics of the lifecycle of *Fasciola* and *Dicrocoelium*

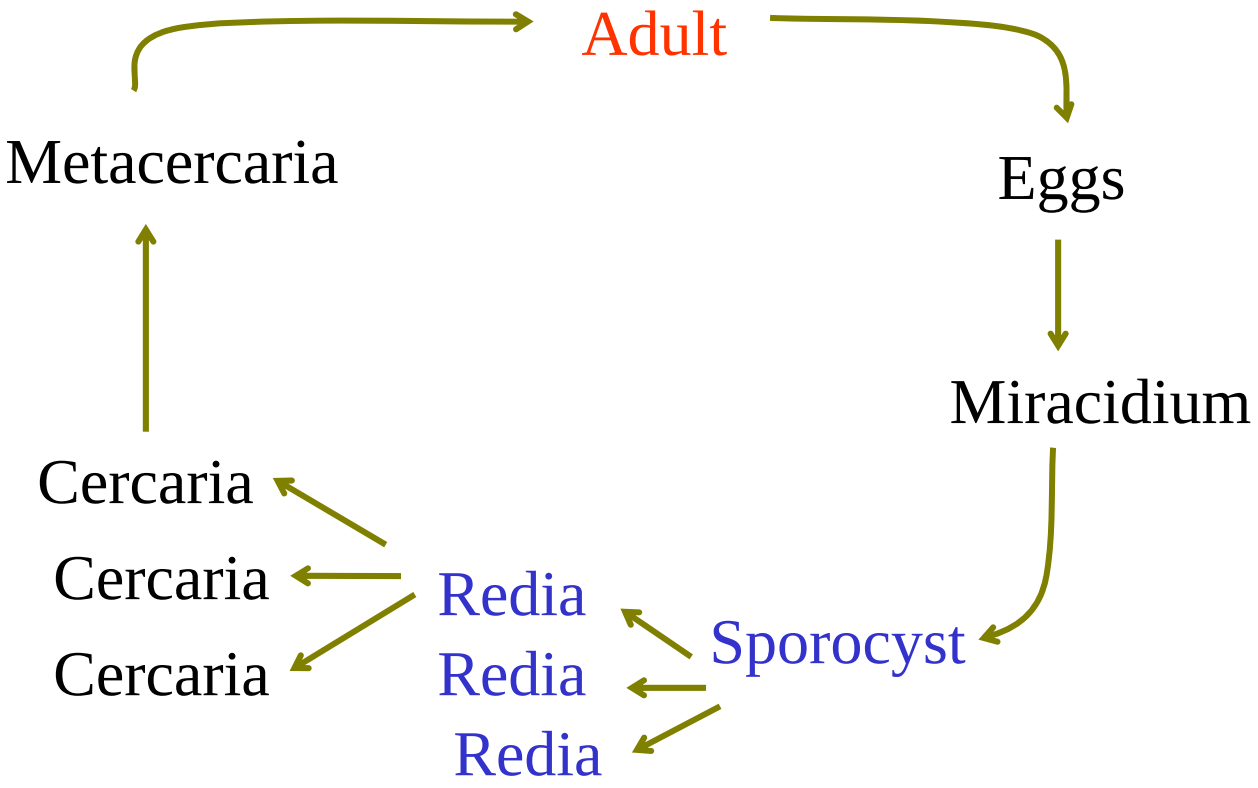
Two Groups

- Monogean
  - Direct life cycles
  - Ectoparasites of fish
- Digenean
  - Indirect life cycles
  - Endoparasites of vertebrates

Digenean Trematodes

- One or more suckers
- Blind gut – no anus
- Monoecious reproductive system
- One or more intermediate hosts
- Free living stages

Digenean Life Cycle



Flukes of Veterinary Importance

- Liver flukes
  - ***Fasciola hepatica***
  - ***Dicrocoelium dendriticum***
- Stomach flukes
  - *Paramphistomium sp*
- Lung flukes
  - *Paragonimus*
- Blood flukes
  - *Schistosoma sp*

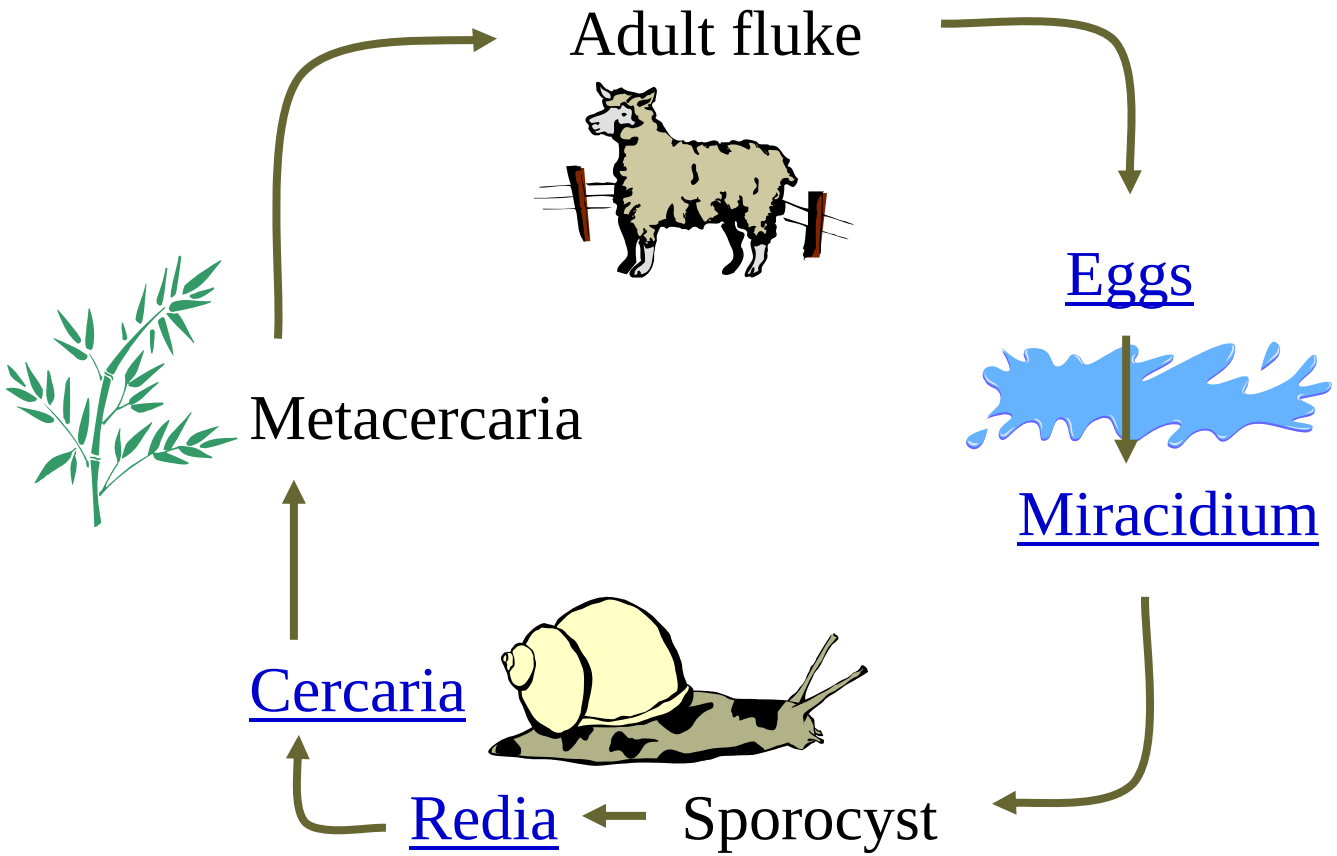
Fasciola hepatica

- Most common form of **liver fluke**
- Adults in bile duct
- Immature forms in liver parenchyma
- One intermediate host – amphibious snails - *Lymnaea sp (truncatula)*
- Zoonotic

Effects of *Fasciola* infection

- **Acute**
  - Large numbers of immature forms migrating through the liver tissue
- **Subacute**
  - Smaller numbers of immature forms migrating through liver and entering bile duct
- **Chronic**
  - Effect of adults on bile ducts

F.hepatica life cycle



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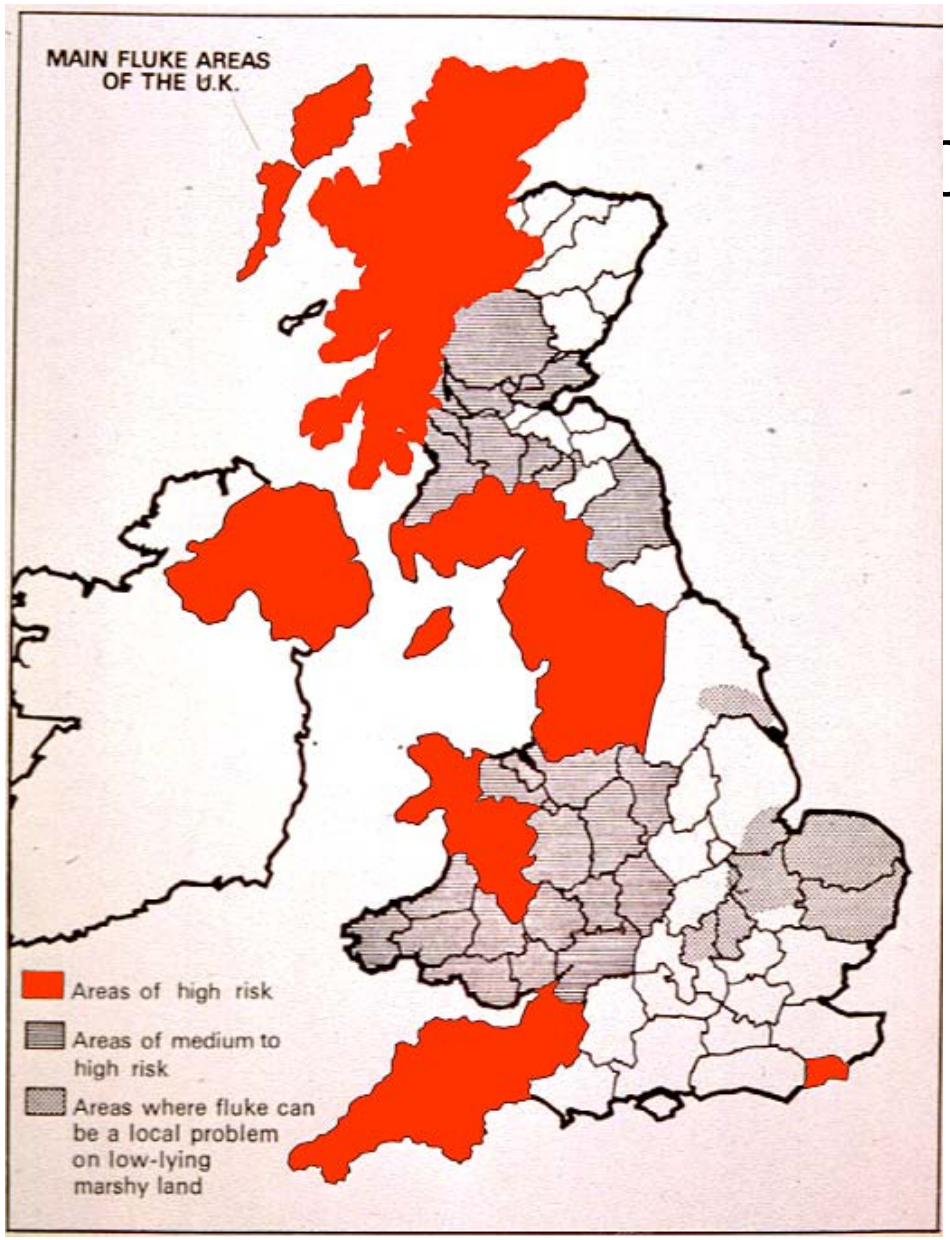
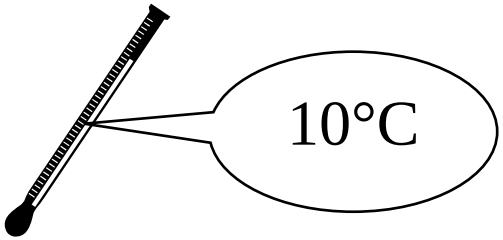
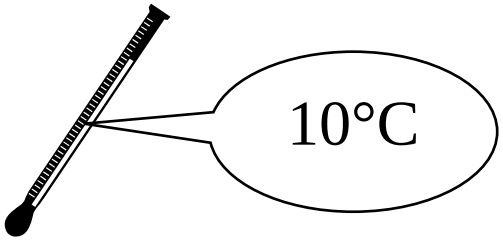
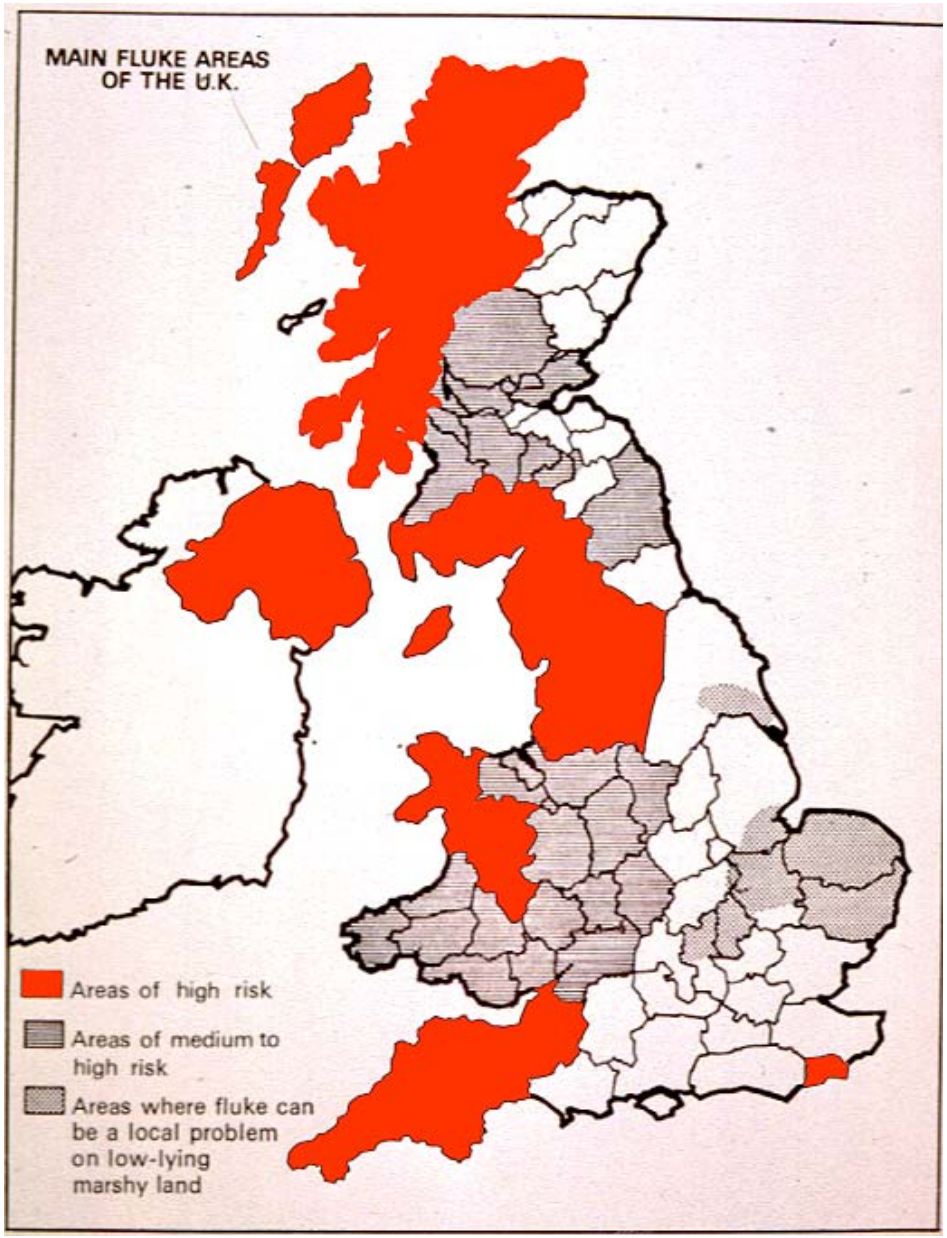

MAIN FLUKE AREAS
OF THE U.K.
Areas of high risk
Areas of medium to high risk
Areas where fluke can be a local problem on low-lying marshy land


10°C

Epidemiology

- Suitable snail habitats
  - Wet mud
- Temperature
  - Snails
  - Hatching of fluke eggs
- Moisture
  - Rainfall>transpiration

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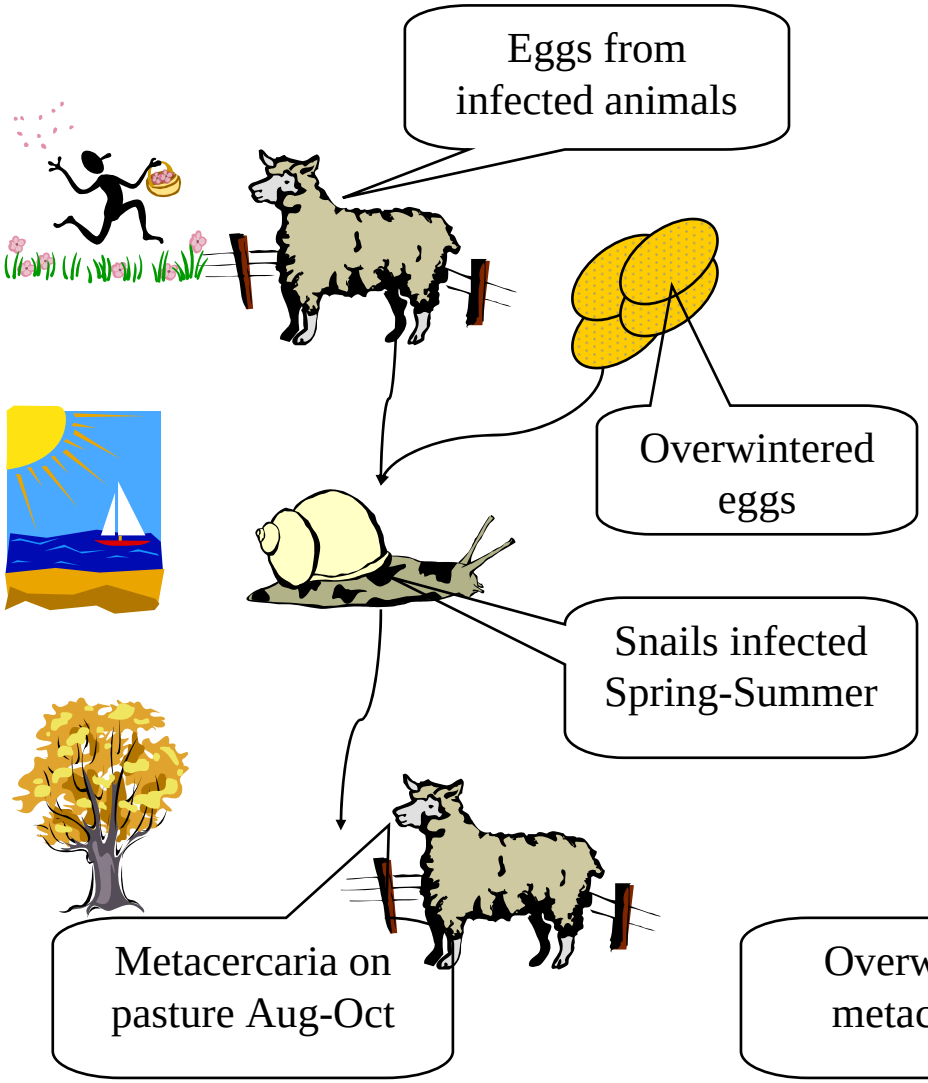
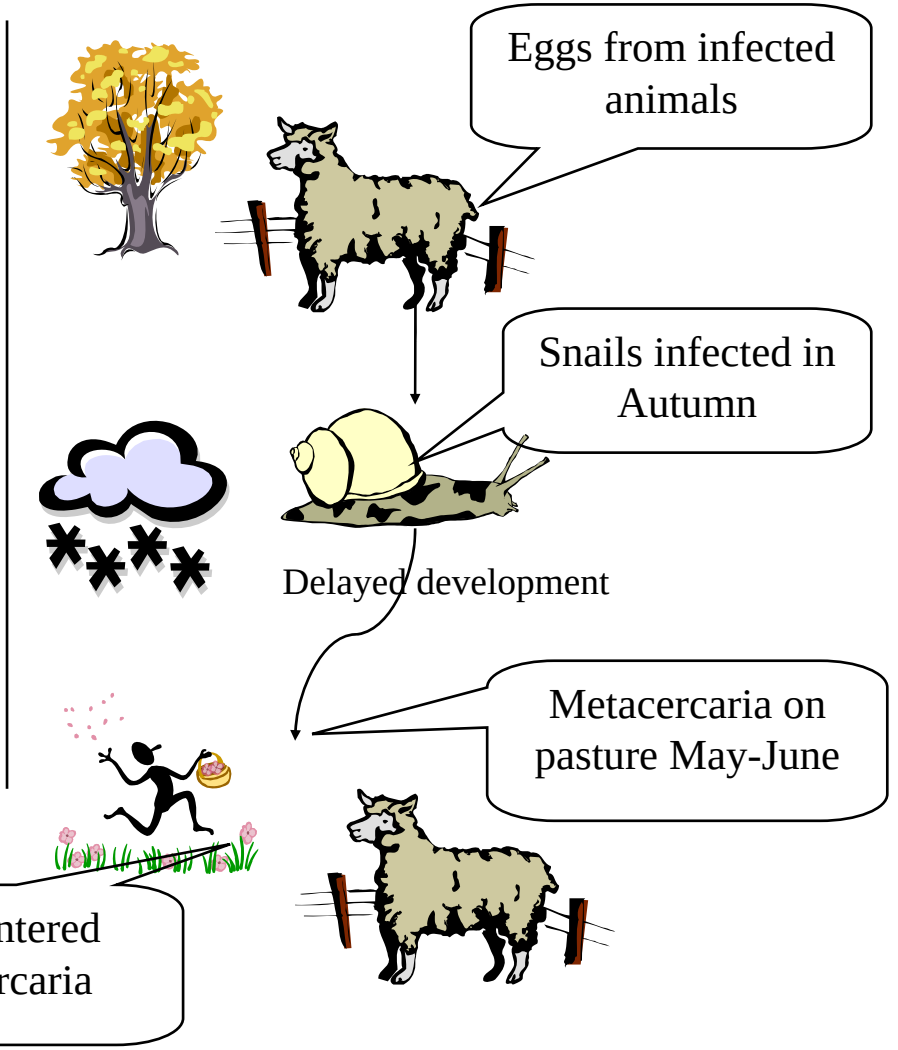
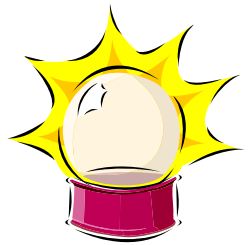
Summer infection of snails



Winter infection of snails



Forecasting



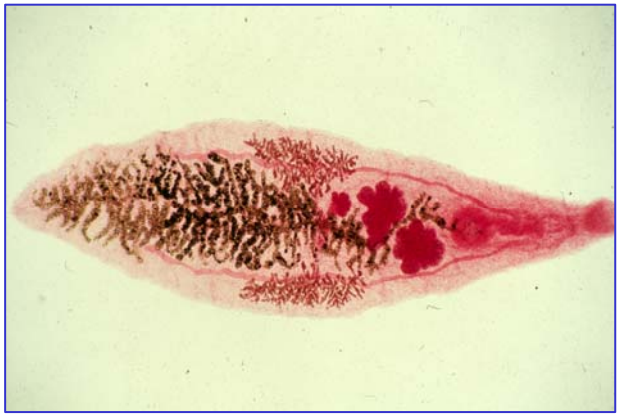
- “Ground surface wetness”
  - Critical factor for summer infection of snails
  - Based on monthly rainfall, evapotranspiration and number of wet days May-October
- “Wet day”
  - Number of wet days/month June-September (>1.0mm rainfall)
  - Seasonally “normal” temperatures

Control

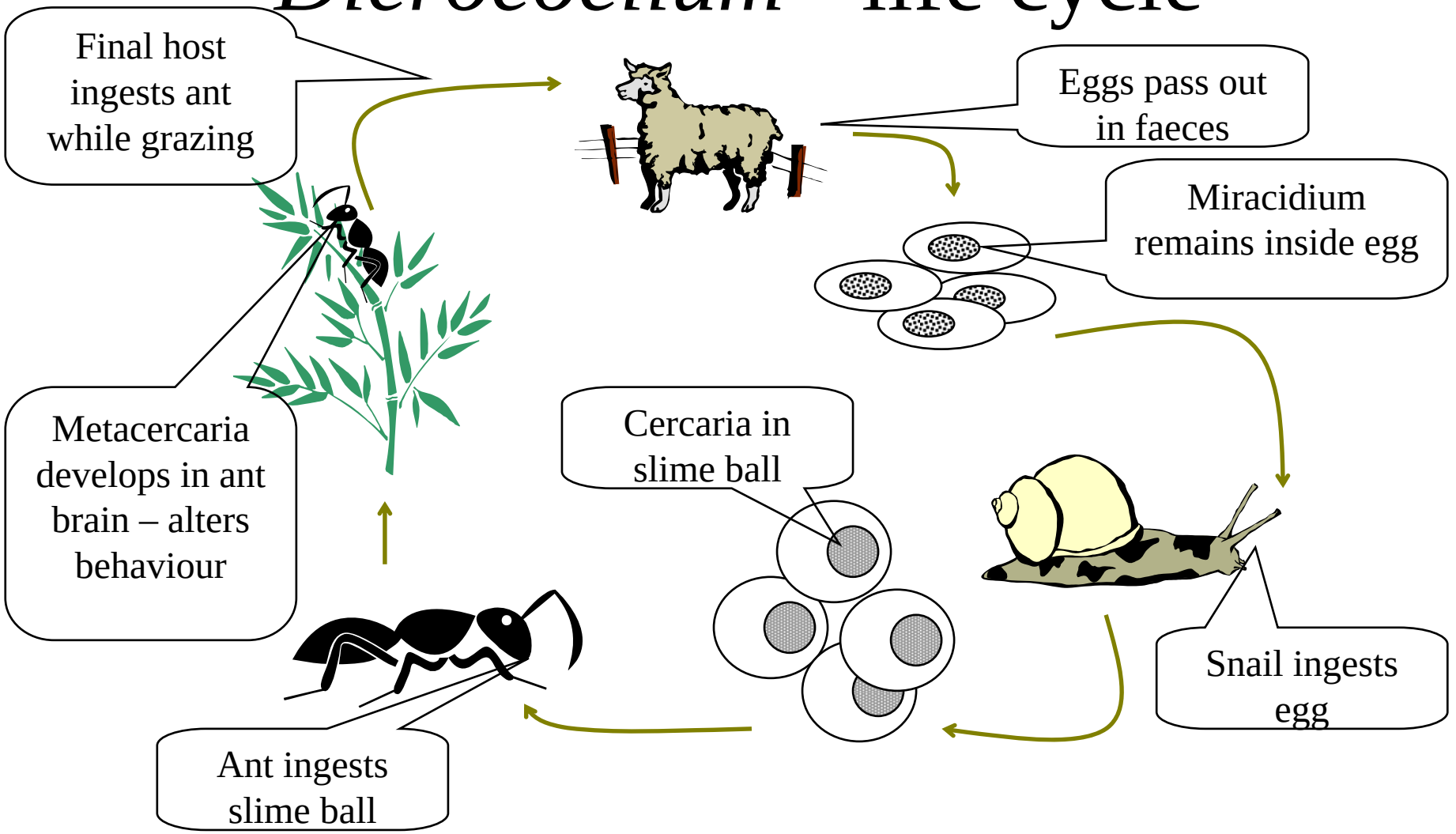
- Drug treatment to:
  - Reduce pasture contamination by fluke eggs (April-august)
  - Remove fluke populations (immature vs adults)
- Reduce snail populations
  - Improved drainage
  - Molluscicides

Dicrocoelium dendriticum

- The “small” or lancet liver fluke
- Immature and adult forms in the bile ducts
- No tissue migration
- Two intermediate hosts
- Limited distribution in UK
- Limited pathogenicity



Dicrocoelium - life cycle



Fasciola vs. *Dicrocoelium*

Feature	***Fasciola***	***Dicrocoelium***
1st int. host	Amphib. snail	Land snail
2nd int host	Not present	Ant
Miracidium	Free-living	In egg
Sporocyst	Snail	Snail (2 gens)
Redia	Snail	Not present
Cercaria	Snail/pasture	Slime ball/ant
Metacercaria	Pasture	Ant brain

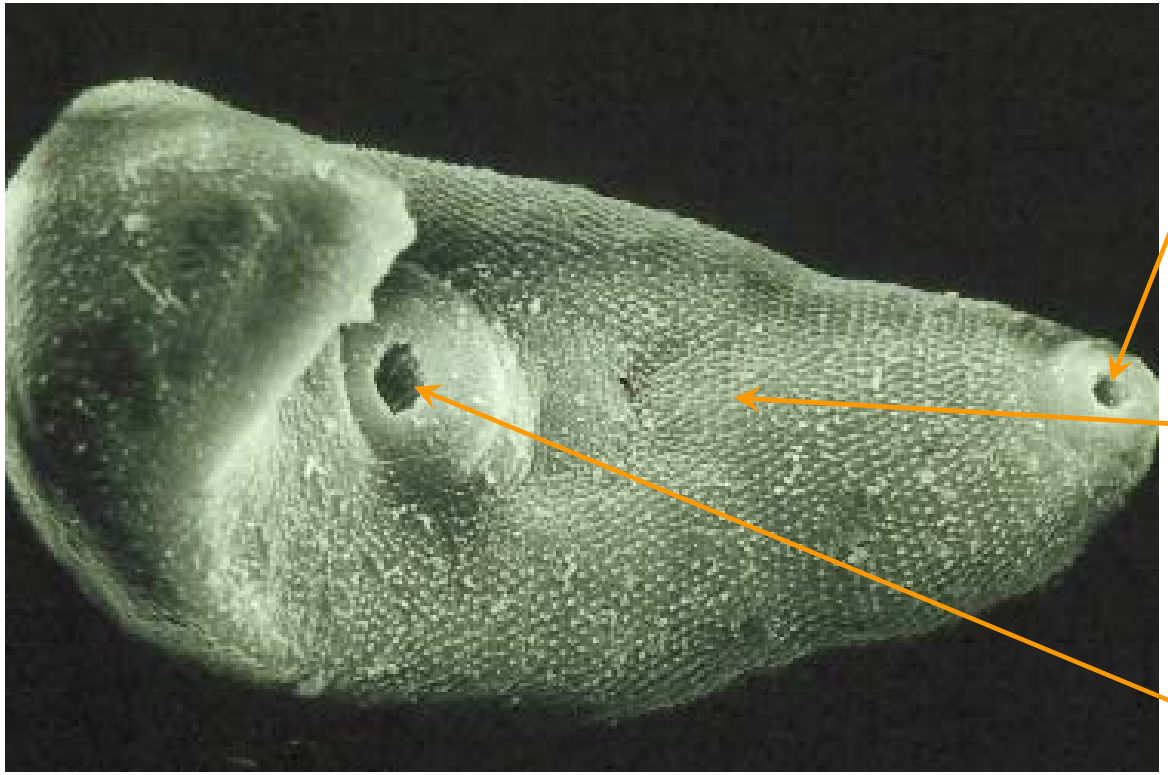
Other flukes you need to be aware of

- Schistosomes
  - Blood flukes - separate male & females
- Paramphistomes
  - Stomach flukes of ruminants, pigs & horses
- Hepatic & pancreatic flukes of dog
  - *Opisthorchis sp* & *Metorchis sp*
- *Weird & whacky*

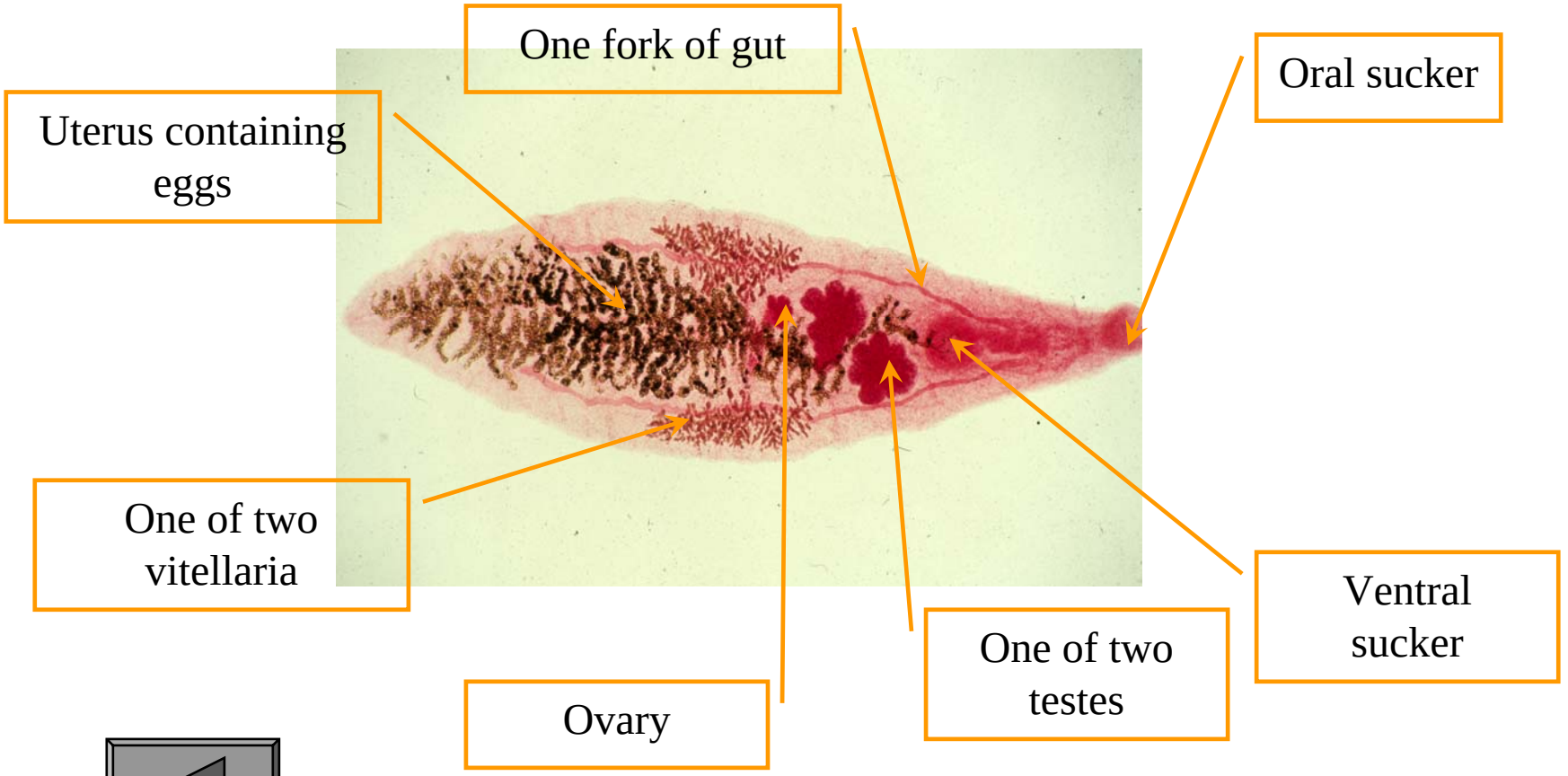
Summary

- Indirect life cycles
- Mollusc always involved
- Multi-stage life cycle
- Impact on host dependent on availability of infective forms
- Control - target parasite and/or intermediate host

Immature form of *F.hepatica*

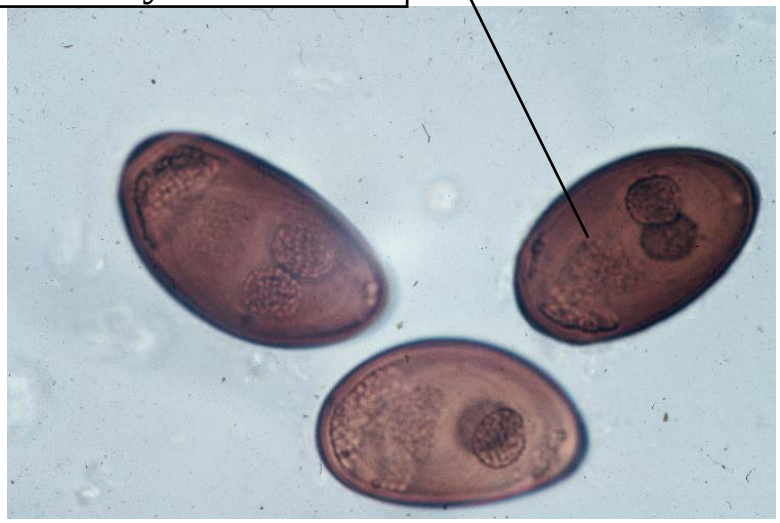


Dicrocoelium adult



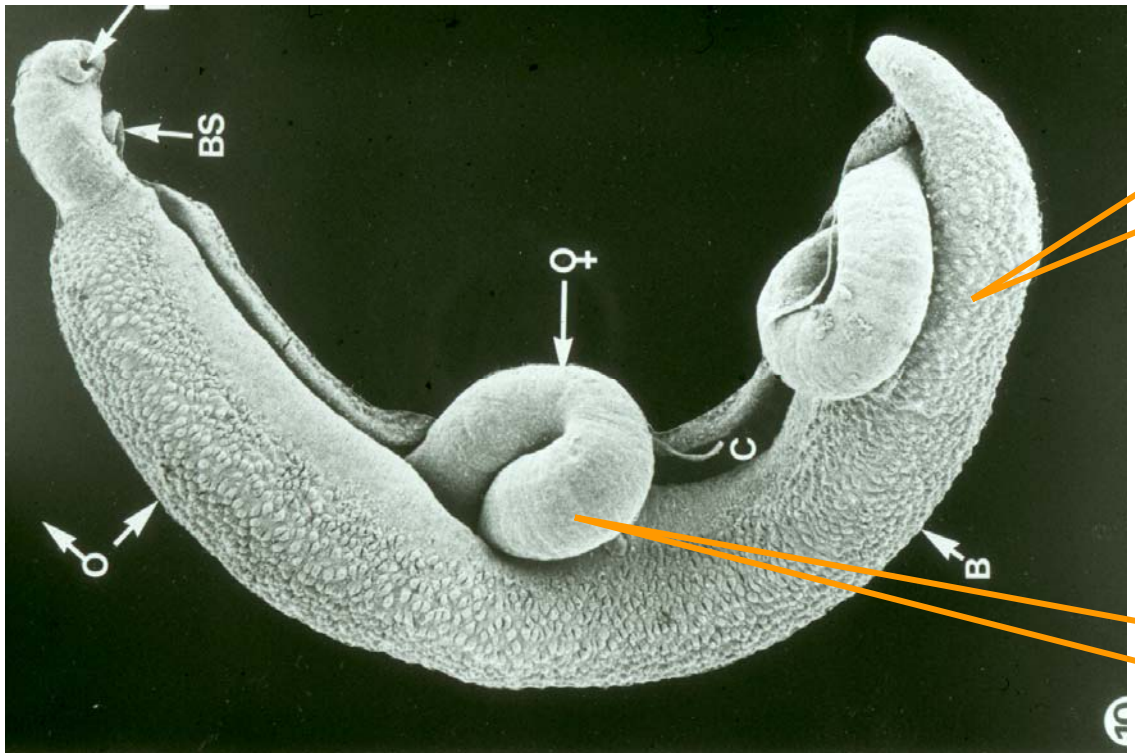
Fasciola vs Dicrocoelium eggs (not to same scale)

Miracidium remains inside egg until eaten by snail



Miracidium hatches from egg via operculum soon after leaving the host

Schistosome adults



Male

Female

“Flukey” areas

Poorly drained pasture

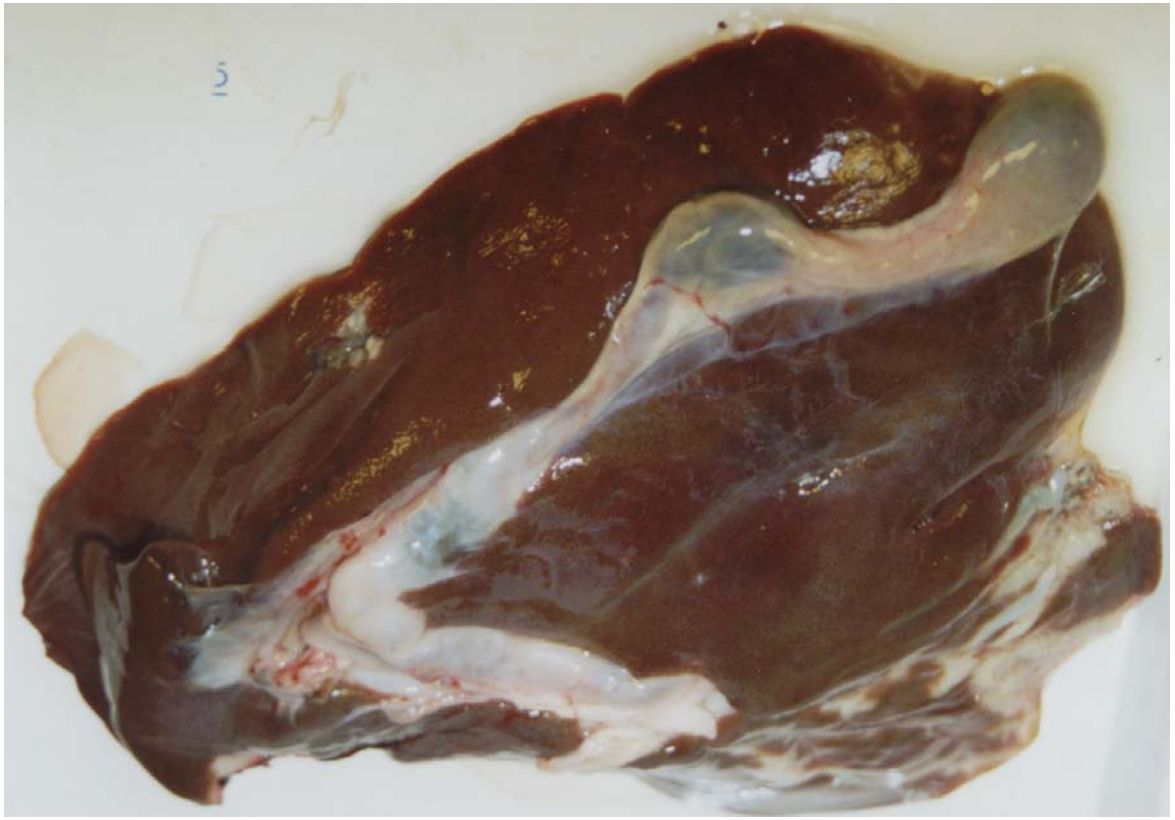
Drainage ditch

Leucochloridium – stacking the odds

The antennae of infected snails become swollen and can't be retracted.

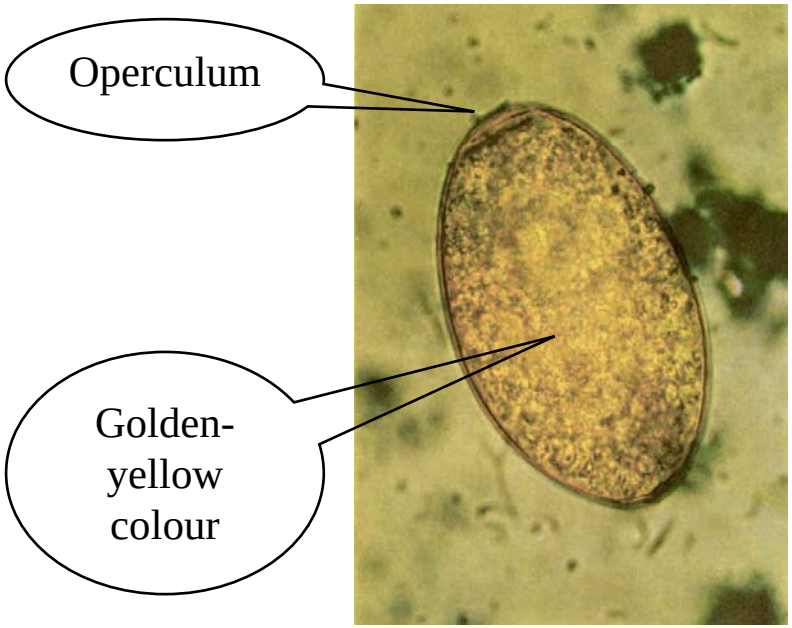
Birds, the definitive host, can easily pick off the antennae and become infected.

Chronic fluke infection

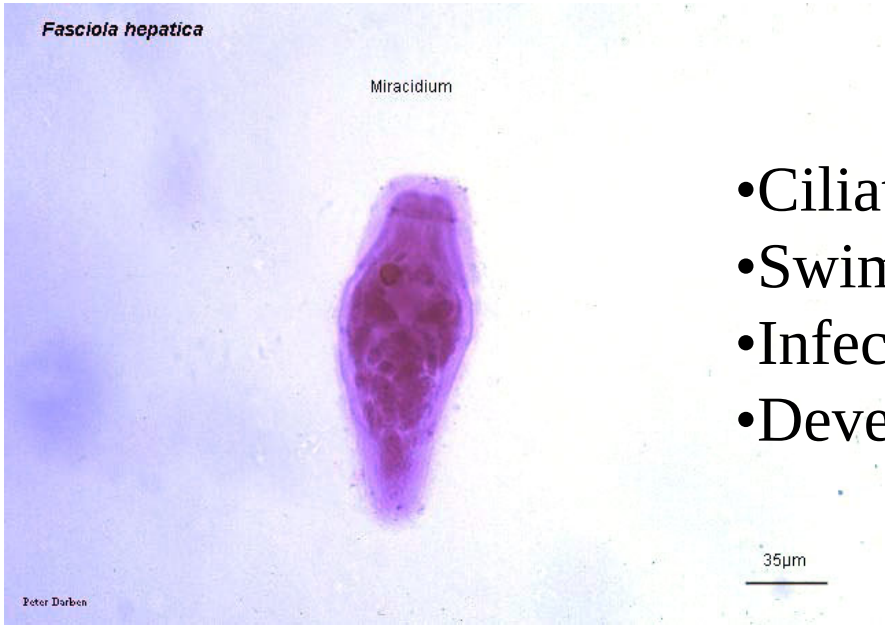


Chronic fluke – clinical signs

Fasciola eggs

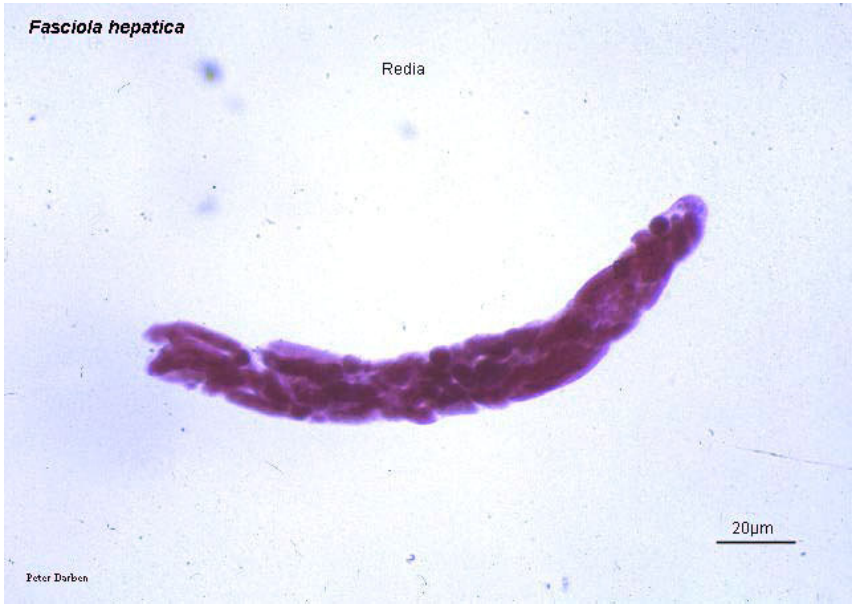


Miracidium stage



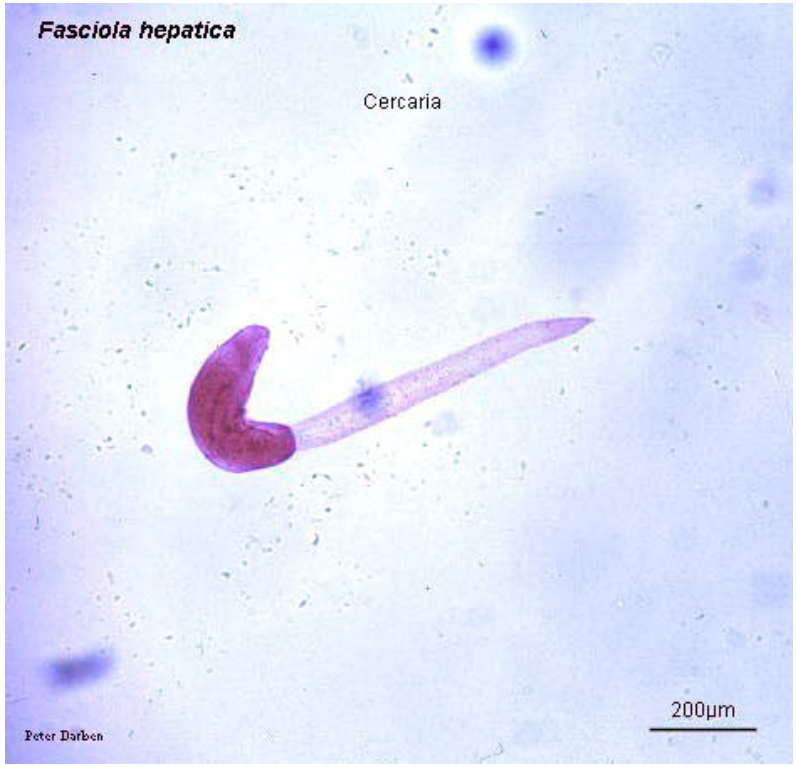
- Ciliated
- Swims to snail
- Infects snail though foot
- Develops into sporocyst stage

Redia stage



- Develops in snail from sporocyst stage
- Gives rise to cercaria stage

Cercaria stage



- Burrows out of snail
- Swims to vegetation
- Changes to metacercaria by
  - Loss of tail
  - Develops thick outer layer
- Infects definitive host