Introduction to helminthology

The Trematodes

BYM&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
• Monoeccious 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*

Liver flukes

Stomach flukes

Blood flukes

Fasciola hepatica

Dicrocoelium dendriticum

Paramphistomium sp

Paragonimus

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**

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

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The Trematodes

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
  - Mollusccicides

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

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

- Oral sucker
- Spines
- Ventral sucker

**Dicrocoelium adult**

- Uterus containing eggs
- One fork of gut
- Oral sucker
- One of two vitellaria
- Ovary
- One of two testes
- Ventral sucker

**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

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**Introduction to helminthology**

**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**

- Operculum
- Golden-yellow colour
Miracidium stage
• Ciliated
• Swims to snail
• Infects snail through 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