Update on rumen fluke and ‘other’ fluke in UK livestock

Philip Skuce\textsuperscript{1}, Ruth Zadoks\textsuperscript{2} & Neil Sargison\textsuperscript{3}

\textsuperscript{1}Moredun Research Institute, \textsuperscript{2}Glasgow University Vet School, \textsuperscript{3}Royal (Dick) School of Veterinary Studies, University of Edinburgh

COWS - Control of cattle parasites sustainably

COWS Fluke R&D Workshop,
Liverpool University, 11\textsuperscript{th} March 2013
Rumen fluke - paramphistomines

- Digenean (2-host) trematode parasites of sheep, goats, cattle, deer etc.
- Name derives from ‘double-mouth’, 2-sucker morphology
- Have been described in UK livestock as far back as 1950s – abattoir study in Glasgow
  - species thought to be Paramphistomum cervi (+/- P. hiberniae & P. scotiae)
  - wildlife ↔ livestock?
- Rumen fluke eggs started to appear in ROI & UK diagnostic samples late 2000s (Murphy et al, 2008; Foster et al, 2008)
- Has similar life-cycle to liver fluke and often found as co-infections in sheep & cattle

Acetabulum: Paramphistomum type. Measurements were taken on sagittal sections. The external diameter is taken from the membrane which delimits the tissue of the acetabulum from the body parenchyma; the internal diameter is the diameter of the cavity of the acetabulum.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>No. of units</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>15-20</td>
<td>19</td>
</tr>
<tr>
<td>Dorsal external 1</td>
<td>20-40</td>
<td>30</td>
</tr>
<tr>
<td>Dorsal external 2</td>
<td>40-40</td>
<td>40</td>
</tr>
<tr>
<td>Dorsal internal</td>
<td>47-60</td>
<td>50</td>
</tr>
<tr>
<td>Ventral internal</td>
<td>17-22</td>
<td>19</td>
</tr>
</tbody>
</table>

Pharynx: (Fig. 1a). Modified Liorzik type. The middle and external circular muscle layers are better developed in the posterior two-thirds of the pharynx. At the anterior end they are quite indistinct. The papillae are fairly long round the opening of the pharynx to the exterior but become progressively smaller towards the oesophageal end, where they are inconspicuous or lacking. Under an oil immersion objective it is possible to distinguish strands running into the papillae.

Willmot, J. Helminth. 1950;24:155-170
Rumen fluke life-cycle

The larval stage of the rumen fluke attaches to the wall of the upper small intestine (duodenum) and feeds on plugs bitten from the wall, causing severe fluid and blood loss if large numbers are present.

Larvae migrate to the first stomach (rumen)

Both cattle and sheep are equally susceptible to infestation

Immature (larval) flukes develop through several stages in aquatic snails (e.g. Planorbis planorbis, the ram’s horn snail)

Rumen fluke eggs are passed out onto the pasture in faeces

Adult rumen flukes lay eggs

Larval flukes form cysts on grass (metacercariae)
How prevalent is it now?...

- More common in Ireland than liver fluke:
  - e.g. diagnosed in ~31% of sheep & 44% of cattle in NI (AFBI 2011)

- Sales of flukicides containing OxyClozanide in Ireland have increased x 600% in 2012

- UK diagnoses based on Faecal Egg detection and finding adults in rumen at post mortem (data, AHVLA VIDA):
  - 60 month period 22.01.07 to 21.01.12 SAC = 9; AHVLA = 188
  - 12 month period 21.01.12 to 21.01.13 SAC = 20; AHVLA =119

  i.e. ‘big upsurge in diagnoses in last 12 months’ (R. Daniel, AHVLA, pers comm)

### Table 2: Endoparasitic infections in ruminants in Northern Ireland, January to March 2011

<table>
<thead>
<tr>
<th>Species</th>
<th>Total</th>
<th>Number negative</th>
<th>Number with &lt;500 epg</th>
<th>Number with &gt;500 epg</th>
<th>Number of parasitic epg</th>
<th>Percentage positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver fluke</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bovine</td>
<td>797</td>
<td>693</td>
<td>83</td>
<td>20</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Oxine</td>
<td>79</td>
<td>63</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Paramphistomiasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bovine</td>
<td>797</td>
<td>448</td>
<td>155</td>
<td>138</td>
<td>34</td>
<td>22</td>
</tr>
<tr>
<td>Oxine</td>
<td>79</td>
<td>54</td>
<td>13</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Oesophaga</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bovine</td>
<td>910</td>
<td>814</td>
<td>82</td>
<td>6</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Oxine</td>
<td>100</td>
<td>62</td>
<td>25</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Strongyle worm epg count</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bovine</td>
<td>873</td>
<td>851</td>
<td>22</td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>Oxine</td>
<td>101</td>
<td>89</td>
<td>12</td>
<td></td>
<td></td>
<td>11.9</td>
</tr>
</tbody>
</table>

* 1-500 epg was considered of likely clinical significance
* + Low, ++ Moderate, +++ High, +++ Very high

© AHVLA
© AHVLA
© SAC VIS
© Vet Record, May 25, 2011
How **important** is it?...

- Topic really divides opinion in veterinary community

- Adult rumen fluke well tolerated on surface of rumen itself

- Disease invariably associated with heavy infestations of immature rumen fluke in the intestine

- 2 reports of disease and death in young stock, one in sheep, one in cattle, in 2012; common denominator – flooded farms! (Mason *et al*; Millar *et al* 2012, Vet Record)

- Symptoms include anorexia, anaemia, ill-thrift, non-responsive diarrhoea etc...variously described as ’profuse, fetid, projectile, bloody’...
Implications for liver fluke diagnosis?

• Faecal egg count – eggs could be confused, leading to mis-interpretation of liver fluke treatment outcome?

• Faecal antigen ELISA – MM3 Mab from commercial Bio-X kit – specific for F. hepatica, does NOT cross-react with rumen fluke
**Rumen fluke species identification**

- Presumed to be *Paramphistomum cervi* in UK
- Rumen fluke (adult, juvenile, eggs) from home-bred Scottish cattle and sheep
- PCR and DNA sequencing of ITS-2 region: database searching & sequence alignment...

→ *Calicophoron daubneyi* – the predominant rumen fluke species in mainland Europe e.g. France, Spain, Italy...

Gordon et al, Vet Para, 2013

- Wanted to broaden our search in UK & Ireland...
All *Calicophoron daubneyi*...have yet to find *P. cervi*...

Including immatures from the Miller *et al* clinical/fatal case at Langford!

Thanks to contacts at AHVLA & Teagasc
Sourcing reference specimens...

Laura Rinaldi, Naples – *Calicophoron daubneyi* from Italian sheep

Marian Varady, Kosice – *Paramphistomum cervi* from Slovakian red deer
Calicophoron daubneyi - what’s in a name?

Q1. How did it get here?
Animal transport? Theories include European water buffalo coming in to S. England – but it’s endemic across UK & ROI!? 

Q2. How long has it been here?
Extracting DNA from archived clinical material from AHVLA (paraffin wax blocks) – ITS-2 PCR works, sequencing in progress – watch this space!

Q3. Implications for epidemiology/disease?
Pathogenicity? +/- Wildlife host? Snail intermediate host?
It’s a bug’s life for politicians

SCOTTISH politicians are experiencing a bug’s life, after offering to help protect one of the country’s most endangered species.

MSPs chose to champion threatened insects, from snails and spiders to mussels and bumblebees, as part of a campaign by Scottish Environment LINK and wildlife charity, Buglife.

Six of the country’s high-profile politicians pledged their support for the campaign.

Falkirk East MSP Angus Macdonald is backing the Bog Sunjumper Spider. It’s only known from five sites in central Scotland, which are fragments of what used to be a well-connected bog network.

And Fiona McLeod, MSP for Strathkelvin and Bearsden, has offered to support the Pond Mud Snail, which was once found at 14 sites in Scotland, but has suffered huge declines in the past 50 years.

Other politicians involved in the project include Mary Scallon, who is championing the Freshwater Pearl Mussel, David Stewart who’s following the Great Yellow Bumblebee, Jamie McGrigor supporting the Narrow-headed Ant and Elaine Murray who’s chosen the Tadpole Shrimp.

The MSPs will now work more closely with wildlife organisations to identify ways to protect and conserve their species.
How important is rumen fluke?

• Important to keep rumen fluke in perspective – the parasite is becoming more common, BUT clinical disease is still rare, liver fluke remains the biggest threat to UK livestock!

Fluke and CAP reform dominate NSA UK Policy and Technical Committee meeting. Tuesday this week (26th February) saw the NSA UK Policy and Technical Committee, which meets four times a year to discuss key policy areas, gather in London. There was an extensive agenda with two items drawing passionate comment from our English, Scottish, Welsh and Northern Irish representatives – and specifically that triclabendazole products are the only ones that kill immature fluke but care needs to be taken not to cause resistance to the drug. As always, NSA recommends members visit www.scops.org.uk, but we are also working in a number of other areas to ensure the need for new tools is fully appreciated by the wider industry.

Timing and testing key to fluke control

Wet weather and grass growth are over;

Are we over panicking about this whole "stomach Fluke" thing? I don't think it is as widespread as people think.
The ‘lancet fluke’, *Dicrocoelium dendriticum*

- Now this really IS rare, but has been found in Cornwall and in a recent case in N. England...

- Heavy infestations cause liver damage and have been implicated in a severe case of ill-thrift and photosensitisation in sheep on the Isle of Coll in the Outer Hebrides (Sargison et al, 2011)
Dicrocoelium dendriticum has the most amazing life-cycle!
Acknowledgements

COWS & Organisers of today’s event

Moredun Staff & Students
- esp. Danielle Gordon, Naomi Lean, Lydia Roberts, Lisa Imrie, Nicola Sargison & Stuart Dawes

Farmers for all their help & hospitality

AHVLA, SAC VIS & Teagasc contacts
- esp. Roger Daniel, Sian Mitchell, Michael Miller, Heather Stevenson, Helen Carty, Rachael Morris, Tim Bebbington

Scottish Government SRP

QMS Grant-in-Aid