Johne’s Disease

Description
Diagnostic Testing
Management Strategies
Vaccination
Johne’s disease

- Infectious intestinal disease
- Caused by *Mycobacterium avium* subspecies *paratuberculosis* (Map)
- Affects ruminants predominantly
- Young animals more susceptible to infection
- Transmission
  - Faecal oral
  - Colostrum/milk
  - *in utero*
  - Semen
- Prolonged incubation period – subclinical infection
- Many infected animals never get disease
The “iceberg effect”

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>Advanced clinical disease</td>
</tr>
<tr>
<td>I</td>
<td>‘Silent’ infection</td>
</tr>
<tr>
<td>II</td>
<td>Little/no symptoms “carrier” adults</td>
</tr>
<tr>
<td>III</td>
<td>Clinical disease</td>
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</tbody>
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- **IV**
  - Emaciation, chronic, profuse diarrhea, bottle jaw
  - High shedders (faeces and milk)
  - High antibody response
  - Pathology + tissue culture positive

- **III**
  - Gradual weight loss,
  - Intermittent diarrhea
  - High shedders (faeces + milk)
  - High antibody response
  - Pathology + tissue culture positive

- **II**
  - Low-medium shedders
  - Tissue culture positive
  - Immune responses
  - Often culled for other reasons

- **I**
  - Low shedders
  - Tissue culture positive
  - Immune responses
Why is Johne’s disease difficult to diagnose?

- Prolonged subclinical infection period before symptoms arise
- Paucibacillary (Tuberculoid) vs Multibacillary (Lepromatous)
- Intermittent shedding
- Predominant immune response changes with disease progression
Course of Infection

- Subclinical Level of response
- Clinical Level of response
- Antibody response
- Faecal shedding
- \( \gamma \text{IFN response} \)

Time

Level of response

Subclinical

Clinical
Diagnosis

There is no single test that will reliably detect all stages of the disease and sub-clinical carriers and . . .

*a negative test result doesn’t mean no infection*
Map is resilient

- Survival in the environment
  - water 9 months
  - slurry 11 months
  - soil 47 months
- Resistance to
  - pasteurisation
  - chlorination
  - freezing
  - many antibiotics
What are the risk factors?

- **Biosecurity**
  - Introduction of NEW STOCK (including semen/embryos)

- **Management practices**
  - Colostrum/waste milk
  - Manure management
  - Water delivery/hygiene

- **Environmental**
  - Water sources
  - Other livestock
  - Wildlife reservoirs
Thank you for your attention

Any questions?
Reducing the risk: biosecurity

• Maintain a closed herd/flock or minimise purchase of replacement stock
• Purchase from a source where absence of the disease has been confirmed for the past 3-5 years
• Where this is not possible and large numbers of replacements are required for herd/flock expansion look to buy from a single herd/flock and test the whole herd/flock
• Consider screening cull cows/ewes and poor yielders to try to detect the disease at an early stage
Reducing the risk: management

- Cull clinical cases and offspring of infected animals
- Keep calving/lambling pens clean and disinfect after use
- Rear calves/lambs in clean environment free from faecal contamination
- Avoid the use of pooled colostrum or discarded milk
Reducing the risk: environment

• Provide clean water for drinking
  • Fence off stagnant water or slow moving water courses
  • Clean out water troughs regularly

• Pasture management
  • Application of slurry or manure
  • Avoid co-grazing or sequential grazing with infected stock
  • Wildlife reservoirs – rabbits/deer?
Vaccination

- Prevents clinical disease and can reduce shedding
- Affordable

- Current vaccine *does not prevent infection*
- Vaccination precludes serological diagnosis of Johne’s disease
- Vaccination interferes with tuberculin test for bovine TB
- No differentiation between vaccinated and naturally infected animals using diagnostic tests
- Not recommended for cattle
What research do we do at Moredun?

- **Diagnostics**
  - Improve understanding of the host immune responses to *Map* infection
  - Refine & improve diagnostic tests initially for cattle

- **Control**
  - Longitudinal study evaluating efficacy of different diagnostic tests in cattle

- **Vaccines**
  - Improve understanding of pathogenesis
  - Identify novel vaccine targets
  - Construct attenuated strains

- **Epidemiology**
  - Molecular typing
  - Interspecies transmission
  - Strain virulence

- **Multi-infection studies**
  - Characterisation of the gut flora in sheep with dual infections of Johne’s disease and intestinal round worms

Photos courtesy of Moredun, Michael Collins and Karen Stevenson
Thank you for your attention

Any questions?