Transmission and control of the parasite *Ascaris suum* (large round worm) in Danish organic pig farms

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Why bother?

- Round worms can:
  - Result in liver condemnation
  - Reduce weight gain
  - Reduce feed conversion
  - Affect body composition (piglets)
  - Reduce effect of vaccines
  - Increase the risk of secondary infections
  - Augment weaning diarrhoea???
Worms

Lifecycle

- **Unembryonated egg in faeces**
- **Infective egg with L3-larva**
- **Ingestion of infective egg**
- **Hatched larvae penetrate the large intestinal wall and migrate via the liver to the lungs**
- **Larvae migrate up the bronchi and are swallowed**
- **Larvae establish in the small intestine and become patent at week 6-8**

**Development and maturation:**

4-6 weeks up to 1-2 years?

Illustration by Wm P Hamilton CMI

Worm congestion
Egg survival and development on pasture (Field)

Pastures contaminated with eggs in 2001

- Eggs with slender larva
- Dead, unembryonated and partially embryonated eggs
- Worm burden (4 days exposure)

Mean no. eggs/g dry soil

Mean no. larvae/pig

S: Spring       A: Autumn
Transmission pathways (5 farms)

Farrowing paddock

- 0.7 infective eggs/g dry soil
  (Total: 1.0 eggs/g dry soil)

Sows 15%

Weaning paddock

- 2.3 infective eggs/g dry soil
  (Total: 8.5 eggs/g dry soil)

Pen area

<table>
<thead>
<tr>
<th>Pen area</th>
<th>Infective eggs/g dry bedding material (Total eggs/g dry material)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starter pigs</td>
<td>Finishing pigs</td>
</tr>
<tr>
<td>Resting</td>
<td>0.7 (73) 1.4 (135)</td>
</tr>
<tr>
<td>Intermediate</td>
<td>6.8 (326) 6.3 (555)</td>
</tr>
<tr>
<td>Latrine</td>
<td>9.2 (1732) 2.6 (1033)</td>
</tr>
</tbody>
</table>

Crops

Transmission pathways:

- Farrowing paddock → Weaning paddock
- Sows 15%
- Weaning paddock → Crops
- Crops → Pen area
- Pen area → Farrowing paddock

Transmission rates:

- Farrowing paddock: 48%
- Weaning paddock: 64%
Necropsy of pigs (2 farms)

- **Weaning**
  - (7-9 weeks, 2x15 pigs)

- **Transfer to finishing stable**
  - (11-13 weeks, 2x15 pigs)

- **Slaughter**
  - (22-24 weeks, 2x15 pigs)

**Infection model**

- Liver white spots
- Larvae in the lungs
- Adult worms in the small intestine

**Immunity**

- Farrowing
- Weaning
- Slaughter
University of Copenhagen – Parasitology and Aquatic Diseases

Resting area: 1 million viable eggs

Latrine area: 100 million viable eggs

Intermediate area: 0.2 million viable eggs

Deep litter → Accumulation of eggs

Resting area: 1 million viable eggs
**Survival of eggs in manure (Field)**

*Covered by a tarpaulin during the study*

![Manure pile covered by a tarpaulin]

**Graph:**
- **Core**
- **Outermost 5 cm**

<table>
<thead>
<tr>
<th>Week</th>
<th>Temperature (°C)</th>
<th>Viable eggs (%)</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>

- Favourable mikro climate (due to low manure concentration)
- Localized survival of eggs
Survival of eggs in slurry (Laboratory)

(Katakam et al. 2012)
Control measures

• Outdoors:
  • **Pasture rotation (5 years or ideally more)**
  • Pastures for weaned and finishing to be avoided?

• Indoors:
  • **Thorough cleaning (removal of faeces, washing and drying out) of pens (disinfectants?)**
  • Semi-open stables may increase development and survival of eggs
  • Stimulate pigs to defaecate on slatted floor areas
  • Bedding material increases overall survival of eggs but the amount is less important (shallow versus deep litter)

• Generally
  • Combined approach incl. monitoring
  • Check and treat new animals
  • Store/compost manure (only fertilize crops)
  • **Strategic treatment – at weaning?**