Use of oxfendazole to control porcine cysticercosis in a high-endemic area of Mozambique

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Background

In Mozambique, data on cysticercosis is scarce and fragmented

CESA project from 2006 – 2010

Prevalence and associated risk factors for *T. solium* cysticercosis in Angónia district, Mozambique assessed in 2009

1. *T. solium* cysticercosis is endemic in the region
   - Porcine Ag-ELISA\(_{B158/B60}\): 231/661 (35%)
   - Human Ag-ELISA\(_{B158/B60}\): 243/1723 (15%)

2. Increasing pig age and pig husbandry practices contribute significantly to PC transmission

*\(T. solium\) cysticercosis is endemic in the region* (Pondja et al. 2010)
Study objective

Evaluate the effectiveness of a single oral dose of 30 mg/kg of oxfendazole treatment for control of porcine cysticercosis
Methodology

• Approach to local authorities & population:
  – Community leaders (willingness to participate)
  – Basic ethical principles explained to participants
  – Willingness to raise study pigs
  – Informed consent
  – OIE’s Terrestrial Animal Health Code for the use of animals in research and education

Ethical clearance from scientific board at Veterinary Faculty, Eduardo Mondlane University
Methodology

A randomized controlled field trial

4 rural villages of Angónia district
(Camuetsa, Campessa, Ndaula, Lilanga)

216 pigs 4 month of age

Obtained from 54 litters from 54 farms in the area

T1: 54 pigs – treat OFZ month 4
T2: 54 pigs – treat OFZ month 9
C : 108 pigs – litter matched controls
30 randomly selected pigs (8 from T1, 8 from T2 and 14 from control group) purchased from villagers, slaughtered locally and dissected for assessment of *T. solium* cysticerci.

**Methodology**

- **4** day bleed all + treat T1
- **9** day bleed all + treat T2
- **12** day bleed all + kill 30

Oxfendazole: 30 mg/kg p.o.  (Oxfen-C Beyer, South Africa).

Blood samples for Ag-ELISA collected before T1 (m 4), T2 (m 9) and month 12.

Ag-ELISA: B158/B60 (Dorney et al. 2002).
Results

Pig race: Landim
Males: 55%, Females 45%

46 pigs lost to follow up
(24 control, 12 T1 and 10 T2 group)

Baseline prevalence 5.1 % (95% CI = 2.6% – 8.9%)
no sig. diff between groups (p > 0.05)
Results - effectiveness

<table>
<thead>
<tr>
<th>Age</th>
<th>Control group</th>
<th>T1 group</th>
<th>T2 group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number tested</td>
<td>Prevalence (%)</td>
<td>Number tested</td>
</tr>
<tr>
<td>4 months</td>
<td>108</td>
<td>5.6</td>
<td>54</td>
</tr>
<tr>
<td>9 months</td>
<td>90</td>
<td>33.3</td>
<td>44</td>
</tr>
<tr>
<td>12 months</td>
<td>84</td>
<td>66.7</td>
<td>42</td>
</tr>
</tbody>
</table>

- **Control**: Significant increase from 4 to 9 and from 9 to 12 month ($p < 0.001$).
- **T1**: Increase from 4 to 12 but significantly lower than control ($p < 0.001$).
- **T2**: Significant increase from 4 to 9 months ($p < 0.001$) and significant decrease from 9 to 12 months ($p < 0.01$).
Results - incidence study

At baseline, 205 pigs from all groups were negative by Ag-ELISA

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of cases per 100 pigs-month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control group</td>
</tr>
<tr>
<td>1 (between 1st and 2nd sampling)</td>
<td>2.2</td>
</tr>
<tr>
<td>2 (between 2nd and 3rd sampling)</td>
<td>11.5</td>
</tr>
</tbody>
</table>

- T1 and T2 had lower incidence rates than control during the follow-up (p < 0.05)
- All infected pigs at the time of treatment were found negative in the subsequent sampling round
### Results - Multivariate logistic regression

<table>
<thead>
<tr>
<th>Factor</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFZ-T1</td>
<td>0.14</td>
<td>0.05 - 0.36</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>OFZ-T2</td>
<td>0.05</td>
<td>0.02 - 0.16</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.02</td>
<td>0.47 - 2.22</td>
<td>0.95</td>
</tr>
<tr>
<td><strong>Free range</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.76</td>
<td>0.38 - 8.20</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>Village</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camuetsa</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campessa</td>
<td>1.12</td>
<td>0.34 - 3.68</td>
<td>0.85</td>
</tr>
<tr>
<td>Ndaula</td>
<td>1.09</td>
<td>0.40 - 2.95</td>
<td>0.87</td>
</tr>
<tr>
<td>Lilanga</td>
<td>1.06</td>
<td>0.23 - 4.81</td>
<td>0.94</td>
</tr>
</tbody>
</table>
Conclusion

Treatment of pigs with oxfendazole in the last part of the fattening period is cost-effective in controlling porcine cysticercosis in endemic low-income areas but should be integrated with other control measures.
Acknowledgements

- Bayer-South Africa for providing the drug
- The Serviços Provinciais de Pecuária de Tete
- Serviços Distritais de Agricultura de Angónia
- Estação Zootécnica de Angónia
- Community authorities
- Pig farmers

- Danida - SLIPP-project (Securing rural Livelihoods through Improved smallholder Pig Production in Mozambique and Tanzania)