PREVALENCE OF HELMINTH PARASITES OF PIGS
SLAUGHTERED IN SENTHLANE FARMS AND GABORONE NORTH ABATTOIRS, BOTSWANA

J. ALLOTEY, O. MANYAAPELO, I. RANDOME and D. LOETO
Department of Biological Sciences, University of Botswana, Gaborone, Botswana.
Corresponding author e-mail: alloteyj@mopipi.ub.bw

Received: 12 September, 2016 Accepted: 3 October, 2016

ABSTRACT: A survey of the helminth parasites associated with pork slaughtered in Senthlane farms and Gaborone north abattoirs was carried out between January and March, 2015. 10 pigs were utilized for the study. A total of 143 helminths were counted in the sample (growers: piglets, 1-12 months old) from Senthlane farms, while 112 helminths were counted in the sample (adults: > 12 months old), from Gaborone north abattoirs. The helminthes from Senthlane farms were; 41.3% *Hydrostrongylus rubidus*, 36.4% *Oesophagostomum* spp., 13.3% *Trichinella spiralis* and 9.1% *Ascaris suum*. The helminthes from Gaborone north abattoir were: 45.5% *Oesophagostomum* spp., 33.9% *H. rubidus* and 20.5% *A. suum*. Thus *H. rubidus* and *Oesophagostomum* spp. were the most predominant helminths (>40%) while *A. suum* was the least (9.1-20.5 %) recorded.

Key words: Helminth, *Hydrostrongylus rubidus*, *Oesophagostomum* spp., *Trichinella spiralis*, pigs

INTRODUCTION

Parasitic helminths can be classified into two phyla; the Platyhelminthes (flatworms) and Nematodes (roundworms). Helminths are parasites that inhabit the circulatory, nervous, digestive, excretory, and reproductive systems of their hosts (BOGTISH et al., 2013). They may also be found free living in fresh water or soil (BOGTISH et al., 2013; ROBERTS and JANOVY, 2005). Helminths receive both nourishment and protection from their host while causing poor nutrient absorption, weakness and disease in the host. Some of the diseases caused by helminths in humans are: ascariasis caused by the nematode *Ascaris lumbricoides*, lymphatic filariasis (elephantiasis) caused by *Wuchereria bancroftii*, *Brugia malayi* and *Brugia timori* nematodes, schistosomiasis (Bilharzia) caused by *Schistosoma* spp. of the flatworms, trichuriasis caused by the nematode *Trichuris trichiura* (whip worm) and hookworm disease caused by nematodes *Ancylostoma duodenale* and *Necator americanus*. Some helminth diseases in pigs include; trichinosis caused by *Trichinella spiralis*, cysticercosis (Cysticercus cellulosae infestation) caused by an intermediate stage of the Platyhelminthes, *Taenia solium* (pork tapeworm), ascariasis caused by the nematode *Ascaris suum*.

Tropical helminthiasis is an infestation with parasitic worms which usually occur in countries found in the tropics. Tropical helminthiasis is of great concern because it is strongly linked with poverty as a result of the debilitating effects in some infected people. The disease flourishes in impoverished environment and thrives best in tropical areas (WHO, 2012). It is estimated that approximately one third of the almost three billion people living on less than two US dollars per day in developing regions of sub-Saharan Africa, Asia and the Americas are infected with one or more helminths (HOTEZ et al., 2006; HOTEZ et al., 2008). In sub-Saharan Africa, helminthiasis is frequently co-endemic with malaria and HIV/AIDS (HOTEZ et al., 2008). The detrimental results of such co-infections include additive effects such as
anemia and synergistic effects such as increased transmission of malaria-causing parasites, HIV and/or increased susceptibility to infection with these pathogens as well as an exacerbated progression of the two killer diseases (HOTEZ et al., 2008). The most common helminthiasis in sub-Saharan Africa is those caused by infection with intestinal helminths which include ascariasis, trichuriasis and hook worm disease; followed by schistosomiasis and lymphatic filariasis (HOTEZ et al., 2008). Other helminthiasis conditions prevalent in sub-Saharan Africa are onchocerciasis, loiasis and dracunculiasis, which have global presence of 37 million, 13 million and 0.01 million respectively (HOTEZ et al., 2008).

Many studies have been conducted on the prevalence of helminth parasites in pigs slaughtered in slaughterhouses. A slaughterhouse is a facility where animals are killed for consumption as food. It is important to note that pigs do not contract helminth parasites from these slaughterhouses but from the production systems (ROEPSTORFF et al., 2011). There is evidence to suggest that pigs in outdoor pig production systems are susceptible to intestinal parasite problems than those in indoor systems (ROEPSTORFF et al., 2011). The primary factors associated with this condition are the increased prevalence of parasitic eggs in outdoor conditions (ROEPSTORFF et al., 2011).

Research on the prevalence of helminth parasites isolated from pigs in Southern Africa has been carried out in Zimbabwe and South Africa, where several helminths were isolated from the pigs. Very little research has been conducted on this topic in Botswana. Considering the importance of helminth parasites and the paucity of information on these important endoparasites, there is a need to provide and add to our scientific knowledge the status of these helminth parasites in Botswana, the objective of the present study was to determine the prevalence of helminth parasites of pigs slaughtered in Sentilane farms and Gaborone north abattoirs, Botswana.

MATERIALS AND METHODS

Sample collection: The samples utilized for the present study were collected Sentilane farm and Gaborone North Abattoir and analyzed in a laboratory located in the Department of Biological Sciences, University of Botswana, from November 2014 to May 2015.

Selection of pigs for examination: Collection of samples was carried out from January to March, 2015. A total of 10 pigs were selected through random sampling technique. The pigs were then placed into two age groups, namely (i) growers (≤ 12 months of age) and (ii) adults (≥ 12 months of age). Examination was then conducted on newly slaughtered pigs using visual inspection, palpation and systemic incision of organs to look for adult parasites.

Collection of fecal samples: Freshly deposited faecal samples were collected from the floor of the Pens inhabited by individual pigs using clean, unused sterilized gloves. The collected samples were then placed in glass vials (2.5 cm dia. X 7.6 cm deep) containing 10% formalin and labeled and kept in a styrofoam cool box containing ice packs during transportation to the laboratory. Faecal samples were kept at 4°C and processed the following day.

Collection of tissue samples: Entire samples of stomach and intestines (small and large) were obtained from the newly slaughtered animals. The samples were wrapped in polystyrene bags and placed in a styrofoam cool box containing ice packs and transported to lab. of Department of Biological Sciences, University of Botswana.
Experimental procedure (Fecal analysis and Simple test tube flotation method): Three gram of each fecal sample was mixed with 50 ml of 0.4g/ml sodium chloride (flotation fluid) using mortar and pistil; the resulting fecal suspension was then be poured through a tea strainer into a beaker; the suspension was poured from the beaker into a test tube leaving a convex meniscus at the top; a cover slip was carefully placed on top of the test tube and the test tube was let to stand for 20 minutes, then the cover slip was carefully lifted from the tube together with a drop of fluid adhering to it and immediately placed on a glass slide for microscopic examination (BAYOU, 2005).

Sedimentation: In the detection of helminth eggs which do not float well in the sodium chloride solution such as Fasciola spp., simple sedimentation technique was carried out. 3 g of feces was put in a conical flask and mixed with 30 ml of water; the mixture was then sieved through a tea strainer into a beaker, transferred into a centrifuge tube and centrifuged at 1500 rotation per minute for 3 minutes; the supernatant was then be discarded, and the sediment was mixed with 1% of methylene blue and examined under the microscope using 40× objective lens (BAYOU, 2005).

Post mortem examination: Post-mortem examination was carried out as per the procedure described by ROEPSTORFF and NANSEN (1998) with slight modifications. The stomach was cut open along the major curvature using a pair of scissors and the contents transferred to a bucket, sieved using a mesh (250μm) and microscopically examined for stomach worms. The stomach wall was inspected for worms attached to the gastric mucosa after being incubated in 0.9% saline for 1 day. The small intestines were sliced longitudinally using a pair of scissors, the contents were sieved using a mesh (250μm) and examined microscopically. The large intestines were sliced longitudinally, the contents were emptied into a bucket and the intestinal walls were washed with water. The samples were examined microscopically for the presence of worms and the intestinal wall inspected for worms attached on the mucosa in a similar manner to that carried out for the stomach wall. The number of worms were estimated using the total count method.

RESULTS AND DISCUSSION
A total of 143 helminths were counted in the sample (growers: piglets, 1-12 months old) from Senthane farms, while 112 helminths were counted in the sample (adults: > 12 months old), from Gaborone north abattoirs (Table-1). Helminth species found to be infecting the pig sample from Senthane farms were Ascaris suum, Hysteroglypus rubidus, Oesophagostomum spp. and Trichinella spiralis. The composition of the helminth parasites from Senthane farms can be given as: H. rubidus (41.3%), Oesophagostomum spp. (36.4%), T. spiralis (13.3%) and A. suum (9.1%). The pigs sampled from Gaborone north abattoirs were infected with three helminths species namely, A. suum, H. rubidus and Oesophagostomum spp. (Table 3). The summary of helminths from the Gaborone north abattoirs can be given as; Oesophagostomum spp. (45.5%) > Hysteroglypus rubidus (33.9%) > Ascaris suum (20.5%). The findings are comparable to those made by AERNANet al. (2011), who found their pig sample to be highly infected with Oesophagostomum spp. (43.7%) while sample showed a low infection Ascaris suum (10.5%). These results are essential to the newly growing pig production industry in Botswana. The helminths found are of great concern as they have many negative effects on the pigs, for instance infections with A. suum result in the pig displaying symptoms such as vomiting, diarrhea and death if the small intestines rupture (LEE, 2012). The latter symptoms result in loss of production in the pig production industry (LEE, 2012).
Table-1: Prevalence of helminth species found in sampled pigs in relation to age

<table>
<thead>
<tr>
<th>Sample location</th>
<th>Age (months)</th>
<th>No. Examined</th>
<th>Total worm count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senthane farms</td>
<td>≤12</td>
<td>5</td>
<td>143</td>
</tr>
<tr>
<td>Gaborone North abattoir</td>
<td>&gt; 12</td>
<td>5</td>
<td>112</td>
</tr>
</tbody>
</table>

Table-2: Prevalence of helminth species with percentages of pigs at Senthane farms

<table>
<thead>
<tr>
<th>Parasites</th>
<th>Predilection site</th>
<th>Total worm count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascaris suumsmall</td>
<td>intestine</td>
<td>13</td>
<td>9.1</td>
</tr>
<tr>
<td>Hysteronylus rubidus</td>
<td>stomach</td>
<td>59</td>
<td>41.3</td>
</tr>
<tr>
<td>Oesophagostomum spp.</td>
<td>large intestine</td>
<td>52</td>
<td>36.4</td>
</tr>
<tr>
<td>Trichinella spiralis</td>
<td>small intestine</td>
<td>19</td>
<td>13.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>143</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Total worm count

Table-3: Prevalence of helminth species with percentages of pigs at Gaborone North Abattoirs

<table>
<thead>
<tr>
<th>Parasites</th>
<th>Predilection site</th>
<th>Total worm count</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascaris suumsmall</td>
<td>intestine</td>
<td>23</td>
<td>20.5</td>
</tr>
<tr>
<td>Hysteronylus rubidus</td>
<td>stomach</td>
<td>38</td>
<td>33.9</td>
</tr>
<tr>
<td>Oesophagostomum spp.</td>
<td>large intestine</td>
<td>51</td>
<td>45.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>112</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Total worm count

There was no significant difference (t-test: p > 0.05), in the prevalence of Oesophagostomum infection amongst pigs in Senthane farms (36.4%) and Gaborone north abattoirs (45.5%). Oesophagostomum worms cause enteritis and nodular formation in the gut wall. These symptoms are especially unflattering to the meat industry as these intestines are usually used as casings for products such as sausages. There was a significant difference (t-test: p < 0.05), in the prevalence A. suum infection amongst pigs in Senthane farms (9.1%) and Gaborone north abattoirs (20.5%). The larva of this helminth species are the cause of milk spots in livers of pigs (LEE, 2012). The latter symptom results in the condemnation of liver (which is consumed by a large population in Botswana) thus resulting in a loss in the pig production industry.

ROEPSTORFF et al. (2011) reported that the major helminth species in temperate pig production are A. suum, T. suis, and Oesophagostomum spp. A study of internal and external parasites of pigs conducted in Botswana by NSOSO et al. (2000), showed a high incidence of A. suum, as well as T. suis and Trichostrongylus spp. NSOSO et al. (2000), reported, 54.55% of pigs being infected with A. suum, 20.48 with Trichostrongylus spp. and 6.8% with T. suis.
AERNAN et al. (2011) conducted a study on the prevalence of helminths in pork slaughtered in Makurdi, Nigeria and reported pigs being infected by; 43.7% *Oesophagostomum* spp., 45.8% *Cysticercus cellulosae*, and 1.8% *Metastrongylus* spp. Pigs usually acquire helminth parasites when scavenging (especially in outdoor systems) for food (ROEPSTORFF and NANSEN, 1998). Eggs of these helminth parasites are in the soil and are picked up by the pigs as they feed. In the case of human helminthiasis, a large number of these parasites are contracted by eating contaminated pork and various pork products (AERNAN et al., 2011). The diseases contracted in the latter manner can be described as food borne zoonoses i.e. diseases acquired through the consumption of food of animal origin (ADEBISI, 2007).
CONCLUSION: The pigs from Sentlane farms (Growers) were predominantly infected with *H. rubidus* while those from Gaborone north abattoirs (adults) were predominantly infected with *Oesophagostomum* spp. Both age groups showed little infection with *A. suum*.

ACKNOWLEDGEMENT: We wish to thank the managers of Sentlane farms (Growers) and Gaborone north abattoirs (adults) for sample collection and examination and to thank the technicians, Monica and Lekoko of the laboratory in the Department of Biological Sciences, University of Botswana in which the experiments were conducted.

REFERENCES


