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Full Length Research Paper

Prevalence of gastrointestinal nematodes in Mukota pigs in a communal area of Zimbabwe

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A one year monitoring study was conducted between November 2005 and October 2006 to determine the prevalence of gastrointestinal nematodes in indigenous Mukota pigs in Hama-Mavhaire communal area of Chirumhanzu District, Zimbabwe. Faecal samples from a total of 143 randomly selected pigs of both sexes and different ages (< 5 months, 5 -12 months and > 12 months) from 10 villages were collected from the rectum for identification and quantification of nematode eggs. Of the 143 pigs, 58.7% were positive for gastrointestinal (GI) nematodes, 17.5% having mixed infections. Four parasite species were identified; *Oesophagostomum* species (54.6%) being the most prevalent followed by *Strongyloides ransomi* (14%), A*scaris* species (7%) and *Trichuris suis* (4.2%). Month had an effect on the prevalence and mean egg counts of the four GI nematode species. However, pig class and the interaction between pig class and month did not have an effect on the prevalence and mean egg counts of the GI nematode species. The present work indicates that parasite prevalence in local indigenous pigs in the communal areas is moderate. Further examinations are needed to determine the pathological importance and impact of parasitic infestations on indigenous pigs in the communal area.

Key words: *Ascaris*, epidemiology, indigenous pigs, internal parasites, *Oesophagostomum*.

INTRODUCTION

The indigenous pig genotype of Zimbabwe, generally known as the Mukota, predominates in smallholder areas where it is kept under the free range system and thrives on low planes of nutrition (Mashatise et al., 2005). These pigs are primarily scavengers (Holness, 1991), utilising food scraps thrown away by people. The roaming of pigs favours the uptake of internal parasite eggs (Roepstorff and Nansen, 1994), making the pigs particularly sus-ceptible to infestation with internal parasites. Moreover, the warm and humid conditions of the tropics and the in-frequent treatment of local pigs against parasitic dis-eases (Mashatise et al., 2005) invariably cause them to carry heavy burdens of gastrointestinal (GI) nematodes (Holness, 1991).

Gastrointestinal (GI) nematodes limit pig production; the direct losses caused by these parasites are attributed to acute illness culminating in death, premature slaughter and rejection of carcasses during meat inspection (Pat-tison et al., 1980). Indirect losses include decreased growth rate, weight loss in sows and reduction in litter size (Pattison et al., 1980; Taylor, 1999) . Ajayi et al. (1988) reported that GI nematodes reduced average daily weight gain by up to 30% in indigenous pigs of all ages. The adult nematodes live in the intestines, grazing on the gut lining and ingesting particulate and liquid digesta, thus limiting nutrient uptake by the pigs. The damage caused by adult GI nematodes includes hemorrhagic gastroenteritis and anaemia. Larval migration through tissues of the pigs results in spread of infectious orga-nisms from the gut as well as extensive tissue damage thus compromising organ function (Kahn, 2006).

The Mukota pigs have been demonstrated to be less susceptible to internal parasites than exotic breeds (Zan-ga et al., 2003). However, parasite prevalence and worm burden in these pigs under the free range system have not been evaluated. Farmers do not keep pig health re-cords, thus parasite prevalence and extent of infestation are not known in communal areas. The prevalence of GI

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nematodes in indigenous pigs in communal areas of Zimbabwe is not known. Moreover, the species of GI nematodes commonly affecting indigenous pigs in communal areas of Zimbabwe have not been elucidated. Knowledge about the prevalence of the nematodes is useful when formulating pig development and extension programmes for communal farmers. In addition, knowledge of the occurrence of particular parasite species enables the veterinary services to understand possible health threats and develop prophylactic measures to use to reduce parasite transmission among indigenous pig herds. Therefore, the objective of the current study was to identify and determine the prevalence of GI nematodes in the indigenous pigs in the communal areas of Zimbabwe.

MATERIALS AND METHODS

Description of study site

The study was conducted in Hama-Mavhaire communal area of Chirumhanzu District in Masvingo Province of Zimbabwe located at 19º 83'S and 30º 78' E. The area has a typical tropical climate with two distinct seasons. The warm rainy season starts in mid November and ends in early April. The cool dry season starts from April to mid November. The receives a mean annual rainfall of 394.5 mm. Temperatures range from 16.0 to 31.5ºC with highest temperatures of average 31.1°C, being recorded during the hot months of October and November and lowest temperatures of on average 12°C, around late June to mid July. The altitude is about 400 m above sea level.

Sampling procedure

A total of 143 free range Mukota pigs were sampled (83 sows, 28 gilts, 15 boars and 17 piglets) over one year from all the10 villages in the Hama-Mavhaire communal area. Since pigs were free ranging, faecal samples were collected from only those pigs that were found at the homesteads at the time of sampling. The same individual animals could not be monitored throughout the study period as farmers periodically sold or slaughtered some of their pigs hence; different individuals were sampled each month. Only pigs that were not showing signs of gastrointestinal nematodiasis were sampled.

Sample collection and processing

Faecal samples were collected from indigenous pigs once a month from November 2005 to October 2006. The samples were collected by rectal palpation, using a glycerine lubricated latex glove for each pig. Faecal samples were placed in an empty faecal pot, which was then stored in a cooler box at 4°C before being transported to the laboratory for analysis within 24 h.

The modified McMaster's technique, as described by the Ministry of Agriculture, Fisheries and Food (1977) was used to prepare the faeces for identification and quantification of worm eggs in the faeces. Whenever samples were positive for eggs characteristic for *Oesophagostomum* species and *Hyostrongylus rubidus*, a faecal culture was set up for identification at genus level (Permin et al., 1999).

Faecal samples were mixed with some dry sterilized cow dung till a marshy consistency was reached this was done to improve aeration of the faecal sample. The faecal pots were then shut with a lid and placed in an incubator at 27°C for seven days. The faeces-dung mixture was turned once a day with a tongue depressor to aid in aeration of the samples before being returned into the incubator. After the seven days larvae were harvested using the technique described by the Ministry of Agriculture, Fisheries and Food (1977) upon which the nematode larvae were identified.

Nematode identification

All nematode worm eggs were identified using a combination of keys given by Soulsby (1982), Uhlinger (1991) and Foreyt (2001). Nematode larvae were identified according to Ministry of Agriculture, Fisheries and Food (1977).

Statistical analyses

The prevalence of each species of GI parasite was computed as:

$$P = \frac{d}{n};$$

Where: p is the prevalence, d is the number of individuals having the GI nematode at a particular point in time; and n the number of individuals in the population at risk at that point (Thrusfield, 1995). The mean, median, standard deviation and range of the eggs per gram of faeces for each GI nematode species was also estimated. The $\log_{10}$ transformed data were analyzed using PROC GLM OF SPSS 15.0 for Windows ® (Statistical Package for Social Scientists, 2006). The effect of pig class and month, and their interaction on the prevalence and mean egg counts of GI nematode species was also determined.

RESULTS

A total of 143 pigs were sampled and 84 (58.7%) were positive for GI nematode eggs, 17.48% (25) had mixed infections, while 41.3% (59) of the pigs sampled were negative for GI nematode eggs. Four parasite species were identified using the modified McMaster flotation technique, namely *Ascaris* spp, *Oesophagostomum* spp, *Strongyloides ransomi* and *Trichuris suis* with the prevalences shown in Table 1. The overall transformed ($\log_{10}$) range and mean egg counts for *Ascaris* species, *Oesophagostomum* species, *Strongyloides ransomi* and *Trichuris suis* are shown in Table 1.

Month of sampling affected ($P < 0.05$) the prevalence and mean egg counts of the four GI nematode species. Significantly higher ($P < 0.05$) overall monthly prevalences were recorded in April and May for *S. ransomi* and *Oesophagostomum* spp respectively, compared to November for *Ascaris* species and *Trichuris suis* (Table 2).

There was a general decrease in overall monthly prevalence between May 2006 and October 2006 for all four nematodes species. Mean monthly egg counts for all four parasite species had two major peaks, the first in November 2005 for all four nematode species; the second in February and March 2006 for *Ascaris* species and *Trichuris suis* respectively, and April and May 2006 for *Oesophagostomum* species and *S. ransomi*, respectively (Figure 1). Pig class and the interaction between pig

Table 1. Prevalence of common gastrointestinal parasites in Mukota pigs of Hama-Mavhaire communal area.

Species*	*Ascaris* spp	*Oes* spp	*S. ransomi*	*T. suis*
Prevalence (%)	7.0	54.6	14.0	4.2
Mean**	0.16	1.37	0.33	0.08
SD**	0.58	1.29	0.83	0.39
Range**	0-2.95	0-3.61	0-3.11	0-2.00

*Species names: *Ascaris* species, *Oesophagostomum* species, *S. ransomi*, *Trichuris suis.* **Log $_{10}$ transformed values.

Table 2. Monthly prevalence of GI nematodes in the Mukota pigs.

Month	Overall	*Ascaris* spp	*Oesophagostomum* spp	*Strongyloides*	*Trichuris*
Nov 05	55.6	38.9^{b}	38.9^{b}	5.6^{a}	22.2^{b}
Dec 05	23.0	0.0^{a}	23.0^{a}	7.7^{a}	7.7^{a}
Jan 06	60.0	0.0^{a}	60.0^{b}	40.0^{b}	0.0^{a}
Feb 06	43.8	12.5^{a}	37.5^{b}	18.8^{a}	0.0^{a}
Mar 06	64.7	5.9^{a}	58.8^{b}	32.3^{a}	0.0^{a}
Apr 06	100.0	0.0^{a}	90.91^{c}	45.5^{b}	0.0^{a}
May 06	91.7	0.0^{a}	91.7^{c}	0.0^{a}	0.0^{a}
Jun 06	70.0	0.0^{a}	70.0^{b}	0.0^{a}	0.0^{a}
Jul 06	77.8	0.0^{a}	77.8^{b}	0.0^{a}	0.0^{a}
Aug 06	44.4	0.0^{a}	44.4^{b}	0.0^{a}	0.0^{a}
Sep 06	58.3	0.0^{a}	58.3^{b}	0.0^{a}	0.0^{a}
Oct 06	0.0	0.0^{a}	0.0^{a}	0.0^{a}	0.0^{a}

^{abc} indicates significant differences of the means.

class and month did not have an effect on the prevalence and mean egg counts of the GI nematode species.

DISCUSSION

The current study is the first to be carried out for GI nematodes infesting free-range indigenous pigs under smallholder management in communal areas of Zimbabwe. Gastrointestinal nematodes were moderately prevalent in scavenging indigenous pigs in the Hama- Mavhaire communal area of Chirumhanzu district. Apart from *Ascaris* species, none of the parasites identified in the current study have been previously reported to affect Mukota pigs in communal areas of Zimbabwe.

Knowledge on the prevalence and significance of parasites in pigs in southern Africa is rather limited, but our findings are, with regard to GI nematodes, largely in agreement with reports from other parts of Africa (Ajayi et al., 1988; Salifu et al., 1990; Esrony et al., 1997; Permin et al., 1999; Nsoso et al., 2000) . In Nigeria, Ajayi et al. (1988) examined faecal samples from 1140 pigs and observed that 97% excreted parasitic eggs. The range of species in their study is similar to our findings. Interestingly, 90% of the pigs excreted *A. suum* compared to only 7% observed in the present study. Salifu et al. (1990) made faecal examinations of about 1000 pigs in Nigeria and observed the range of nematode species that is similar to the present study, but again with a higher prevalence for *A. suum* (60%). The high prevalence of *A. suum* in both Nigerian studies might be due to the differrences in breed and production systems as reported by Roepstorff et al. (1998).

In Tanzania, faecal samples from 424 local and cross-bred pigs kept under different management systems, were examined (Esrony et al., 1997). The coprological examination revealed that only 53% of the pigs excreted helminth eggs in their faeces. The range of species in this study is similar to the current study's findings; however, the prevalence of *S. ransomi* is lower (9%) compared to our findings (14%). This might be attributed to the fact that the Tanzanian study site included semi arid areas and as such these provide unfavourable environment for survival of *Strongyloides* larvae as these larvae are susceptible to desiccation (Melancon, 2003).

Faecal samples from 259 local cross-bred pigs in Ghana were examined and 91% excreted parasitic eggs (Permin et al., 1999). Interestingly, *S. ransomi*, which was observed in the present study, was not identified in the Ghanaian study. The 259 pigs sampled were all growers in the Ghanaian study and *S. ransomi* usually affects younger piglets. In a study by Nsoso et al. (2000), faeces

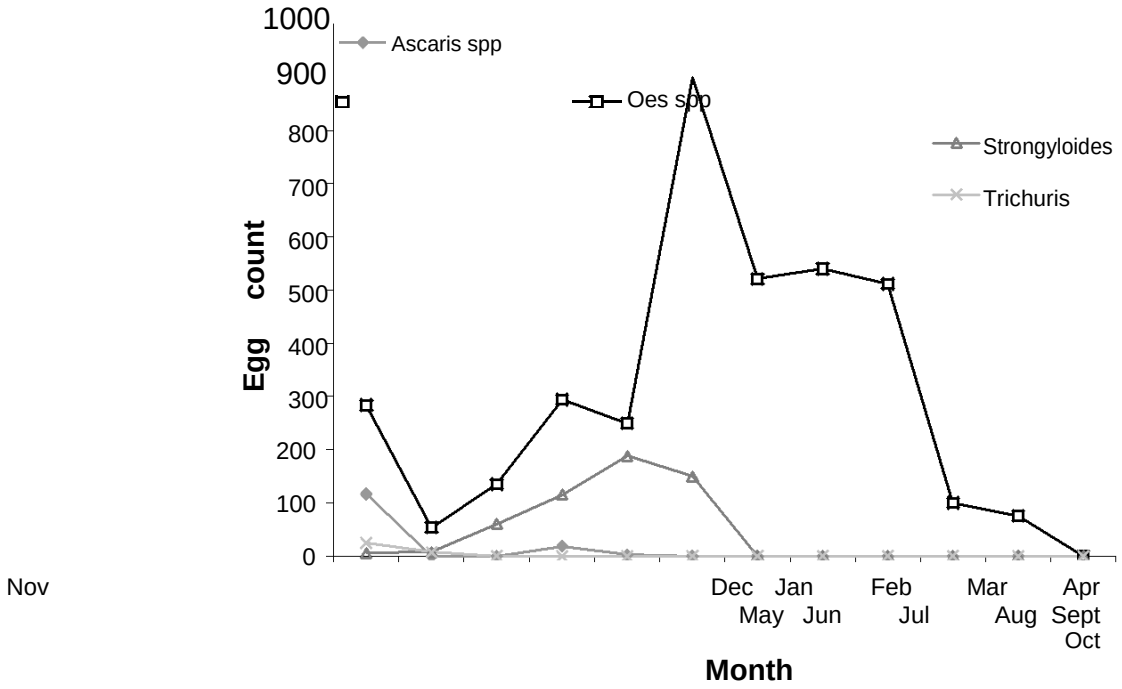

Figure 1. Mean monthly egg counts of GI nematodes in Mukota pigs.

from 29 local and cross-bred pigs in Botswana were examined. Coprological examination revealed that 52% of the pigs excreted helminth eggs in their faeces. The eggs belonged to three different helminth species namely *A. suum*, *Trichostrongylus* species and *Trichuris suis*, with prevalences of 55, 24 and 8%, respectively. The prevalence of *A. suum* was markedly greater than that observed in the present study but a possible explanation to this finding could not be established.

The prevalence of internal parasites is thought to be generally higher in young animals than in adults (Visco et al., 1977; Bugg et al., 1999); however, this was not observed in the present study. Piglets are considered to be the most susceptible group and therefore it would not be surprising to find the highest egg counts in this age group. Based on a study on production of indigenous pigs in the same area, Chikwanha (2006) suggested the occurrence of high mortality in piglets in the Hama-Mavhaire communal area. Nematode infections may be one of the contributing factors in piglet mortality. The pig-lets are undernourished and when exposed to heavily contaminated pastures, they acquire high levels of infec-tion with severe consequences. Hence the few piglets sampled could be the only survivors that resisted infec-tion and so shed few GI nematode eggs thus giving a lower prevalence. Among the adult animals only the boars had low mean egg counts that may be explained by age immunity (Urqhart et al., 1996).

Clinical disease and death are not the common manifestations of internal parasitism and often develop only subsequent to malnutrition or stress (Vassilev, 1999). Though the impact of nematode infection was not determined, the moderate prevalence of GI nematodes and other helminth infections may be regarded as a real problem affecting productivity of the animals in the study site. Our results suggest that antihelmintic treatment of animals should be carried out even if the levels of infection are only low to moderate. Furthermore there should be extensive diagnostic and epidemiological studies on the internal parasites of pigs in this and surrounding communal farming areas, so that sound control programmes can be formulated.

Based on the present data, it is suggested that for the control of gastrointestinal nematodes, pigs in communal farming areas should be given an antihelmintic in April / May to destroy the worm burden acquired during the rainy season. This would also help the animals to withstand the nutritional stress of the dry season. A second treatment in the mid-rainy season may be advocated to reduce the build up of rangeland contamination during the rains. However any program should be applied at a locality level so that animals using the same rangeland are treated at the same time. It might be useful to treat the lactating sows to reduce the chances of contaminating piglets. It should be pointed out that any antihelmintic treatment regime would not be effective unless the nutrition of the animals is also improved (Vassilev, 1999). Knox and Smith (2000) outlined the progress on vaccination against nematode parasite based on proteins isolated from the microvillar surface of the parasite enterocyte. This could be a new avenue in the control of gastrointestinal nematodes in the study site.

In conclusion, our results show that parasite prevalence in local indigenous pigs in the Hama-Mavhaire communal area is moderate. The clinical examinations revealed that the majority of the animals were in good condition, sugg-

esting that the indigenous pigs have developed tole-rance to GI nematodes. Further examinations are needed to determine the pathological importance and impact of parasitic infestations on indigenous pigs in the communal area. *Oesophagostomum* species, *S. ransomi*, *A. suum* and *Trichuris suis* with prevalences of 54.6, 14, 7 and 4.2% respectively, were the gastrointestinal nematode species observed to occur in indigenous Mukota pigs of Hama-Mavhaire communal area of Chirumhanzu district of Zimbabwe.

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REFERENCES

Ajayi JA, Arabs WL, Adeleye GA (1988). Helminths and protozoa of pigs on the Jos Plateau, Nigeria: Ocurrence, Age, Incidence and seasonal distribution. Bulletin Animal Health and Production in Africa. 36:47.

Bugg RJ, Robertson ID, Elliot AD, Thompson RC (1999). Gastrointestinal parasites of urban dogs in Perth, Western Australia. Vet. J. 157(3): 295-301.

Chikwanha O (2006). MSc Thesis. University of Zimbabwe, Harare, Zimbabwe.

Esrony K, Kambarage DM, Mutambo MMA, Muhairwa AP, Kusiluka LJM (1997). Helminthosis in local and cross-bred pigs in the Morogoro region of Tanzania. Preventive Veterinary Medicine. 32: 41-46.

Foreyt WJ (2001). Veterinary Parasitology Reference Manual, 5th Edition. Blackwell Publishers, Iowa: pp.137 – 150.

Holness DH (1991). Pigs. Macmillan, London. p.16

Kahn CM (2006). The Merck Veterinary Manual, 9th Edition. Merck and Co. Inc., Whitehouse Station, NJ, USA. p.254

Knox DP, Smith WP (2001). Vaccination against gastrointestinal nematode parasites of Ruminants using gut expressed antigens. Vet. Parasitol. 100: 21-32.

Mashatise E, Hamudikuwanda H, Dzama K, Chimonyo M, Kanengoni A (2005). Effects of Corn Cob-based Diets on the Levels of Nutritionally Related Blood Metabolites and Onset of Puberty in Mukota and LandracexMukota Gilts. Asian Australasian J. Anim. Sci. 18(10): 1469-1474.

Melancon JJ (2003). IVOMEC (ivermectin) Brand Products for Swine: The Parasite Solution for Today's Pork Producer. Merial Veterinary Bulletin. MVB: pp. 3-12.

Ministry of Agriculture, Fisheries and Food (1977). Manual of Veterinary Parasitological Laboratory Techniques. Crown Printers: pp. 8-12.

Nsoso SJ, Mosala KP, Ndebele RT, Ramabu SS (2000). The prevalence of internal and external parasites in pigs of different ages and sexes in Southeast District. Botswana. Onderstepoort Journal of Veterinary Research. 67(3): 217-20.

Pattison HD, Thomas RJ, and Smith WC (1980). Veterinary Record. 107: 415.

Permin A, Yelifani L, Bloch P, Steehard N, Hansen NP, Nansen P (1999). Vet. Parasitol. 87:63.

Roepstorff A, Nansen P (1994). Epidemiology and control of helminth infections in pigs under intensive and non-intensive production systems. Vet. Parasitol. 54: 69-85.

Roepstorff A, Nilsson O, Oksanen A, Gjerde B, Richter SH, Örtenberg E, Christensson D, Martinsson KB, Bartlett PC, Nansen P, Eriksen L, Helle O, Nikander S, Larsen K (1998). Intestinal parasites in swine in the Nordic countries: prevalence and geographical distribution. Vet Parasitol. 76: 305-319.

Salifu DA, Mang TB, Onyali IO (1990). A survey of gastrointestinal parasites in pigs of the Plateau and River States, Nigeria. Rev. Elev. Med. Vet. Pays. Trop. 43(2): 193-196.

Soulsby EJL (1982). Helminths, Arthropods and Protozoa of Domesticated Animals, 7th Edition. Lea & Febiger, Philadelphia. pp. 143-148, pp. 186-190.

Statistical Package for Social Scientists (SPSS) 15.0 for Windows, 2006. SPSS AnswerNet. http://www.spss.com/tech/answer/

Taylor DJ (1999). Pig Diseases 7th edition. Glasgow, p. 49.

Thrusfield M (1995). Veterinary Epidemiology, 2nd Edition. Blackwell Science, London. pp. 39-41.

Uhlinger CA (1991). Equine small strongyles: epidemiology, pathology and control. The Compend. Contin. Educ. Pract. Vet. 13: 332- 338.

Urqhart GM, Amour J, Duncan JL, Dunn AM, Jennings FW (1996). Veterinary Parasitology, 2nd Edition. Blackwell Science Ltd, London. pp. 17-70.

Vassilev GD (1999). Survey of Trichinella spp. Infection in pigs from commercial piggeries in Zimbabwe. International – des- Epizooties. 18 (3): 753-757.

Visco RJ, Corwin RM, Selby LA (1977). Effect of age and sex on the prevalence of intestinal parasitism in dogs. J Am Vet Med Assoc. 170 (8): 837-935.

Zanga J, Chimonyo M, Kanengoni A, Dzama K, Mukaratirwa S (2003). A comparison of the susceptibility of growing Mukota and Large White pig genotypes to infection with Ascaris suum. Vet Res Communic. 27: 653–660.