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ORIGINAL PAPER

The prevalence of gastrointestinal helminth infections in pigs in Kenya

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Abstract The prevalence of helminth infection, species spectrum and worm burdens in Kenyan pigs was examined. A total of 115 gastrointestinal tracts (GIT) from 61 growers and 54 adult pigs were examined between February 2005 and January 2006. Seventy eight (67.8%) had one or more helminth parasites, of which thirty six (31.3%) were mixed infection. Ten types of helminth parasites encountered in descending order of prevalence were, *Oesophagostomum dentatum* (39.1%), *Trichuris suis* (32.2%), *Ascaris suum* (28.7%), *Oesophagostomum quadrispinulatum* (14.8%), *Trichostrongylus colubriformis* (10.4%), *Trichostrongylus axei* (4.3%), *Strongyloides ransomi* (4.3%), *Hyostrongylus rubidus* (1.7%), *Ascarops strongylina* (1.7%) and *Physocephalus sexalutus* (0.9%). *Oesophagostomum dentatum* was the most prevalent species (51.9%) in the adult pigs, while *Trichuris suis* was the most prevalent species (44.3%) in growers. The highest worm counts were recorded in the out door production system. *Oesophagostomum quadrispinulatum*, *Trichostrongylus colubriformis*, *Trichostrongylus axei*, *Hyostrongylus rubidus*, *Ascarops strongylina* and *Physocephalus sexalutus* were recorded in Kenya for the first time. The high prevalence and wide spectrum observed in the present study suggests that helminth infection may be a constraint to economic pig production in the country and there is need to institute control measures.

Keywords Helminths · Kenya · Pigs · Prevalence · Spectrum

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Introduction

Gastrointestinal helminthosis is one of the commonest and most important diseases of pigs in the tropics. The infection is associated with severe economic losses as evidenced by decreased litter sizes, poor growth rates, reduced weight gains, visceral organ condemnations at slaughter and deaths (Stewart and Hale 1988). The prevalence, worm burden and spectrum of helminth species largely depends on the type of swine production system. In the highly intensive production systems, the infection levels are usually low and involve only few species. On the other hand, in most traditional systems, the poor hygienic conditions allow a higher prevalence, burden and rate of helminth transmission as may be the case with extensive out door management systems without athelmintic interventions (Roepstorff and Nansen 1994; Nansen and Roepstorff 1999).

In Kenya, approximately 80% of the pigs are reared indoors mainly in Central, Rift Valley and

Nairobi Provinces of the country, largely due to their close proximities to the main market out lets in Nairobi city. Of these, 60% are under small holder farming systems, mostly with poor management practices, poor housing, suboptimal feeding and without standard helminth control programmes (KARI 1996; Wabacha et al. 2004). A few pigs are kept under the free range system mainly in Nyanza and Western Provinces (MALD 1995).

Previous surveys on helminth infections in Kenyan pigs have shown presence of *Ascaris suum*, *Strongyloides ransomi*, *Trichuris suis* and *Oesophagostomum* spp. (Kagira et al. 2002; Wabacha et al. 2004) and *Cysticercus cellulosae* (Githigia et al. 2005). This is indeed a very narrow spectrum of species compared to other African countries (Ajayi et al. 1988; Permine et al. 1999; Tamboura et al. 2006). The prevalence data in the country is mainly based on faecal examination. Although this method gives an impression of infection levels, it does not reveal adequately the species identification and furthermore there is no clear correlation between egg output and worm burden (Reopstorff and Nansen 1998). On the other hand, post-mortem worm counts provide a more precise assessment of worm burdens and species spectrum. Considering the pig production systems in Kenya, a wider spectrum of helminth species may exist in the country than previously recorded. It is imperative that the latter method be used to give a clear picture of the worm burdens and species spectrum in Kenyan pigs. The aim of the present study was therefore to determine the prevalence, burden and spectrum of helminth infection through examination of organs obtained from pig slaughtered in Nairobi and from the post-mortem room in the Department of Veterinary Pathology, Microbiology and Parasitology, University of Nairobi.

Materials and Methods

A total of 115 gastrointestinal tracts (GIT) from pigs were examined for gastrointestinal helminth parasites between February 2005 and January 2006. Forty four GIT were obtained from pigs slaughtered in two main slaughter houses in Nairobi of which 2 were from the out door production area in Nyanza Province, the rest were from the indoor production areas in Central, Rift Valley and Nairobi Provinces. Seventy one others GIT were obtained from pigs brought for post-mortem examination in the Department of Veterinary Pathology, Microbiology and Parasitology, University of Nairobi mainly from the indoor production areas around the institution. Helminth parasites were recovered from the GIT as described by Roepstorff and Nansen (1998) and identified based on the morphological features described by Soulsby (1982). In addition to GIT helminth investigations, the 71 carcasses brought for post-mortem examination were screened for, kidney worms, lung worms and liver flukes.

Statistical analysis

Sixty one of the pigs examined were below six months of age and were categorized as growers while 54 were six months and above and classified as adults. Worm burdens recorded from the organs of these pigs were logarithmically transformed [log (x+10)] to normalize their distribution and comparisons made between the two age groups through analysis of variance (ANOVA) (GenStat ® 2005).

Results

The percentage prevalence of infections in the 115 gastrointestinal tracts from pigs examined for helminth infections are shown in Table 1. Seventy eight (67.8%) of them had one or more helminth parasites out of which thirty six (31.3%) had mixed infection. Ten different types of helminth parasites were identified from the gastrointestinal tracts. In descending order of prevalence, the ten species were, *Oesophagostomum dentatum* (39.1%), *Trichuris suis* (32.2%), *Ascaris suum* (28.7%), *Oesophagostomum quadrispinulatum* (14.8%), *Trichostrongylus colubriformis* (10.4%), *Trichostrongylus axei* (4.3%), *Strongyloides ransomi* (4.3%), *Hyostrongylus rubidus* (1.7%), *Ascarops strongylina* (1.7%) and *Physocephalus sexalatus* (0.9%). *Oesophagostomum dentatum* was the most prevalent species (51.9%) in the adult pigs, while *Trichuris suis* was the most prevalent species (44.3%) in growing pigs.

Oesophagostomum species, *Trichuris suis*, *Ascaris suum*, *Trichostrongylus* species, *Strongyloides ransomi* and *Hyostrongylus rubidus* were recorded in pigs in from both the indoor and out door production systems.

Table 1 Percentage prevalence of helminth infections and their range at various levels of the GIT in the 115 pigs examined, figures in brackets represents the percentage prevalence infection in a specific age group

Organ	Parasite species	Age of pigs, number infected, percentage prevalence and range of infections			
		Growers n=61	Adults n=54	Prevalence (%)	Range
Stomach	*Ttrongylus axei*	3 (4.9)	2 (3.7)	4.3	1 – 13
	Hyostronylus rubidus	1 (1.6)	1 (1.9)	1.7	9 – 1000
	Physocephalus sexalatus	-	1 (1.9)	0.9	0 – 8
	Ascarops strongylina	1 (1.6)	1 (1.9)	1.7	2 – 46
Small intestines	*Trichostrongylus olubriformis*	5 (8.2)	7 (13)	10.4	1 – 112
	Stronyloides ransomi	2 (3.3)	3 (5.6)	4.3	1 – 449
	Ascaris suum	17 (27.9)	16 (29.6)	28.7	1 – 96
Large intestines	*Oesophastomum dentatum*	17 (27.9)	28 (51.9)	39.1	1 – 5113
	O. quadrispinulatum	5 (8.3)	12 (22.2)	14.8	2 – 902
	Trichuris suis	27 (44.3)	11 (20.4)	33.0	1 – 111
	Mixed infections	19 (31.1)	17 (31.5)	31.3	2 – 7032
	Total infected	38 (62.3)	40 (74.1)	67.8	1 – 7032

However, *Ascarops strongylina* and *Physocephalus sexalatus* only occurred in the indoor and out door systems respectively.

The worm burdens in the infected pigs ranged from 1 – 7,032. The higher range was recorded in a pig from the out door production system. Overall, the adult pigs had a significantly higher worm burden ($p< 0.05$) than the growers. The burden of *O. dentatum* was significantly higher ($p<0.05$) in the adult pigs than in the growers. The burdens of other species except *O. quadrispinulatum* and *P. sexalatus* were higher in growers than in adults though not significantly. None of the 71 carcasses screened for, kidney worms, lung worms and liver flukes was infected.

Discussion

The 67.8% prevalence of gastrointestinal helminth parasites observed in the present study is higher than 39% to 43.5% prevalence rates previously recorded in the country (Kagira et al. 2002; Wabacha et al. 2004). This may be attributed to the fact that all previous studies largely relied on faecal sample examination as opposed to the current study which used post-mortem worm recovery, which provides a more precise assessment of worm burdens and species spectrum. Such a higher prevalence of GIT helminth parasites as recorded in this study is an indication of high infestation in Kenyan pigs. This may be due to the fact that majority of pigs in the country are under smallholder production systems with poor management practices, poor housing, suboptimal feeding and without standard helminth control programmes (Wabacha et al. 2004). In such conditions, the pigs are exposed to continuous infestations and re-infections. There is need therefore to improve on the above constraints in order to reduce the levels of helminth infestation in Kenyan pigs and ensure economic production.

Most of the parasites encountered during this study are pathogenic and have been associated with decreased litter sizes, poor growth rates, declines in weight gains, visceral organ condemnations at slaughter and deaths leading to severe economic losses. However, only *Oesophagostomum* species, *Ascaris Suum* and *Trichuris suis* were widely distributed and / or occurred in relatively large numbers to be of any pathogenic significance. The high prevalence of *Oesophagostomum* species is attributed to the fact that its transmission is favoured by the high egg excretion and humid and unhygienic conditions (Roepstorff and Nansen 1998), similar to those seen in most smallholder production units in Kenya (Wabacha et al. 2004). Since the parasite is only moderately immunogenic, worm loads tend to accumulate with increasing age (Roepstorff and Nansen 1994) as was evident in the present stud where pigs had a higher abundance.

Globally, *Ascaris suum* is one of the most prevalent parasites of pigs. Infections with *Ascaris suum* occur in both outdoor and confined pigs. The thick shelled eggs of *A. suum* like those of *Trichuris*

suis are resistant to adverse environmental factors as well as chemicals and can maintain infectivity for long periods of time (Roepstorff and Nansen 1998). The infections by the two species usually stimulate the development of rather strong protective immune reactions so that older animals have low worm burdens (Eriksen et al. 1992; Nansen and Roepstorff 1999) as was evident in this study.

Infections with *Trichostrongylus* species, *Hyostrogylus rubidus*, *Ascarops strongylina* and *Physocephalus sexalutus* are mainly confined to out door reared pigs (Roepstorff and Nansen 1998). Infections are thus likely to be more severe in scavenging pigs, compared to those in intensive system of production. In Kenya, the majority of pigs are reared indoors (KARI 1996; Wabacha et al. 2004). This may be the reason these parasite species had a relatively low prevalence in the present study and were not detected in previous studies in the country. However, a few pigs are kept under the free range system mainly in Nyanza and Western Provinces of Kenya where the prevalence of these parasites may be relatively high as observed in the two pigs in the present study. The helminth spectrum in the present study is not all inclusive, possibly due to the small sample size from certain regions of the country. There is need for regional studies that will give clear pictures of the prevalence and spectra of infections in the respective areas and to provide a basis for development of helminth control programmes for the specific locality.

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