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GASTROINTESTINAL PARASITES IN PIGS: PREVALENCE AND DIAGNOSIS

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SUMMARY

The prevalence of gastrointestinal parasites in pigs in Shah Alam abattoir, Selangor was studied. A total of 120 faecal samples were collected. Each faecal sample was examined by direct smear (DS), simple floatation (SF) and formal-ether sedimentation (FES). The results revealed the presence of *Balantidium coli* (53.3%), *Trichuris suis* (17.5%), *Ascaris suum* (15.8%), coccidia (11.6%), strongyles (8.3%), *Entamoeba suis* (2.5%) and *Echinostoma malayanum* (1.7%). The detection rates for *B. coli* and *E. malayanum* were highest with FES. The detection rates for coccidia, *Trichuris suis* and strongyles were highest with SF. The detection rates for *Ascaris suis* and *Entamoeba suis* were the same with FES and SF. Generally DS had the lowest detection rate compared to FES and SF. The agreement between FES and SF was the highest when compared to SF and DS; FES and DS. It is concluded that the SF remains the method of choice for the detection of gastrointestinal parasites in pigs.

Keywords: Gastrointestinal parasites, pigs, faecal examination

INTRODUCTION

Pig farming is the third largest livestock industry in Malaysia, contributing to 102% self sufficiency in pork with the excess exported to the Republic of Singapore (DVS, 2001). The pig farming industry in Malaysia has evolved from a scene dominated by small scale, backyard farmers into its current state where capital intensive, medium to large scale porker production farms are the dominant players (Anon., 2003). Changes in farming systems are known to affect not only production economics, but also the epidemiology of diseases and their agents in a population of farmed animals (Radostits *et al.*, 1994). Endoparasites are ever present in pigs and must be considered in the economic production of pork (Corwin and Stewart, 1999). Loss of appetite, reduction in daily weight gain, poor feed utilization and the potentiation of other pathogens that may be present are the more common results of parasitism. The damage caused by the presence or migration of parasites results in the condemnation of internal organs or carcasses unfit for human consumption. However, only few reports of parasites of pigs in Malaysia are available in the past two decades. An abattoir survey of gastrointestinal parasites was reported by Lee *et al.*, (1987). This was followed by a published work on clinical trichuriasis by Too (1994). It is interesting to note that there were no similar reports on swine parasites in Malaysia after these studies.

The direct smear, simple floatation and formal-ether sedimentation methods are the three common techniques performed at the Veterinary Parasitology Laboratory in Universiti Putra Malaysia (UPM) to detect endoparasites in pig. This paper reports the prevalence of gastrointestinal parasites in pigs from Shah Alam abattoir and compares the detection rates of three techniques namely: direct smear, simple floatation and formal-ether sedimentation and their relative agreements.

MATERIAL AND METHODS

Study design

This study was conducted at the Shah Alam abattoir in Selangor using a cross-sectional prevalence study design. A total of 120 gastrointestinal tracts from 120 porkers were collected over a period of four weeks, between 18 October to 12 November 2004. The pigs were mainly Landrace and Yorkshire crosses with ages ranging from five to seven months. Two visits per week were made to the abattoir. During each visit, faeces was extracted from 15-20 gastrointestinal tracts and transported back to the Veterinary Parasitology Laboratory, UPM for processing. About three grams of faeces was squeezed out from the rectum of each set of gastrointestinal tract. One gram of faeces each was processed in the simple floatation (SF) and formal-ether sedimentation (FES). A tiny quantity of the remaining faeces (amounting to a pin-head) was processed for the direct faecal wet mount (DS).

Faecal examination

The faecal examination techniques namely the DS, SF and FES were performed as described by Lee (1983).

Data analysis

The ability and suitability of the three diagnostic techniques to detect parasites in faecal samples were compared based on their respective detection rate, and the level of agreement to the other two methods. A high detection rate suggested the superiority of a diagnostic method in detecting faecal parasites. A high agreement index between two methods indicated that these methods had equivalent detection ability and were highly comparable with each other. The detection rate for each method was constructed as follows:

$$\text{Detection rate of DS} = \frac{\text{Number of positives detected using DS only}}{\text{Total number of positives using DS+SF+FES}}$$

$$\text{Detection rate of SF} = \frac{\text{Number of positives detected using SF only}}{\text{Total number of positives using DS+SF+FES}}$$

$$\text{Detection rate of FES} = \frac{\text{Number of positives detected using FES only}}{\text{Total number of positives using DS+SF+FES}}$$

The kappa test of agreement was employed to measure the percent of agreement between two diagnostic methods (Gerstman, 1998). The agreement index is indicated by the kappa statistic (k) which ranged between 0 (no agreement) to 1 (highly agreeable to each other).

RESULTS

The parasites found in this study are shown in Table 1. Based on the morphology and measurement of oocysts, the coccidia was identified as *Isospora* spp. Morphological examination and measurements also determined that the strongyle-type eggs belonged to *Oesophagostomum dentatum* and *Stephanurus dentatus*.

The detection rates of the three diagnostic techniques used is shown in Table 2. The highest detection rate for *Balantidium coli* was with FES (93.8%), followed by SF (78.1%) and DS (56.3%). Both the FES and DS had a 100 % detection rate for the heavy *Echinostoma malayanum*.

Generally, SF had the highest detection rates for coccidial oocysts, *Trichuris* eggs and strongyle eggs. The next highest detection rate was achieved using FES. However, the detection rate for direct smear (DS) was the lowest compared to simple floatation (SF) and formal-ether sedimentation (FES). It was also noted that FES and SF demonstrated the same detection rate for *Ascaris* eggs.

Table 3 illustrates the kappa agreement between the three diagnostic techniques for each parasite. The SF and FES demonstrated fair to good agreements for each parasite, which were higher than the agreements between SF and DS, as well as FES and DS.

DISCUSSION

Balantidium coli was the most common parasite encountered in this study where it was detected in 53.3% of the 120 pigs in this survey. This figure was lower than the previous *B.coli* prevalence reported by Lee *et al.* (1987) for the same abbatoir at 65 %. *B.coli* may cause an explosive bloody diarrhoea in pigs. This is a zoonotic protozoa and humans have been found to be clinically affected (Corwin and Stewart, 1999). An outbreak of balantidiosis in which 17% of 895 piglets died before weaning was reported by Omar and Lim (1969). *Isospora suis* is the only important pathogenic coccidian known to cause clinical disease in piglets. The adults are generally protected from this disease because prior exposure to *I. suis* at a younger age would confer resistance against subsequent challenge infections (Lindsay *et al.*, 1999). *Entamoeba suis* occurs in pigs throughout the world. This protozoa is not known to be pathogenic to pigs or man. However, several cases of human infections have been reported, especially in Papua-New Guinea (Ewers, 1972).

Trichuris suis was the second most common parasite in the study. *Trichuris* eggs are very resistant to adverse environmental factors and remain infective for as long as six years (Corwin and Stewart, 1999). Most *Trichuris suis* infections are symptomless, but heavy infections can cause profuse diarrhoea with mucus and blood, dehydration, anorexia and death (Too, 1994).

Oesophagostomum dentatum and *Stephanurus dentatus* were the two strongyles detected in this study. *Stephanurus dentatus* is rarely encountered these days (Too, 1997). *S. dentatus* eggs were detected in only one sample in this study. *S. dentatus* eggs are usually detected in the urine (Charles, 1998). This pig may have acquired the ova through the ingestion of faeces (coprophagia) contaminated with urine. The very low prevalence of *S. dentatus* is due to the high standard of hygiene practised on most farms. The prevalence of *Trichuris suis, Ascaris suum* and strongyles was higher compared to those reported by Lee *et al.* (1987). This indicated that the control of parasites in the farms may have been ineffective. This may be due to the presence of anthelmintic resistance or the total non-usage of anthelmintics.

Ascaris suum is an important parasite of pigs worldwide (Corwin and Stewart, 1999). This is because *A. suum* causes tremendous economic losses due to condemnation of organs, lower growth rate and feed conversion (Nilsson, 1982). A liver pathology survey

Table 1: Prevalence of gastrointestinal parasites in 120 porcine faecal samples

		No. positive	Percentage (%)
PROTOZOA	*Balantidium coli*	64	53.3
	Coccidial oocysts	14	11.6
	Entamoeba suis	3	2.5
NEMATODA	*Trichuris* eggs	21	17.5
	Ascaris eggs	19	15.8
	Strongyle eggs*	10	8.3
TREMATODA	*Echinostoma malayanum* eggs	2	1.7

*Ova of *Oesophagostomum dentatum* (100_m X 60_m): 9 samples
*Ova of *Stephanurus dentatus* (120_m X 80_m) : 1 sample

Table 2: Detection rates of the direct smear, simple floatation and formalin-ether sedimentation techniques

Parasite	Diagnostic technique					
	Direct smear (DS)		Simple floatation,(SF)		Formal-ether sedimentation (FES)	
	No. positive in DS	Detection rate of DS (%)	No. Positive in SF	Detection rate of SF (%)	No. positive in FEF	Detection rate of FES (%)
Balantidium coli (64*)	36	56.3	50	78.1	60	93.8
Coccidial oocysts (14*)	9	64.3	12	85.7	10	71.4
Entamoeba suis (3*)	1	33.3	1	33.3	1	33.3
Trichuris eggs (21*)	8	38.1	18	85.7	15	71.4
Ascaris eggs (19*)	5	23.8	16	76.2	16	76.2
Strongyle eggs (10*)	3	30.0	9	90.0	4	40.0
Echinostoma malayanum eggs (2*)	2	100.0	0	0	2	100.0

* Total number of positive samples using direct smear, simple floatation and formal-ether sedimentation among 120 samples

Table 3: Kappa agreement values between the direct smear (DS), simple floatation(SF) and formalin-ether sedimentation (FES) techniques

Parasite	SF & FES	SF & DS	FES & DS
Balantidium coli	0.73	0.64	0.54
Coccidial oocysts	0.70	0.53	0.37
Trichuris eggs	0.72	0.55	0.60
Ascaris eggs	0.71	0.34	0.28
Strongyle eggs	0.60	0.31	0.26

> 0.75 : Excellent agreement
0.4 to 0.75 : Fair to good agreement
< 0.4 : Poor agreement

conducted within the same abattoir found that the most common lesion in porkers was milk spots due to *A. suum* (Siti-Salmiyah and Sheikh-Omar, 1985).

The trematode, *Echinostoma malayanum,* has not been reported over the last 17 years in Malaysia (Lee *et al.*, 1991) Trematodes are rare findings in animals managed under intensive system because of the necessity of intermediate host (snails) in their life cycles. However pigs in Malaysia are sometimes given plants incorporated into their feed. The plants may be a source of snails.

Generally, the three detection methods used in this survey (SF, FES, DS) showed variable levels of test agreements to each other. The FES and SF had similar detection rates for most species, whereas the detection rates of DS were very different from those of SF and FES. Extreme differences in prevalence rates and detection abilities were among the factors that contributed to poor test agreements when two tests were compared to each other (SPSS, 2003). Conversely, excellent agreement was observed between tests when both had comparable positive and negative detection rates (Heath, 1995). The DS had poor to fair agreements with FES and SF mainly because the DS method depended on a limited portion of the faecal sample for microscopic examination, whereas both FES and SF had a higher probability of detecting the faecal parasites since more faecal materials were able to be processed in these methods. Therefore, it is concluded that the SF method is a reliable and economical method to detect gastrointestinal parasites in pigs compared to FES and DS.

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