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Prevalence and Pathology of Helminth Infections in Pigs

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Abstract. In 30 viscera of local slaughtered pigs from different areas of Tangail and Mymensingh districts of Bangladesh, six species of helminths were identified; 2 of them were trematodes namely *Fasciolopsis buski* (36.70%) and *Gastrodiscoides hominis* (26.70%) and 4 species were nematodes namely *Ascaris suum* (60%), *Metastrongylus elongatus* (53.33%), *Stephanurus dentatus* (10%) and *Physocephalus sexalatus* (56.71%). Three nematode species, *viz*. *M. elongatus* extracted from lung, *S. dentatus* from peri-renal fat and *P. sexalatus* from stomach, were recorded for the first time in pigs in Bangladesh. No gross lesion was observed in pigs affected with *M. elongatus*. In *A. suum* infection, intestinal wall was infiltrated with plasma cells, lymphocytes and eosinophils. In *M. elongatus* infection, lymphocytes and macrophages mainly eosinophilic infiltration was observed in the parenchyma of lung. Age exerted a significant ($p<0.05$) influence on the development of the helminths, *P. sexalatus, F. buski*, *A. suum* and *G. hominis*.

Keywords: helminth infection, pigs, Bangladesh

Introduction

In Bangladesh, the pig rearing is limited to the minority people. Pig population in Bangladesh is estimated as 8 millions (Rahman, 2004). Some of the pig parasites have public health significance (Talbot, 1972). It is reported that most of the pig parasites are the causes of great economic loss in terms of poor growth and weight loss (Johnson *et al.*, 1972). Internal parasites devitalize pigs by robbing them of essential nutrients and injuring vital organs. Pigs heavily parasitized are more susceptible to diseases such as scours and pneumonia (Soulsby, 1982). The resulting diseases and unthriftiness are a major cause of economic loss.

Bangladesh due to its conducive geo-physical condition and tropical climate is considered as haven of parasites (Salkeld *et al.*, 2008). Situation is further aggravated by orthodox husbandry methods such as rearing pigs in clay, feeding the pig herd in dirty places etc. As such pigs remain susceptible to both ecto- and endoparasites. Basak (1988) has documented 5 species of parasites from visceral samples of pigs from some districts of Bangladesh. Moreover, Shaikh and Huq (1984) recorded *Ascaris suum, Trichuris suis, Fasciolopsis buski* and *Ancylostoma duodenale*. But unfortunately no attention has been paid to study the pathology of parasites in pigs in Bangladesh. The present study was aimed at determi-ning the prevalence of helminth infections and pathological lesions produced by them.

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Materials and Methods

For the study, a total of 30 viscera of slaughtered pigs were examined for helminths during the period from July, 2005 to May, 2006. Visceral examination, parasite identification and preservation were conducted in the laboratory at the Department of Parasitology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, whereas, pathological study was performed in the Department of Pathology, Bangladesh Agricultural University, Mymensingh.

Post-mortem examination, parasite collection and identification. Viscera of 30 slaughtered pigs were collected from different places of Mymensingh and Tangail districts. In Mymensingh district the pigs are reared by lower cast Hindus and in Tangail district, non-Muslim ethnic people are engaged in the practice. These were the only two areas from where the visceral samples could be collected and brought to the laboratory within five to six hours and so it was possible to examine all the samples on the day of collection. Viscera were collected from local markets where the pigs are slaughtered. After collection the viscera were brought to the laboratory. Each part of the gastrointestinal tract was opened through long axis by giving longitudinal incision with scissors in separate clean buckets. The contents of the respective part were made clear by repeated washing and sedimentation. The mesentery were cut into small pieces with the help of a sharp pair of scissors and kept in a jar containing sufficient amount of normal saline. After 20 min, the supernatant was decanted and the sediment was examined. Lungs, kidney with perirenal fat, liver, mesentery and spleen were also separated carefully and examined for the detection of lesions if any produced by parasites. These organs were cut into small pieces and kept in two separate glass jars with normal saline. Then the pieces were squeezed gently and removed from the jar. After several washings, the supernatant was poured off carefully and the sediment was examined for presence of parasites. Lungs were collected from all slaughtered pigs and were examined grossly for lung worms after opening the bronchial passages with a pair of scissors. The collected parasites were carefully washed in saline to remove mucus and other waste materials. Diaphragms and intercostal muscles were examined for the larvae of *Trichinella spiralis* and *Cysticercus cellulose* by artificial digestion method.

Artificial digestion method. Selected piece of muscle was minced in a household mincer. Minced tissues 10 g were then stirred in 100 ml peptic digestion fluid at 37 ºC. This was incubated at 37 ºC for 4 to 6 h. Then the content was poured through a wire mesh screen with an aperture of 0.25 mm, held over another on with an aperture of 0.75 mm. This was then washed well in running tap water. Then the content was allowed to settle and the sediment was examined for *Trichinella spiralis* and *Cysticercus cellulose* (Rahman *et al.*, 1996).

Nematodes were preserved in 70% glycerine alcohol and trematodes, in 10% formalin.

Trematode identification. Trematodes were identified according to the keys and description given by Soulsby (1982) by preparing permanent slide following the methods, described by Cable (1957).

Nematode identification. Nematodes were identified by preparing temporary slides adding one drop of lactophenol (Cable, 1957) according to the keys and description given by Soulsby (1982), Anderson (1992) and Yorke and Meplestone (1962).

Study for pathological lesions. Lesions containing tissues or organs were collected and preserved in 10% buffer neutral formalin. Fixed tissue sections were processed, paraffin embedded, sectioned and were routinely stained with hematoxylin and eosin (H & E) as per standard procedure (Luna, 1968).

Statistical analysis. The multivariable logistic regression models were fitted to determine whether, age and sex significantly influenced the helminth infections (Hosmer and Lemeshow, 1989).

Results and Discussion

To study the prevalence of helminth parasites and pathological lesions produced by them in pigs, 30 viscera were examined. Of them 27 (90%) viscera were found to be infected with one or more species of helminths. During visceral examination only 6 species of parasites were recovered, among them were 2 species of trematodes such as *F. buski* (Fig. 1) and 4 species of nematodes namely *A. suum* (Fig. 2), *M. elongatus*, *P. sexalatus* and *S. dentatus* and *G. hominis* (Table 1). This finding is almost similar to the finding of Davidson and Taffs (1965) who reported 95% helminth infections in pigs. However, the present finding was much higher than the results reported by Rajkhowa *et al.* (2003) in India who recorded 63.31% gastrointestinal

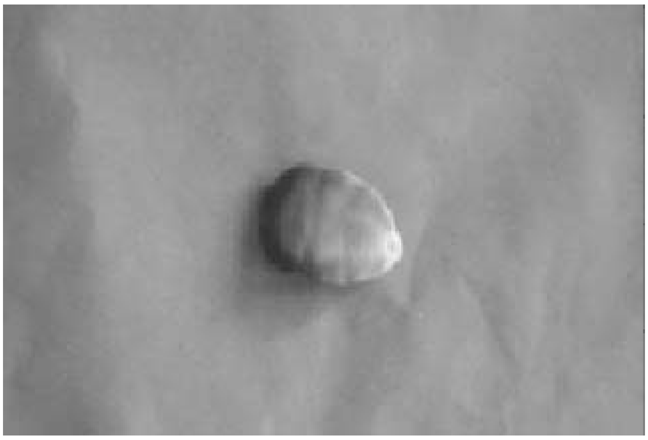

Fig. 1. *Fasciolopsis buski*, Lankester, 1975.

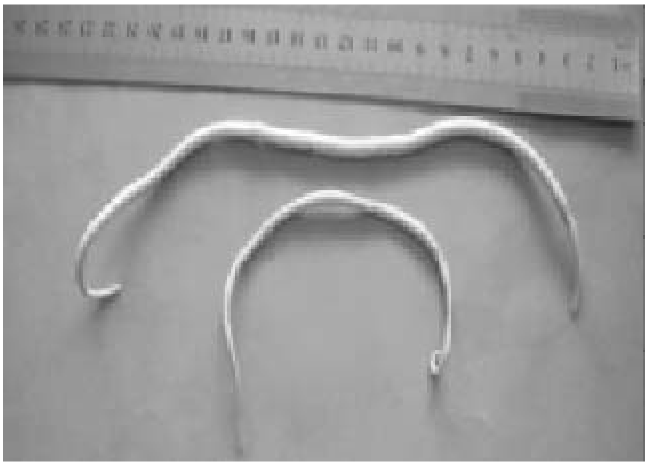

Fig. 2. *Ascaris suum*, Goeze, 1782.

Table 1. Helminth parasites of pigs with their location in the host

Class or order of parasites	Name of parasite	Location in the host
Trematoda	*Fasciolopsis buski*, Lankester, 1875 (Fig. 1)	Small intestine
	Gastrodiscoides hominis, Lewis and McConnel,1913	Caecum and colon
Nematoda	*Ascaris suum*, Goeze, 1782 (Fig. 2)	Small intestine
	Physocephalus sexalatus, Molin, 1860 (Fig. 3,4)	Stomach
	Metastrongylus elongatus, Gmelin, 1790 (Fig. 5,6)	Bronchi and bronchioles of lung
	Stephanurus dentatus, Diesing, 1839 (Fig. 7,8)	Perirenal fat

helminth infection in pig. These parasites were also recorded in pigs by Carstensen *et al.* (2002), Saikh and Huq (1984), Varma (1957) and Lapage (1962) in different countries. The nematodes, *P. sexalatus* (Nematoda: Spiruroidea, Fig. 3,4), *M. elongates* (Nematoda: Stongyloidea, Fig. 5,6), and *S. dentatus* (Nematoda: Stongyloidea, Fig. 7,8), were recorded for the first time in lung, stomach and perirenal fat of local pigs, respectively, in Bangladesh.

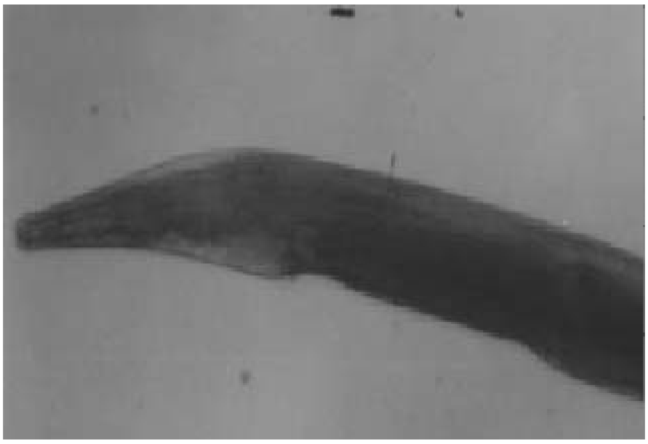

Fig. 3. Anterior portion of *Physocephalus sexalatus* 4x.

Prevalence of helminth parasites was the highest in case of *A. suum* (60%) followed by *M. elongatus* (53.33%), *T. suis* (56.71%), etc. Overall mean parasitic burden was 33.22±3.30 (Table 2).

Effect of age and sex on parasitism. In this study, the result of multivariable logistic regression model lead to the conclusion that age was a significant ($P<0.05$) risk factor for developing each of the helminths, *P. sexalatus*, *F. buski*, *A. suum* and *G. hominis*. But sex exerted no significant ($P> 0.05$) influence on the development of these helminths. The positive sign of the coefficients of age indicates that the risk of being infected by the helminths, *P. sexalatus*, *F. buski* and

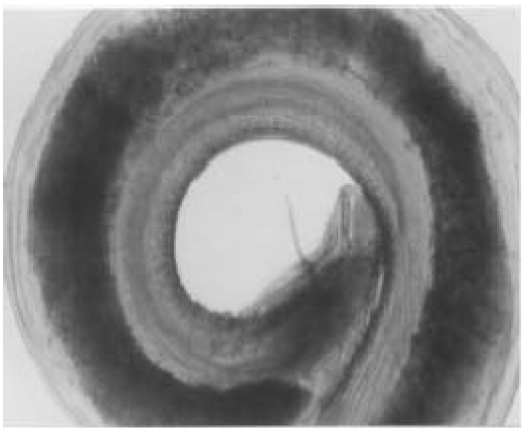

Fig. 4. Posterior portion of *Physocephalus sexalatus* 4x.

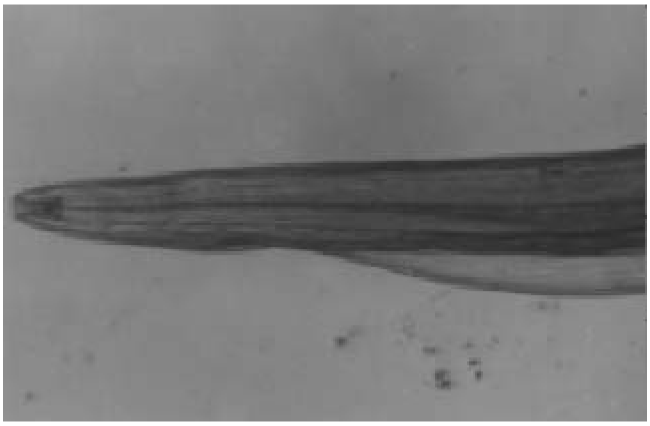

Fig. 5. Anterior portion of *Metastrongylus elongatus* 4x.

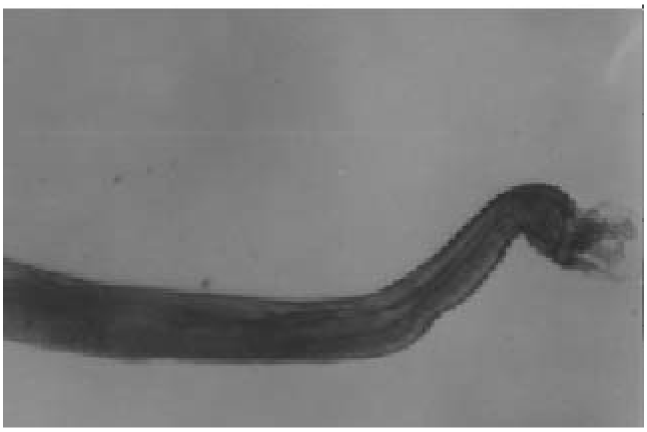

Fig. 6. Posterior portion of male *Metastrongylus elongatus* 4x.

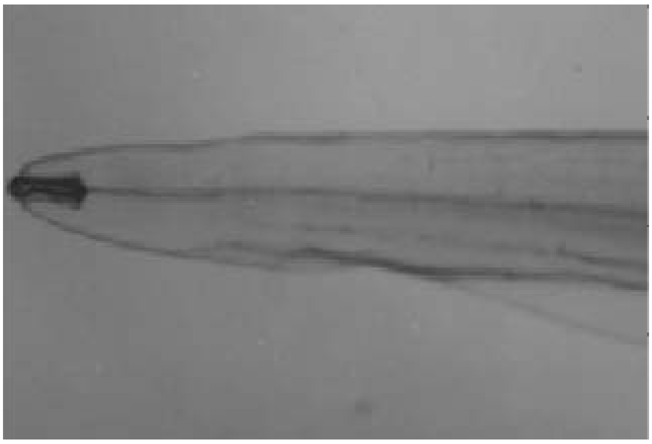

Fig. 7. Anterior portion of *Stephanurus dentatus* 4x.

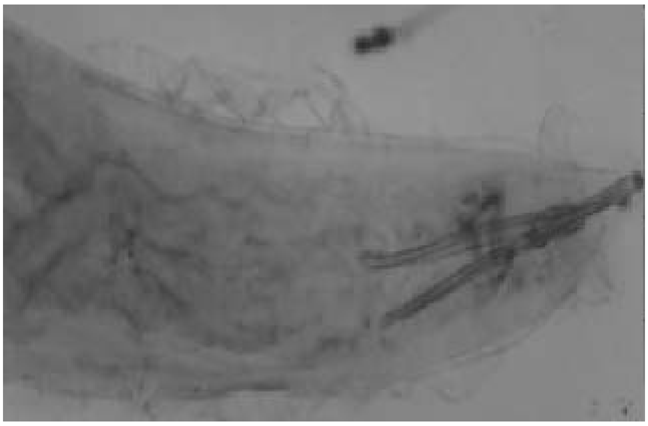

Fig. 8. Posterior portion of male *Stephanurus dentatus* 4x.

G. hominis, by a pig increases with the increase in age. This result could not be compared and contrasted due to the lack of relevant literature. Probably inverse age resistant phenomenon is associated with more prevalence of these parasites in aged animals. Besides, life cycle of these parasites are indirect (Lapage, 1962). Dung beetle acts as intermediate host in the life cycle of *P. sexalatus* and aquatic snail in case of *F. buski*, and *G. hominis*. Adult pigs are allowed to scavenge

Table 2. Prevalence and mean burden of helminths in pigs

Name of helminth	Animals affected (%) n=30	Parasitic load	
		Range	Mean ± SE
A. suum	18 (60%)	7-50	21.89±3.14
M. elongatus	16 (53.33%)	10-30	17.31±1.63
T. suis	17 (56.71%)	1-4	2.12±0.21
F. buski	11 (36.70%)	1-5	2.73±0.45
G. hominis	8 (26.70%)	8-20	12.25±1.46
S. dentatus	3 (10%)	17-25	20.67±2.33
Overall	90%	1-71	33.22±3.30

in the fields and marshy areas. So adult pigs have more chance of getting infection. On the other hand, the negative sign of the age coefficient of the 3rd model implies that the risk of the pig being infected by *A. suum* decreases as age increases (Table 3). This finding is in full agreement with the findings of Lapage (1962) and Soulsby (1982). Perhaps, immunity increases with the increase in age.

Table 3. Results of multivariable logistic regression model fitted on the data of helminths

Model[a]	Variable	Coefficient	SE(b)	Wald's P	OR	95% CI
1	Age	1.34	0.579	0.021	3.81	1.22-11.84
	Sex	-0.50	0.861	0.561	0.61	0.11-3.27
2	Age	1.51	0.622	0.016	4.51	1.33-15.27
	Sex	2.16	1.119	0.054	8.67	0.97-77.79
3	Age	-1.29	0.527	0.014	0.27	0.10-0.77
	Sex	-0.64	0.897	0.473	0.53	0.09-3.05
4	Age	1.63	0.661	0.014	5.10	1.40-18.62
	Sex	2.24	1.31	0.087	9.43	0.72-123.45

[a] = model 1, 2, 3 and 4 were only significant and they were successively fitted for the helminths: *P. sexalatus*, *F. buski*, *A. suum* and *G. hominis;* model Chi-square values were 8.491 (P=0.014), 13.987 (P=0.001), 14.00 (P=0.001) and 9.818 (P= 0.007), respectively, and in each case d. f. = 2

Study of pathological lesions. No gross lesions were detected but parasite *M. elongatus* was present in the bronchi and bronchioles. The lung showed inflammatory exudates in the lumen of the bronchus. During the histopathological study, infiltration of lymphocytes, macrophages mainly eosinophils in the parenchyma of the lung was observed (Fig. 9). There was an increased cellularity in the alveolar wall of the affected

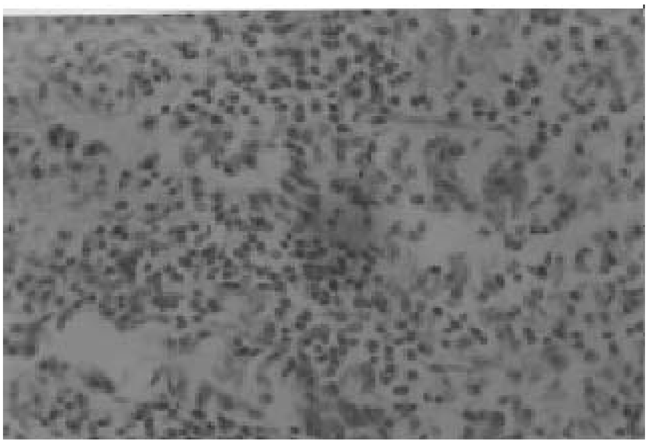

Fig. 9. Lung: Note the infiltration of lymphocytes, macrophages and mainly eosinophils in parenchyma.

lung. These findings conform to the findings of Vercruysse *et al.* (1986), Anthony and Lewis (1961) and Soulsby (1965). *M. elongatus* is incapable of lacerating the lung tissue (Porter, 1936). Probably for this reason, no gross lesion was produced.

No gross lesions were observed in case of *A. suum* infection. The wall of the intestine was infiltrated by plasma cells, lymphocytes and eosinophils in the mucosa and sub mucosa. This tissue reaction occurred due to parasitic infestations. The lumen consisted of necrotic debris (Fig. 10). These observations were supported by the observations of Soulsby (1965). Mouth parts of *A. suum* are adapted for the feeding of epithelial cells of intestine. In fact they feed on epithelial cells of the intestine. But there is no evidence that they actively suck blood (Soulsby, 1965). For that reason, probably, they usually do not produce deep wounds in the mucosa of the intestine.

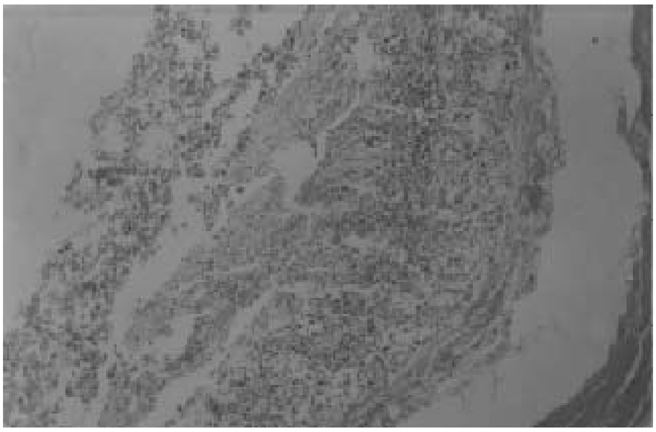

Fig. 10. Intestine: Note the Infiltration of eosinophils in the wall of intestine due to *A. suum* infection.

During the present study, the prevalence and pathology of parasites in pig which were reared in two different management systems were studied. But it was not possible to determine the effect of parasites on the production performance of pig in terms of growth rate, meat production, furrowing etc. With the use of available anthelmintics in our country, such as the combination of levamisole and triclabendazole or tetramisole and oxyclozanide at 4 months interval, this parasitism can be controlled. This parasitism in pigs can be easily detected by examination of faecal samples provided by any government veterinary hospital. But due to lack of awareness most of the pig rearers are not involved in deworming practices reguarly. So, all pig rearers should deworm their pigs at an regular interval to keep their pigs healthy and to keep away the risk of zoonotic parasitic diseases.

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