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A Survey on the Prevalence Rate of *Balantidium coli* in Pigs in Japan

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Abstract

Fecal examination for the detection of *Balantidium coli* was performed on 88 healthy bred pigs of mixed varieties (about 6 months old) brought to the slaughter-house in Ibaraki Prefecture, Japan from June 1986 to June 1987. The feces were collected from the caecum, colon (ascendens, central flexure, descendens) and rectum of each pig. As a result of this survey, it was found that all pigs examined were infected with *B.coli,* and the density of infection was highest in the caecum (1149.2/ml on average). Prevalence and density of the trophozoites decreased gradually, but those of cysts increased posteriorly. Average size of the trophozoites was 71.3×43.0 μm, and cysts 56.0×50.9 μm. Macronuclei measured 26.8×13.7 μm in trophozoites and 28.0×13.8 μm in cysts on average.

Key words: *Balantidium coli,* cyst, pig, prevalence, trophozoite

Introduction

Balantidiosis caused by *Balantidium coli* is one of the zoonoses with cosmopolitan distribution (Flynn, 1973; Levine, 1973). Epidemiological studies of human balantidiosis have been carried out in various areas of the world (Covree and Rijpstra, 1961; Geddes, 1952; Walzer *et al.*, 1972) and it has been reported that this parasite occurred at high prevalence in pigs (Awakian, 1937; Pritze, 1928; Van der Hoeven and Rijpstra, 1957). However, very little informations on the distribution of this parasite have been available in Japan.

The present paper deals with a study of prevalence and density of infection of *B. coli* in the caecum, colon and rectum in Japanese pigs.

Materials and Methods

The feces examined were collected from 88 healthy bred pigs of different varieties (about 6 months old) brought to the slaughter-house in Ibaraki Prefecture over a period from June 1986 to June 1987. The sampling locations in the digestive tract are shown in Fig. 1.

Collected materials were suspended in twice their volume of methylgreen-formalin-saline (MFS) solution as soon as possible to fix and stain the *B.coli* (Ogimoto and Imai, 1981). They were then filtered through a double-folded sheet of muslin, and kept at room temperature until microscopic examination.

For counting of *B.coli,* a plankton counter glass slide was used (Ogimoto and Imai, 1981). Trophozoites (n = 100) and cysts (n = 100) were measured with a micrometer.

Results and Discussion

In the present study, all pigs examined were positive for *B. coli.* Seventy two pigs (81.8%) were infected with this parasite at all the locations examined in the digestive tract (caecum, colon and rectum). In one case, only the caecum was positive (Table 1).

The prevalence rates in respective locations were generally similar to each other, but the highest prevalence (93.2%) was observed at the colon descendens, followed by the caecum where the prevalence was 92.0%. The density of *B. coli* was highest at the caecum (1149.2/ml on average), and lowest at the colon ascendens

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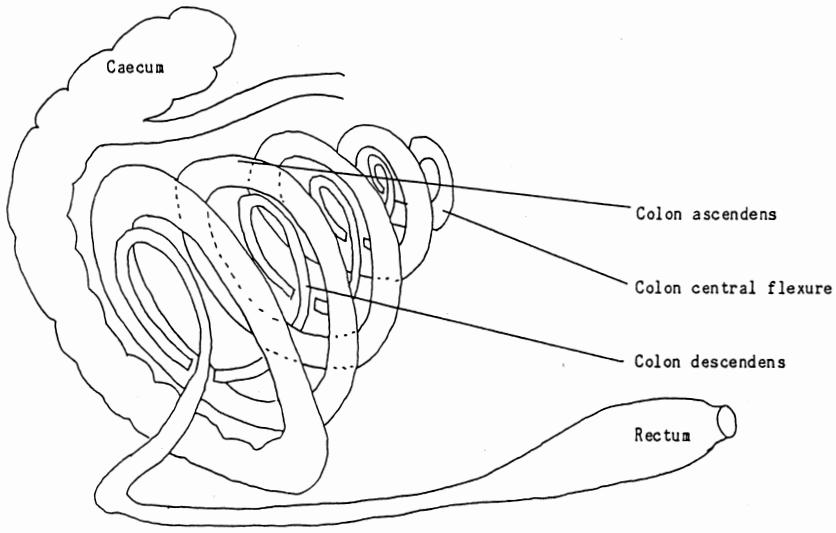

Fig. 1 Diagram showing of pig caecum, colon and rectum, in which the location are pointed.

Table 1 Multiple location involvement of *Balantidium coli* in pigs

In locations involved	No. of pigs	Positive rate (%)
Caecum, Colon and Rectum	72	81.8
Caecum and Colon	8	9.1
Colon and Rectum	7	8.0
Caecum	1	1.1
Total	88	100.0

(638.2/ml on average). At the location posterior to the colon ascendens, the parasite density increased (Table 2).

It has been reported that the colon is an important organ for regulating the absorption of water, and the concentration of colon liquor increase gradually posteriorly (Alexander, 1962; Billich and Levitan, 1969; Cooperstein and Brockman, 1959; Levitan *et al.*, 1962). It may be considered that regional difference in density of both stages of *B. coli* (trophozoites and cysts) correlates with the absorption of water by the host.

Prevalence and density of trophozoites and cysts in each location are shown in Table 3, in which both are decreasing posteriorly. In contrast, density of cysts were increasing posteriorly.

Table 2 Prevalence and density of *Balantidium coli* in various locations of the pigs (n = 88)

Location	Prevalence (%)	Density (/ml)	
		Mean	S E
Caecum	92.0	1149.2	186.3
Colon			
ascendens	90.0	638.2	124.1
central flexure	89.7	715.5	104.4
descendens	93.2	997.5	159.9
Rectum	89.8	1002.8	178.0

The highest prevalence of trophozoites was obtained from the caecum (92.0%) and the lowest one from the rectum (51.1%). In contrast, the prevalence of cysts was lowest in the caecum (9.1%) and highest in the rectum (89.8%). The highest density of trophozoites was observed at the caecum (1143.8/ml on average) and the least at the rectum (159.9/ml on average). Cysts were smallest in the caecum (5.5/ml on average) and largest in the rectum (842.7/ml on average).

From these results, it was considered that *B.coli* encysted in the large intestine, and the encystment rate increased gradually posteriorly.

Alexander (1962) has reported that pH, CO_2

Table 3 Ratio of incidence and number of *Balantidium coli* trophozoites and cysts in various locations of digestive tract in pigs (n = 88)

Location	Trophozoite			Cyst		
	Incidence (%)	Number (/ml)		Incidence (%)	Number (/ml)	
		Mean	S E		Mean	S E
Caecum	92.0	1143.8	186.1	9.1	5.5	2.5
Colon						
ascendens	89.8	549.9	118.2	46.6	88.3	18.1
central frexure	83.9	445.9	64.6	64.4	269.7	64.8
descendens	78.4	363.4	60.2	84.1	634.1	136.8
Rectum	51.1	159.9	37.2	89.8	842.7	164.7

and electrolytes changed in each location of the digestive tract in the pig. Therefore, the encystment of this parasite would occur as protection against unfavorable environmental conditions, such as absorption of water and NaCl, decrease of CO_2 content and increase of electrolytes (phosphate and potassium) in the large intestine.

It was reported that *B.coli* was readily obtained both from caecum and colon in pigs (Flynn, 1973), but the highest prevalence of trophozoites was obtained from the caecum in the present study. Therefore, the caecum may be the most favorable region for *B.coli* to exist in pigs.

From the epidemiologic stand point, it has been described that pigs were the most important source of *B.coli* infection (Awakian, 1937; Covree and Rijpstra, 1961; Walzer *et al.*, 1972).

The high prevalence and density of *B.coli* obtained in the present study indicates that care should be taken to avoid infection of *B.coli* from pigs because it sometimes causes diarrhea in man.

Measurements of the trophozoites, cysts and their macronuclei of *B.coli* in the present examination are shown in Table 4.

According to the histograms, normal distribution patterns with one peak were indicated in each measurement in *B.coli* (Fig. 2). Body size of *B.coli* in the present examination agreed with the data from many investigators (Flynn, 1973; Hoare, 1962; Levine, 1973). Lamy and Roux (1950) have described that the size of the parasite changed when it was fully engorged and undergoes division. Therefore, a range in size is

Table 4 Measurements of body and macronucleus of *Balantidium coli* trophozoite and cyst

	Body			Macronucleus	
	Length (μm)	Width (μm)	Length/Width	Length (μm)	Width (μm)
Trophozoite (n = 100)					
Range	27.6–108.2	23.8–78.6	1.1–2.4	11.8–45.6	6.2–37.2
Mean	71.3	43.0	1.7	26.8	13.7
S D	16.9	10.5	0.3	6.4	4.4
Cyst (n = 100)					
Range	44.8–74.0	36.4–71.2	1.0–1.4	13.0–48.0	8.4–21.2
Mean	56.0	50.9	1.1	28.0	13.8
S D	7.4	7.1	0.1	6.3	2.7

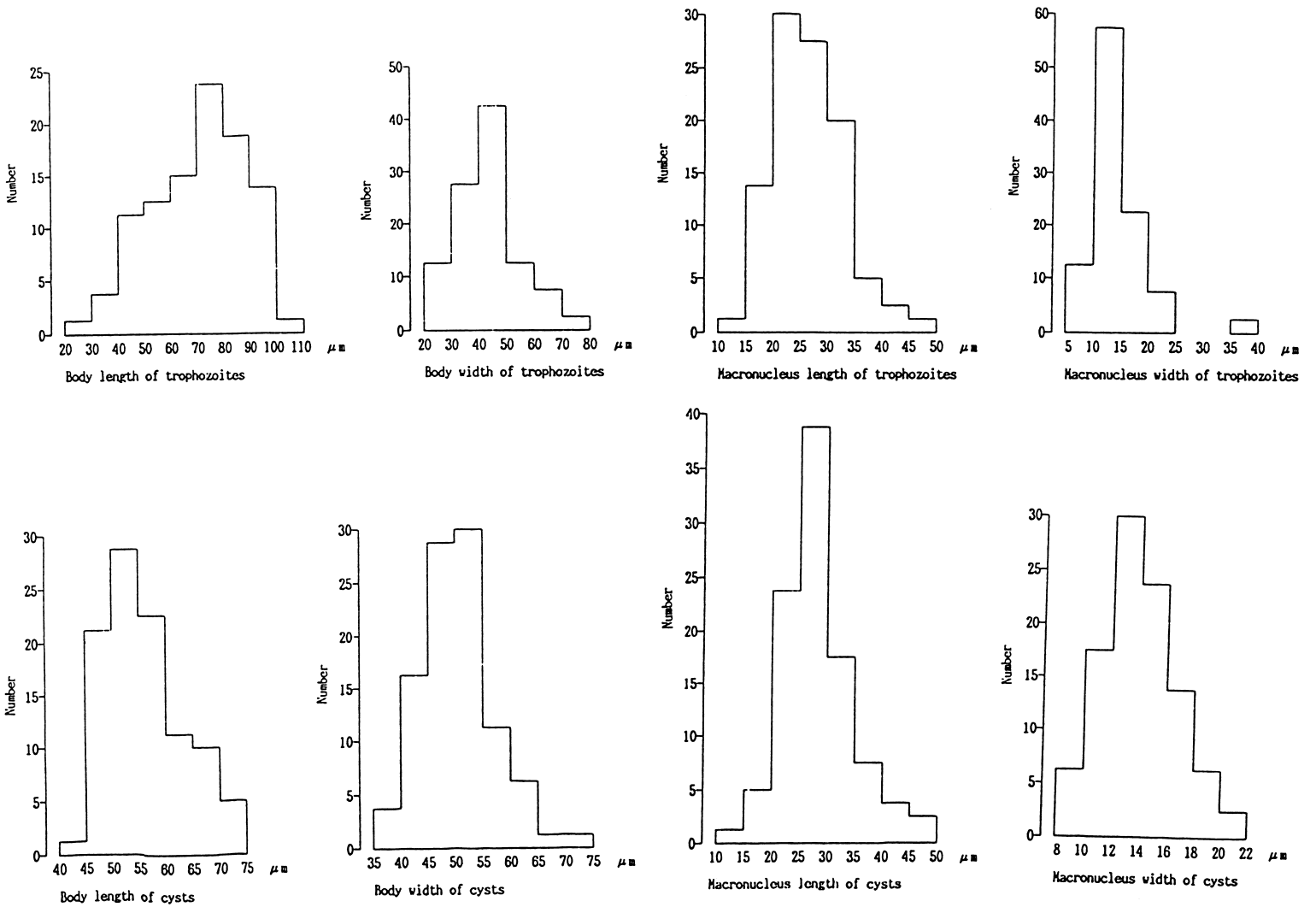

Fig. 2. Histograms of distributional pattern of size of *Balantidium coli.*

expected from parasites in conditions under measurement.

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