Fecundity of *Pharyngostomum cordatum* Parasitic in Domestic Cats

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**ABSTRACT.** *Pharyngostomum cordatum* [PC] was investigated on the relation in number between the eggs detected by fecal examination and the flukes parasitic in the small intestine of four cats. Stoll’s and the MGL methods were examined on the detecting ability of the eggs in the feces. The number of eggs per day per worm (EPDPW) was calculated at about 1,000. Based on this egg count, the average detectable number of eggs was calculated at 19.1 on average (from 6.5 to 34.4) in cats parasitized by one fluke by MGL method with 0.5g of feces. From the results, the MGL method was confirmed to be highly reliable on diagnosing *Pharyngostomum cordatum* infections, even with a single worm.—**KEY WORDS:** cat, fecal examination, MGL method, *Pharyngostomum cordatum.*

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*Pharyngostomum cordatum* (PC), a well known parasite of small pet animals, especially cats, was first discovered in Japan from a cat in Kyushu district [6] in 1967, and later several additional cases have been reported mostly in the western area of Japan [2, 3, 5, 7–11]. However, its distribution is recently extending eastward [4], so it is one of the most important parasites of small pet animals in Japan. In order to diagnose the infections with this fluke, fecal examination is generally used in veterinary clinics, but false negative cases have been often reported in the examinations by the routine methods. Therefore, we examined the relation between the number of eggs excreted in feces by PC-infected cats and the number of parasites, and we considered the relation of their fecundity to the detecting ability of the fecal examination methods.

**MATERIALS AND METHODS**

**Materials:** Four Japanese cats, A, B, C and D shown in Table 1, were used, and their infections with PC and *Spirometra erinacei* were preliminary confirmed by fecal examination. These cats were fed with a definite amount of cat food in the laboratory.

**Fecal examination:** Stoll’s method was first used [1]. When no eggs were detected by this method, the feces was re-examined by the MGL method. The number of eggs per gram of feces (EPG) was calculated daily for each cat by either method, and then the number of eggs excreted in a day (EPD) was computed with EPGs and fecal weights of cat A, B and C for 20 consecutive days, except D for 14 consecutive days.

**Autopsy:** Immediately after the fecal examination, the cats were autopsied and the intestines were removed. After the number and habitat of the flukes were examined, the number of eggs per day per worm (EPDPW) was calculated for each cat.

**Histochemical examination:** To search for the fecundity of PC, histochemical examination was performed by the following procedures; flukes were fixed with Bouin’s or Carnoy’s solution, embedded in paraffin, and sectioned. Then the sections were stained with PAS, methylgreen-pyronine and Sudan-black to detect polysaccharides, nucleic acids and fats, respectively. The same procedures were also applied to the
Table 1. Cats examined

<table>
<thead>
<tr>
<th>Cat</th>
<th>Locality</th>
<th>Sexa)</th>
<th>Body weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Chiba Pref.</td>
<td>M</td>
<td>3.5</td>
</tr>
<tr>
<td>B</td>
<td>Saitama Pref.</td>
<td>F</td>
<td>2.5</td>
</tr>
<tr>
<td>C</td>
<td>Saitama Pref.</td>
<td>F</td>
<td>3.4</td>
</tr>
<tr>
<td>D</td>
<td>Saitama Pref.</td>
<td>F</td>
<td>3.6</td>
</tr>
</tbody>
</table>

a) F: female, M: male.

examination of paramphistomes, *Calicophoron calicophorum* (CC) as a control.

RESULTS

Clinical symptoms: Cat A developed diarrhoea, but no clinical abnormalities were recognized in the other three cats.

Parasitological examination: Figure 1 shows the changes in EPG of each cat. The range of EPGs was quite wide; that is, in cat A and C, the values were about 50 to 500, in cat B, about 2,000 to 17,000, and in cat D less than 200. The fecal amounts and the EPDs of each cat are shown in Fig. 2. There were no relations between defeation (or non-defecation) or fecal amounts and EPDs.

After the examination, the cats were autopsied, and the number and habitat of PC were examined (Table 2). All the flukes were located in the upper part of the small intestine; however, in cat B, 51 of 158 flukes (32.3%) were found in its lower part. The average EPDPW/ values calculated from EPD values and the number of flukes in each cat were 1,012 in cat A, 1,366 in B, 894 in C, and 1,130 in D (Table 2). From these data, it was estimated that one fluke passed about 1,000 eggs daily.

Histochemical examination: The yolk glands of PC were filled with a great amount of polysaccharides, and its quantitative ratio to whole body was extremely large compared to that of CC (Figs. 3 and 4). The yolk glands of both flukes, PC and CC, contained a large amount of RNA (Figs. 5 and 6). The presence of fats was confirmed in the yolk glands of both flukes (Figs. 7 and 8).

Furthermore, the uterus of PC was shorter than that of CC. This finding was conspicuous in the flattened specimens. The uterus of PC invariably contained no more than 37 (9.6 on average) eggs.

![Fig. 1. Changes in EPGs of each cat.](image-url)

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DISCUSSION

The present examinations revealed that PC passed about 1,000 eggs per worm per day, and that the number of eggs did not so differ among the four cats. As the number of detectable eggs per worm was calculated at 6.5 in cat A, 19.0 in B, 34.4 in C, and 16.6 in D by the MGL method, the MGL method was highly reliable for diagnosing feline PC infections. However, cats defecated not everyday as shown in Fig. 2, and EPDs and EPDs fluctuated considerably, so that the fecal examination should be carried out at least for 3 consecutive days.

Kifune [7] reported that cats infected with this fluke develop chronic diarrhoea. In our cases, however, only one of the four cats, which had only 11 flukes in the intestine,
Fig. 3. Longitudinal section of *Pharyngostomum cordatum* (PC). Yolk glands (arrow) contain much polysaccharides. PAS stain. ×52.

Fig. 4. Sagittal section of *Calicophoron calicophorum* (CC). Yolk glands (arrows) contain polysaccharides. PAS stain. ×25.

Fig. 5. Longitudinal section of PC stained with methylgreen-pyronin. Yolk glands (arrow) are deeply stained with pyronin, showing the presence of a large amount of RNA. ×52.

Fig. 6. Sagittal section of CC. Yolk glands (arrows) contain RNA. Methylgreen-pyronin stain. ×25.

Fig. 7. Longitudinal section of PC stained with Sudan-black. Yolk glands (arrow) contain fats. ×52.

Fig. 8. Sagittal section of CC stained with Sudan-black. Yolk glands (arrows) contain fats. ×25.
exhibited definite diarrhoea, while cat B with 158 flukes developed no diarrhoea. This shows that there is no relation between the number of parasites and the occurrence of diarrhoea, at least, the severity of the symptom. This supports the report by Uga et al. [12], in which only 11 of 95 cats (11.6%) infected with PC showed definite diarrhoea.

The number of eggs passed by PC was fairly larger than that expected by us. However, the average number of uterine eggs was 9.6 in 102 flukes; and there was a large difference between EPDPWs and the numbers of uterine eggs. To elucidate the reason of this difference, gonadal activity was examined by using PAS, methylgreen-pyronine and Sudan-black stains. PC had the fairly large gonads which abounded with polysaccharides, RNA and fats to produce lots of eggs. The uterus of this fluke had no capacity to contain many eggs, so that most of the eggs produced in numbers will be soon expelled from the uterus.

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REFERENCES


要約

猫寄生壱形吸虫の産卵数に関する検討：藤正治・大熊浩樹・石田陽・今井壮一・石井俊雄（日本獣医畜産大学獣医寄生虫学教室）—愛知県および千葉県より搬入された壱形吸虫寄生猫4頭の粪便中に排出される虫卵数と腸管内の寄生虫体数との関連および壱形吸虫の産卵能力と粪便検査による検出限界について検討した。その結果、本吸虫のEPDPW（eggs per day per worm）は、約1,000個であった。また、本吸虫1隻寄生の場合に、通常、粪便量0.5gを用いたMGL法により検出できる虫卵数は、平均19.1個（範囲6.5～34.4個）となり、本法は、たとえ少数寄生であっても本吸虫の寄生を確認する上で、極めて確実性が高い。