[Jap. J. Parasit., Vol. 33, No. 1, 29-39, February, 1984]

Experimental Infection of Domestic Cats with *Eurytrema pancreaticum* and *E. coelomaticum* (Trematoda ; Dicrocoeliidae)

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(Received for publication ; December 2, 1983)

Key words: *Eurytrema pancreaticum*, *E. coelomaticum*, domestic cats, experimental infection

Introduction

The genus *Eurytrema* belongs to the family Dicrocoeliidae and two species of the genus, *E. pancreaticum* and *E. coelomaticum*, occur in Japan. These two species are parasitic in the pancreatic duct and occasionally in the bile duct of final hosts. *E. pancreaticum* has been reported from cattle, water-buffaloes, goats, pigs, deer, Bactrian camels, hares, man and others, and *E. coelomaticum* from cattle, goats, sheep, Bactrian camels, and so on (Yamaguti, 1971). Recently small laboratory animals such as nude mice were experimentally infected with *E. coelomaticum* in addition to laboratory rabbits (Sakamoto *et al.*, 1981) but no experimental infection has been carried out on carnivores.

Materials and Methods

The specimens of *E. pancreaticum* and *E. coelomaticum* were obtained from the pancreatic duct of cattle slaughtered in Fukuoka and Tokyo respectively, and the uterine eggs were used for experiments. Snail hosts, *Bradybaena similaris*, were infected with the eggs after the technique of Chinone and Itagaki (1976); A thin small piece (5×5 mm) of the feed prepared for freshwater snails after a modified Standen's formula (Oshima *et al.*, 1969) was put in a small amount of water dropped on a slide glass, and then excess water was absorbed with filter paper. Eggs, less than 5 in number, were pipetted on the small pieces of feed under a stereoscopic microscope of 100 to 200 magnifications. A single host snail was then fed on the piece of feed with eggs. Twenty five infected snails were kept in a plastic container (180×130×45 mm) with a slip punctured with a nail and a layer of small pebbles of 1 cm thickness on the bottom. The containers were incubated at 26 C. The snails were fed on lettuce and a piece of cuttlebone for supply of calcium. Lettuce was supplied every 2 days when the containers were cleaned.

Daughter sporocysts were liberated from the snails 80 to 90 days after infection. Two daugher sporocysts were given to each of insect hosts, *Conocephalus chinensis*. The insects were fed on powdered fish-meal and 5% sucrose solution ad libitum. Plastic containers (200×120×110 mm) each with 20 infected grasshoppers were kept in the laboratory from June to September in 1980 and 1981.

Cats used for the experiments were 11 kittens, 2 to 4 months old, and 3 adults. The animals were infected by two methods: One is to feed the animals on the grasshoppers inoculated with daugher sporocysts more than 30 days before and the other is to feed on a given number of metacercariae obtained from the hemocoel of the grasshoppers.

The flukes recovered at autopsy were fixed in 70% alcohol after flattened between two slides and stained with van Cleave's combination hematoxylin. Measurement was taken of

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Table 1 Experimental infection of domestic cats with *E. coelomaticum*

Days from inoculation to autopsy	No. of metacercariae or infected grasshoppers*	No. of worms recovered	Recovery rate of worms (%)
10	3 grasshoppers*	52	....
54	1,000	0	0
60	450	27	6.0
60	3 grasshoppers*	0	0
74	500	0	0
90	3 grasshoppers*	0	0
236	3 grasshoppers*	3	....

* When grasshoppers infected with metacercariae were fed to cats, the number of metacercariae ingested was not determined.

Table 2 Experimental infection of domestic cats with metacercariae of *E. pancreaticum*

Days from inoculation to autopsy	No. of metacercariae	No. of worms recovered	Recovery rate of worms (%)
9	280	47	16.8
12	296	38	12.8
47	200	30	15.0
60	200	36	18.0
90	160	2	0.19
90	400	8	2.0
230	180	11	6.1

the mounted preparations. The average diameters (ad) of the sucker, testis and ovary were culculated by the equation as follows:

$$ad = \frac{\text{maximum length} + \text{maximum width}}{2}$$

Results

Four kittens were each given three infected grasshoppers and the other kittens each were fed *E. coelomaticum* metacercariae obtained from the hemocoel of the insects. The flukes were recovered from 3 of the 7 animals: infection rate was 42.8% and the number of worms recovered ranged 3 to 52. Two of the three infected kittens had been inoculated with grasshoppers and the other one with metacercariae, a recovery rate of worms being 6.0% (Table 1). This shows that infection was established by oral inoculation both with infected grasshoppers and with metacercariae. So, hereafter, experiments were performed by feeding of metacercariae. As shown in Table 2, all the seven cats inoculated with metacercariae of *E. pancreaticum* were infected and infection rate was 100%. The recovery rate of worms ranged 0.16 to 18.0% with a mean of 10.12% and the number of worms recovered ranged 2 to 47 (Table 2). Consequently, the cat was more susceptible to *E. pancreaticum* than to *E. coelomaticum*.

Morphology of E. coelomaticum *from cats*: Juvenile flukes recovered at day 10 after inoculation were club-shaped, 0.59–0.72×0.18–0.20 (0.65±0.06×0.19±0.006, average) mm in size and the esophagus, pharynx, intestine and genital anlages were already formed. The oral and the ventral suckers were 0.073–0.088 (0.083±0.009 average) mm and 0.090–0.150 (0.10±0.01, average) mm in average diameter respectively, and the oral sucker was smaller than the ventral one, with a ratio of the ventral sucker to the oral one of 1.20–1.29 (1.24 ± 0.04 average). The flukes at day 60 after inoculation were 0.95–

Table 3 Measurements (in mm) of *E. coelomaticum* of different developmental stages from experimentally infected cats

Days after inoculation	10	60	236
No. of worms recovered (No. of worms measured)	52 (6)	27 (8)	3 (3)
Body length	0.59−0.72† (0.65±0.06)	0.95−2.50† (1.48±0.59)	4.60−6.50† (5.86±0.09)
Body width	0.18−0.20 (0.19±0.006)	0.30−1.09 (0.57±0.13)	2.20−2.40 (2.30±0.10)
Distance from anterior end of body to ventral sucker	0.33−0.41 (0.37±0.03)	0.54−1.15 (0.75±0.20)	2.20−3.10 (2.68±0.41)
Oral sucker (Average diameter*)	0.073−0.088 (0.083±0.009)	0.12−0.26 (0.17±0.05)	0.43−0.55 (0.48±0.06)
Ventral sucker (Average diameter*)	0.090−0.150 (0.10±0.01)	0.140−0.290 (0.22±0.06)	0.52−0.63 (0.56±0.05)
Ratio of body length to body width	2.94−3.67 (3.37±0.38)	2.05−3.33 (2.77±0.75)	2.00−2.95 (2.55±0.49)
Ratio of body length to distance from anterior end of body to ventral sucker	1.54−1.92 (1.74±0.20)	1.66−2.17 (1.91±0.21)	2.02−2.40 (2.17±0.20)
Ratio of ventral sucker to oral sucker	1.20−1.29 (1.24±0.04)	1.12−1.88 (1.32±0.28)	1.10−1.26 (1.17±0.08)
Cirrus pouch (Length)	....	0.34	1.24−1.36 (1.30±0.07)
Right testis (Average diameter*)	....	0.17	0.37−0.40 (0.39±0.01)
Left testis (Average diameter*)	....	0.11	0.32−0.34 (0.33±0.01)
Ovary (Average diameter*)	....	0.088	0.27−0.37 (0.32±0.07)
Eggs (μm)	....	....	42.1−54.5×28.0−34.7 (48.7±2.7×31.7±1.4)

* Average diameter=(maximum length+maximum width)/2
† Mean±S.D.

2.50×0.30−1.09 (1.48±0.59×0.57±0.31, average) mm in size and were different in development. The well developed parasites already had the testes, ovary, seminal receptacle, and vitelline glands. The seminal vesicle included spermatozoa but no eggs were observed in the uterus (Fig. 1). The oral and the ventral suckers were 0.12−0.26 (0.17±0.05, average) mm and 0.14−0.29 (0.22±0.06, average) mm in average diameter respectively, with a ratio of the ventral to the oral sucker of 1.12−1.88 (1.32±0.28, average). The ratio of body length to the distance from the anterior end of body to the posterior end of the ventral sucker was 1.66−2.17 (1.91±0.21 average), so the ventral sucker was situated slightly anterior to the middle of body. The flukes obtained at day 236 after inoculation were completely matured. The ventral sucker was situated more anteriorly than in flukes of day 60. The seminal vesicle was club-shaped and large, 1.24-1.36 (1.30±0.07, average) mm in length, being full of spermatozoa. The testes were circular or elliptical in shape and were situated posterior to the ventral sucker. The right testis was 0.39±0.01 mm and the left one 0.33±0.01 mm in average diameter. The ovary, subcircular in shape, was 0.27 to 0.37 mm with an average diameter of 0.32±0.07 mm and was situated innerposterior to the left testis. The seminal receptacle was situated interior to the ovary, containing many spermatozoa. The penetration glands were observed throughout the developmental stages (Figs. 3, 4). Mature eggs were shed in the feces of the cats and measured 48.7±2.7×31.7+1.4 μm in average size.

Morphology of E. pancreaticum *from*

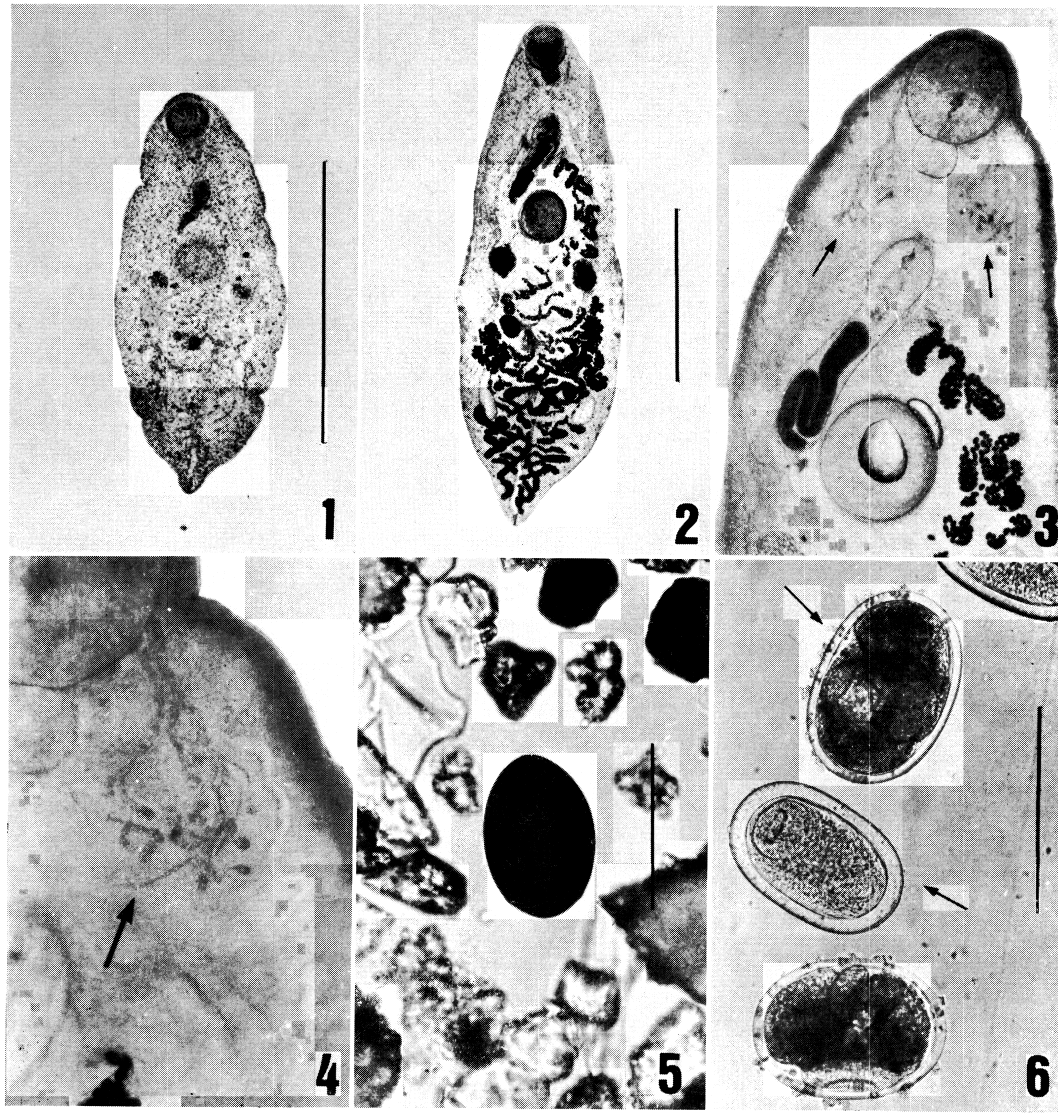

Fig. 1 Immature specimens of *Eurytrema coelomaticum* from an experimentally infected cat, 60 days after inoculation. (Scale : 1 mm)
Fig. 2 Mature specimen of *E. coelomaticum*, 236 days after inoculation. (Scale : 2 mm)
Fig. 3 Showing penetration gland cells (arrows) in a fresh specimen of *E. coelomaticum*, 236 days after inoculation.
Fig. 4 The same specimen as that in Fig. 3.
Fig. 5 Eggs of *E. pancreaticum* in stool of a cat. (Scale : 50 μm)
Fig. 6 Metacercariae of *E. pancreaticum* (upper arrow) and *E. coelomaticum* (lower arrow). Scale : 0.4 mm

cats : Juvenile flukes of day 9 after inoculation had the larger ventral sucker than the oral one just as in *E. coelomaticum*. In the flukes of day 47 we recognized the formation of the testis and ovary but not of the vitelline glands and uterine eggs (Fig. 7). The flukes

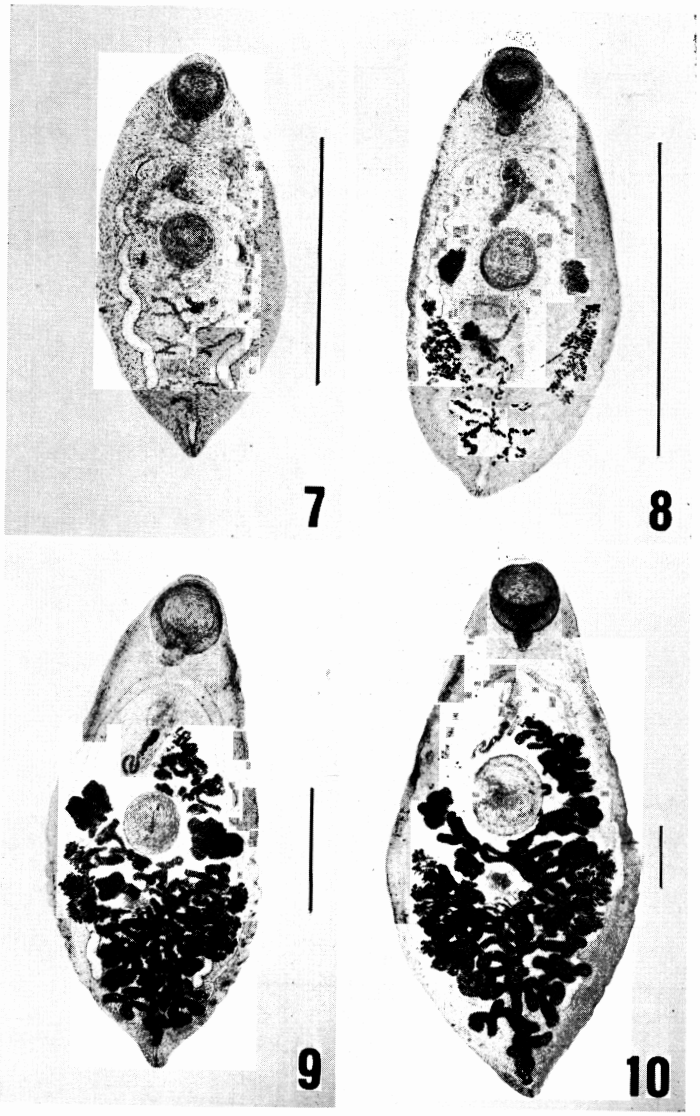

Fig. 7 Immature specimen of *E. pancreaticum* from an experimentally infected cat, 47 days after inoculation. (Scale : 2 mm)

Fig. 8 Mature specimen of *E. pancreaticum*, 60 days after inoculation. (Scale : 2 mm)

Fig. 9 Mature specimen of *E. pancreaticum*, 90 days after inoculation. (Scale : 2mm)

Fig. 10 Mature specimen of *E. pancreaticum*, 230 days after inoculation. (Scale : 2 mm)

of day 60 were almost the same in size as those of day 47 but already had the testis and ovary in addition to the vitelline glands. The uterus and seminal vesicle were full of eggs and spermatozoa respectively (Fig. 8). At day 90 the parasites were rapidly developed and the testis and ovary became lobulated, lobulation of the testis being a characteristic

Table 4 Measurements (in mm) of *E. pancreaticum* in different developmental stages from experimentally infected cats

Days after inoculation	9	47	60	90	230
No. of worms recovered (No. of worms measured)	47(9)	38(20)	30(18)	10(8)	11(7)
Body length	0.56−0.69† (0.65±0.04)	2.12−4.00† (3.31±0.44)	2.12−4.18† (3.25±0.60)	5.30−6.99† (6.49±0.57)	6.84−9.61† (8.92±1.08)
Body width	0.20−0.24 (0.22±0.01)	0.84−1.81 (1.50±0.22)	0.96−2.00 (1.56±0.29)	2.61−3.23 (2.93±0.19)	4.07−4.61 (4.37±0.24)
Distance from anterior end of body to ventral sucker	.....	1.15−2.06 (1.79±0.02)	1.06−2.50 (1.80±0.35)	3.07−3.99 (3.63±0.32)	3.69−5.22 (4.06±0.53)
Oral sucker (Average diameter*)	0.09−0.10 (0.10±0.01)	0.28−0.51 (0.45±0.06)	0.22−0.53 (0.43±0.08)	0.75−1.00 (0.91±0.08)	1.10−1.40 (1.24±0.10)
Ventral sucker (Average diameter*)	0.10−0.14 (0.12±0.01)	0.26−0.51 (0.44±0.06)	0.28−0.56 (0.46±0.07)	0.73−1.00 (0.86±0.08)	1.18−1.46 (1.31±0.09)
Ratio of body length to body width	2.40−3.30 (2.88±0.26)	1.68−3.47 (2.23±0.35)	1.59−3.57 (2.10±0.42)	2.00−2.38 (2.21±0.12)	1.67−2.14 (2.02±0.16)
Ratio of body length to distance from anterior end of body to ventral sucker	.....	1.16−2.95 (1.86±0.27)	1.67−1.92 (1.81±0.08)	1.72−1.90 (1.78±0.06)	1.84−1.96 (1.93±0.10)
Ratio of ventral sucker to oral sucker	1.02−1.48 (1.20±0.14)	0.74−1.18 (0.98±0.09)	0.94−1.16 (1.12±0.22)	0.95−1.21 (1.06±0.07)	0.98−1.13 (1.05±0.05)
Cirrus pouch (Length)	.....	0.26−0.62 (0.46±0.08)	0.25−0.67 (0.49±0.11)	0.93−1.34 (1.16±0.13)	1.33−1.68 (1.46±0.13)
Right testis (Average diameter*)	.....	.....	0.08−0.28 (0.21±0.05)	0.50−0.86 (0.68±0.14)	0.34−0.96 (0.57±0.23)
Left testis (Average diameter*)	.....	.....	0.08−0.31 (0.21±0.05)	0.41−0.92 (0.69±0.17)	0.34−0.87 (0.59±0.22)
Ovary (Average diameter*)	.....	.....	0.07−0.25 (0.15±0.04)	0.35−0.48 (0.42±0.04)	0.45−0.60 (0.53±0.05)
Eggs (μm)	.....	.....	.....	.....	44.6−54.1× 29.2−34.5 (50.6± 1.9× 31.5± 1.2)

* Average diameter=(maximum length+maximum width)/2

† Mean±S.D.

feature of *E. pancreaticum*. Eggs filled all the course of uterus and reached the genital orifice (Fig. 9). The full-grown specimens at day 230 were apparently larger than those of *E. coelomaticum* of day 236. The oral and the ventral suckers were almost the same each other in size and the ventral sucker was situated more posteriorly than in *E. coelomaticum*, near the middle of body. The testes were irregular in shape and deeply lobulated and were situated lateral to the ventral sucker along the lateral edges of body. The ovary was irregular in shape and was composed of 3 to 5 lobules, being situated innerposteriorly to the left testis. The penetration glands were not detected in any developmental stage (Fig. 10).

Experimental infection of the intermediate hosts with E. pancreaticum *from cats*: Snail hosts, *Bradybaena similaris*, were orally given mature eggs of *E. pancreaticum* collected from the uterus of the flukes at day 230 after inoculation to cats, and then the snails were kept at 26 C. Daughter sporocysts were passed out of the snails 75 to 95 days after inoculation (Fig. 11). The daughter sporocysts were then given to the insect hosts, *Conocephalus chinensis*, and metacer-

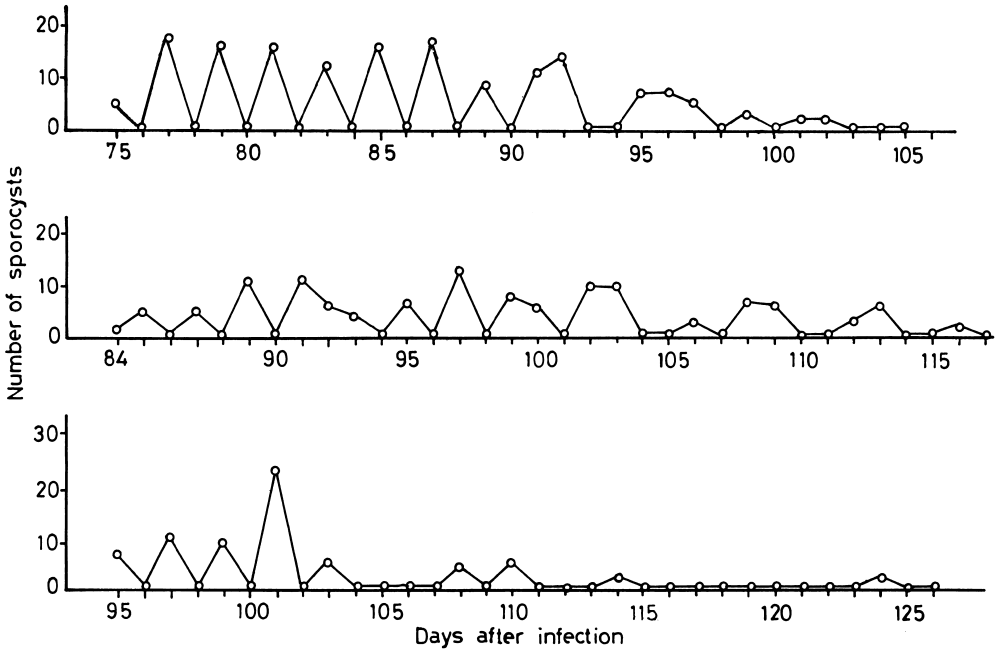

Fig. 11 Shedding rhythm of daughter sporocysts from land snails, *Bradybaena similaris* infected with eggs of *Eurytrema pancreaticum* from domestic cats.

cariae were recovered from the hemocoel of the insects 35 days after inoculation. The metacercariae were matured and 388.4×269.0 μm in average size and the cyst wall was 20.1 μm in thickness.

Experimental infection of the first and second intermediate hosts with *E. coelomaticum* was not performed.

Discussion

The genus *Eurytrema* includes such species as *pancreaticum*, *coelomaticum*, *dagi* from zebus, *medium* from sheep, *tonkinensis* from cattle, *satoi* from macaques, *ovis* from sheep and goats, *parvum* from cattle, *rebelle* from dogs (Yamaguti, 1971), *escuderoi* from cattle and waterbuffaroes (Eduardo, 1976), *fukienensis* from a goat, *hydropotes* from Chinese water deer, and *cladorchis* from cattle and goats (Tang and Tang, 1978). Of these species only *rebelle* was reported from carnivorous mammals. The genus *Concinnum*, also belonging to the family Dicrocoeliidae, is most closely related to the genus *Eurytrema* but differs in final host species. Most species of *Concinnum* have been reported from carnivoires: *ten* from foxes, raccoon dogs and martens (Yamaguti, 1971; Uchida *et al.*, 1976), *concinnum* from Oriental civets, *brumpti* from chimpanzees and gorillas, *dathei* from mangooses, *epomopis* from epauleted bats, *minense* from armadillos, *peromysci* from white-footed mice, *planiceps* from flat-headed cats, *procyonis* from raccoons, eastern gray foxes and domestic cats, and *vulpis* from red foxes (Yamaguti, 1971). The present experiments revealed that the genera *Eurytrema* and *Concinnum* resemble each other not only in morphology and life cycle but also in the infectivity to carnivorous mammals. But *E. pancreaticum* was more infective to cats than *E. coelomaticum*: This was shown by the following results of the experiments: First, infection rate was higher (100%) in *pancreaticum* than in *coelomaticum*(42.5%). Secondly, the average recovery rate of worms was higher in *pancreaticum* (10.1%) than in *coelomaticum* (6%). Thirdly, the full-grown specimens of *pancreaticum* and *coelomaticum* were smaller than those from natural hosts, but they were sexually matured. The full-grown specimens of *pancreaticum* at day 240

Table 5 Measurements (in mm) of *Eurytrema pancreaticum* and *E. coelomaticum* from different species of hosts

	Host	Age in days	Measurements of flukes (mean+S.D.)	Experimental or natural infection	Authority
E. pancreaticum	Hares	....	8.5−14.5×3.0−4.6	Natural	Kurisu (1931)
	Cattle	....	9.5−16.0×5.5−8.5	Natural	Watanabe (1960)
	Cattle	....	11.0−13.0×6.5−9.5 (11.33×7.44)	Natural	Eduardo *et al.* (1976)
	Laboratory rabbits	240	9.08−11.4×4.2−4.5 (10.5×4.30)	Experimental	Chinone & Itagaki (1976)
	Cattle	....	16.0−20.3×7.1−8.4 (18.44±1.33×7.61±0.47)	Natural	Moriyama *et al.* (1980)
	Cats	230	6.84−9.61×4.07−4.61 (8.92±1.08×4.37±0.24)	Experimental	The present authror
E. coelomaticum	Cattle	....	5.0−8.0×3.0−5.0	Natural	Watanabe (1960)
	Cattle	....	5.92−10.34×1.85−4.27	Natural	Eduardo *et al.* (1976)
	Cattle	....	10.2−12.2×3.5−6.4 (11.39±0.55×5.03±0.76)	Natural	Moriyama *et al.* (1980)
	Hares	....	6.10−11.2×2.12−4.55 (8.26±1.52×3.33±0.77)	Natural	Sakamoto (1981)
	Nude mice (BALB/c-n/+)	265	6.55+10.20×2.45−3.46 (8.62±1.19×3.11±0.31)	Experimental	Sakamoto *et al.* (1981)
	Cats	236	4.60−6.50×2.20−2.40 (5.86±1.09×2.30±1.00)	Experimental	The present authors

after inoculation were smaller than those collected from cattle but were almost the same in size as those from experimentally infected rabbits (Chinone and Itagaki, 1976). Those of *coelomaticum* at day 236 were also smaller than those from naturally infected cattle and hares (Watanabe, 1960 ; Eduardo *et al.*, 1976 ; Sakamoto, 1981 ; Moriyama *et al.*, 1980) and those from experimentally infected nude mice (Sakamoto *et al.*, 1981). The feline specimens of *coelomaticum* differed from those of *pancreaticum* in the existence of 12 pairs of penetration gland cells in all the developmental stages of *coelomaticum* from days 10 to 236. The penetration gland cells, which Tang and Tongmin (1980) first observed in excysted metacercariae of *pancreaticum*, are usually not found in the flukes parasitizing final hosts, so the existence of the cells in the *coelomaticum* specimens from cats shows that the susceptibility of cats is lower to *coelomaticum* than to *pancreaticum*. Fourthly, the life cycle of *pancreaticum* from cats was completed in landsnails, grasshoppers, and cats. And further, the eggs of *pancreaticum* shed by the experimentally infected cats were matured, whereas those of *coelomaticum* were mostly underdeveloped.

Much confusion has arisen on the validity of the species *E. coelomaticum* which might be synonymous with *E. pancreaticum*. Pryadko (1962) came to a conclusion that *E. coelomaticum* and *E. media* were synonymous with *E. pancreaticum* with his many measurements of pancreas fluke specimens. But recent comparative studies on the life cycle of *E. pancreaticum* and *E. coelomaticum* revealed the differences in the morphology of daughter sporocysts, testis and ovary, and in the ratio of body length to the distance from the anterior tip of body to the posterior end of ventral sucker (Tang *et al.*, 1979 ; Chinone *et al.*, 1981). And further the study of karyotype of pancreas flukes from cattle drew a clear distinction between the two species (Moriyama *et al.*, 1980). The present study of the fluke specimens from different species of hosts showed the most useful criteria

distinguishing between the species to be the size of body, morphology of the testis and ovary, and the ratio of body length to the distance between the anterior tip to the ventral sucker. The ratio of the ventral to the oral sucker in average diameter, however, ranged from 0.98 to 1.13 (1.05±0.05, average) in the specimens of *E. pancreaticum* from cats though it was reported to be less than 1.0 in *E. pancreaticum* and so, to be one of the useful features for identification of the species (Nosaka *et al.*, 1970).

The penetration gland cells were observed in all the developmental stages of *E. coelomaticum* but not in any stage of *E. pancreaticum* in cats. This shows that the difference in infectivity to cats exists between *pancreaticum* and *coelomaticum* and consequently, shows the validity of the species of *E. coelomaticum*.

Summary

A total of 14 mongrel cats, 3 adults and 11 kittens, were inoculated with metacercariae of *E. pancreaticum* or *E. coelomaticum*. *E. pancreaticum* was recovered from all the seven cats inoculated with the metacercariae, whereas *E. coelomaticum* from 3 of the 7 cats inoculated, so infection rate was 100% in *E. pancreaticum* and 42.8% in *E. coelomaticum*. Recovery rate of worms ranged 0.16 to 18.0 (10.12, average) % in *E. pancreaticum* and 6.0% in *E. coelomaticum*.

The full-grown specimens of *E. pancreaticum* recovered from cats at day 230 after inoculation were 6.84-9.61×4.07-4.61 (8.92±1.08×4.37±0.24, average) mm and those of *E. coelomaticum* at day 236 were 4.60-6.50×2.20-2.40 (5.86±0.09×2.30±1.00, average) mm. All the full-grown fluke specimens obtained were sexually matured and eggs of both the species of flukes were passed in the feces of cats.

E. coelomaticum was morphologically discriminated from *E. pancreaticum* by means of the size of body, the morphology of the testis and ovary, and the ratio of body length to the distance from the anterior tip of body to the posterior end of the ventral sucker.

The penetration gland cells, which usually can not be detected in the stages in final hosts, were found in all the developmental stages of *E. coelomaticum* in cats, but not in any stage of *E. pancreaticum*. This situation will show that cats are more suitable for *E. pancreaticum* than for *E. coelomaticum* as final hosts.

Experimental infection of the first intermediate hosts, *Bradybaena similaris*, were successfully made with eggs shed by cats, and further the second intermediate host, *Conocephalus chinensis*, were also infected with sporocysts passed by the snail hosts.

Acknowledgment

We are deeply indebted to Dr Shigehisa Habe of Department of Parasitology, Fukuoka University and the members of the Meat Inspection Center in Fukuoka and Tokyo for the materials.

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膵蛭 *Eurytrema pancreaticum* (Janson, 1883) Looss, 1907 および小形膵蛭 *E. coelomaticum* (Giard et Billet, 1892) Looss, 1907 の猫への実験感染

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Eurytrema 属は Dicrocoeliidae 科に属する吸虫でありわが国においては膵蛭 *Eurytrema pancreaticum* および小形膵蛭 *E. coelomaticum* の2種類が存在することが知られている．これら両種は主に反芻獣の膵管まれに胆管に寄生し，膵蛭は牛・水牛・山羊・豚・鹿類・フタコブラクダ・野兎・人などから，また小形膵蛭は牛・山羊・羊・野兎・フタコブラクダなどから，また近年，ヌードマウス (BALB/c-n/＋, BALB/c－＋/＋) などの実験小動物にも小形膵蛭が感染することが報告 (Sakamoto *et al*, 1981) されているが肉食獣に対する実験感染例は未だ知られていない．今回ネコに膵蛭および小形膵蛭の感染実験を試みた結果，いずれも感染が成立し，以下の成績が得られた．

1．日本産雑種の生後2～4カ月齢のネコ11頭，成ネコ3頭，計14頭に膵蛭 *Eurytrema pancreaticum* および小形膵蛭 *E. coelomaticum* を実験感染させた結果，膵蛭は7頭 (100%)，小形膵蛭は3頭(42.8%) からそれぞれ虫体が回収され，その回収率は膵蛭で0.16～18.0 (平均10.12%)，小形膵蛭では6.0%であつた．このことからネコを膵蛭および小形膵蛭の実験的な宿主として追加する．

2．今回ネコから得られた膵蛭 (感染後230日) の大きさは6.84～9.61 (8.92±1.08)×4.07～4.61 (4.37±0.24) mm，小形膵蛭 (感染後236日) では4.60～6.50 (5.86±1.09)×2.20～2.40 (2.30±1.00) mm であり，虫体はいずれも成熟し，糞便中には成熟虫卵が検出された．

3．膵蛭および小形膵蛭の区別は従来の分類基準である虫体の大きさ，精巣および卵巣の形状などの特徴から，また体長／体前端～腹吸盤間長比および両種のネコに対する感受性の違いからも可能であつた．

4．本来，成熟虫にはみられない穿通腺 Penetration gland がネコから得られた全ての小形膵蛭に認められた．このことから小形膵蛭よりも膵蛭の方がネコに対して好適な寄生虫であると考えられる．

5．ネコから得られた膵蛭の成熟虫卵を使つて第1および第2中間宿主への感染実験を行つた結果，いずれも感染が成立し全発育環が完成した．このことから今後，自然界においても肉食系の動物から *Eurytrema* 属の寄生虫が得られる可能性が示唆された．