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Experimental infection of mice with *Taenia taeniaformis* eggs from cats—Course of infection and pathological studies

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Cysticercus fasciolaris, the larval form of *Taenia taeniaformis* is commonly encountered in rodents most often in mice and rats through contaminated feed and bedding materials. The infection is asymptomatic and is considered harmless, but its presence in the laboratory mice/rats could lead to misinterpretation of results for biological experiments. The course of infection and pathogenesis of induced *C. fasciolaris* was studied in Swiss albino mice. The number of established cysts were not significantly different during the course of infection. The mean diameter of the cysts and the metacestode were significantly different during the course of infection reaching a maximum size of 8.1±2.2 mm and 80.4±20.2 mm, respectively on 45 DPI. Histopathologically, on 15 DPI, the duodenum of the affected mice revealed cross sections of early larval stage of *C. fasciolaris*. On 30 and 45 DPI, the liver showed tract of migration of *C. fasciolaris* larvae with a thick zone of inflammatory reaction and encapsulation against mature larvae in liver. The routine spontaneous *Cysticercus* infection is clinically asymptomatic in these animals and is considered harmless. The present experimental infection also followed the same course resulting only in asymptomatic colonisation of the parasites.

Taenia taeniaformis is a helminth parasite with cosmopolitan distribution, is found in the intestine of cat and related carnivores. Development of metacestode, *Cysticercus fasciolaris* occurs in the liver of rodents most often in mice and rats[1]. Spontaneous occurrence of *C. fasciolaris* in laboratory mice and rats by contaminated feed and bedding materials has been reported[2]. The present communication reports the course of infection and pathogenesis of experimental infection of mice with *T. taeniaformis* ova from cats under confined housing conditions.

A couple of domestic cats (*Felis felis*) frequently visiting the feed and straw stores were monitored for intestinal parasites. Eggs from faecal samples found positive for *Taenia* sp. were collected and harvested. Twentyone Swiss albino mice (12 weeks old, weighing 25-35 g) maintained on standard diet and water *ad libitum*, were divided into 2 groups of 15 (Group I) and 6 mice (Group II). These animals were medicated with Tetramisole hydrochloride, 30% w/w ('Nilverm', ICI India Ltd.) for any endoparasitic infections a week before use in experiments. Group I received *Taenia* sp. eggs, @ 100 per mice *per as* and the Group II served as uninfected control. Five and two mice each, from Group I and II respectively, were sacrificed on day 15, 30 and 45 day post-infection (DPI) and complete necropsies were performed. The number of metacestodes established size of the cysts and metacestode and other gross tissue changes were recorded in each group on different days as described elsewhere[2] and the data were analyzed statistically using SigmaStat statistical software (Jandel Scientific Software, San Rafael, USA) by one way ANOVA. A value of $P<0.05$ was considered to be statistically significant. Representative samples of various tissues including the liver with cysts *in situ* were fixed in 10% formalin and processed for routine histopathological examination after H & E staining.

At necropsy, all mice infected orally were positive for encysted parasitic metacestodes in the liver at various stages of development. All other visceral organs were grossly normal. The number of cysts varied from 2-8 on 15 DPI, 1-8 on 30 DPI and 1-2 on 45 DPI (Table 1). Although there seems to be a higher number of cysts/animals on 15 DPI than the later periods, the difference in number of cysts established on 15, 30 and 45 were not statistically

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significant. However, the mean dimension of the cysts and the metacestodes were significantly diffferent ($P<0.05$) during the course of infection. The cyst measurements reached a maximum diameter of 12 mm, while the stretched metacestode inside reached a maximum of length of 96 mm by 45 DPI. The uninfected control mice did not show any infection at any stage during the course of the study.

Table 1—Results of experimental infection of mice with ova (@ 100 *per os*) of *T. taeniaformis*

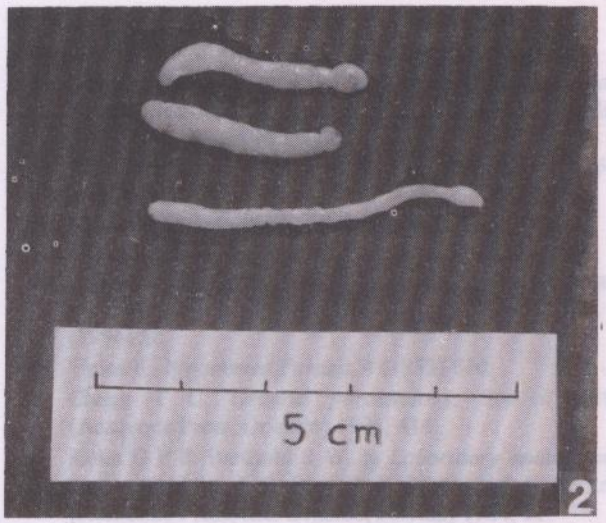
[Values are mean±SD]

Parameter	Days Post Infection (DPI)		
	15	30	45
No of cysts	4.0±2.82	2.8±3.03	1.4±0.54
Diameter of cyst, mm	2.7±1.72[a]	4.1±3.00[a]	8.1±2.20[b]
Length of metacestode, mm	3.6±1.14[a]	51.6±22.4[b]	80.4±20.2[c]

[Values with different superscripts are significantly different ($P<0.05$)]

Generally, liver showed 1-2 parasitic cysts (Fig. 1) and each containing a single, live characteristic larvae called strobilocercus with flocculent white to opalescent fluid. The larva was characterized by an extruded scolex with a long neck, pseudosegmentations along the length, and a relatively small terminal bladder, thus resembling a small tape worm (Fig. 2). The parasite measured 28-80 mm by 30 DPI and 42-96 mm by 45 DPI. The morphological features of larvae were similar to those reported earlier[2].

Histopathologically, on 15 DPI, the duodenum revealed cross sections of early larval stages of *C. fas-*



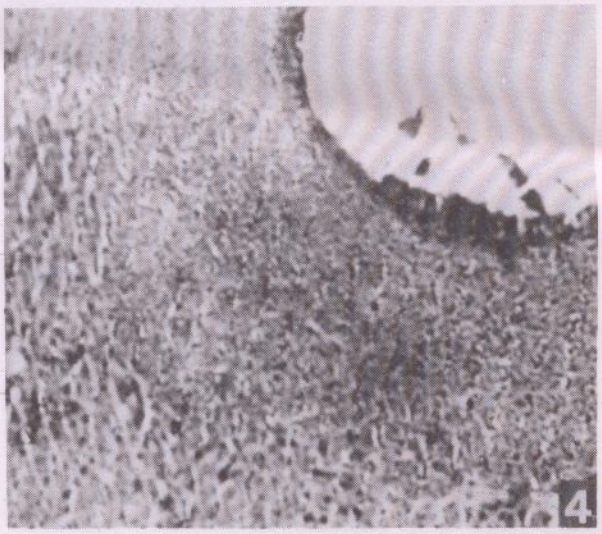


Fig. 1—Multiple cysts of *C. fasciolaris* in liver. Fig. 2—The strobilocercus larvae showing terminal bladder. Fig. 3—T.S. of intestine (duodenum) showing cross sections of multiple larvae (H&E). Fig. 4—Migratory tract of *C. fasciolaris* young larvae showing a thick zone of neutrophilic inflammatory reaction in liver (H&E).

ciolaris (Fig. 3). Due to their presence slight pressure atrophy was seen in villi. Inflammatory reaction was not observed. Liver showed non specific vascular changes. On 30 and 45 DPI, engorged blood vessels, haemorrhagic tracts and inflammatory reaction were seen in hepatic parenchyma. This was characterized by lumina in centre, newly formed loose fibrous connective tissue and a thick cuffing zone of mononuclear (predominantly lymphocytes) cells (Fig. 4). As time passed inflammatory reaction was encapsulated by connective tissue. Up to this interval inflammatory reaction adjoining to connective tissue capsule was not seen as observed in mature *C. fasciolaris* cysts.

Although 100 ova were given orally, only a limited number of them established in the host in the form of metacestodes. An inverse relationship between the total number and the size of the cysts were observed. Though the presence of larval form is high immediately after infection, the same get perished with passage of time due to tissue reaction, thus enabling a peaceful coexistence of a limited number of metacestodes in the host.

Cysticercus fasciolaris, the larval form of *Taenia taeniaformis*, is also known as *T. crassicollis, Hydatigera fasciolaris, Strobilocercus fasciolaris* and bladder worm[3]. *Cysticercus fasciolaris* is commonly encountered in laboratory animals particularly in rodents and lagomorphs through contaminated food and bedding materials[2,4]. Prevalence and pathoanatomical changes associated with *C. fasciolaris* in wild rats in subtemperate Himalayan region of Mukteshwar (U.P.) has been reported[5]. The routine spontaneous *Cysticercus* infection is clinically asymptomatic in these animals and is considered harmless. The present experimental infection also followed the same course resulting only in asymptomatic colonisation of the parasites. However, it could lead to misinterpretation of results for biological experiment[6]. The metacestode larvae reached a length of 4.2 to 9.6 cm in mice in the present study on 45 DPI. The size of the larvae may reach up to 32 cm as against an usual size of 6-20 cm in rats[3,7]. Host connective tissue capsules can give rise to sarcomas in older animals typically 12-15 months post-infection[3,8]. Further studies are in progress to investigate the long term effect of *C. fasciolaris* in Swiss mice.

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References

1 Soulsby E J L, *Helminths, arthropods and protozoa of dometicated animals*, Seventh edition (ELBS and Bailliere Tindall, London) 1982, 116.
2 Jithendran K P & Somvanshi R, *J Vet Parasitol*, 12 (1998) (in press).
3 Hanes M A, *Vet Pathol*, 32 (1995) 441.
4 Tripathi K P & Ray D K, *Indian Vet J*, 53 (1976) 329.
5 Somvanshi R, Ganga Rao G S C, Laha R & Bhattacharya D, *Indian J Comp Microbiol Immunol Infect Dis*, 15 (1994) 58.
6 Tirina K, *Tropenmed Parasit*, 4 (1953) 510.
7 Cheng T C, *General parasitology*, Second edition (Academic Press, Orlando) 1991, 414.
8 Kohn D F & Barthold S W, in *Laboratory animal medicine*, edited by J G Fox, B J Cohen and F M Loew (Academic Press, Inc. Orlando, Florida) 1984, 91.