

# Taenia crassicepsシスティセルクスのスナネズミ小腸への付着に対するプレドニゾン処置の悪影響

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## Deleterious Effect of Prednisolone on the Attachment of *Taenia crassiceps* Cysticerci to the Intestine of Gerbils

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Recently, golden hamsters treated with prednisolone tertiary-butyacetate (PTBA) were shown to become an alternative definitive host of *Taenia crassiceps* which occurs naturally in canids and rodents as definitive or intermediate hosts, respectively [12]. Thus, a complete life-cycle of the cestode can be readily reproduced in a laboratory using small rodents alone, and that system may facilitate intensive investigations concerning interactions between taeniid cestodes and definitive hosts.

We also examined Mongolian gerbils, *Meriones unguiculatus*, treated variously with PTBA as a potential definitive host of *T. crassiceps*. In that experiment, more worms were recovered from the intestine of the gerbils treated soon after the oral administration of the cysticerci, and the gerbils treated from 1 week or more prior to the infection harbored less worms on 35 days postinfection [13]. There existed a statistically-significant difference between the gerbils with and without PTBA-treatment prior to infection (Student's *t*-test,  $P < 0.01$ ). The aim of the present study is to determine whether PTBA-pretreatment or sex and age of hosts might affect early establishment of orally-

administered cysticerci of *T. crassiceps* in the intestine.

Mongolian gerbils bred in our laboratory were divided into 8 groups of 3 to 5 animals each (Table 1). Injections of PTBA (Suspension of Codelcortone-T.B.A., MERCK & CO., INC., Rahway, N. J., USA) were made subcutaneously in the dorsal region of gerbils. Cysticerci of *T. crassiceps*, originally isolated from *Microtus montebelli* in Nagano Pref., Japan in 1985 and maintained in our laboratory thereafter, were removed from the peritoneal cavity of a gerbil infected 14 months before. Gerbils were orally administered with 50 fully-developed cysticerci each. The animals were sacrificed on 2 days postinfection. The peritoneal cavity of each carcass was washed several times with physiological saline. The intestine and mesentery were removed from the carcass, separated with 2 pairs of tweezers, and the longitudinaly-opened intestine and mesentery, which were interposed between 2 glass plates, were observed respectively under a dissection microscope.

Recovery sites of worms were divided into 3, *i.e.*, the intestinal lumen, intestinal wall and peritoneal cavity. Worms from the first were inserting the head into the mucosa, worms from the second were penetrating through the intestinal wall in the direction of either the intestinal

Table 1. PTBA-treatment, age and sex of Mongolian gerbils

Group	Host			PTBA-treatment	
	Age	Sex	Number	Dose/each	Injection days postinfection
1	13wks	♀	4	5mg	-11, -8, -6, 0
2	16wks	♀	4	15mg, 5mg <sup>a)</sup>	0 <sup>a)</sup>
3	16wks	♀	4	5mg	0
4	16wks	♂	4	5mg	0
5	16wks	♀	4	— <sup>b)</sup>	—
6	16wks	♂	4	—	—
7	4wks	♀	5	—	—
8	4wks	♂	3	—	—

a) Injections of 15 mg and 5 mg prednisolone were made at -6 hrs and 0 hr PI, respectively.

b) Not treated.

lumen or peritoneal cavity, and worms from the third were free or embedded in the mesentery.

Worm recovery from the intestinal lumen was generally constant except for Group 1 (Table 2), and the differences between Groups 1 and 3, 6 or 7 were statistically significant ( $P < 0.05$ ). The difference was conspicuous in number of worms recovered from the peritoneal cavity and total recovery number of worms between adult (Groups 1 to 6) and juvenile gerbils (Groups 7 and 8) ( $P < 0.005$ ). A few worms were found to be penetrating through the intestinal wall of 10 to 40 mm from the pylorus. More than half of them were in the direction of the intestinal lumen.

Kroeze and Freeman [9] conducted oral administration of *T. crassiceps* cysticerci to mice, and concluded that similar proportion of different doses of worms reached the peritoneal cavity within 24 hours regardless of the size of the inoculum and sex and strains of mice used. They did not examine a relation between age of mice and worm recovery. The present result shows that in juvenile gerbils an increasing number of cysticerci can attach to the intestinal mucosa and penetrate it into the peritoneal cavity, whereas a constant number of worms establish early within the intestinal lumen in gerbils regardless of the age and sex.

As suggested previously, it is apparent that PTBA-pretreatment of the hosts affected deleteriously the attachment or early establishment of the cysticerci, although statistical significance is only partly demonstrated due to some variation in the present results. It is felt to be strange, since administration of large doses of PTBA during experimental infections with a wide range of parasites generally results in a depression of the

host's natural resistance and PTBA-treatment commenced around the infection day are known to diminish or prevent apparently the sequential rejection of *T. crassiceps* in the intestine of golden hamsters [12] and gerbils [13]. Exceptionally, it has been known that treatment of mice with hydrocortisone acetate around the time of infection with *Schistosoma mansoni* markedly reduces the mature worm burden and the number of eggs produced by the surviving worms [2, 4]. The mechanism(s) of this phenomenon is not elucidated because of the manifold effects of the corticosteroids directly and/or indirectly on the host and parasite.

In some species of cestodes, evagination of the metacestodes requires trypsin and/or bile [8, 10, 14], but that of *T. crassiceps* cysticerci does not necessarily require either and the evagination occurs easily when placed in warmed physiological saline. Therefore, this deleterious consequence of the PTBA-pretreatment on the early worm recovery may be related to the insufficient stimuli initiating attachment of *T. crassiceps* cysticerci to the mucosa rather than those for the evagination. However, similar consequence was never observed in the hamsters and gerbils inoculated orally with the protoscoleces of *Echinococcus multilocularis*, and the hosts treated with sufficient doses of PTBA prior to the infection had obviously more worms in the intestine [7]. Beveridge and Rickard [1] suggested that evagination of metacestodes is a relatively non-specific phenomenon, but the stimuli which initiate attachment are quite unknown and may be more specific.

Up to the present, artificial induction of maturation of taeniid cestodes in unnatural

Table 2. Number of *T. crassiceps* recovered on 2 day postinfection from the intestine and peritoneal cavity of Mongolian gerbils of Groups 1 to 8, that were orally inoculated with 50 cysticerci.

Group	Mean number $\pm$ S.D. (range) of worms recovered			
	Intestinal lumen	Intestinal wall	Peritoneal cavity	Total
1	2.75 $\pm$ 1.30 (1-4)	0	1.25 $\pm$ 1.64 (0-4)	4.00 $\pm$ 2.45 (2-8)
2	6.50 $\pm$ 4.97 (3-15)	0	3.50 $\pm$ 2.69 (0-7)	10.00 $\pm$ 5.15 (3-17)
3	5.25 $\pm$ 2.77 (2-8)	0.50 $\pm$ 0.87 (0-2)	3.00 $\pm$ 2.55 (0-6)	8.75 $\pm$ 5.85 (3-16)
4	12.50 $\pm$ 9.86 (2-27)	0	0.50 $\pm$ 0.50 (0-1)	13.00 $\pm$ 9.77 (2-27)
5	5.75 $\pm$ 3.90 (2-12)	0.25 $\pm$ 0.43 (0-1)	3.50 $\pm$ 3.20 (0-8)	9.50 $\pm$ 6.58 (2-17)
6	7.50 $\pm$ 3.77 (2-11)	0	2.75 $\pm$ 2.38 (0-6)	10.50 $\pm$ 6.10 (3-17)
7	8.20 $\pm$ 3.19 (4-12)	1.00 $\pm$ 1.00 (0-2)	23.80 $\pm$ 5.26 (18-32)	33.00 $\pm$ 3.81 (29-37)
8	6.67 $\pm$ 4.73 (3-12)	1.33 $\pm$ 1.53 (0-3)	35.33 $\pm$ 13.32 (20-44)	43.33 $\pm$ 9.87 (32-50)

laboratory hosts is limited as followings; *T. solium* and *T. saginata*/golden hamsters [3, 15], *T. crassiceps* and *E. multilocularis*/golden hamsters and Mongolian gerbils [7, 11, 12, 13]. Although we failed to infect golden hamsters with *T. hydatigena* or golden hamsters and rats with *T. taeniaeformis* as alternative definitive hosts, Hutchison [5] reported the latter species survived for 2 days in the intestine of rats. Corticosteroids, sometimes the effect of which is not ascribed to immunosuppression, are known to be the most useful drugs sufficient to permit metacystodes of several species to mature in unnatural host animals [6]. However, as shown in the present study, it is important to notice that the commencement of the treatment prior to infection does not necessarily bring about a good result. Studies on the stimuli initiating attachment of cestodes, that have not been made yet, have a fundamental importance in further development of taeniid cestode/rodent systems.

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#### 要 約

*Taenia crassiceps* システィセルクスのスナネズミ小腸への附着に対するプレドニゾン処置の悪影響(短報) : 佐藤 宏・神谷正男(北海道大学獣医学部家畜寄生虫病学講座)——宿主(スナネズミ)のプレドニゾン処置・週齢・性別が, 経口投与した *Taenia crassiceps* システィセルクスの初期定着に及ぼす影響を検討した。スナネズミの週齢・性別によっては小腸内での定着数に有意差は認められなかったが, 感染以前からのプレドニゾン処置により定着数は減少する傾向があった。成個体と比べると, 幼若個体では小腸から腹腔内へ移行する虫体が著しく多く, 総回収数にも有意差が認められた。

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