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☐ **Brief Communication** ☐

Susceptibility of some vertebrate hosts to infection with early third-stage larvae of *Gnathostoma hispidum*

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Abstract: Susceptibility of some vertebrates was examined to the early third-stage larvae (EL_3) of *Gnathostoma hispidum*. The larvae collected from the Chinese loaches were infected to 4 silk carps, 3 snake heads, 3 bullfrogs, 5 mice and 9 albino rats. No worms were detected in fish, silk carps and snake heads. In 3 bullfrogs fed 30 larvae, a total of 9 EL_3 was recovered in the gastrointestinal tract (8 larvae) and liver (one). In 5 mice infected with 50 larvae, a total of 37 (74.0%) advanced third-stage larvae (AdL_3) was recovered from the muscle (31 larvae), liver (5 larvae) and kidney at 4 weeks after infection. In 9 albino rats infected with 115 larvae, a total of 40 (34.8%) AdL_3 was found in the muscle. The mammalian hosts were found susceptible to the EL_3 of *G. hispidum* from Chinese loaches.

Key words: *Gnathostoma hispidum*, early third-stage larvae (EL_3), susceptibility, vertebrates

Gnathostoma hispidum is a causative agent of human gnathostomiasis. In Japan, many human cases were found infected with this nematode by eating raw flesh of loaches imported from China (Morita *et al.*, 1984; Demitsu and Aizawa, 1985; Araki, 1986). In Korea, no human cases of gnathostomiasis have been reported except an imported one (Lee *et al.*, 1988). However, the third-stage larvae of *G. nipponicum* and *G. hispidum* have been detected in the imported Chinese loaches (Sohn *et al.*, 1993; Sohn and Lee, 1996). Especially, loaches infected with larval *G. hispidum* have been imported in bulk from China. The loaches are released all over the country under the good name of release of captive animals by Buddhists. The larvae in the released loaches may play a role in the settlement of gnathostome life cycle in Korea. The released loaches may transmit the larvae when the loaches are eaten by other animals. In this study, susceptibility of some vertebrates to the early third-stage larvae (EL_3) of *G. hispidum* was observed to investigate a possibility of the settlement of this nematode s life cycle.

The EL_3 of *G. hispidum* were collected from the imported Chinese loaches by the artificial digestion using pepsin-HCl solution. Four silk carps, 3 snake heads, 3 bullfrogs, 5 mice and 9 albino rats were fed 10-20 EL_3 each. The experimental animals were killed at 2-8 weeks after infection, and their organs were digested with pepsin-HCl solution. The susceptibility was examined by the worm recovery from the digested materials.

No worms were detected in the experimental silk carps and snake heads. From the 3 bullfrogs infected with 30 larvae, a total of 9 EL_3 was recovered in the gastrointestinal tract (8 larvae) and liver. In 9 albino rats infected

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Table 1. Recovery of gnathostomes from the experimental animals infected with the EL_3 of *G. hispidum* from Chinese loaches

Host animals	Duration of infection	No. of hosts used	Total No. larvae given	Total No. worms recovered (%)
Silk carp	2 weeks	4	40	0
Snake head	2 days[a]	3	45	0
Bullfrog	2 weeks	3	30	9 (30.0)[b]
Mouse	4 weeks	5	50	37 (74.0)
Albino rat	Total	9	115	40 (34.8)
	4 weeks	5	60	23 (38.3)
	8 weeks	4	55	17 (30.9)

[a]expired during the study; [b]8 worms were found in the G-I tract and one was in the liver of frog.

Table 2. Location of worms detected in mice

Mouse No.	No. larvae given	No. larvae recovered from			Total No. worms recovered
		Muscle	Liver	Kidney	
1	10	8	0	0	8
2	10	9	0	0	9
3	10	6	1	0	7
4	10	5	2	0	7
5	10	3	2	1	6
Total	50	31 (83.8)	5 (13.5)	1 (2.7)	37 (100.0)

with 115 larvae, a total of 40 (34.8%) AdL_3 was found in the muscle. In 5 mice infected with 50 larvae, a total of 37 (74.0%) AdL_3 was recovered from the muscle (31 larvae), liver (5 larvae) and kidney at 4 weeks after infection (Tables 1 & 2).

In this experiment, the larval *G. hispidum* did not infect two species of fishes. They infected bullfrogs, but not developed to advanced L_3. In rats and mice, they developed to AdL_3. These results indicated that the larvae of *G. hispidum* can maintain their life cycle in Korea utilizing food-chains of fish-eating paratenic hosts.

Akahane *et al.* (1983) and Koga *et al.* (1985) studied the life cycle of *G. hispidum*. They attempted to infect several kinds of vertebrates with the EL_3 from Chinese loaches, and recovered the larvae from a goldfish, a pond frog, mice and rats. However, they were not able to recover the larvae or adults from lizards, quails, dog, cat and pig. On the other hand, Ando *et al.* (1992) had experimentally infected the EL_3 of *G. nipponicum* to various animals such as loach, killifish, pond frog, bullfrog, salamander, snake, quail, mouse, rat and weasel. They recovered the larvae from all kinds of animals except snake and quail. Interestingly, snake and quail were also infected with AdL_3. Taken together, the results of present and previous studies confirmed that the paratenic host-range for gnathostome larvae is broad.

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=초록=

돼지악구충 제3기 유충에 대한 여러 척추동물의 감수성 관찰

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중국산 수입 미꾸리에서 검출한 돼지악구충(*Gnathostoma hispidum*)의 유충(early third-stage larvae: EL_3)을 10~20개씩 비단잉어, 가물치, 황소개구리, 마우스 및 흰쥐 등에 각각 경구 감염시킨 후 감수성을 관찰하였다. 총 40마리 및 45마리의 유충을 감염시킨 비단잉어 4마리와 가물치 3마리에서는 충체가 한 마리도 검출되지 않았다. 유충을 총 30마리 감염시킨 황소개구리 3마리에서는 감염 후 2주에 위 및 장(8마리)과 간(1마리)에서 각각 검출되었는데 미꾸리에서 검출된 것과 같은 EL_3이었다. 마우스 5마리에 유충을 각각 10마리씩 감염시키고 4주 후에 감염여부를 검사하였던 바, 총 37마리(74%)가 근육(31마리), 간(5마리), 신장(1마리) 등에서 검출되었다. 유충 115마리를 흰쥐 9마리에 감염시키고 4주 및 8주 후에 충체를 회수하였던 바, 총 40마리(34.8%)가 모두 근육에서 검출되었다. 이상의 결과로 중국산 수입 미꾸리에서 검출한 돼지악구충의 제3기 유충이 어류나 개구리에서 보다 마우스와 흰쥐에 더 잘 감염됨을 알 수 있었다.

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