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Research Note

Infectivity to Rats with Eggs of the *Echinococcus multilocularis* Isolate from a Norway Rat in Hokkaido, Japan

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It is generally known that main intermediate host of *Echinococcus multilocularis* in Hokkaido, Japan, is the gray red-backed vole, *Clethrionomys rufocanus bedfordiae*. The Norway rat, *Rattus norvegicus* is considered to be resistant to oral infection with *E. multilocularis* eggs. Webster and Cameron (1961) confirmed experimentally that white rats are resistant to *E. multilocularis sibiricensis* eggs. But natural cases of multilocular echinococcosis in *R. norvegicus* have been reported at least three times. Lukashenko and Zorikhina (1961) reported the natural cases in 4 of 50 *R. norvegicus* in west Siberia. Okamoto *et al.* (1992) reported the cases in 1 of 42 *R. norvegicus* (male, 10.4 mo old) in Hokkaido. Iwaki *et al.* (1993) also found immature protoscoleces of *E. multilocularis* from 1 of 78 *R. norvegicus* (female, 4.2 mo old) at the same place as Okamoto *et al.* (1992). In this study, Wistar rats and gray red-backed voles were orally infected with the eggs of the isolate from a *R. norvegicus* to investigate the infectivity to the rodents.

Gray red-backed voles used were captured in a suburb of Sapporo, Hokkaido, and bred in the laboratory. Wistar rats and golden hamsters were purchased from commercial breeders and bred in the laboratory. The isolate of *E. multilocularis* from a *R. norvegicus* was obtained at Kamiiso, Hokkaido on November 1991 (Iwaki *et al.*, 1993), and transplanted to peritoneal cavity of Wistar rats. Protoscoleces of the isolate were obtained from the liver of the rats killed painlessly under a general anesthesia.

Golden hamsters (5 wk old, female) were used as the laboratory definitive hosts to obtain eggs of *E. multilocularis*. Treatments to the hamsters with prednisolone tertiary butylacetate (suspension of Codelcortone – T.B.A.®, Merck and Co., Inc., Rahway, N.J., U.S.A.) were based on the procedure of Kamiya and Sato (1990), and were done at intervals of 2–4 days. Eggs of the isolate were collected from the adult worms obtained from small intestine of the hamsters, which were administered with protoscoleces of the isolate and killed at 43 days PI. Five Wistar rats (9 mo old, female) and three voles (4.5 mo old, 1 male and 2 female) were administered with 0.1 ml of physiological saline containing approximately 300 eggs by stomach tube under anesthesia. The rats and voles were examined at 49 days PI.

In the liver of all voles, remarkable multilocular foci were observed. Some solitary foci were about 6–7 mm in diameter. Thin laminated layer, germinal layer, and many protoscoleces with hooks and suckers were observed inside the cysts. In all rats, however, no focus was observed macro- and microscopically.

The results showed that rats are resistant to

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primary infection of the isolate, as Webster and Cameron (1961) noted. However, the Wistar rats we used were 9 mo old when they were infected, and it was possible that the rats were comparatively resistant to the infection. Greenfield (1942) suggested age resistance in the albino rat to *Taenia taeniaeformis* larvae. At least, we confirmed that the isolate can not infect to the 'adult' rats, but to the voles as *E. multilocularis* generally known in Hokkaido.

The natural cases of *E. multilocularis* infection in Norway rats might have occurred accidentally, but the mechanism is still unknown. There is a possibility that immunosuppression or genetic variation contributed in these cases, as Okamoto *et al.* (1992) stated.

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