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FRENKELIA SP. FROM THE RED-BACKED VOLE, CLETHRIONOMYS RUFOCANUS BEDFORDIAE, IN HOKKAIDO, JAPAN

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The genus Frenkelia is a tissue cyst-forming coccidium. The life cycle is obligatorily heteroxenous, with carnivorous birds as definitive hosts and rodents as intermediate hosts (ROMMEL & KRAMPITZ, 1975; KRAMPITZ et al., 1976; ROMMEL et al., 1977). Frenkelia is very similar to Sarcocystis except that its cyst is formed in the brain and spinal cord of the intermediate hosts. Up to this time Frenkelia sp. has not been reported in Japan.

Twenty-nine red-backed voles, Clethrionomys rufocanus bedfordiae, were trapped near Sapporo city, Hokkaido, Japan during the period of November 11 to 19, 1987. Their brains were removed by necropsy for examination. In six voles many thin-walled lobulated cysts, 0.5-1.0 mm in diameter, were found in fresh squash specimens (Fig.1). Histologically, the cysts were observed in both cortex and medulla of the cerebrum, cerebellum and brain stem. The cyst was deeply lobulated, thin-walled and divided into numerous compartments by septa (Fig.2). Bradyzoites were crescent-shaped, 8.3-10.6 (average 8.7) μ by 1.5-2.7 (average 1.9) μ in the fresh specimen (Fig. 3), and periodic acid-Shiff positive. Lesions caused by the parasite were hemorrhage, perivascular and meningeal mononuclear cell infiltration and gliosis, but those were very slight. Granulomatous encephalitis, which have been reported in rats infected with F. microti (HAYDEN et al., 1976) was not observed in this case.

In the genus Frenkelia, two species are widely accepted: F. microti (FINDLAY & MIDDLETON, 1934) BIOCCA, 1968 and F. glareoli (ERHARDOVA, 1955) BIOCCA, 1968 (syn. F. clethrionomyobuteonis ROMMEL & KRAMPITZ, 1975) (FRENKEL et al., 1979). The differences in these species are in the shape and size of cyst formed in the brain of the intermediate hosts (FRENKEL et al., 1979). Cysts of F. glareoli are spherical or

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egg-shaped and up to 0.4 mm in diameter (FRENKEL et al., 1979). The bank vole, Clethrionomys glareolus, is the experimental and natural intermediate host of F. glareoli (KRAMPITZ et al., 1976). The spherical cyst was also reported from C. rufocanus in the U. S. S. R. (TADROS et al., 1972). The cyst of F. microti is lobulated and 0.2-1.0 mm in diameter (FRENKEL et al., 1979) and is similar to that of the present Frenkelia sp. The range of experimental intermediate hosts of F. microti is wide, i.e., Microtus agrestis, M. arvalis, Apodemus sylvaticus, A. flavicollis, A. agrarius, Rattus norvegicus, Mesocricetus auratus, Mus musculus, Mastomys natalensis, Cricetus cricetus, Chinchilla laniger and Oryctolagus cuniculus (ROMMEL & KRAMPITZ, 1975; KRAMPITZ & ROMMEL, 1977). However, experimental infection of Clethrionomys glareolus with F. microti have not proved successful (KRAMPITZ & ROMMEL, 1977). The lobulated cyst has been observed in North America (HAYDEN et al., 1976; KENNEDY & FRELIER, 1986) and Europe (TADROS et al., 1972). The definitive hosts of F. microti and F. glareoli are the common European buzzard, Buteo buteo (ROMMEL & KRAMPITZ, 1975; KRAMPITZ & ROMMEL, 1977). Though Buteo buteo japonicus breeds and is found not rarely in Hokkaido, the definitive host of the present Frenkelia sp. has not yet been determined.

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References

Fig. 1  Squash preparation of the brain, showing lobulated, thin-walled and septate cyst
Unstained, (scale = 0.2 mm)

Fig. 2  Cyst in the cerebral cortex without inflammation H-E stain, (scale = 0.2 mm)

Fig. 3  Crescent-shaped bradyzoites
Differential interference microphotograph, (scale = 10 μ)