BRIEF NOTE

***Hepatozoon* Infection in a Wild Fox (*Vulpes vulpes schrencki* KISHIDA) in Japan**

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In mammalian *Hepatozoon* sp. gametocyte develops in leukocytes, and sporogony takes place within the body of a tick, mite or other blood-sucking invertebrate, depending on the species. The vertebrate hosts are infected by the indigestion of the invertebrate hosts. The shizogonic cycle of the parasite occurs in cells of internal organs of the vertebrates [6]. Although *Hepatozoon* infection in mammals have been mostly described from rodents [3, 5, 9], some carnivores, such as the dog, cat, coyote, genet, mink, jackal, hyaena, lion, leopard and cheetah have also been recorded as hosts of *Hepatozoon* sp. [1, 2, 6, 8]. However, its infection in the fox has not been reported. The purpose of this report is to record the discovery of *Hepatozoon* sp. in a wild fox in Japan and to describe some clinical signs observed in the fox.

On the early morning of June 25, 1980, a male fox (*Vulpes vulpes schrencki*) about 3 months old was found crouching by the roadside in Yufutsu district of Hokkaido in Japan, and it was admitted to the Veterinary Hospital of Hokkaido University on that

day. The fox was semicomatose when first seen. The conjunctiva was intensely injected and the rectal temperature was 38.0°C. Extensive hemorrhage in the episclera of the right eye were observed, although any superficial injuries were found. Radiography showed no abnormalities of any bones and internal organs. Hematological examinations revealed the following results. Packed cell volume was 34% and total leukocyte count was 9,000/ μ l, with 1% band neutrophils, 87.5% segmented neutrophils, 5% lymphocytes, 5% monocytes and 1.5% eosinophils. Blood urea nitrogen and blood glucose was 20 mg/dl and 90 mg/dl of blood, respectively. Serum total protein was 6.0 g/dl, serum glutamic oxalacetate transaminase was 38 unit, serum glutamate pyruvate transaminase was 52 unit and serum total bilirubin was 0.38 mg/dl. These results seemed to be within normal range, except an increase of the neutrophils in the peripheral blood. Urine examinations revealed no abnormalities. On Giemsa's stained blood smears large intracytoplasmic inclusion bodies were

found in many of the neutrophils [Fig. 1]. The bodies were oval or elliptical form, 9.8 to 10.4 μm by 5.5 to 6.5 μm in dimension, faint blue in color and surrounded by an unstained capsule. Many of the bodies have a nucleus which was round or semi-lunar, deep-staining and usually located at one side of the body. Sometimes the nucleus was disintegrated and discolored [Figs. 1, 2]. Only the capsule was seen in the cytoplasm of the cells [Fig. 2]. The bodies were usually found within the cells and only one was present in one cell, but free bodies were rarely seen in the plasma [Fig. 3]. Such free bodies contained many small granules with red-violet color and their nucleus was often located at the center of the bodies. From the observations the inclusion bodies were regarded as gametocyte of *Hepatozoon* sp. The size of the neutrophils invaded by the parasite was larger than that of normal cells, and the cells appeared to be somewhat degenerative.

After treatment with injection of antibiotics and 20% glucose for 3 days the fox returned to normal conditions, while the parasite were still observed in the blood smears. On the fourth day, however, epileptic convulsion suddenly developed. At the onset of the convulsion the fox lay down and shut its eyes, and then tonic seizure activity associated with severe contraction and extension of all limbs developed, and it lasted for 20 to 30 seconds. After the convulsion the fox appeared to be exhausted, but no lethargy. The attack was repeated at half- to one-hour intervals for several hours, but the next day and thereafter any convulsion developed, and the fox became active and clinically normal. One month later, *Hepatozoon* gametocytes were still observed in a few circulating neutrophils.

In Japan, *Hepatozoon* sp. has not been

reported from mammals, except *Hepatozoon muris* from some wild rats [4]. Although the host-specificity of the *Hepatozoon* has not been clarified, Levine [7] stated that the parasites described from the cats, jackals and hyenas under the different specific names, respectively, were indistinguishable in their forms and they were probably all the same species, *Hepatozoon canis*. In the present case, the morphologic feature of the gametocyte observed closely resembled that of the *H. canis* illustrated by other investigators [2, 6].

On the other hand, the pathogenicity of the *Hepatozoon* is yet controvertible. Some investigators have considered that the parasite was not pathogenic to vertebrate hosts [5, 8], but the others stated that the dogs infected with *H. canis* had shown some clinical symptoms such as fever, emaciation, anemia, splenomegaly, lumbar paralysis and stiffness [2, 4, 7]. McCully et al. [8] studied hepatozoonosis in several carnivores in Africa and found the schizonts of the parasite in the lung, spleen, liver, lymphonodes, myocardium and skeletal muscles of the animals, although the host response was usually very mild.

Further investigation is needed to clarify those problems on the host-specificity and pathogenicity of the parasite found in the present case.

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要 約

野生キツネから発見されたヘパトゾーン (短報): 前出 吉光・大杉剛生 (北海道大学獣医学部家畜内科学講座), 大泰司紀之 (北海道大学歯学部口腔解剖第一講座)——北海道勇払地方の道路上で衰弱して保護された約3カ月齢のキツネの血中から、ヘパトゾーンのガメトサイトが発見された。同ガメトサイトは長径 9.8~10.4 μm , 短径 5.5~6.5 μm の卵円形または長楕円形で、透明な被膜に包まれ、淡青色の細胞質と濃赤紫色の核を有していたが、核はしばしば変形し、染色性が低下していた。これらは通常、好中球の細胞質内に存在していたが、まれに血漿中に遊離するものもみられた。現在まで、キツネにおけるヘパトゾーン感染の報告はない。今回発見されたヘパトゾーンの種類およびその病原性については、今後の研究が必要である。

Explanation of Figures

- Fig. 1. Numerous neutrophils containing the gametocyte of Hepatozoon (arrows) in the peripheral blood of a fox. $\times 1,000$.
- Fig. 2. Two neutrophils containing the degenerating gametocytes are seen. One of them contains only a capsule of the gametocyte (arrow). $\times 1,200$.
- Fig. 3. A free gametocyte in the peripheral blood. $\times 3,300$.