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White Spots of the Liver in Pigs Experimentally Infected with *Metastrongylus apri*

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Generally, the main cause of white spots in the liver of fattening pigs is thought to be larval migration of *Ascaris suum* (Ronéus, 1966; Taffs, 1968; Eriksen *et al.*, 1980; Nakagawa *et al.*, 1983). In addition, presence of larvae from *Fasciola hepatica, Cysticercus tenuicollis, Stephanurus dentatus* and *Metastrongylus apri* (White, 1941; Nieberle and Cohrs, 1962; Schwartz and Alicata, 1934; Dunn, 1956), which migrate into the organ, is considered to be the cause of liver lesions. Apart from *M.apri,* however, the other helminthiases mentioned above are seldom noted in Japan. Preliminary studies have been made on the relationship between the appearance of white spots and *M.apri* infection in the liver of pigs (Dunn, 1956).

The purpose of this study is to describe the development of hepatitis in pigs infected with lungworm.

The infective larvae of *M.apri* were collected from *Eisenia foetida* earthworms experimentally infected with the nematode by using artificial gastric juice. Four conventional crossbred pigs weighing approximately 30 kg (one male and three females) were used. These animals were negative for helminth infections by Watanabe's fecal examination method (Watanabe *et al.*, 1953). Furthermore, they showed no antibodies against antigen in Ouchterlony's double diffusion in agarose (AGT), complement fixation test (CFT) (Yoshihara *et al.*, 1987) or the intradermal test (IDT) (Andrews *et al.*, 1976) at the start of this study, and they were maintained under sanitary conditions during the experimental period.

Since no severe white spots were found in the liver of pigs that received 5,000 larvae of *M.apri* at once, two of the four animals were inoculated weekly with 1,000 larvae for five weeks and the remaining animals served as controls. After the initial inoculation, blood samples were taken weekly from all the pigs. Fecal examination was also performed by the above-mentioned method twice weekly until the end of the period. These animals were sacrificed at one week after the final inoculation with *M.apri.*

At autopsy, white spots were seen in the liver of the infected pigs (Fig. 1). The majority of the lesions were fine and measured 0.5–1.0 cm in diameter. Several compact lesions, 0.5–0.6 cm, were also observed. No typical lymphonodular lesions were noticed in the liver. No macroscopical changes were found in the organ of the control pigs.

Next, pieces of the liver lesions were fixed in 10% formation solution. Paraffin sections were

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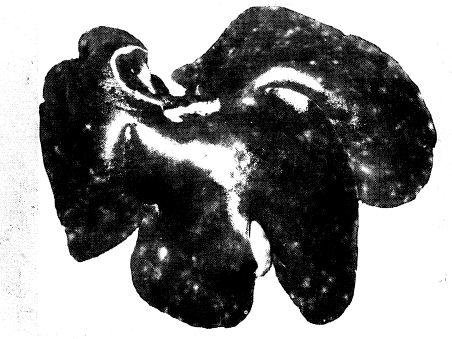

Fig. 1 White spots of the liver in pig infected with *Metastrongylus apri.*

stained with hematoxylin and eosin (HE) and phosphotungustic acid-hematoxylin (PTAH) to demonstrate fibrinoid degeneration of the arteriole in the lesions. Histologically, slight hyperplasia of interlobular connective tissue was seen (Fig. 2-1). Mild hyperplasia of interlobular connective tissue accompanied by a slight infiltration of lymphocytes and eosinophils were

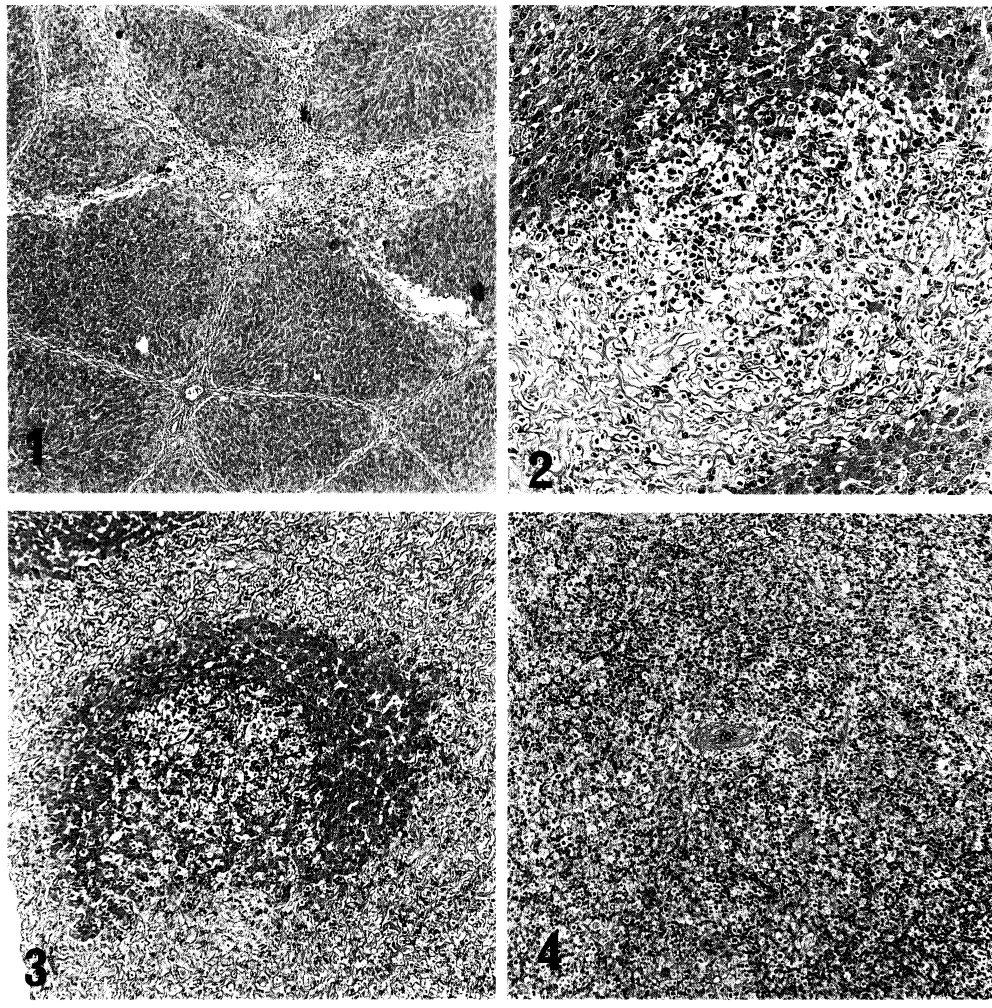

Fig. 2 Microscopic findings of lesions.
1: Slight hyperplasia of interlobular connective tissue. HE, ×50.
2: Mild hyperplasia of connective tissue accompanied with slight infiltration of lymphocytes and eosinophils. HE, ×150.
3: Necrosis in lobule. HE, ×150.
4: Severe lymphocytic infiltration and fibrinoid degeneration of small artery, PTAH. ×75.

observed (Fig. 2-2). Circular necrosis in the lobule was also noticed (Fig. 2-3). Severe lymphocytic infiltration and fibrinoid degeneration of the small arteriole were found in the lesion of interstitial hepatitis (Fig. 2-4). However, no lymphofollicular hyperplasia was seen in the liver.

M.apri eggs were first detected at 29 days after initial inoculation with the larvae. At autopsy, a large number of worms were recovered from the lung of the infected pigs. No helminths were obtained from the intestines or any other organs of the pigs used in this study.

Nomura (1970) investigated metastrongylidosis of swine in detail. Dunn (1956), who studied comprehensively the life history of *M.apri* in pigs, observed white spots in the liver of infected animals and assumed that the lesions were probably due to accidental migration of lungworm larvae through the liver. In addition, he described the presence of worms of *A.suum* in the intestine of a pig infected with *M.apri*. In the present study, however, pigs bred and maintained under sanitary conditions were used. From the result of the present examination, it is clear that white spots were formed in the liver of pigs experimentally infected with 1,000 *M.apri* larvae per week for five weeks. Accordingly, it is possible that the lesions may appear in pigs from stys contaminated with lungworm larvae.

By AGT and CFT with antigen from adult worms of *M.apri,* sera from infected pigs gave positive results (Figs. 3 and 4). Before autopsy, the result of IDT was also positive (Fig. 5). On the other hand, the same positive reaction was obtained by CFT and IDT with antigen from adult worms of *A.suum*. The two control pigs developed no detectable antibodies against antigen from two nematodes throughout the experimental period or before autopsy. The results suggested that common antigen(s) may have existed in the extracts of adult worms of *M.apri* and *A.suum*.

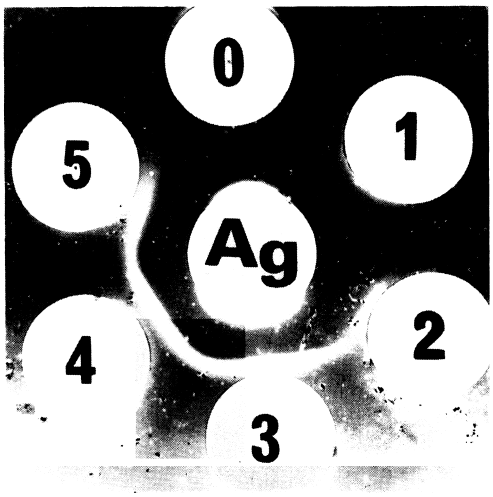

Fig. 3 Agar gel diffusion test
0–5: Showing weeks after infection when serum samples were collected.
Ag: Antigen of *M.apri*.

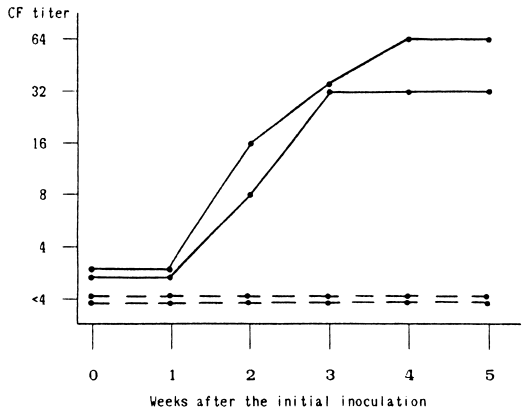

Fig. 4 Transition of CF antibody titers in pigs infected with *Metastrongylus apri*.
●——●: Infected pigs.
●-----●: Control pigs.

Fig. 5 Intradermal test of immediate type. Antigen was injected into the site on the left, control solution into the site on the right.

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