In the sika deer (*Cervus nippon*), infectious diseases such as tuberculosis [10, 12, 15], malignant catarrhal fever [1, 7, 16] and necrotic enteritis [17] have been reported. Mycosis was reported in the red deer (*Cervus elaphus*) [11, 14, 18] and in the fallow deer (*Dama dama*) [11]. The authors encountered an occurrence of gastric mucormycosis associated with proliferation of *Clostridium perfringens* (*C. perfringens*) in a sika deer (*C. nippon yakushimae*). The present paper is the first report on mucormycosis in this species.

The occurrence was seen in a park in Nagano Prefecture, Japan, where 30 sika deer consisting of 10 adult males, 9 adult females and 11 young deer less than 2 years old, were kept. The paddock, 1,740 m², is surrounded by wire-fence and there is a cabin, 50 m², for feeding and drinking. Rice straws and concentrate were given in the cabin and grass, hay and vegetables were given on the paddock ground by the fence.

During the period from October to November 1997, 3 adult males, 3 adult females and 1 young deer died suddenly or within a few days after onset of clinical signs. Of four examined, the forestomach of one adult female deer died suddenly, the present case, conspicuously distended and suddenly, the present case, conspicuously distended and unexpectedly died. Necropsy was performed on one adult female deer died suddenly was necropsied. Severe hemorrhages were noted beneath the serous membranes of the forestomach and abomasum. Hyphal proliferation with neutrophil infiltration was observed in the mucous membranes of the stomachs, and the hyphae showed characteristics of order Mucorales. Catarhal enteritis with hemorrhages was also observed. A large number of *Clostridium perfringens* was isolated from the contents of the abomasum and small intestine. The case was diagnosed as gastric mucormycosis associated with proliferation of *Clostridium perfringens*. The incidence occurred during breeding season and incorrect management was considered to be a predisposing factor for the infection.

**— KEY WORDS: Clostridium perfringens, mucormycosis, sika deer.**

**ABSTRACT.** Seven sika deer (*Cervus nippon*) died in a park where 30 deer were kept. One adult female deer died suddenly was necropsied. Severe hemorrhages were noted beneath the serous membranes of the forestomach and abomasum. Hyphal proliferation with neutrophil infiltration was observed in the mucous membranes of the stomachs, and the hyphae showed characteristics of order Mucorales. Catarhal enteritis with hemorrhages was also observed. A large number of *Clostridium perfringens* was isolated from the contents of the abomasum and small intestine. The case was diagnosed as gastric mucormycosis associated with proliferation of *Clostridium perfringens*. The incidence occurred during breeding season and incorrect management was considered to be a predisposing factor for the infection.**

Chihaya et al. [5] investigated incidence of systemic mycosis in calves for 10 years and reported that 19 (4.7%) out of 406 autopsied had the infection and 12 of them were alimentary mycosis as seen in the present case.

Infection of the Mucorales is characterized by the presence of suppurative or pyogenic cellular reaction and accumulation of neutrophils in the tissue [6], but not eosinophilic involvement. In the present study, numerous hyphae characterized a member of order Mucorales were observed in the mucous membranes of the forestomach and abomasum with neutrophilic infiltrations. These findings clearly suggest the present case as mucormycosis, though no mycological examination was performed.

Systemic mycosis in cattle occurs after certain period of illness [3–6, 8], while the deer in the present case died suddenly. A large number of C. perfringens were found in the gastric and intestinal contents. Moreover, catarhal enteritis associated with hemorrhages was observed in the small intestine, resembling necrotic enteritis in sika deer [17]. It seems likely that the proliferation of C. perfringens in the alimentary tract caused sudden death of the deer. Epizootiologically, contamination of the paddock with C. perfringens where the deer were fed was suspected as a source of the infection.

Jensen et al. [11] reported pulmonary mycosis in farmed deer, and suggested that paratuberculosis in the red deer and incorrect management in fallow deer induced fungal infections. Munro et al. [14] also reported systemic mycosis in Scottish red deer and stressful husbandry as a predisposing factor for the infection. In the present incidence, 6 out of 19 adult deer died, while only one young died among 11. Other 3 adult dead deer were diagnosed as Salmonella Typhimurium infection, which is considered to be more pathogenic and fatal to young animals. During breeding season, aggressive attacks and mating were frequently observed among adult deer [13]. One dead male had traumatic injury on the dorsolumbar area. It is said that one male to 20–30 females is suitable ratio for breeding of sika deer [9], nevertheless, there were 10 males to only 9 females in the herd. This inadequate ratio of male to female accelerated these breeding behavior more aggressive in the herd during the breeding season. Consequently, the adult deer had been disposed by more conspicuous stress than young deer, which probably induced mucormycosis as well as Clostridium and Salmonella infections in the herd.

REFERENCES

Fig. 3. Hyphal proliferation with neutrophil infiltration seen in the mucous membrane of the abomasum. The hyphae were nonseptate and aberrant in the lesion and branched often at right-angles. PAS stain, ×210.

Fig. 4. Catarrhal enteritis associated with severe hemorrhages and hyperemia observed in the small intestine. Lymphocytic infiltrations were noted in the mucous membrane. HE stain, ×105.