A Case Report of Tyzzer's Disease in Two Kittens in Japan

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ABSTRACT

Clostridium piliforme is an obligatory intracellular bacterium that causes Tyzzer's disease in a wide range of hosts. This is a report of Tyzzer's disease in kittens. Two kittens with no remarkable clinical anamnesis were sent for a necropsy. Gross necropsy findings were not promising except for the signs of diarrhea, roundworms, and foreign body. Histopathology of paraffin-embedded tissue revealed focal necrosis in the liver and diffuse degeneration of intestinal mucosa. Giemsa and Warthin-Starry stains revealed the presence of intracellular filamentous organisms arranged in parallel or crisscross bundles around necrotic areas of the liver and intestine. These findings were supported by previous reports to be Tyzzer's disease caused by Clostridium piliforme.

***Keywords**: Cat; Clostridium piliforme. Tyzzer's disease*

INTRODUCTION

Tyzzer's disease is an acute, spontaneous infection of young animals caused by spore-forming gram-negative obligatory intracellular bacteria, *Clostridium piliforme.* Tyzzer's disease has been reported in a wide range of hosts which include laboratory animals such as a mouse, rabbit, guinea pig, hamster, gerbil, rat, and a variety of wildlife including muskrat, cottontail rabbit, snow leopard, coyote, gray fox, lesser panda, raccoon, marsupial and white-tailed deer. It is a highly fatal disease of young foals but rare in other domestic animals like dogs, cats, and calves (Ikegami et al., 1999). One case of human infection has been reported in HIV-1 infected patient (Smith et al., 1996). The disease is also reported in 2 psittacine birds and a weaver bird (Mete et al., 2011). In short, these organisms can infect a wide range of mammalian species and also the avian species.

Naturally occurring Tyzzer's disease has been reported in many instances in cats. All cats presented hepatic lesions and lesions in the small intestines with a few cases presenting colitis. Most of the cases reported included kittens of ages 2 months or less and concurrent immunosuppressive factors like viral infections and administration of corticosteroid drugs. The clinical signs and symptoms are peracute and acute as in most of the cases the animals die within three days in laboratory animals though it is noticed that lethargy, depression, anorexia, and rapid abdominal discomfort and distension are constant in dogs and cats. The actual pathogenesis of this disease is not well understood but is presumed to be transferred by faeco-oral route through ingestion of spores. *Clostridium piliforme* adheres to the intestinal epithelial cells and there is local proliferation after infection. The mechanism by which the bacteria attaches to and enters host cells is unknown (Jones et al., 2012). When a host is immune suppressed, the organism spread through

the portal circulation to the hepatic cells and causes multifocal periportal necrotic lesions. The organism has an affinity to the cells of the intestine, liver, and heart.

DESCRIPTION OF THE CASE

Two kittens of the same litter, approximately 2-3 months of age were sent for necropsy at the veterinary pathology laboratory, The University of Tokyo. Clinical anamnesis was not remarkable but one cat had bloody diarrhea. Specimens of the stomach, small intestine, large intestine, liver, kidney, heart, lungs, pancreas, tongue, thyroid, spleen, adrenal gland, hypothalamus, urinary bladder, bone marrow, bronchus, and trachea were fixed in 10% buffered formalin and paraffin-embedded blocks were prepared. The paraffin-embedded tissues sectioned at approximately 4µm were examined using routine hematoxylin and eosin (HE) stain. Liver and intestines with lesions were stained with Giemsa and Warthin-Starry stains.

Gross necropsy findings were unremarkable but both cases had dark purple colored spleen while the stomach and duodenum of both kittens revealed multiple roundworms. A plastic tube of 1.5 cm length was found in the jejunum and petechial bleeding in the mucosal surface of the pyloric part of the stomach with thinning of the intestinal wall was seen in one kitten. The intestinal content of both kittens had scant whitish liquid providing evidence of diarrhea.

Histopathological findings were restricted to the liver, small intestine, and large intestine. In the liver, multiple focal necrosis was seen in both kittens (Fig 1). The necrotic area consisted of eosinophilic materials, necrotic cellular debris, erythrocytes, and mononuclear cells. Hepatic cells bordering the necrotic area showed bundles of basophilic, filamentous structures in the cytoplasm which was faintly visible with HE stain. With Giemsa stain, the basophilic structures were visible as purple to blue-stained structures (Fig 2). The Warthin-Starry stain revealed the organisms as a brown to black colored filaments (Fig 2, inset). In both cases, small and large intestinal mucosa showed diffuse necrosis with a moderate number of lymphocytes, neutrophils, plasma cells and cell debris (Fig 3). Like in hepatic cells, the intestinal mucosal cells also had the presence of basophilic filamentous structures arranged in bundles which were vivid as blue-purple with Giemsa stain (Fig 4) and brown-black with Warthin-Starry stain (Fig 4 inset).

In this study, hepatic and intestinal involvements were seen with the presence of the filamentous, basophilic structures which resembles *Clostridium piliforme,* the causative organism of Tyzzer's disease in both cases. The lesions in the liver and intestines were similar to those reported in other species of animals with Tyzzer's disease. A majority of infected feline cases had naturally or experimentally induced immunosuppressive diseases such as feline leukemia, feline panleukopenia, and feline infectious peritonitis. Unlike previous case reports by Neto *et al.* (2015), Bennett *etal.* (1977), and Ikegami *et al.* (1999), neither of the cases had evidence of any concurrent diseases nor immunosuppressive factors. But these cases resemble with few case reports that also did not find the involvement of the immunosuppressive factors or other concurrent diseases (Wilkie et al., 1985).

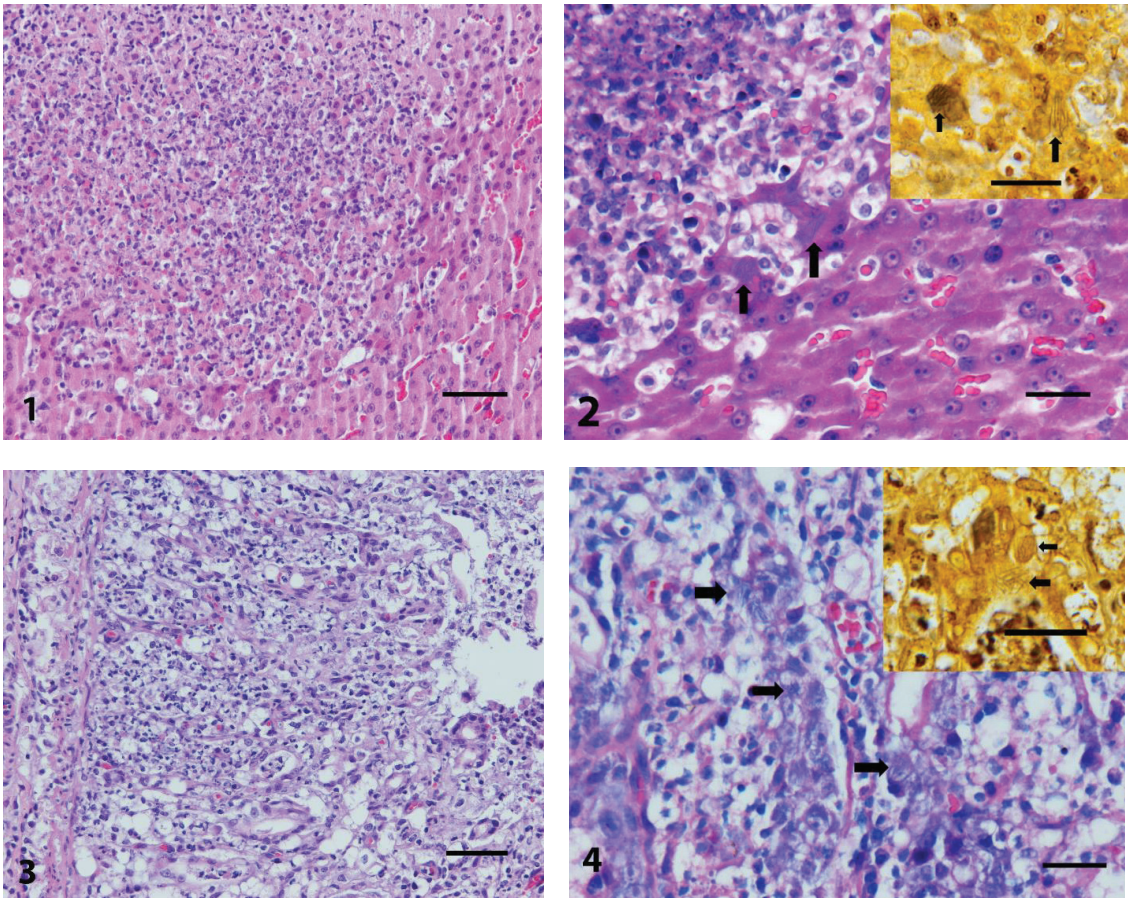

Figure 1: Focal necrosis in liver with cell debris. Hematoxylin and Eosin stain (HE). Scale: Bar= 50 µm
Figure 2: Blue stained bundles of long filamentous organisms (arrows) in giemsa stain. *Inset:* black stained filamentous organisms (arrows) in Warthin-Starry stain. Scale: Bar = 25 µm
Figure 3: Cell debris and inflammatory cells in intestine. HE Scale: Bar = 50 µm
Figure 4: Blue stained bundles of intracellular long organisms (arrows) in mucosal cells of intestine seen through Giemsa stain. *Inset*: brown to black bundles of organisms in mucosal cells as seen in Warthin–Starry stain. Scale: Bar = 25 µm

Stress as a result of weaning, overcrowding, poor sanitation, shipping, irradiation, or corticosteroid administration often predisposes Tyzzer's disease (Ganaway et al., 1971). Both kittens were 2-3 months of age that is about the age of weaning. During weaning, the change in diet and environment might have contributed for the infection of the kittens with *Clostridium piliforme* from the environment. Experimental disease has been difficult in healthy dogs and cats and most feline cases have occurred in cats with rodent contact in the lab (Jones et al., 2012). The presence of roundworms in the stomach in both cases and the plastic tube in one case were insufficient to contribute to the death of the kittens. But necrotic enteritis and focal hepatic necrosis with the presence of *Clostridium piliforme* can be contributive for the death of both the kittens. According

to Gelberg H.B. (2017), the presence of causative bacillus around the necrotic hepatic foci is the definitive diagnosis for Tyzzer's disease which supports these are the cases of Tyzzer's disease.

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