



## Tyzzler's Disease in Laboratory Animals

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### Abstract

The spore-forming bacterium *Clostridium piliforme*, formerly known as *Bacillus piliformis*, is the source of Tyzzler's disease, an acute epizootic bacterial illness that is characterised by focal necrotic lesions on the liver and heart and segmental necrosis of the caecal mucosa. Young, well-fed animals, especially those given high-protein diets, are the animals most commonly affected by the disease. A Gram-negative, obligatory intracellular bacteria with varied shape in tissue sections, *Clostridium piliforme*. Production of exotoxin by bacteria leads to necrosis of intestinal epithelium. Bacteria can be returned to the lumen by being deposited there, or they can occasionally penetrate farther into the intestinal wall, where they can infect smooth muscle cells or enter the portal circulation. Bacteria from the portal vein may infect the heart and/or liver. Mortality is highest at weaning age in rabbits. Tyzzler's illness in mice can cause perianal discoloration, diarrhoea, and temporary appearances of being skinny and unclean. Additionally, sudden deaths without warning symptoms are possible. In rabbits there is watery diarrhoea leading to staining of hindquarter, lethargy and anorexia. Mortality occurred in weanling rabbits. In adult rabbits wasting disease is very common.

**Keywords:** Epizootic; *C. Piliforme*; Necrosis; Intracellular; Exotoxins; Rabbits; Mice; Diarrhoea

### Introduction

Tyzzler's disease is an acute epizootic bacterial disease characterized by segmental necrosis of caecal mucosa and focal necrotic lesions on the liver and heart caused by the spore-forming bacterium *Clostridium piliforme*, formerly known as *Bacillus piliformis*. Tyzzler's disease was first identified in mice in 1917. It was first discovered in laboratory rabbits a few years later, and then it was found in other tiny laboratory mammals such guinea pigs, hamsters, gerbils, and rats. Young foals are affected by this sickness, which is extremely fatal. The disease does not harm other domestic animals like dogs, cats, or calves. Muskrats, cottontail rabbits, coyotes, grey foxes, smaller pandas, snow leopards, raccoons, marsupials, and white-tailed deer have all been seen to exhibit it. The

disease primarily affects well-nourished animals young, and particularly those who are at high protein rich diet.

While others seem to be sensitive without immunosuppression, certain species seem resistant unless under stress or immunosuppressed. It appears that dietary factors, such as the high nitrogenous diets offered to lab animals and nursing mares, may weaken the immune system and predispose vulnerable animals to the illness. Other immunosuppressive substances, medications, and some antibacterials, particularly sulfonamides, may also put animals at risk for contracting the illness.

### Etiology

*Clostridium piliforme* is gram-negative obligate intracellular bacterium and exhibit variety of morphologies in different tissue

section. In the cytoplasm of infected cells, it typically takes the form of a long, slender (i.e., hair-like or piliform) bacillus that is 8-10 mm long and 0.5 mm wide, while shorter, thicker, cigar-shaped forms may also infrequently be observed. It can be cultivated in tissue culture cells or the yolk sac of chick embryos but does not grow in cell-free media.

### Spread and Pathogenesis

It can persist in contaminated bedding for at least a year and in the natural environment for at least five years. Spores are shed in the faeces. Animals became infected by spore intake from the environment or from faeces. The bacterium is phagocytosed by intestinal epithelial cells after being consumed by the spores. The vegetative form inside the cell escapes the phagosome and starts replicating in the cytoplasm. Intestinal epithelial necrosis is caused by bacteria producing exotoxins. Bacteria can be returned to the lumen by being deposited there, or they can occasionally penetrate farther into the intestinal wall, where they can infect smooth muscle cells or enter the portal circulation. Bacteria from the portal vein may infect the heart and/or liver. In rabbits, at weaning age mortality is highest. Signs.

The majority of ill mice show no symptoms. If disease does develop, it is typically seen in freshly weaned pups or mice with genetically or artificially compromised immune systems. Megaloileitis in Tyzzer's disease-affected weanling rats causes an enlarged abdomen, however this has not been observed in mice. Tyzzer's illness in mice can cause perianal discoloration, diarrhoea, and temporary appearances of being skinny and unclean. Additionally, sudden deaths without warning symptoms are possible. In rabbits there is watery diarrhoea leading to staining of hindquarter, lethargy and anorexia. Mortality occurred in weanling rabbits. In adult rabbits wasting disease is very common.

### Pathology

Animal infections typically target the gut (distal ileum, caecum, and proximal colon), liver, and less frequently the heart. The ileum, caecum, and colon may seem somewhat enlarged and scarlet as a result of hyperemia or little haemorrhage. Clusters of organisms can be seen under a microscope in enterocytes and smooth muscle, as well as areas of intestinal and muscularis mucosal degeneration, inflammation, edema, and necrosis. Typically, the liver's parenchyma has larger, umbilicated foci or miliary pale foci. The hallmarks

of the lesions are polymorphonuclear leukocyte infiltration and multifocal coagulation to caseation hepatic necrosis.

### Diagnosis

Gross lesions are seen, but an accurate diagnosis must be made by looking at the organism within the heart, intestinal epithelium, or hepatocytes. For a quick diagnosis, liver impression smears stained with Giemsa, PAS, Gram, PAS, silver, or methylene blue stains at necropsy may be helpful. To confirm a diagnosis, formalin-fixed specimens stained using the Giemsa or Warthin-Starry techniques are typically used. As a diagnostic tool, indirect fluorescent antibody tests are also available. In addition to specific histochemical staining, the PCR method can be utilised to identify *C. piliforme* gene sequences in liver tissues from infected animals.

### Treatment and control

Currently, the only effective means of treating disease are antibiotic medications like penicillin or tetracycline. Reducing the amount of bacterial spores in the environment aids in the prevention of disease in wild populations. To accomplish this, scat and polluted carcasses can be removed.

### Zoonosis

Although there is no known public health importance, it is important to take note of the report of *B. piliformis* infection in a rhesus monkey. Pregnant women have been discovered to carry *B. piliformis* antibodies. Given that *B. piliformis* affects such a diverse range of animal species, it's possible that under specific conditions, man could develop a clinical illness.

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