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## TYZZER'S DISEASE IN MUSKRATS: RE-EXAMINATION OF SPECIMENS OF HEMORRHAGIC DISEASE COLLECTED BY PAUL ERRINGTON

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**Abstract:** Organisms typical of those seen in Tyzzer's disease of muskrats (*Ondatra zibethica*) were found in tissue sections from two muskrats found dead in Iowa in 1947 by Paul Errington. These findings support further the hypothesis that Errington's and Tyzzer's diseases of muskrats are a single entity.

### INTRODUCTION

In 1946, Errington<sup>4</sup> described an apparently infectious epizootic disease of muskrats (*Ondatra zibethica*) in Iowa. This "hemorrhagic disease" as it was called by Errington, or "Errington's Disease" (ED) as it has come to be known, has been diagnosed over a wide area of North America, and Errington<sup>5</sup> suggested that it might occur over the entire geographic range of the muskrat. The pathology of ED has been well described,<sup>10</sup> but the etiology of the disease is controversial. Lord *et al.*<sup>11</sup> concluded that an organism of the genus *Clostridium* was involved; however, this has not been accepted universally.<sup>8</sup> Karstad *et al.*<sup>9</sup> described Tyzzer's disease (TD) in the muskrat in 1971 and suggested, on the basis of the similarity of lesions, that TD and ED might be identical. Wobeser *et al.*<sup>13</sup> described TD in free-living muskrats and indicated further similarities between the two diseases. We have since recognized TD in a muskrat from the Cumberland Marsh area of Saskatchewan, (Wobeser, unpubl.), an area in which Errington<sup>5</sup> concluded that ED occurred. The foregoing is convincing, but indirect, evidence of the similarities of the two diseases. In this report we describe the re-examination of

specimens from muskrats collected in Iowa during 1947 by Paul Errington.

### MATERIALS AND METHODS

A chance conversation between two of the authors at the 1977 Wildlife Disease Association Meeting resulted in a search of files at the Department of Veterinary Pathology, College of Veterinary Medicine, Ames, Iowa, for any remaining specimens from cases of ED collected by the late Paul Errington. Paraffin-embedded tissues and original pathology record sheets from two cases were found. The tissues had been obtained from immature female muskrats from the area of Lansing, Iowa, and had been collected in March, 1947. The tentative diagnosis prior to necropsy was recorded as the "muskrat disease".

The gross lesions were described on the pathology record sheets by Dr. E. A. Benbrook as "typical for 'muskrat disease' encountered previously . . ." and consisted of acute hemorrhagic enteritis with bloody anal discharge, focal hepatic necrosis, slight splenomegaly, pulmonary hyperemia and serosanguineous pleural and peritoneal effusions.

Sections (6  $\mu$ m) cut from the paraffin blocks were stained with hematoxylin-eosin (H&E) and Warthin-Faulkner<sup>1</sup> stains.

## RESULTS

Sections of liver, colon and lung were available, and lesions were similar in both animals. There were multiple small foci of acute hepatic necrosis scattered randomly through the liver. In one case, small numbers of slightly basophilic filamentous bacteria were evident within hepatocytes adjacent to the necrotic foci on the H&E stained slide. Argyrophilic, beaded organisms typical of *Bacillus piliformis*<sup>6</sup> were present in small numbers within intact hepatocytes adjacent to many of the necrotic foci in both cases, on slides stained by the Warthin-Faulkner technique. Although there was a hemorrhagic colitis the tissues were autolyzed and *B. piliformis* could not be identified in these sections. The lungs were congested.

## DISCUSSION

TD and ED of muskrats are characterized by a combination of

enteric and hepatic lesions that are distinct from the lesions of other diseases of muskrats.<sup>1,3</sup> The demonstration of organisms diagnostic for TD<sup>6</sup> in these muskrats confirms that at least some cases of ED are due to *B. piliformis* infection. Although TD was described first in 1917,<sup>12</sup> it was thought to be restricted to laboratory mice (*Mus musculus*) until 1965,<sup>1</sup> and the broad host range of the disease has been recognized only very recently. These cases demonstrate that the disease has been present in muskrats for more than 30 years, and the available reports<sup>2,7,9,13</sup> indicate that the disease is widespread.

Unfortunately, there are no remaining specimens of the Wisconsin cases of ED investigated by Lord *et al.*<sup>10,11</sup> in 1956; however, organisms very similar to *B. piliformis* were described and illustrated<sup>10</sup> at that time, and Dr. Lord (pers. comm.) has indicated that he now believes that the two diseases are identical, as suggested originally by Karstad *et al.*<sup>9</sup>

This study illustrates the value of permanent specimen and record collections for the retrospective study of disease.

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