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Anthrax Epizootic in White-Tailed Deer¹

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Abstract

Bacillus anthracis caused high mortality among white-tailed deer (*Odocoileus virginianus*) on Beulah Island, Desha County, Arkansas. Sixty-seven carcasses were located and the total loss was estimated between 200 and 300 deer. Range conditions indicated that the deer herd had greatly exceeded carrying capacity. Lesions in deer were similar to those ascribed to anthrax in domestic cattle, sheep, and goats.

Introduction

Beulah Island, Arkansas, comprises a 3600 acre land mass located on the eastern side of the Mississippi River adjacent to Bolivar County, Mississippi. The island is naturally fertile, and large portions are covered by a deciduous, hardwood forest that is typical for the area. There are no agricultural or livestock interests on the island. White-tailed deer and wild turkey (*Meleagris gallopavo*) are abundant.

Observations of range conditions afforded conclusive evidence that the deer herd on Beulah Island had greatly exceeded carrying capacity. A summer browse-line was pronounced. In supplementary food plots, which ranged in size

from one to five acres, wheat had matured and most of the grain had fallen. Heavy utilization of plantings was obvious, and in most instances deer were eating from the ground. Water for the herd was available from three stagnant lakes and the Mississippi River.

Between June 14 and 16, 1963, nine dead deer were found in the area. Livestock deaths occurred simultaneously in adjacent Bolivar County, Mississippi, with 17 cattle, 4 horses, 2 mules, and several pigs included. Cattle that had been vaccinated for anthrax were not dying. On June 20 and 21, investigators from the Arkansas and Mississippi Game and Fish Commissions found carcasses of 33 additional deer and noted that

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observations of live deer had declined noticeably. Putrefaction of carcasses was extremely rapid due to high temperature and humidity. Few, if any, of the carcasses had been opened by carrion feeders since vultures were virtually nonexistent and a limited predator control program was in effect.

For two months prior to deer mortality, drought conditions prevailed throughout the area. During that period heavy concentrations of biting flies (Tabanidae) were prevalent and reached peak populations in early June. On June 26, a field laboratory was established to determine the cause of deer mortality.

Procedures

A moribund or recent mortality victim was sought by search parties which traveled on foot and "trail cycles". Although records were kept on the numbers of additional deer carcasses found, no attempt was made to locate all dead

animals.

Suitable deer found by field teams were necropsied and where considered feasible, standard bacteriologic procedures were employed for isolating bacterial pathogens.

Results

Twenty-five additional deer carcasses were located on Beulah Island, and of these, only three were suitable for necropsy. In adjacent Bolivar County, Mississippi, one fresh steer carcass was located.

Necropsy Findings

Two of the deer carcasses were in a state of advanced decomposition, but enlarged spleens, dark unclotted blood, and diffuse hemorrhages were noted. The third deer appeared to have died recently and rigor mortis was evident. A frothy, sanguineous fluid exuded from the nostrils, but blood was not observed at other body openings. Gross lesions suggestive of an acute septicemia were obvious upon opening the body cavities. Petechial and ecchymotic hemorrhages with congestion were pronounced throughout the thoracic and abdominal viscera. Dark, unclotted blood filled the heart and major vessels, and free blood surrounded fecal pellets within the rectum. The spleen was greatly enlarged (3-4X) and when cut, exhibited a "blackberry jam" appearance. Sanguineous fluid was present in the abdominal cavity, trachea, and bronchi. Gelatinous edema surrounded the kidneys and occurred between the musculature of the rear legs.

Gross lesions found in the steer were similar to those in deer. The steer exhibited a "saw horse" attitude and

blood exuded from body orifices. Large amounts of sanguineous fluid were present in the thoracic and abdominal cavities, and dark, unclotted blood filled the heart and vessels. The spleen was greatly enlarged (3-4X).

Bacteriologic Findings

Specific bacteriophage tests⁷ on spleens of the deer and steer were positive for *Bacillus anthracis*. Cultural procedures and inoculation of test animals (guinea pigs) further confirmed the presence of anthrax organisms. Guinea pigs died within 36 hours after inoculation, and lesions characteristic of anthrax were observed. Pure cultures of *B. anthracis* were recovered from guinea pig tissues.

Histopathologic Findings

Extensive edema and extravasation of blood were observed in the lungs, liver, and kidneys of the affected deer. A complete loss of splenic architecture had occurred with both red and white pulp replaced by frank hemorrhage. The only recognizable structures remaining in the spleen were the trabeculae and capsule. Varying degrees of degeneration ranging from cloudy swelling to pronounced focal necrosis were observed in the liver. Marked tubular degeneration was evident in the kidneys. Hematoxylin-stained, rod-shaped bacteria occurred in hemorrhagic areas within the liver and kidneys.

Discussion and Conclusions

Anthrax has long been recognized as an infectious disease of man and animals. Williams⁶ surmised that it was introduced to the Mississippi River Delta by ships bringing cargoes from the valley of the Nile. Carpenter¹ believed that the first observations of anthrax in America were in deer of the Mississippi Delta during the time of French settlement. Since that time the disease has been reported in herbivorous animals in most of the continental United States.⁴ Anthrax in deer under natural conditions has been reported from California, Florida, Louisiana, and Texas.^{2,8}

Although 67 white-tailed deer carcasses were found during this investigation, it is doubtful that one-fourth of the deer which died were located. It seems plausible to assume that from two to three hundred deer succumbed to infection. Game and Fish Commission personnel suspected that deer mortality ranged from 60 to 90 percent of the herd.

The idea that anthrax outbreaks often "develop" in an area, rather than "spread" to it,⁵ is strongly suggested by this epi-

zootic. Conditions favoring anthrax were: previous occurrence of anthrax in the area,⁴ high deer population, low food supply, bottomland soils, presence of large numbers of biting flies, high summer temperatures, drought conditions, and utilization of stagnant lakes for water supply.

Anthrax wrought havoc within the Beulah Island (Arkansas) deer herd, but only a few dead deer were found on the Mississippi side of the meander line which separates Beulah Island from Bolivar County. The only apparent difference between these two areas was deer population density. Doe hunting had been initiated as a population control measure prior to 1963 in Mississippi, but recommendations for drastically reducing the deer herd on Beulah Island were not accepted by sportsmen. Over-population therefore appears to have set the stage for an infectious agent to move through the high deer population of Beulah Island, whereas the relatively lower deer population in the adjoining county virtually stopped the spread of anthrax at a man-made boundary.

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