

EPIDEMIOLOGICAL STUDIES OF *MYCOBACTERIUM BOVIS* IN WILDLIFE AND DOMESTIC LIVESTOCK, MICHIGAN, USA

Kaneene JB¹, Fitzgerald SD², Schmitt S³, Miller RA¹, Bruning-Fann C⁴, O'Brien D³,
Judge L⁵

¹ Population Medicine Center, Michigan State University, East Lansing, MI, USA, 48824-1314

² Animal Health Diagnostic Laboratory, Michigan State University, East Lansing, MI, USA, 48824-1314

³ Wildlife Division, Michigan Department of Natural Resources, East Lansing, MI, USA, 48823

⁴ USDA APHIS, Veterinary Services, East Lansing, MI, USA, 48823

⁵ Michigan Department of Agriculture, Lansing, MI, USA, 48913

Bovine tuberculosis (TB) caused by *Mycobacterium bovis* had never before been reported in free-ranging deer in the United States as a self-sustaining infection. In the fall of 1994, the second recognized case of TB in a hunter-killed wild white-tailed deer (*Odocoileus virginianus*) was found in Michigan.¹ Since that time, cooperative studies of TB in Michigan's deer have been conducted by the Michigan Department of Natural Resources, Michigan State University, the Michigan Department of Community Health, the Michigan Department of Agriculture, and the United States Department of Agriculture Animal and Plant Health Inspection Service. These studies have revealed endemic TB in wild Michigan white-tailed deer, and the potential for transmission of TB from wildlife to livestock in the area. Our objectives are to: 1) describe surveillance programs for *M. bovis* in Michigan wildlife and livestock; 2) present results to date from the wildlife and surveillance programs; and 3) describe control/eradication programs for *M. bovis* in wildlife and livestock.

Materials and Methods

In 1994, a hunter shot a 4-year-old male white-tailed deer with TB in northeastern Michigan. Although the state had been considered TB-free since the 1970s, surveillance of hunter-harvested deer in an area within 16 km of the TB case during the fall of 1995 revealed endemic TB. The area surveyed was expanded in 1996 to encompass four involved counties. In 1997, the area was expanded to include a fifth county to the north, and, in 1998, surveillance was expanded to include a buffer zone around the five counties (collectively referred to as the Movement Restriction Zone

(MRZ)). In the MRZ, hunters were encouraged to turn in deer heads at check stations during the hunting season. In addition to hunter-harvested deer, any deer taken with wildlife control permits, as well as deer found dead with recoverable tissues, were included as part of the surveillance program.

Levels of TB in the wild deer population were measured using prevalence for each surveillance area. Deer with complete location of collection, age and sex data were used to compute prevalence, calculated as the number of culture-confirmed cases of *M. bovis* infection divided by the number of deer tested, adjusted for age and sex.

Ante-mortem livestock surveillance involved testing cattle, goats, and captive deer located within the MRZ. The initial goal of the livestock surveillance program was testing all cattle, goats, and captive deer located in the core area by August 1998, followed by testing all livestock on farms in the five-county area by April 1999, regardless of age, reproductive, or health status. The classification of livestock as TB-positive or -negative was conducted according to procedures outlined by the USDA.² For captive deer herds, either single cervical test surveillance or slaughter surveillance was used. Additional livestock surveillance was conducted if any TB-positive deer were found outside the MRZ: all livestock within a 16-km radius of the location the deer was collected would be tested. Also, for herds classified as TB-positive through livestock surveillance, other operations identified through tracebacks and epidemiological studies as being potential sources or recipients of cattle from the affected herd would be tested.

Results

Prevalence was computed for a subset of 11,959 deer from the full dataset, using those with complete location of collection, age and sex data (Table 1):

Area	1995		1996		1997		1998	
	# Deer	Prev.						
Core	307	3.2	1,518	1.8	962	4.2	1,709	3.0
4-County Area w/o Core	0	-	1,281	.2	1,255	.4	2,788	.3
Fifth County	0	-	38	2.4	478	.4	1,102	.1
Buffer Zone	0	-	1	0	0	-	520	.2
Overall	307	3.2	2,838	1.1	2,695	1.8	6,119	1.1

Table 1. Number of deer tested, and prevalence (per 100 deer) adjusted for deer age and sex, from wild

white-tailed deer surveillance, 1995 - 1998, by geographic surveillance area

Over 57,356 livestock on 1,131 cattle farms have been tested as of March 2000, and 16 cattle on 6 cattle herds (5 beef, 1 dairy) have been found TB-positive.

Approximately 570 captive deer herds have been tested, including 33 herds with 1,701 deer from the five-county area and 37 herds with 2,864 deer from the buffer zone: only one captive deer operation was found with TB.

Discussion

Results of wildlife surveillance showed evidence of a substantial TB problem, and programs for control and eradication of the disease were formulated. High deer populations and unnatural concentration of deer through supplemental feeding were believed to increase the risk of TB transmission: extensive supplemental feeding helped raise the population from approximately 19 to 35 deer/mile² from the 1960s to 1998.³ Therefore, supplemental feeding and baiting were banned in the 5-county area to reduce the spread of TB between deer. To reduce the deer herd in the 5-county area, the hunting season was extended and more antlerless deer permits were made available.

The livestock TB eradication program began in 1996, and, in 1999, the MRZ was placed under quarantine. The quarantine order allows for the free movement of cattle and goats into the MRZ, but restricts movement of cattle and goats from the MRZ. The main TB eradication program for cattle and captive deer operations was herd depopulation. The captive deer operation and all of the beef operations have been depopulated, while the dairy farm is currently undergoing retesting and development of herd plans for TB control.

References

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2. USDA/APHIS. Bovine Tuberculosis Eradication: Uniform Methods and Rules, Effective January 22, 1999. *APHIS 91-45-011.* 1999; 13-17.
3. Schmitt, S.M., Wildlife Division, Michigan Department of Natural Resources. Wildlife Surveillance. in: *Bovine Tuberculosis in Michigan: Conference 2000*, March 6-7, 2000, Lansing, MI.