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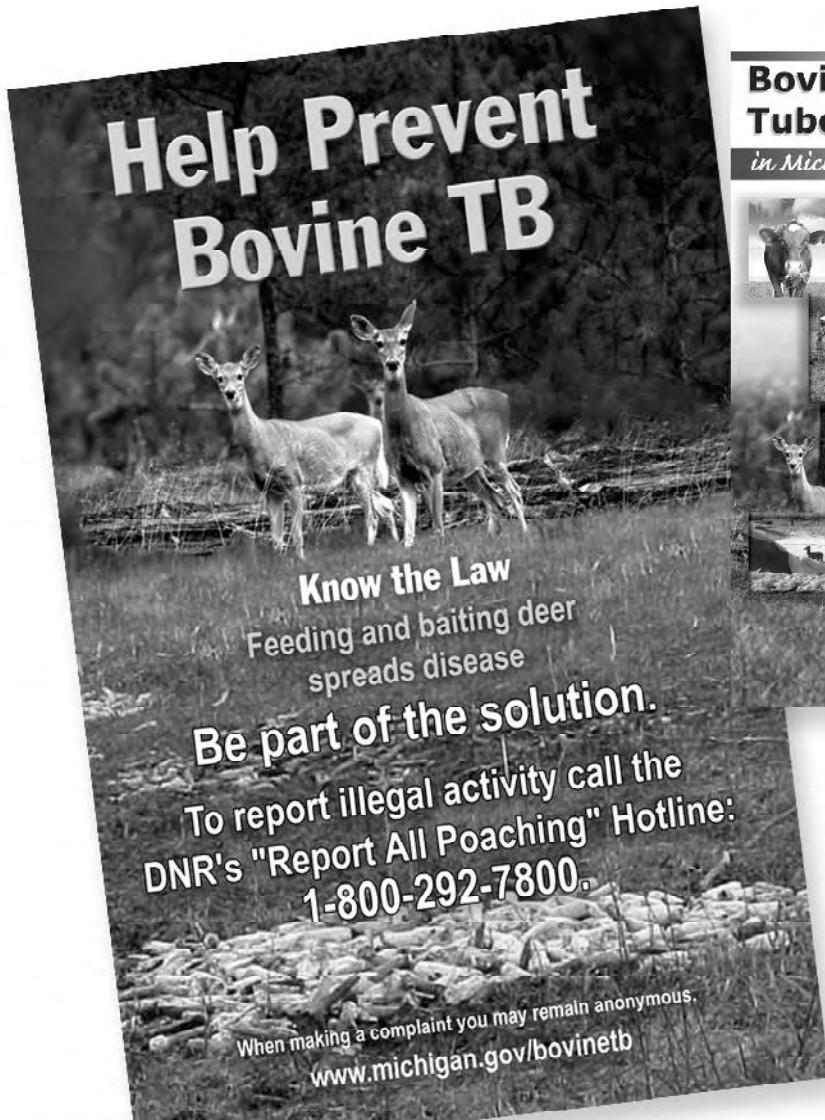
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Michigan

Bovine Tuberculosis

Eradication Project



Help Prevent Bovine TB

Know the Law
Feeding and baiting deer spreads disease

Be part of the solution.

To report illegal activity call the DNR's "Report All Poaching" Hotline: 1-800-292-7800.

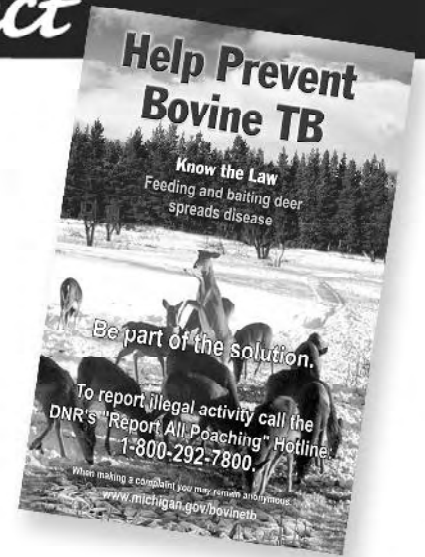
When making a complaint you may remain anonymous.

www.michigan.gov/bovinetb



Bovine Tuberculosis

in Michigan



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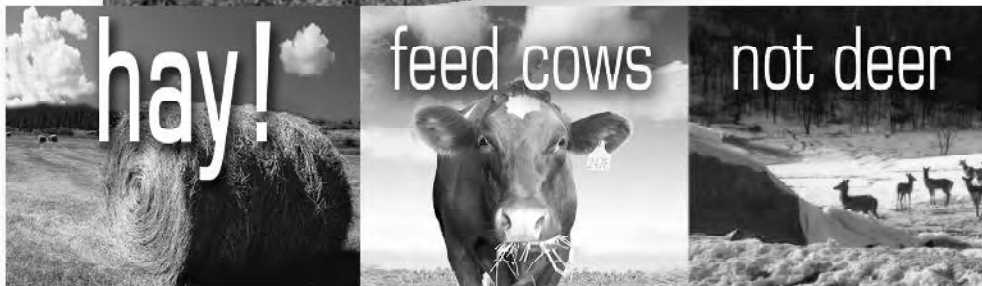
www.michigan.gov/bovinetb

October 2005

Activities Report

and Conference Proceedings

June 2005



hay!

feed cows

not deer



JENNIFER M. GRANHOLM, Governor

BOVINE TB ERADICATION PROJECT

Department of Natural Resources
Rebecca A. Humphries, Director

Department of Community Health
Janet D. Olszewski, Director

Department of Agriculture
Mitch Irwin, Director

Dear Michigan bovine TB eradication project stakeholder:

On June 7 and 8, 2005, the State of Michigan and U.S. Department of Agriculture hosted the ninth annual bovine Tuberculosis (TB) meeting of scientists, with the intent to share research information and provide updates on policies, regulations and activities regarding bovine TB.

This document is a thank you to stakeholders and serves as an annual report offering insight into the finer points of this multi-agency project. The year 2005 has been one of milestones. The Upper Peninsula received TB-Free Status; only one TB positive farm was found during routine surveillance testing; and the disease prevalence rate in Deer Management Unit (DMU) 452's free-ranging white-tailed deer population remained at 1.7 percent.

As the disease eradication effort moves forward we must also emphasize health precautions. For the second time, a person has contracted this particular Michigan strain of bovine TB. In this case it was transmitted from a deer infected with TB to a hunter through a skin wound, while the hunter field dressed the deer. As always noted, but necessary to reinforce – personal protection methods to prevent both hunters and livestock producers from infection must be used. Bovine TB is an insidious bacterium and requires antibiotic treatment for nine to 12 months. Pasteurization is necessary to kill it; therefore raw milk from an area where bovine TB is endemic should never be consumed.

The project partners, through testing surveillance, have identified the pockets of bovine TB positive cattle and deer and feel confident that we know where 98 percent, or the highest incidence of the disease, occurs. We expect to take additional steps to move forward in our effort to eradicate bovine TB from Michigan. These steps may include the use of a rapid blood test for free-ranging deer and a change in attitudes toward the test and removal strategy for cattle.

This past year saw an increase in communications, meetings and resolution planning. Although a timeline for total elimination of bovine TB from Michigan is difficult to establish, we expect success through hard work and perseverance. What was reiterated last year remains true today. Bovine TB is ominous, and history shows that it will re-emerge if every effort isn't made to continue with disease eradication strategies. We fully intend to eliminate bovine TB from Michigan, and to do so will take a strong commitment from everyone impacted by the disease.

Sincerely,

Handwritten signature of Rebecca A. Humphries in black ink.

Rebecca A. Humphries
DNR Director

Handwritten signature of Janet D. Olszewski in black ink.

Janet D. Olszewski
MDCH Director

Handwritten signature of Mitch Irwin in black ink.

Mitch Irwin
MDA Director

Bovine Tuberculosis: Michigan's Eradication Project

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Michigan Department of Community Health Updates

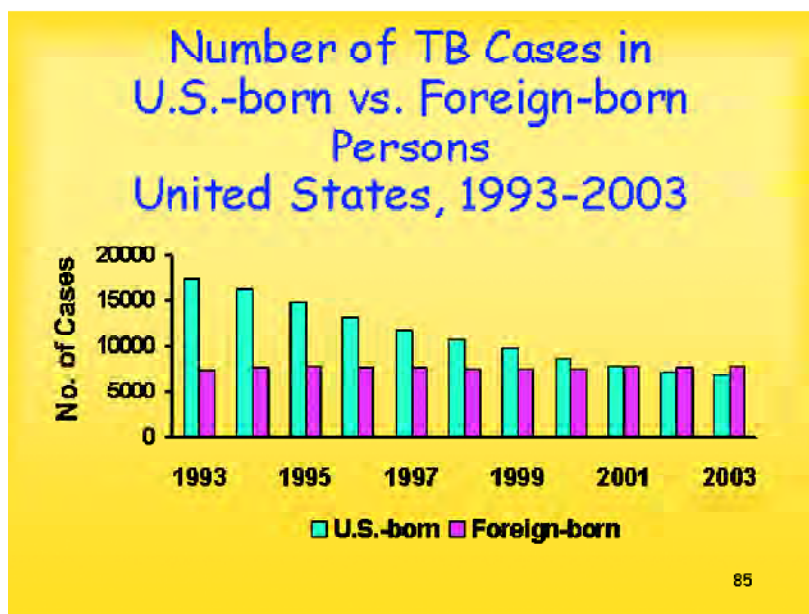
M. bovis in humans:

Mary Grace Stobierski, DVM, MPH, DACVPM
Michigan Dept Community Health

Tuberculosis has been known since ancient times. Worldwide, 2-3 million deaths are attributed to tuberculosis, with 8 million new cases annually. In the United States, surveillance data makes no distinction between *M. bovis* and *M. tuberculosis*, thus the true prevalence of disease caused by *M. bovis* is unknown, but is likely low. In general, when looking at *M. TB*, 10 percent of newly infected persons will develop active disease. Persons with impaired immune systems, caused either by old age or another disease, are at a greater risk of developing active disease. Persons who do not develop active disease are said to have latent infection. Preferred treatment of latent infection is 9 months of the antibiotic isoniazide.

In 2002, a 74 year-old male resident of Alpena County was diagnosed with tuberculosis after *M. bovis* was isolated from a pulmonary specimen obtained just prior to death. The cause of death was unrelated to *M. bovis*. The strain of *M. bovis* from the patient matched *M. bovis* circulating in Michigan's wildlife/livestock. An attempt was made to determine how and when this individual was infected with bovine TB. As a youth he had exposure to unpasteurized dairy products. He also had a lifelong history of hunting – but not for 10 years prior to death. Most of his life was spent in Southeast Michigan; he moved to Northern Michigan at retirement. He was exposed to a family member with TB over 40 years earlier.

It is generally believed that people involved in the production of milk and meat, and slaughterhouse workers are at increased risk for bovine TB. However, new risk groups in Michigan include hunters, trappers, taxidermists, and venison processors. Additional risk factors include drinking unpasteurized milk or milk products, exposure to *M. bovis* in wildlife/livestock, and diminished immune system response. In Michigan, five cases of *M. bovis* have been reported in people in the past five years. Three of the five cases were in U.S. -born individuals and remainder in foreign-born individuals residing in the U.S. less than two years. Two of the three U.S.-born cases have matched the *M. bovis* strain in Michigan cattle and wildlife, the case mentioned above and an additional case infected in 2004 (to be discussed by the next speaker).



Bovine TB diagnosed in Michigan hunter

Susan Spieldenner, RN,BS
MDCH

On October 1, 2004, opening day of bow season, an experienced hunter took a white-tailed deer in Alcona County. Upon opening the chest cavity the hunter immediately recognized signs of bovine TB infection. While field dressing the deer, he sustained a small puncture at the base of his left first finger, which at the time, he did not consider significant. Unfortunately, instead of being reported to the Michigan Department of Natural Resources, the deer was buried.

The hunter, a 29-year-old male, was a long-time resident of northern Lower Michigan, with no known previous exposure to tuberculosis. He sought treatment approximately 2 ½ weeks following the injury, when his finger became hot, swollen and painful. He was first seen by his family doctor who ordered general oral antibiotic treatment. A tuberculin skin test was also placed at that time which was later read as negative. Approximately one week later when there was no improvement, the hunter again sought treatment. He was admitted to an in-patient health care facility and seen by an orthopedic specialist. Intravenous antibiotic treatment was initiated, and the finger was opened and drained. Due to the hunter's lack of response to general antibiotics and his self-reported history of injury while field dressing a deer with gross signs of tuberculosis infection, he was diagnosed with cutaneous, non-infectious tuberculosis. Standard four drug therapy for tuberculosis was begun. A culture of the finger grew *M. bovis*. Genotyping matched the hunter's isolate to the deer strain found in Michigan. The hunter is expected to make a complete recovery.

This is the first documented case of *M. bovis* transmission from deer to hunter, and emphasizes the importance of hunter education in both the recognition of TB and what to do if exposed. While the clinical course of this case was relatively routine and the contact follow-up responsibilities minimal, it highlighted the need for good communication between various departments and stakeholders. The transmission of bovine TB through hunting activities impacted not only local and state health departments much like any other case of reported TB, but also other state agencies including the Michigan Department of Natural Resources and the Michigan Department of Agriculture, legislators, small business associations, and, most of all, other hunters.



MDCH TB Laboratory 2004 activities update

Dale E. Berry, B.S.

Michigan Department of Community Health
TB/Mycology Laboratory

The MDCH TB/Mycology Laboratory provides services in Michigan to assist in the diagnosis of disease caused by *Mycobacterium* species. Diagnostic services are provided for both humans and animals. The laboratory tests approximately 8,000 clinical samples and 2,000 referred culture isolates, using a variety of methods including acid fast slide examination, rapid culture isolation, genetic probe, chromatographic profiling, biochemical identification, susceptibility testing and DNA fingerprinting.

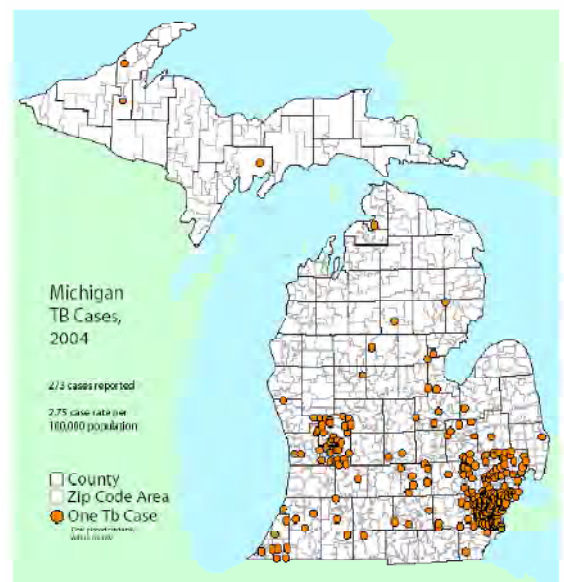
Approximately 270 new cases of human TB are diagnosed in Michigan annually. The vast majority of cases are due to *Mycobacterium tuberculosis*, not *Mycobacterium bovis*, which is responsible for bovine TB. The ability of MDCH laboratory to quickly and accurately diagnose TB infection and to specifically determine the type of TB is not only important for patient care and public health, but also important to Michigan's effort to eradicate bovine TB from cattle and wildlife.

Human cases of tuberculosis in Michigan

Year	<i>M. TB</i>	<i>M. bovis</i>
1997	373	3
1998	385	2
1999	351	0
2000	287	1
2001	330	0
2002	315	1*
2003	243	2
2004	273	1*

* same strain as found in Michigan deer and cattle.

The MDCH TB/Mycology Laboratory has over 25 years' experience in testing a variety of animals, including deer, elk, cattle, raccoon, opossum, cat, dog, coyote, fox, badger, elephant, black rhino, chimpanzee, reindeer, otter, camel, turkey, skunk, mink, and fish. The laboratory has provided testing services for, and collaborated with, the USDA, national Veterinary Services Laboratory, MDNR and MDA. MDCH continues to look forward to collaborate with these public health partners to eliminate tuberculosis from Michigan.



Communication Activities

Bovine TB Education Campaign

Bridget Kavanagh-Patrick

Infectious Disease Liaison

Bovine TB Eradication Project Coordinator

Michigan Department of Community Health

The Bovine Tuberculosis (TB) Eradication Project, a collaborative interagency effort established in 1997 to eliminate bovine TB from Michigan, has seen the successful use of sound science to both measure and reduce disease prevalence in Michigan's wildlife and cattle.

With the cooperation of Michigan hunters the Department of Natural Resources has seen the prevalence rate of bovine TB in wild white-tailed deer go from 4.7 percent in 1998 to the current 1.7% prevalence rate in 2004.

The Michigan Department of Agriculture, with the cooperation of livestock producers, has tested every known cattle herd in the state and found that the disease is focused in the northern Lower Peninsula, with a hot area near and around the free-ranging TB positive deer in Deer Management Unit 452 in Northeastern Lower Michigan.

As policies begin to work and the disease eradication effort shows promise, we expect to encounter challenges to the protocols and policies from both agriculture and natural resources stakeholders.

Experience and history show however, that policies that are working need continued support and that is where the 2005 education campaign kicked in. We anticipated challenges to baiting and feeding bans, livestock feeding practices and animal testing, but chose to head off these challenges through public relations and communications.

We formulated a focus group made up of individuals including beef and dairy producers and hunters who are familiar with the program's goals. The bovine TB (bTB) Focus Group met four times to brainstorm and discuss advertising and communication proposals.

Material developed as a result of the focus group meetings was published in special interest group outdoor and farming magazines, on television programs, radio programs and in newspapers. Visits with several stakeholders and opinion leaders took place in Alpena, Rogers City, Hillman, Atlanta, Gaylord, Petoskey and Charlevoix. Cinema advertising on risk mitigation strategies occurred over several weeks. Bumper stickers and posters were passed out at Chamber of Commerce offices, Extension, DNR and MDA field offices, rest areas and hunting license outlets. Two brochures were developed, one an update of the program activities and a second with risk mitigation suggestions for livestock producers. These messages and communications gave support to the Bovine TB Eradication Project's public relations efforts already in place.

Michigan Department of Natural Resources Updates

Management of bovine tuberculosis in Michigan deer

Dr Stephen M Schmitt, Dr Dan O'Brien, Dr Graham Hickling
Michigan Department of Natural Resources

Since 1994, the state of Michigan has recognized a problem with *Mycobacterium bovis* in wild white-tailed deer from a 13-county area in northeastern Lower Michigan. In 2004, surveillance activities for *M. bovis* continued statewide, with an emphasis on the northern half of the Lower Peninsula. That year, 28 white-tailed deer cultured positive for *M. bovis* from 15,127 deer submitted for testing.

Since the index cases were first identified, 138,394 free-ranging deer have been tested for bovine tuberculosis; 509 infected animals have been found. Increasingly, the spatial epidemiology of the disease is revealing a highly focal, clustered pattern. Approximately 97 percent of all positive deer identified to date originated from a five-county area. Moreover, within that area, the vast majority of positive deer were from Deer Management Unit (DMU) 452. Even within DMU 452, the spatial arrangement of cases is highly clustered, in spite of the fact that the sampling effort has been relatively uniform geographically.

Strategies for eradication of bovine TB from Michigan wildlife continue to focus on 1) reducing deer population densities to biological carrying capacity and 2) reducing artificial congregation of deer by restriction or elimination of baiting and feeding. These strategies have been implemented through provision of extra rifle seasons and unlimited antlerless deer permits and by prohibition or restriction of deer baiting and feeding. In the five-county area most affected by bovine TB, deer numbers have declined approximately 38 percent since 1995. The achievement of this substantial population reduction highlights the critical role that hunters have played in the control of TB in Michigan. Nonetheless, persistent focal areas of high density on private land remain problematic. Since 2002, baiting and feeding have been prohibited in the seven counties from which approximately 98 percent of all bovine TB-positive deer have originated. Policy makers have committed to keeping these regulations consistent for a five-year period in order to improve compliance and enforcement. The overall scope of baiting and feeding has declined dramatically since 1997, with large-scale feeding largely a thing of the past. While some illegal baiting and feeding continues to occur, the size of these sites is substantially reduced, and heightened enforcement is expected to reduce the practice further over the next several years.

While much work remains, substantial progress has been made toward eradication of bovine TB from Michigan wildlife. Apparent prevalence in the core area of the outbreak, DMU 452, was 1.7 percent in 2004, a decrease of 64 percent since 1995. Trend analysis of prevalence data from 1995 to 2004 indicates a statistically significant decreasing trend. And two methods of estimating TB transmission rate in the deer herd in DMU 452 are showing statistically significant decreasing trends.

Michigan's TB intervention strategies are working; however, it is too early to claim victory in eradicating the disease. The need to stay the course is important, but may be difficult, due to ever increasing pressure from a variety of sources to lessen these intervention strategies.

Summary of Michigan wildlife bovine tuberculosis surveillance

Updated October 4, 2005 by Michigan Department of Natural Resources Wildlife Disease Lab

Initial Occurrences

In 1975, a 9-year-old female white-tailed deer from Alcona County, and in 1994 a 4-year-old male deer from Alpena County were submitted with lesions consistent with and testing positive for bovine TB.

White-tailed Deer TB Surveillance

Year	Number Positive	Total Tested
1995	18	403
1996	56	4,966
1997	73	3,720
1998	78	9,057
1999	58	19,496
2000	53	25,858
2001	60	24,278
2002	51	18,100
2003	32	17,300
2004	28	15,128
2005	0	3,242
Grand Total	509	141,550

2005: POSITIVE

White-tailed Deer

0 pending

Other Wildlife

1 coyote (Montmorency)

2004: POSITIVE

White-tailed Deer

Alcona 9

Alpena 8

Montmorency 5

Oscoda 3

4-County Area 1

Presque Isle 2

Elk Surveillance

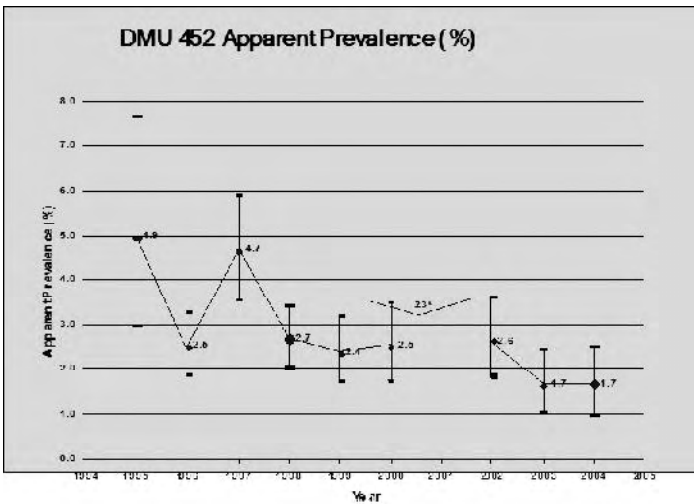
- 1,441 elk have been tested from May 1996 to the present
- 49 tested in 2005, 109 tested in 2004, 97 tested in 2003
- One elk from Montmorency tested positive in 2000
- One elk from Montmorency tested positive in 2001
- Two elk - Presque Isle & Montmorency - tested positive in 2003

Moose Surveillance

- 8 tested in 2005, 21 tested in 2003 & 2004 - all tested negative

Carnivore (Non-cervid) Surveillance 1996-2002

- 1,514 carnivores tested (16 species). 43 tested positive for bovine TB: 19 coyotes, 8 raccoons, 7 black bear, 4 bobcat, 3 red fox, 2 opossum



White-tailed deer management in Northeast Lower Michigan: Population, hunting, and harvest trends

Brent Rudolph

Wildlife Research Specialist, Michigan Department of Natural Resources

The overall goal of the DNR is to manage Michigan’s wild white-tailed deer population. The use of scientific studies guides the management practices. A major priority is to maintain a healthy deer herd. In regards to bovine TB, eradication of bovine TB-infected animals is being accomplished by elimination of infected animals from the wild deer population and reducing transmission of disease from infected to uninfected animals. Other DNR considerations regarding deer management include assessing the carrying capacity of the range, determining the effects on native plants, farming, and public safety.

Management strategies to eradicate bovine TB from free-ranging deer in Michigan include removing conditions that unnaturally concentrate deer, increasing harvest of deer and evaluation of these practices. Unnatural concentration of deer, as occurs with feeding and baiting, spreads disease, including bovine TB. Therefore, decreasing conditions that cause deer to congregate would be expected to decrease the spread of disease. Decreasing congregation of deer is done primarily by eliminating feeding and baiting of deer. Increasing the harvest of deer, by hunting in the fall and winter, would be expected to reduce the population and therefore the encounter rate. Evaluation of hunting participation and harvest trends, as well as size and structure of the deer population, is a useful tool to determine our success as well as where we should focus our efforts in the future.

Evaluation, monitoring and management of bovine TB in while-tailed deer occurs on three different levels: statewide, the 5-county area, and DMU 452. The 5-county area is where the majority of bovine TB has been diagnosed in both deer and cattle, and includes Alcona, Alpena, Montmorency, Oscoda, and Presque Isle counties. Deer Management Unit (DMU) 452 is located at the junction of the first four counties listed, and is where most bovine TB-positive deer have been found.

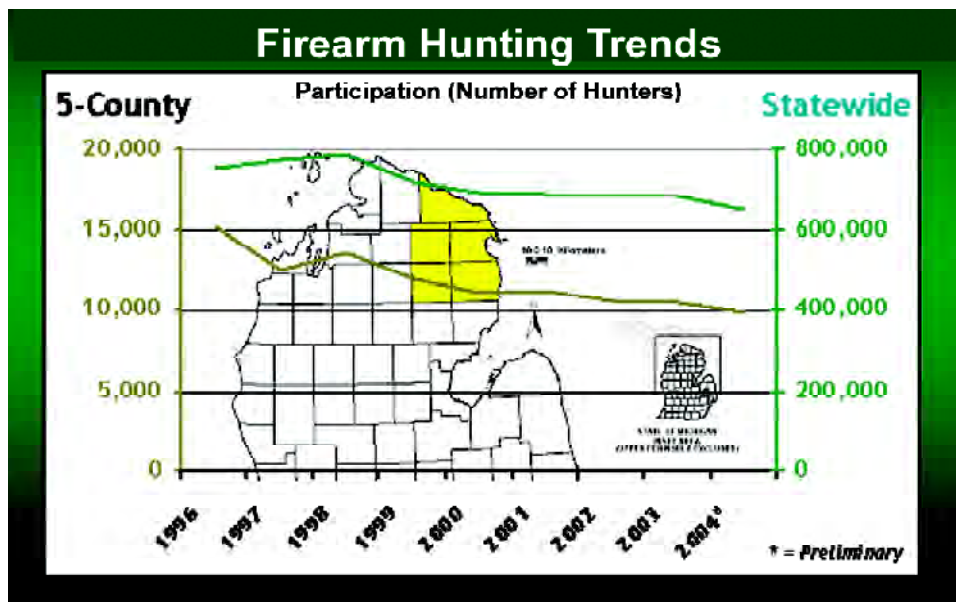
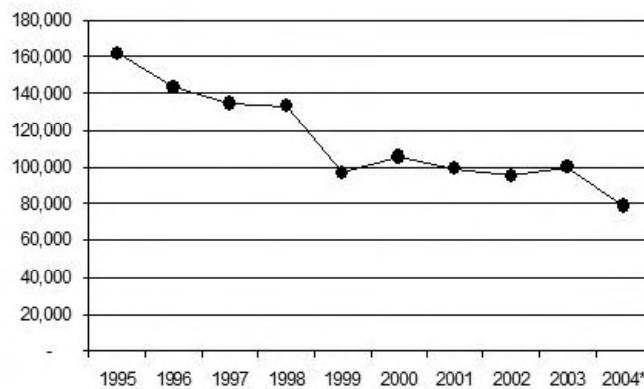
Participation in hunting, assessed as both number of hunters and hunter days, has decreased in the 5-county area, and this decrease parallels the statewide decrease in hunting.

Total number of deer harvested, during archery and firearm season, statewide, in the 5-county area, and DMU 452 from 2001 to 2004 is shown in table 1, below.

Table 1:	2001	2002	2003	2004
Michigan	400,746	416,711	433,874	387,706
5-county area	20,927	18,455	22,420	16,053
DMU 452	5,104	5,338	6,212	3,609

There has been a downward trend in the number of harvested deer in the state, 5- county area and DMU 452. The decrease in the 5-county area is slightly greater than that statewide. However, there is also an estimated decrease in the deer population in the 5-county area (figure 1), suggesting that hunting efforts in that area have been successful in decreasing the deer population.

Figure 1. Estimated deer population in the 5-county area, 1995-2004.

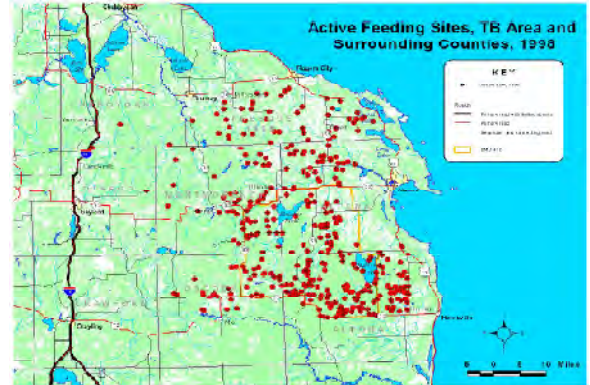


Tales from the sky – normal agricultural practices or illegal feeding?

Glen Matthews

Michigan Department of Natural Resources, Wildlife Division

Control of supplemental deer feeding is a cornerstone of efforts to reduce bovine TB transmission between wild white-tailed deer in northeast lower Michigan. Aerial monitoring has proven to be an effective method of assessing winter feeding of deer. In 1997, prior to the ban on deer feeding, flights were conducted in the 5-county TB management area to identify feed sites. From 1998 to the present, flights have been conducted annually to quantify the number of deer feed locations and characterize the level of compliance with the feed ban. MDNR planes and pilots fly systematic flight lines at consistent elevations with two observers. Some variability in conditions and coverage areas make precise statistical comparison between years difficult. However, it is quite evident that the number and size of feed sites declined dramatically after the feed ban. Feed locations are recorded via GPS and are used to supplement law enforcement efforts.



DNR regulations and enforcement strategies in the 5-county area

Chief Alan Marble
Michigan DNR

Prior to May 1, 1998, there were no restrictions on baiting deer in Michigan. At that time, bait was defined as a five-gallon limit in the bovine TB-area only. On July 8, 1999, baiting was banned in any county having a deer diagnosed with bovine TB. The limit for the Lower Peninsula was decreased to two gallons; the Upper Peninsula remained at five gallons. On October 1, 2001, baiting was restored in DMU 452 to one gallon per day from October 1 to November 30. On June 8, 2002, regulations were enacted that prohibited all use of bait in the seven northeast counties (Alcona, Alpena, Crawford, Montmorency, Oscoda, Otsego, and Presque Isle). These regulations remain in effect. Bait may not exceed two gallons in the remainder of the state.

As is true in every enforcement scenario, discretion may be applied in the enforcement of the two-gallon limit; however, fair enforcement is critical to assuring hunters of their opportunity to see and take deer during the season.

Compliance with baiting regulations continues to be below acceptable levels. Conservation officers are working with county prosecutors, courts and landowners to increase awareness of the problems associated with unlawful baiting practices and to improve the rate of compliance, to better protect the state's deer population.

Future enforcement strategies include conducting more aircraft surveillance patrols, mandatory license revocation for violations, hiring more conservation officers, targeting low compliance areas with increased effort, and enhancing second offender investigations. Additional efforts could include educating the courts and prosecutors regarding importance of the issue, listing fines in a hunting digest, and intensifying a public relations campaign to educate the public.



Michigan Department of Agriculture Activities Updates

Michigan animal identification and tracking program

A cooperative program between USDA, APHIS, VS and MDA

Kevin Kirk

Animal Industry, MDA

The bovine TB issue has positioned Michigan to be one of the first states in the nation to have all cattle premises with premise identification and all animals officially identified. As of May 31, 2005, there are 15,644 livestock premises identified in a database. Electronic identification (EID) is used in 1,945 of these premises, and 120,024 animals have been identified with EID tags. In addition, 11 animal markets throughout the state have been fitted with EID readers. As of June 2005, 41,132 animals at these markets have been identified. EID readers have also been installed in seven large cattle processing plants. In addition, 20 small processors are collecting tags for MDA.

On August 27, 2004, MDA announced a cost share for EID tags for the Upper Peninsula. As of June 1, 2005, over 232 producers have utilized 42,006 tags.

In addition, movement within and outside of the Modified Accredited (MA) Zone requires a permit, which can be obtained online. Total permits issued from January 1, 2002 to May 31, 2005 was 9,854, with a total of 48,592 head of cattle moved.

The goal of the National Animal Identification System (NAIS) is to identify animals and premises in contact with a potential foreign animal disease within 48 hours. The required components for this system are premise registration, animal identification and animal tracking. Michigan is well on its way to being compliant with all components of the NAIS.



Bovine tuberculosis eradication in Michigan livestock

Michael S Vanderklok, DVM
MDA

Statewide surveillance for bovine TB in cattle herds from January 1, 2000 to January 1, 2005 has resulted in the testing of over 17,000 herds (32,798 herd visits) with over 1,049,000 animals tested. As of June 2005, no herds infected with bovine TB have been found outside the Modified Accredited Zone.

Surveillance for bovine TB in privately owned cervids from January 1, 1998 to January 1, 2005, has resulted in 33,802 negative live animal tests and 3,816 negative slaughter tests. As of June 2005, no additional tuberculosis infected herds have been identified.

The table lists the number and type of herds identified with bovine TB since 1997:

Year	Cervid	Beef	Dairy
1997	1		
1998		3	
1999		1	
2000		5	2
2001		8	
2002		5	2
2003		4	2
2004			1

Both the herd prevalence and the number of infected herds identified have decreased during each testing cycle.

Surveillance activities continue; over 25,000 head of cattle have been inspected at the Mackinac Bridge, with 44 subsequent investigations, and six violations. Statewide identification efforts are underway. All Michigan animals must be officially identified prior to movement. ID is allocated to premises. Because of the ongoing efforts, Minnesota, Ohio, and Indiana have changed their import restrictions for Michigan cattle, reducing marketing barriers. Additional efforts are underway to identify and control risk of transmission of bovine TB from wildlife.

Wildlife TB risk mitigation: A new educational effort by the Michigan Department of Agriculture and USDA Wildlife Services

Brett Nelson, MDA and Tim Wilson, USDAWS

It has been well established that wildlife infected with bovine TB can contaminate feed. Cattle that eat contaminated feed can become infected. The overall goal of the program is to decrease disease transmission between wildlife and cattle. The first step in this educational campaign is to inform producers about the potential risks from wildlife and to provide strategies to decrease these risks.

A series of informational meetings were hosted by MSU Livestock and Extension Agents from northeast Lower Michigan. Additional meetings for private, state and federal veterinarians were hosted by MDA, Animal Industry Division and USDA, Veterinary Services.

Meetings were designed to inform producers of disease transmission risks; what they could do to minimize the risk of bovine TB infection from wildlife; and what prevention services are available. It is important that producers know that wildlife-livestock interactions create TB risks for farms. They are made aware of the factors that make a farm appealing to wildlife. They are encouraged to formulate a strategy to minimize wildlife risks and to take pro-active countermeasures to reduce the potential of bovine TB transmission.



Services to reduce the risk of TB transmission between wildlife and cattle, available from MDA and Wildlife Services, include wildlife risk evaluations on farms, deer removal under disease control permits and fencing of feed stuffs.

Twenty-five producers, 25 private practice veterinarians, and 12 regulatory veterinarians attended the meetings. Most producers were not aware of the services available before the meetings. Future projects include developing criteria for prioritizing farms in the Modified Accredited Zone at highest risk for contracting bovine Tb from wildlife, so that efforts can be concentrated in these areas.

Feeding & baiting complaint response activity: A Michigan update

Stephen Shine

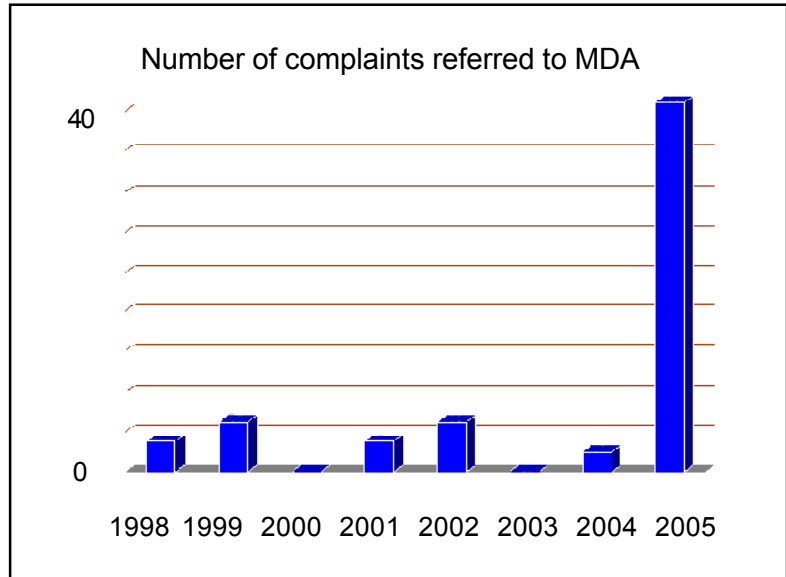
Michigan Department of Agriculture

The Wildlife Conservation Act (WCA) defines *bait* as grains, minerals, salt, fruit, vegetables or other materials which may lure, entice or attract deer. Baiting is defined as to place, deposit, tend, distribute, or scatter bait to aid in the taking of a deer. Bait is not wildlife plantings or food plots, foods scattered as the result of normal agricultural planting or harvesting practices, foods available as the result of normal agricultural practices for livestock feed where the livestock are present, or standing farm crops under normal agricultural practices.

The WCA defines *feed* as a substance composed of grain, mineral, salt, fruit, vegetable, hay or any other food material that may attract deer or elk. Feeding is defined as depositing, distributing, or tending of feed in an area frequented by deer or elk. Feed is not, plantings for wildlife, standing farm crops under normal agricultural practices, or agricultural commodities scattered solely as the result of normal agricultural practices.

Feeding is not feeding birds or scattering of feed solely as the result of normal logging or agricultural practices. In addition, feeding is not the storage or use of feed where livestock are actively consuming the feed, the feed is covered to exclude deer or elk, or the feed is in a storage facility consistent with normal agricultural practices.

The graph below indicates the number of investigations into complaints or potential feeding violations on agricultural premises that have been referred to the Michigan Department of Agriculture since 1998.



U.S. Department of Agriculture Updates

An update of activities to reduce the spread of bovine tuberculosis in Michigan

Pete Butchko
USDA, APHIS, WS

Wildlife Services (WS) has been involved in several aspects of the bovine TB eradication project. These include deer removal, wildlife risk evaluations, fencing and assistance with research.

Deer removal assistance is provided under landowners' Disease Control Permits issued by DNR. These permits allow hunting of deer out of season. The meat is donated to charity, and the heads are submitted for TB testing. To date, 122 deer have been removed from 11 farms under Disease Control Permits.

The goal of Wildlife Risk Evaluations is to help producers identify risks from wildlife and how to reduce those risks. This program is a cooperative effort with MDA and USDA. Risk assessments are performed on TB infected and non-infected farms and the information may be used in test-and-remove herd plan recommendations.

The goal of the fencing program is to provide practical and effective fencing to exclude deer from stored feed in an attempt to reduce the spread of TB from potentially infected deer to cattle. Research suggests *M. bovis* can persist on feed up to 12 weeks at 46°F, providing data to support preventing contact of deer with cattle feed. Therefore, fencing and proper feed storage may reduce risk of infection from deer via stored feed.

WS has constructed 26 fences and has funded 100 percent of the materials and labor. After construction, the farm is responsible for maintenance and operation of fence. WS conducts periodic fence evaluations. The average length of fence is 1,170 and the average size is $\frac{3}{4}$ acre (range: 0.1 to 8 acres). The total cost to date is approximately \$202,000. The average cost per linear foot (including supplies and labor) is \$6.77, ranging from \$6.09 for electric fence to \$7.11 for woven wire fence. Average fence cost is \$7,918; with the average cost of electric fence at \$6,165, and that of woven wire \$9,399.

The effectiveness of the fence is evaluated by periodic visits to conduct track counts both inside and outside of fence, observations on how fence is maintained, and interviews with producer to evaluate effectiveness. Evaluation is to occur over a 24-month period, with an average of visits of 15 per farm. As of June 2005 the fences appear to be extremely effective, with no observed deer intrusions over woven wire or high-tensile electric and only one noted deer intrusion through Electrobraid™ fencing.

Evaluation of farmer participation and compliance reveals that most (61 percent; n=14) have no problems using the fence. However there have been problems with fence operation and maintenance in approximately 39 percent (n=9) of cases. These issues include: occasionally leave the gates open (n=3), frequently leaving the gates open (n=3), or producers have failed to either repopulate with cattle, repeatedly left feed outside enclosure, repeatedly left gates open, or repeatedly failed to keep electricity on (n=3).

Problems with fencing in the past include poor craftsmanship by fence contractors and excessive delays in finishing construction. The solution to this problem was a cooperative agreement with MDA in the beginning of 2005.

Epidemiologic update for the Michigan bovine TB program

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The gamma interferon test has been used statewide when an animal responds to tuberculin on the caudal fold test (CFT). Gamma interferon is a blood test used in place of the traditional comparative cervical test (CCT). It essentially measures the same response as the CCT, but in a test tube, and therefore requires less cattle handling and time.

Comparison of bovine TB tests:

	Sensitivity	Specificity
CFT	85-90%	95-98%
CCT	75%	98%
Gamma interferon	85%	93%

From January 2005 to May 2005, 3,200 gamma interferon tests were conducted statewide. The majority of tests (2132) were done in the Modified Accredited Zone. Statewide, 220 tests were positive, 129 in the Modified Accredited Zone and 91 in the Modified Accredited Advanced Zone. False positive results were more common in both zones in the late winter and early spring. Overall there have been more false positives in the Modified Accredited Advanced Zone. These observed differences may represent a “more reactive” state of the animal due to increased environmental exposure to bacteria.

The gamma interferon test relies on live white blood cells. To obtain useful test results, testing protocols must be followed and test samples must be received by the Michigan State University Diagnostic Center for Population and Animal Health (DCPAH) within 24 hours of the samples being collected.

Status of the U.S. bovine tuberculosis eradication program

Steven Bengtson

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Presented by

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Currently there are 47 states (plus Puerto Rico and the Virgin Islands) that are classified as TB Accredited-free. California was granted Accredited-free status in April of 2004. New Mexico and Texas are Modified Accredited Advanced (MAA) and Michigan has split state status, with the northeast corner of the Lower Peninsula classified as Modified accredited (MA) and the remainder of the state MAA.

For the first half of 2005, slaughter surveillance has identified 21 cases compatible with bovine TB and 15 cases have been confirmed. Seven of these cases originated from Mexico. In addition, most slaughter plants are compliant with the required submission rates.

The new version of the UM&R went into effect January 1, 2005. A revised rule is being drafted to strengthen the import requirements of roping steers. Plans are also under way to have Michigan's Upper Peninsula classified as TB Free*. The new UM&R also lists major changes in surveillance standards to maintain state TB status. Surveillance must be sufficient to identify TB, if it exists, at 0.05 percent disease prevalence or lower with 95 percent confidence. At slaughter facilities, granulomas must be submitted at a rate of at least one submission for every 2,000 adult cattle killed. The new rules establish a system for monitoring accredited veterinarian tuberculin test response rates and taking corrective actions and officials must implement a plan to collect critical surveillance data and document plant visits.

* [editor's note: Michigan's Upper Peninsula received Bovine TB-Free Status effective September 30, 2005.]

Bovine TB Research Projects in Michigan

Using an agent-based model as a tool for managing bovine TB in Michigan

Brandi D. Hughey
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Thomas DeLiberto
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We use models every day, perhaps without knowing it. Known information or data is entered into a model to predict certain behaviors, for example hurricane tracking. Based on what is known about past storms, and current storm data, predictions can be made about the present storms behavior. This study was designed to be a useful tool in making management decisions and to help MDA with developing risk assessments. The information from the model will provide farmers who may be reluctant to invest in biosafety measures without evidence, the evidence they need to make informed decisions.

The objective of this project was to build, verify, and validate a multi-species (deer & cattle) simulation model that can reproduce TB prevalence patterns & trends. The model includes the deer population model, to which bovine TB and then cattle are added. The final phase is hypothesis testing.

Deer data, including population estimates, harvest estimates, biodata, radio-collared deer data, and TB data are entered into the model. Cattle data, including the MDA TB testing from 1994 to March 2004 as well as risk assessments of TB positive farms, is also entered into the model.

The first phase of model development is the deer population model. The temporal/spatial aspects of the model include the basic biology of deer . In the model, deer have home ranges assigned by season, sex and age; an estrus cycle, that bucks can impregnate multiple does in the vicinity, and that gestation and birth occur. It appears that bucks may have “riskier behavior” because they are more social. After deer are added to the model, transmission of bovine TB is added to the model, and finally cattle are added as farms, not individual animals.

Using this model it appears that prediction depends on the precision of population estimates. This model requires high density in order to maintain high prevalence. Home range size alone is not a major factor in transmitting disease, and disease transmission requires some difference in behavior. The model supports strategies of lowering deer population by allowing harvesting of does and young bucks. In addition, since bucks have riskier behavior, taking older bucks may decrease disease transmission.

Achievements of National Wildlife Research Center's five years of research on Bovine Tuberculosis– The wildlife/livestock interface in Michigan

Mike R. Dunbar, DVM

Project Leader for Rabies and Bovine Tuberculosis Research

This presentation covers several research projects designed to obtain basic information on bovine tuberculosis in wildlife reservoirs and vectors. Goals of the program include: to develop methods that decrease transmission of bovine tuberculosis among wildlife and livestock; to develop a method to evaluate the effectiveness of management practices on reducing the prevalence of diseases in wildlife; and to produce risk assessments for transmission of bovine TB among wildlife and livestock.

The first study was designed to evaluate interactions between wildlife and cattle in northeastern Michigan and to determine if wildlife visit areas commonly used by cattle when the cattle are absent. Visual observations over two seasons revealed that transmission between wildlife and cattle is more likely to be indirect. This results from deer using food resources and pasture.

The next study, entitled, "The Role of Wildlife in Bovine Tuberculosis in the United States with Preliminary Results from Northern Michigan," involved the bacterial culture results as of March 2005. Samples were collected for culture from 1,037 animals from or near TB infected cattle farms. Of the 962 culture results to date, 10 are culture positive for *M. bovis*. This includes five raccoons, four opossum and one gray fox.

The next study was designed to determine if prevalence of bovine TB in deer and coyotes is related. Coyotes taken by trappers were field necropsied and lymph nodes were sent to NVSL for histology, PCR, and culture. Preliminary data from coyotes taken from DMU 452 showed that 46 of 151 coyotes tested positive for bovine TB - a prevalence of 30 percent. Given the small home range of coyotes, and that coyotes become infected with bovine TB through contact with deer, coyotes would be a useful sentinel animal for bovine TB.

The next study was designed to determine the role of raccoon and fox in the ecology of bovine tuberculosis and to evaluate if these animals could be used as sentinel animals for bovine TB. Raccoons (n=61) were equipped with radio collars and located via radio telemetry. Location was done three times per week to ascertain home range size, spatial distribution, dispersal characteristics and proximity to cattle. Average home ranges for male raccoons is 0.824 km² and females is 0.608 km².

Additional studies were designed to determine if various effigies were useful in deterring deer from feeding in specific areas. They were not. However, deer were 75 times more likely to feed on cattle feed in pastures without dogs. In addition, deer were about 40 times more likely to contact cattle directly in pastures without dogs.

Evaluation of a new strategy for control of bovine tuberculosis in Michigan white-tailed deer

Progress report: Year 2

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Wildlife Division, DNR

Graham Hickling
Department of Fisheries and Wildlife, MSU

Graham Nugent
Manaaki Whenua Landcare Research (New Zealand)

Peter Butchko
USDA, APHIS, WS

The State of Michigan is striving to eliminate bovine TB infection among free-ranging white-tailed deer in the northeastern Lower Peninsula. Aggressive reduction in the overall deer population may help to further reduce TB prevalence, but this course of action is unacceptable to many hunters and landowners. Targeted culling of sick deer would likely be more acceptable to these stakeholders.

With that in mind, the State of Michigan is evaluating a new intervention strategy that may be more acceptable to many hunters and landowners. The new strategy is based on live-trapping and TB-testing of wild deer, and removal of positive animals. This strategy is not intended to replace initial strategies, but may assist them in eliminating TB from the deer herd.

The Michigan Department of Natural Resources pilot-trialed the new strategy in a township with relatively high TB prevalence within DMU 452 during the winter of 2003. The results of the pilot are cause for optimism on a number of fronts. The project was well received and supported by the public. Appreciable numbers of deer were captured with reasonable efficiency and low mortality. Tracking and removal techniques worked well. The one facet of the project that failed was the blood test. The Cervigam blood test proved not to be accurate in detecting TB positive deer. While the blood test did not perform as expected, the capture, handling and tracking techniques nevertheless provided us with a field-tested protocol for obtaining deer for other diagnostic tests and future control projects. For example, should a suitable TB vaccine ever be developed, it could be delivered by this protocol.

An effort to develop a more accurate blood testing procedure was the focus of the pilot during the 2004 hunting season. Hunters were asked to collect blood from deer harvested in DMU 452, and to submit the blood and deer heads to a deer check station. The lymph nodes from the deer heads were cultured for TB and culture results compared with results from four TB blood tests. One blood test (Rapid Test) that can be done in 10-15 minutes in the field with whole blood looks promising.

Further trials with the Rapid Test (RT) may show it to be acceptably accurate for the purposes of the new strategy. If so, the RT's ability to use small quantities of whole blood and provide near instant results (which could obviate the need to collar, release and track down suspect deer, resulting in substantial cost and labor savings), would justify a more rigorous evaluation of its potential application in a test-and-cull strategy.

Bovine tuberculosis (*Mycobacterium bovis*) in the Riding Mountain National Park regional ecosystem

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Manitoba, Canada

Bovine tuberculosis reappeared in the Riding Mountain National Park (RMNP) regional ecosystem in 1991 when a cattle herd was detected with the disease. Since that time, there have been five additional outbreaks in cattle in the area near RMNP. There have also been 29 confirmed cases of bovine TB in elk and six cases in deer. Most of the positive elk and deer have been found within the western portion of RMNP or adjacent to the park boundary. During the winter of 2004-2005, the two main wildlife management objectives were: to determine the geographic distribution of bovine TB in elk and deer, and to initiate a deer movement and distribution study. Surveillance was enhanced in areas where bovine TB has not yet been identified. A primary focus included increased sampling in the Duck Mountain (DMPP) region, a protected area 30 km north of RMNP. During the hunting season, 250 elk and 1,400 deer samples were collected and examined. Two hunter killed deer from the RMNP area were confirmed positive for bovine TB. As of June 2005, three elk (two from RMNP and one from DMPP) were confirmed positive for bovine TB.

***Mycobacterium bovis* fluorescence polarization**

Mick Jolley, Mohammad Nasir, Ed Corrigan
Diachemix

Anna Romanowska, Om Surujballi

Animal Diseases Research Institute, Canadian Food Inspection Agency:

Presented by Ed Corrigan:

One of the drawbacks of the current and most widely used tests for bovine tuberculosis, the caudal fold test and the comparative cervical test, is that these tests require two visits from the veterinarian. The first visit involves injecting the tuberculin antigen, and the second involves reading the test. Not only does this involve the veterinarian's time, but the animals must be handled twice. A single screening blood test would dramatically decrease the time and effort involved in surveillance for bovine TB.

The goal is to develop a commercially available, serological method (blood test) for screening and surveillance of *Mycobacterium bovis* in cattle, deer, sheep and goats. The fluorescence polarization test is highly automated, uses stable reagents, and has a reaction time of minutes. The test involves the use of a labeled antigen, which binds to a bovine TB antibody, if present. The labeled compound is detected. Fluorescence polarization test is a promising serological tool for general surveillance of multiple species.

Advances in blood-based TB tests for cervids

Ray Waters

National Animal Disease Center, Ames, Iowa

An accurate blood test for bovine tuberculosis would be useful in surveillance of wild and captive cervids. Such a test would decrease handling and provide more rapid diagnosis. A rapid or “deer side” test would prove to be particularly useful. The United States Animal Health Association (USAHA) has granted conditional approval to the Cervigam, to be used in conjunction with skin tests. To assess the accuracy of the test, samples from 200 white-tailed deer, reindeer, fallow deer and elk from various locations in the U.S. will be tested. To date, samples from 171 white-tailed deer, 35 reindeer and 21 elk have been tested. The responses to the test indicated that it may be useful for detection of bovine TB in reindeer, but less useful in white-tailed deer and elk.

Effects of skin testing on interferon-gamma production in cattle

Mitch Palmer, W Ray Waters, Tyler C Thacker, and KP Lyashchenko

NADC, Ames, Iowa

Tuberculin skin testing, the hallmark of bovine TB eradication efforts, lacks sensitivity and specificity, and cannot be repeated within 60 days due to desensitization. To overcome these difficulties, a blood test for bovine TB, called the gamma interferon test, was developed.

Previously, the only way to determine if a caudal fold test (CFT) responder was a false positive was to do the comparative cervical test (CCT). This test involves injecting a small amount of bovine and bird TB in the neck, and returning 72 hours later to read the test. Skin fold thickness is measured before and after injection, and plotted. The gamma interferon test is useful after an animal responds to the screening caudal fold test.

The effects of previous bovine TB skin testing on gamma interferon production is variable. This study was done to determine the effects of different TB skin testing regimens on production of gamma interferon in calves experimentally infected with bovine TB. Gamma interferon was measured in bovine TB infected and control calves after different skin testing protocols.

This study shows that administration of the CFT resulted in a transient (3-7 day) increase in gamma interferon production from cattle experimentally infected with bovine TB. However, following the CFT with the CCT one week later did not have an effect on this transient increase. Administration of the CCT 55 days after the CFT had no effect on gamma interferon. Administration of the CFT had no effect on gamma interferon production by non-infected cattle.

Rapid Test for tuberculosis in multiple host species

Konstantin Lyashchenko, Ph.D.
Chembio Diagnostics, Inc

One of the drawbacks of the current and most widely used tests for bovine tuberculosis is that these tests require two visits from the veterinarian. This is a particular problem in screening wildlife and zoo populations. A single screening blood test would dramatically decrease the time and effort involved in surveillance for bovine TB.

The goal is to develop a commercially available, serological method (blood test) for screening and surveillance of *Mycobacterium bovis* that would be useful in multiple species. Developed tests include the TB Rapid Test and the MultiAntigen Print ImmunoAssay. Both blood tests involve the interaction of an antibody produced by the animal to a specific antigen associated with bovine TB.

These tests have been evaluated by testing cattle, bison, white-tailed deer, reindeer, elk, elephant, gazelle, alpaca, jaguar, lion, lynx, and primates. The serological approach has potential to improve surveillance and control programs. However, due to variations in antibody reactivity patterns, multiple antigens need to be used.

Response of Michigan deer hunters to the risks and the reality of bovine TB in wild deer

Peter Bull, Ben Peyton and Frank Lupi

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If hunters leave an area there are implications for local economics, as well as deer management strategies. To understand how hunters choose their sites and to determine if bovine TB has influenced hunting practices, two surveys of Michigan's deer hunters were undertaken in 2003.

The first survey investigated immigration and emigration patterns of Michigan hunters as a result of bovine TB related deer management policies (response rate 77%, n=1894). A sample of deer hunters who hunted Michigan's five county TB area in 1997 (TB area hunters) was compared to deer hunters who hunted in one of five counties near, but outside, the TB area (Control). TB area hunters were subjected to strict baiting/feeding regulations and liberal harvest quota changes, while control hunters encountered fewer regulations. Behavioral and attitudinal questions related to hunter mobility were asked and differences between the groups identified. Overall, a major reason for changing a hunting area was low deer numbers. Ability to bait was not reported as a major reason for change. While there were statistical differences in the mobility of hunters in both areas, the differences were not substantial. Over 60 percent of '97 hunters were persistent in use of both areas over five years. Between 1997 and 2003, 10 percent of TB area hunters moved out of the TB area while 7 percent of control area hunters left the control area. A quarter of the emigrants from the TB area stated that baiting regulations were a reason for changing hunting area, compared to 6 percent of control emigrants. These results indicate that the ban on baiting and feeding did not cause a major exodus from the TB area.

A concurrent survey was sent to a random sample of Michigan's deer hunters and focused on hunter travel patterns and the conditions hunters valued for choosing their hunting areas (response rate 67%, n=1919). In addition to many items shared with the first survey, the second survey investigated factors which potentially affect hunting location: deer health, deer numbers, hunter density and regulation changes. Hunters with experience in the TB area had a reduced concern regarding the consequences of bovine TB in wild deer. Hunters from the TB area were less concerned about deer having TB, and less likely to think that TB is a threat to Michigan's deer, or is a human health threat for those who eat or handle deer.

2005 Update on bovine tuberculosis activities at DCPAH, MSU

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The Diagnostic Center for Population and Animal Health, Michigan State University has been involved in the bovine TB eradication effort in both service and research areas.

Recent research investigates the influence of Johne's disease (caused by *Mycobacterium avium* sub species paratuberculosis, MAP, a relative of bovine TB) on TB skin test results. Over a three-year period, we retrospectively examined formalin-fixed tissues from 352 cattle which were necropsied as TB suspects. Of the 189 suspects on the comparative cervical test, all were negative for MAP. Of the 99 suspects on caudal fold test, three were positive for MAP. Of the 64 negative on caudal fold test, two were positive for MAP. It appears that Johne's disease plays a minor role in false negative TB reactors in MI cattle. Furthermore, the comparative cervical test does an excellent job screening out MAP.

Another recent study was designed to evaluate the effect of two vaccines (BCG and a new recombinant vaccine) on bovine TB infection in mice. Mice were vaccinated and then challenged with the bovine TB bacteria given into the nose. Control mice were not vaccinated but challenged with *M. bovis*. All control mice and all mice vaccinated with the recombinant vaccine were sacrificed early. All developed severe lung lesions, disseminated *M. bovis* with very high bacteria counts. Only three mice vaccinated with BCG were sacrificed early, and they had mild lesions, significantly lower bacteria counts. These data suggest that the recombinant vaccine is not effective in preventing bovine TB infection in mice.

Research Publications

(updated June 1, 2005)

Research in Progress

Campa, H., Winterstein, S.R., Walsh, D., Beyer, D. (in progress) **Quantifying elk movement patterns, interactions with white-tailed deer and estimating the population size and demographics in Michigan.** *Michigan State University, Rocky Mountain Elk Foundation and Michigan Dept. of Natural Resources.*

Fine, A.E. (in progress) **Indirect transmission of bovine TB: an investigation of the survival of *Mycobacterium bovis* in the environment in northeast lower Michigan.** Ph.D. candidate, *Dept. of Large Animal Clinical Sciences, College of Veterinary Medicine, Michigan State University.*

Dunbar, M.R. (in progress) **Controlling wildlife vectors of bovine tuberculosis and rabies.** USDA/APHIS/WS/NWRC. Project goal: To study the ecology of wildlife diseases, assess the risk of disease transmission among wildlife, domestic animals, and humans, and develop methods that reduce or eliminate transmission.

2005

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