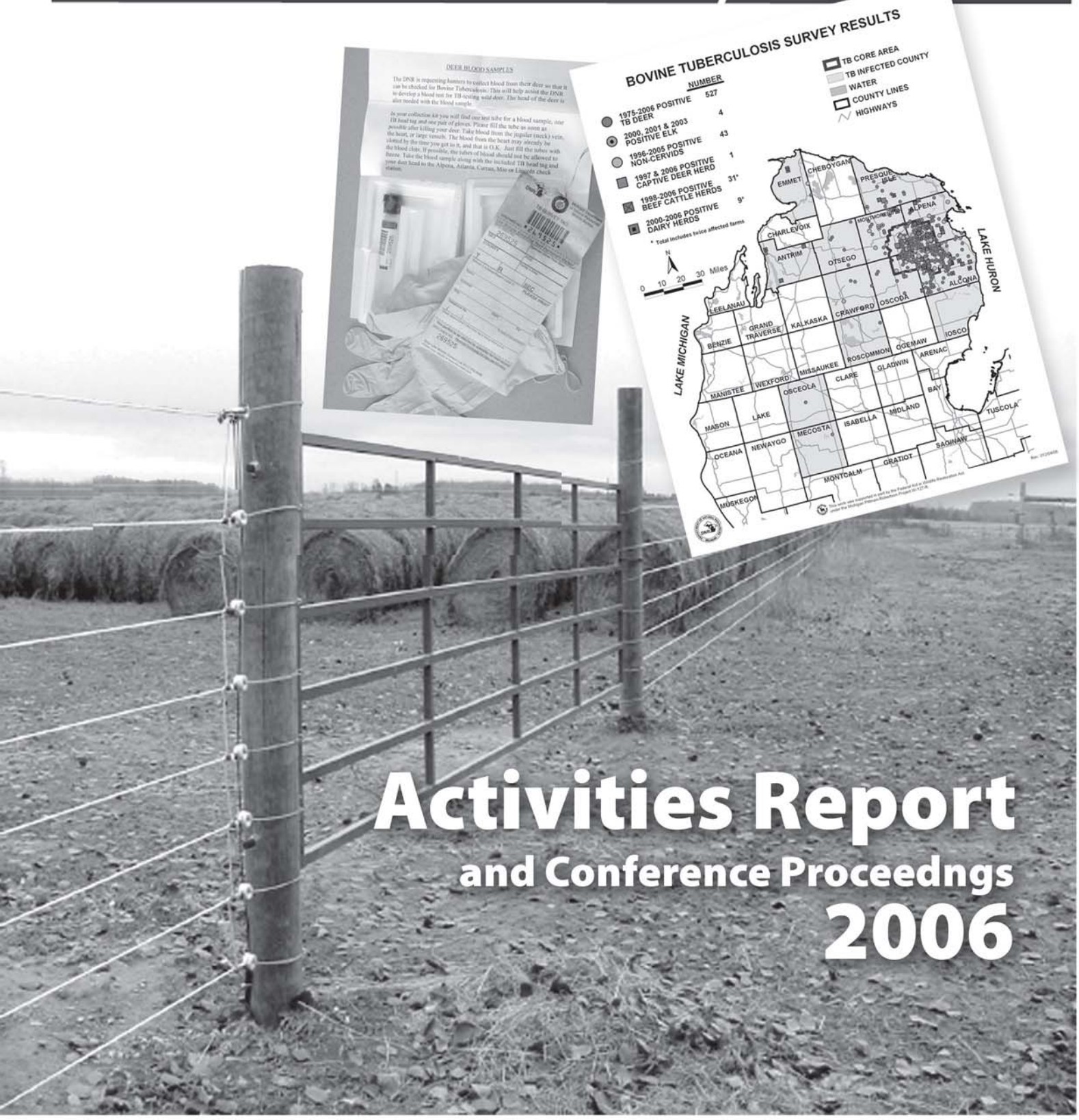
# Michigan Bovine Tuberculosis Eradication Project




# Activities Report and Conference Proceedngs 2006

# Michigan's Bovine Tuberculosis Eradication Project

## INTRODUCTION

Bovine tuberculosis (TB) is an infectious disease that is close to being eradicated in the United States, but still poses a significant risk to domestic livestock, wildlife, companion animals and humans throughout the world.

The Michigan Bovine TB Eradication Project involves a multi-agency team of experts from the Michigan Departments of Agriculture (MDA), Natural Resources (DNR) and Community Health (DCH); Michigan State University (MSU) and the US Department of Agriculture (USDA).

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# Bovine Tuberculosis in Minnesota

**Linda C. Glaser**,DVM, Minnesota Board of Animal Health

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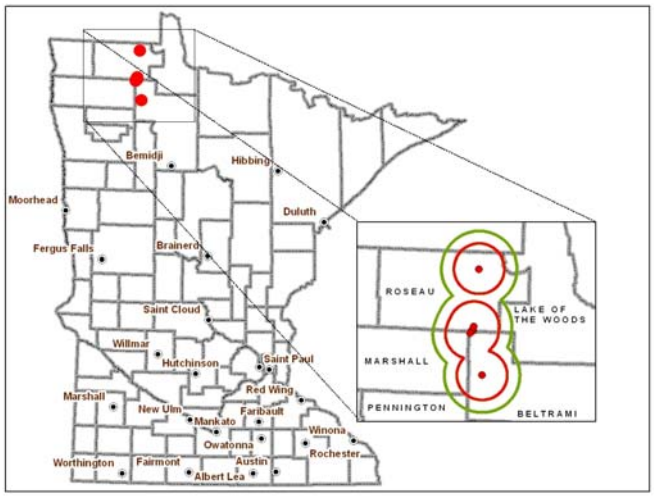
In February 2005, a five-year-old beef cow was identified by United States Department of Agriculture meat inspectors as a bovine tuberculosis suspect. The suspect cow, identified at a Wisconsin facility, was traced to Roseau County in Northern Minnesota. The USDA and the Minnesota Board of Animal Health (BAH) began an investigation and the herd was placed under quarantine. TB testing of this herd resulted in 21 TB suspects. On July 12, 2005 testing on these animals at the National Veterinary Service Laboratory, Ames, Iowa confirmed the diagnosis of TB in some animals and USDA and BAH declared this herd infected. Examination of herd records led to quarantine of 14 Minnesota herds and traces to Iowa, Kansas, Nebraska, and South Dakota. Four additional herds in Minnesota have been quarantined because they purchased animals from the index herd or had fence line contact with the infected herd.

Veterinarians from the Michigan departments of Agriculture and Natural Resources came to Minnesota to share their expertise. Because of the Michigan experience with TB, the Minnesota Department of Natural Resources began testing deer. In addition, they began testing of all cattle within a 10-mile radius of infected herds.

Substantial and rapid progress was made in the TB investigation. By October 2005, four herds were identified as infected with TB; three of these have bordering pastureland and the fourth purchased cattle from the index herd. Whole herd testing within a 10-mile radius of these herds as well as trace back were done.

A fifth affected herd was identified in Beltrami County. All TB infected herds have been depopulated and premises have been cleaned, disinfected and inspected resulting in release of quarantine. With the identification of the fifth infected herd, USDA downgraded the state's TB status to Modified Accredited Advanced. Additional TB testing prior to out-of-state movement is now required.

In the index herd, TB infection was identified in seven of 1,038 animals. In the other herds, three of 248; one of 310; three of 660; and three of 1,007 animals were infected. The average age of infected animals was five years (range nine months to 14 years). Nine of 17 animals were born on the farm and two of 17 were males. A total of 173 trace ins and 761 trace outs have been completed. Indemnity of more than $3 million has been paid on 3,554 animals.




The strain of TB identified in Minnesota's cattle is genetically identical to that recovered from infected deer, suggesting that efforts to eradicate TB in Minnesota must include deer management strategies.

# Surveillance of White-tailed Deer for Bovine TB in Northern Minnesota

**Michelle Carstensen Powell**, PhD, Minnesota Department of Natural Resources

Until the 1970s, deer were scarce in most parts of Minnesota. The low deer numbers resulted from both hunting and land management practices. With habitat and population management the deer population recovered. Deer are often referred to as our wildlife success story, but now we often deal with too many deer. With the increase in the deer population came an increased risk of emergent wildlife diseases, including bovine TB.

The importance of the economic and social value of hunting in Minnesota cannot be underestimated. There are more than half a million hunters in the state, with one of the highest per capita hunter participation rates in the nation. Deer hunting generates $465 million annually, including $3.5 million in state taxes and $21.8 million in federal taxes. In addition, more than two million people like to watch wildlife, and they spend $531 million annually.

The initial goals of the TB surveillance project were to determine if TB is present in wild deer, to identify surveillance zones, and establish the sampling protocol. The project was conducted during the opening weekend of firearms deer season, November 5 and 6, 2005. Cranial lymph nodes were obtained from deer harvested in a 15-mile radius around cattle infected farms. Of the 474 deer examined, only one was positive for the *Mycobacterium bovis*, the cause of bovine TB. The strain of TB was the same as the strain from infected cattle. Surveillance is again planned for fall 2006.

In terms of legislative issues, there has been an increase in the amount of cost-share for deer-proof fencing within the TB zone. Cost-share for fencing is available to farmers within five miles of infected herds. In addition, there is a bill to restrict feeding within five miles of TB-infected farms. Forty-six deer feeding sites have been identified in that area.

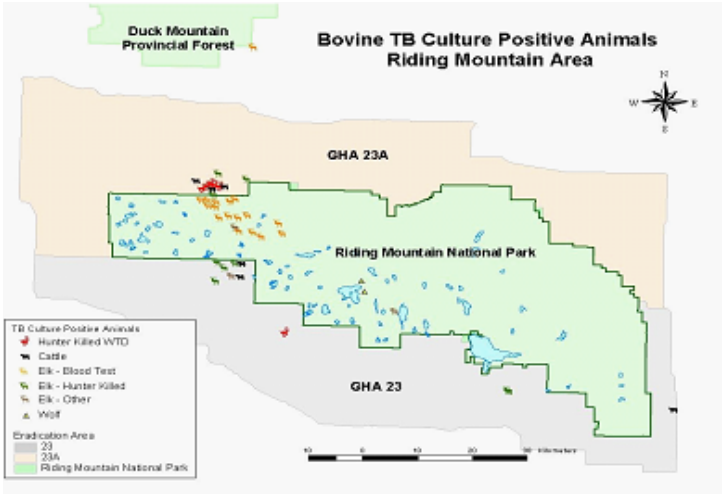
The overall goal is for the state to regain TB free status. This will require that TB surveillance in wild white tailed deer continue for at least three years. Some level of statewide surveillance will also be required. Recreational feeding will be banned.

# Riding Mountain National Park
# Wildlife Health Program 2006

**Doug Bergeson, Todd Shury,** DVM**,** and **Tim Sallows**, Manitoba, Canada

Riding Mountain National Park (RMNP) is situated in southwestern Manitoba, Canada, directly north of North Dakota. Bovine TB reappeared in the RMNP regional ecosystem in 1991 when an infected cattle herd was identified. Since 1991, there have been five additional outbreaks of bovine TB in cattle in the area near RMNP. The primary bovine TB wildlife management objectives for 2006 were to determine the geographic distribution of bovine TB in the regional elk and deer populations and to continue the surveillance program of cattle in the region. Additional ongoing programs included: barrier fencing of hay storage sites: and aggressive enforcement of feeding and baiting of wildlife in the area.

During the 2005-2006 hunting season, 320 elk and 1,100 deer samples were collected and examined; for a total to date of 2,600 elk and 4,300 deer. Of hunter killed animals with gross visible lesions in 2006 (27 elk and 29 deer), all were found to be culture negative. In February and April, a total of 89 elk were captured from a helicopter and blood tested for bovineTB; 25 from RMNP (all bulls) and 64(23 bulls; 41 cows) from the Duck Mountain area (located 30 km north of RMNP) . Total elk involved in the capture and blood test program since 2002 is 556 (210 bulls and 346 cows). One of 25 elk in RMNP and 17 of the 64 in the Duck Mountain area were considered suspects on one or more of the blood tests and subsequently recaptured and euthanized. Culture results from these elk are pending. Total elk involved in the helicopter capture and blood test program since 2002 is 556 (210 bulls and 346 cows). There were 49 deer also captured with a helicopter and blood tested for Bovine TB. Of these 14 were considered suspect on one or more of the blood tests and were re-captured and euthanized. Culture results from these 14 deer are also pending.




Since the wildife surveillance program was initiated in the RMNP region a total of 31 elk (16 bulls and 15 cows) and seven deer (six bucks, one doe) were positive for TB. Most positive animals were older than three years (24 elk and six deer). The apparent prevalence of TB in elk is less than three percent, except in western RMNP where the apparent prevalence is approximately six percent. The apparent prevalence of TB in deer is approximately one percent.

# Evaluation of Blood Testing & Lesion Distribution in Elk from Riding Mountain National Park

**Todd Shury,** DVM, Parks Canada
**O. Suruijballi, C. Lutze-Wallace,** Canadian Food Inspection Agency
**Konstantin Lyashchenko,** PhD, Chembio Diagnositcs

An accurate and rapid field blood test capable of identifying animals with bovine TB would be a very valuable addition to our disease management strategy. The purpose of these studies was to compare results from several different TB blood tests with post mortem and culture data from the same animals. Blood tests used were the Leukocyte Stimulation Test (LST), the Fluorescent Polarization Assay (FPA), the Lateral Flow Immunoassay (Rapid Test) and the Multi-antigen Print Immunoassay (MAPIA). All suspect animals on any blood test were examined and cultured. Elk were considered positive for TB with identification of the organism either by culture or PCR. Comparisons were made between blood test results and culture positive animals. Of the elk tested, 19 were culture positive and 153 were culture negative. Of the culture positive elk, 50 percent had visible gross lung lesions on necropsy. The greatest accuracy could be achieved by combining the LST and Rapid test. The FPA had a high number of false positive results. These false positive results raise several questions: have these animals been exposed to bovine TB, are they infected, and what are the long-term consequences of a test and removal program?

| Assay | Sensitivity | Apparent Specificity | PPV | NPV | Accuracy |
|---|---|---|---|---|---|
| RT | 57.9% (11/19) | 98.4% (179/182) | 78.6% (11/14) | 95.7% (179/187) | 94.5% (190/201) |
| MAPIA | 57.9% (11/19) | 96.2% (175/182) | 84.6% (11/13) | 95.2% (180/189) | 94.6% (191/202) |
| LST | 89.5% (17/19) | 96.1% (147/153) | 73.9% (17/23) | 98.7% (147/149) | 95.4% (164/172) |
| FPA | 47.4% (9/19) | 84.7% (144/154) | 25.7% (9/35) | 93.5% (144/154) | 81.0% (153/189) |

# Bovine Tuberculosis Eradication in Livestock: Where We've Been, and What We're Doing

**Michael S. Vanderklok,** DVM, Bovine TB Eradication Program Coordinator

The goal of Michigan's TB program is to eradicate TB from domestic and wild animals, while retaining both a viable cattle industry and a sustainable wildlife population. The state of Michigan has more than one million cattle. The Modified Accredited Zone (Northern Lower Michigan) has five percent of the state's dairy cows and 10 percent of the beef cows.

Statewide surveillance for TB in cattle herds from January 1, 2000 to June 1, 2006 has resulted in testing of more than 18,000 herds (33,138 herd visits) with 1,191,063 animals tested. Since the surveillance program began in 2000, no herds infected with TB have been identified outside the Modified Accredited (MA) Zone.

Surveillance in the MA Zone involves annual whole herd testing of all animals 12 months of age or older. Depending on age, purpose, and herd status, additional testing may be required to move animals off the farm. In the MA zone, movement permits are required to move off the farm. Approximately 231,000 TB tests have been conducted in this zone since 2000 and all cattle have radio frequency identification (RFID) - or "electronic ID" tags.

The table lists the number and type of herds identified with TB since 1997. As of June 6, 2006, 40 cattle herds have been diagnosed with TB. Of the 3,889 head in these herds, 97 animals have tested positive for TB by Polymerase Chain Reaction. All TB infected cattle herds are located in the Modified Accredited zone.

| Fiscal Year (FY) Oct-1 to Sept.-30 | Cervid | Beef | Dairy |
|---|---|---|---|
| 1997 | 1 | - | - |
| 1998 | - | 3 | - |
| 1999 | - | 1 | - |
| 2000 | - | 5 | 2 |
| 2001 | - | 8 | - |
| 2002 | - | 5 | 2 |
| 2003 | - | 4 | 2 |
| 2004 | - | - | 1 |
| 2005 | - | 1 | - |
| 2006 | - | 4 | 2 |

It has become clear that there is a risk to cattle from direct and indirect interaction with wildlife. Therefore, we have developed a risk identification and mitigation strategy. The goal of this cooperative effort is to help producers identify risks from wildlife and demonstrate how they can reduce those risks. About 200 herds have enrolled in this program since mid-December 2005.

**Surveillance activities.** From April 2005 to 2006 approximately 21,000 head of cattle have been inspected at the Mackinac Bridge, 90 percent of these animals were moving for eventual slaughter. Random surveillance continues in the Modified Accredited Advanced zone, with more than 896,000 TB tests done since 2000. Statewide identification efforts are underway. After March 1, 2007, all Michigan cattle must be identified with RFID prior to movement. The tags are allocated to cattle premises. Because of the ongoing efforts, Minnesota, Ohio, and Indiana have changed their import restrictions to Michigan cattle eliminating marketing barriers. Additional efforts are underway to identify and control risk of TB transmission from wildlife.

## Feeding & Baiting Complaint Response Activity 2006: The Year in Review

**Stephen Shine**, Conservation Programs Unit Manager

The Wildlife Conservation Act (WCA) (PA 256 of 1988) 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.

"Normal agricultural practices" (NAP) means generally accepted agricultural and management practices as defined by the Commission of Agriculture (PA 66 of 1999). Although referenced in the WCA, normal agricultural practices are not there in defined. Because it is important to define NAP so that it is clear what constitutes a violation, MDA organized a workgroup consisting of stakeholders to draft the practices. Stakeholders included the USDA, DNR, MSU Extension, livestock producers, fruit and vegetable producers and commodity groups. The NAP covers three broad areas: feed storage, hay rack and feed bunk management, agricultural by-product, and culled and unmarketable commodity management. The number of complaints was less than eight until 2005, when they peaked at 40. In 2006 complaints dropped to approximately 20. Complaints are resolved at a minimal cost to producers, and in general, producers are willing to resolve complaints. Changing producer behavior regarding storage of hay, however, has proven to be very difficult.

## MDA Livestock and Plant Inspection Point

**Al Rodriquez**, Regulations Manager

The only way to move livestock between the Upper and Lower Peninsulas of Michigan is by crossing the Mackinac Bridge. The two peninsulas are completely separated by water, other states and Canada. Monitoring livestock movement across the bridge is a relatively easy way to assure that cattle from the Modified Accredited Zone are in compliance with movement requirements when leaving the zone. In 2001, MDA began monitoring livestock movement north across the Mackinac Bridge and, in 2004, MDA staff were stationed at the bridge during various times to monitor livestock movement requirements. In 2005, MDA's Pesticide Plant Pest Management Division joined with Animal Industry for surveillance at the Mackinac Bridge to monitor cattle and firewood (because of Emerald Ash Borer) movement.

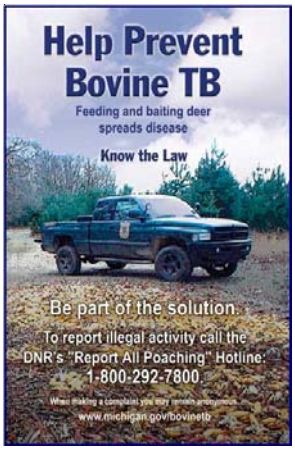
From April 2005 to April 2006, 2,045 livestock vehicles crossed the bridge. Of these, 767 (38 percent) had cattle, for a total of 21,659 head of cattle. Most (89 percent) went directly to slaughter, while 2,439 head moved back to a farm (11 percent). The vast majority of cattle moving across the bridge are going directly to slaughter.

One issue that needs to be addressed is some vehicles with livestock trailers drive by without inspection, often because they have alternative livestock. This behavior has happened with 258 vehicles. Proposals to curtail the drive by without inspection include: (1) making it an additional violation for not stopping, (2) change in follow-up procedures, and/or (3) increasing the en route signage to the bridge.

Few enforcement actions have been necessary. To date, we have notified Wisconsin of importation of a cow in violation of their import laws (the cow was destroyed) and verified the TB testing status of breeding stock. The staff has indicated there have been no repeat violations. It appears education and quick follow-up on potential violations has positively influenced compliance with movement requirements across the Mackinac Bridge.

## DNR Law Enforcement Activities

**Lt. Jeff Gaither**, Law Enforcement Division




Unnatural congregation of wild white-tailed deer leads to transmission of infection, including bovine TB. A major cause of unnatural congregation of deer is feeding and baiting. Efforts to enforce the no baiting and feeding regulations are focused in the following seven counties: Alcona, Alpena, Crawford, Montmorency, Oscoda, Otsego, and Presque Isle. Despite the ban, illegal baiting and feeding continues. Michigan conservation officers are on the front line of baiting and feeding enforcement issues.

The DNR Law Enforcement Division has worked extensively with prosecutors to provide background information on feeding and baiting. Elimination of these practices is important for successful eradication of TB in Michigan. Conservation officers have revisited prosecutors and courts, incrementally increased bait enforcement, visited sportsman's clubs and service groups, contacted retailers selling bait, and provided media coverage.

Conservation officers believe there are very few hunters who are not aware of the baiting regulations. Hunters continue to use bait in "no bait" areas for a number of reasons including social acceptance, clubs and camp owners adding the cost of a baiting ticket into the cost of hunting, retailers sell bait in "no bait" areas, and some courts do little to support the regulations. Currently the DNR Law enforcement division is writing tickets, responding to complaints, utilizing aircraft to identify bait piles, and continuing media contacts. A large percentage of time is spent on baiting enforcement. Agriculture complaints are referred to MDA.

## Bovine Tuberculosis Annual Report

**Stephen M. Schmitt,** DVM, **Dan O'Brien,** DVM, **Graham Hickling**, PhD

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. Surveillance activities for *M. bovis* continue statewide, with an emphasis on the northern half of the Lower Peninsula. In 2005, 16 animals cultured positive from 7,361 deer submitted. Surveillance for elk continues with a total of 1,520 elk submitted. No positive elk have been found since 2003. In 2004, 109 elk were tested and 129 elk were tested in 2005. Since the index cases were first identified, 145,752 free-ranging deer have been tested for bovine tuberculosis; 525 infected animals have been found. Increasingly, a highly focal, clustered pattern of disease is emerging. Approximately 97 percent of all positive deer originated from a five county area. Moreover, within that area, the ast 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 sampling effort has been relatively uniform geographically.

Strategies for eradication of TB from Michigan wildlife continue to focus on reducing deer population densities to biological carrying capacity and reducing artificial congregation of deer by restriction or elimination of baiting and feeding. Additional tools in the research phase include the "trap, test and cull pilot project," which is using a blood test for TB in white-tailed deer, and the "bovine TB vaccine study." If an effective vaccine can be developed, test negative deer could be vaccinated for TB prior to release.

While much work remains, substantial progress has been made towards eradication of TB from Michigan wildlife. Apparent prevalence in the core area of the outbreak DMU 452 was 1.2 percent in 2005, a significant decrease since 1995. Trend analysis of prevalence data from 1995 to 2005 indicates a significant decreasing trend. There is also a significant decrease in disease transmission between deer (measured as new infections per 1,000 deer per year). Not only has the average annual rate of new infections decreased 84 percent since 1995, the decline in transmission is concurrent with a decline in deer population and reduced feeding and baiting.

Together, these data suggest we are making progress toward eliminating TB from the wild deer population. It is too early, however, to claim victory in eradicating the disease. Experience from other countries dealing with a wildlife reservoir of TB firmly support the notion we cannot become lax in our efforts to eliminate TB from white-tailed deer. Maintaining this focus is crucial, especially in the face of 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 Occurences

In 1975, a nine year-old female white-tailed deer from Alcona County, and in 1994 a four 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 of Deer Positive | Total Deer Tested |
|---|---|---|
| 1995 | 18 | 403 |
| 1996 | 56 | 4,967 |
| 1997 | 73 | 3,720 |
| 1998 | 78 | 9,057 |
| 1999 | 58 | 19,500 |
| 2000 | 53 | 25,858 |
| 2001 | 60 | 24,278 |
| 2002 | 51 | 18,100 |
| 2003 | 32 | 17,308 |
| 2004 | 28 | 15,130 |
| 2005 | 16 | 7,361 |
| 2006 | 2* | 160* |
| **Total** | **527** | **145,844** |

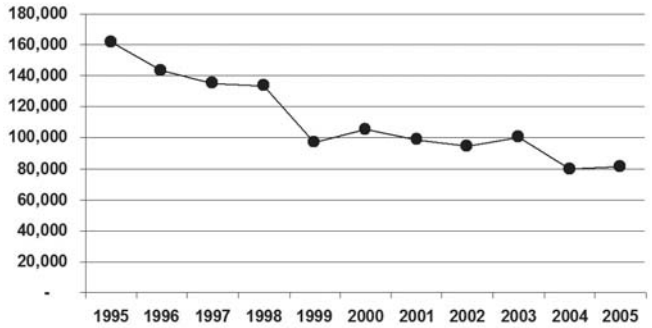
* As of October 3, 2006

# Deer Population Estimates, Hunting, and Harvest Trends, and Attitudes Toward Deer Management in Northeast Michigan

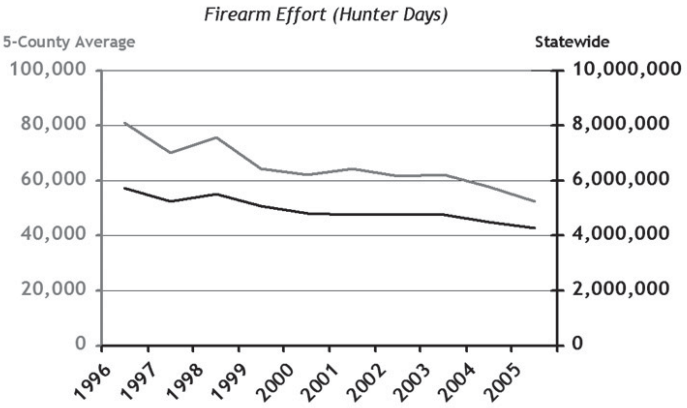
**Brent Rudolph**, Wildlife Research Specialist

The overall goal of the DNR is to manage Michigan's wild white-tailed deer herd using management practices based on scientific research. The overall priority is to maintain a healthy deer herd. The carrying capacity of the range, in addition to the effects of deer on native plant communities, agricultural, horticultural, and silvicultural crops, and public safety must be considered. The DNR also places a priority on maintaining an active public information program. This program is necessary to acquaint the public with the conditions necessary to have a healthy and vigorous deer herd and the methods of deer management needed to achieve this goal.

Estimated deer population in the 5-county area, 1995-2005.




TB eradication efforts are being accomplished by elimination of infected animals from the wild deer population and reducing transmission of disease from infected to uninfected animals. Management strategies to eradicate bovine TB from free-ranging deer in Michigan include: removing conditions that unnaturally concentrate deer and increasing harvest of deer and evaluation of these practices. Unnatural concentration of deer, as occurs with feeding and baiting, spreads disease, including TB. Therefore, decreasing conditions causing deer to congregate would be expected to decrease the spread of disease. Efforts to decrease the unnatural congregation of deer primarily involve eliminating feeding and baiting. Increasing the harvest of deer, by hunting in the fall and winter, would be expected to reduce the population and therefore decrease the encounter rate between infected and uninfected deer. 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 for focusing future efforts.




Evaluation, monitoring and management of TB in while-tailed deer occurs on three different levels: state wide, the five-county area, and Deer Management Unit (DMU) 452 . The five-county area is where the majority of TB has been identified in both deer and cattle, and includes Alcona, Alpena, Montmorency, Oscoda, and Presque Isle. DMU 452 is located at the junction of the first four counties listed, and is where most TB positive deer have been found. Participation in hunting, assessed as both number of hunters and hunter days, has decreased in the five-county area, although this decrease parallels a statewide decrease in hunting. There has been a downward trend in the number of deer harvested in the state, five-county area and DMU 452. The decrease in the 5-county area is slightly greater than that statewide. There is also an estimated decrease,

in the deer population in the five-county area, suggesting hunting efforts in the area have been successful in decreasing the deer population. Harvest, especially antlerless, continues to decline from late 1990s levels.

Proposed deer goals were developed for every DMU for 2006 to 2010. Input from various groups, including other divisions, agencies, private companies and groups, and the public, was sought in developing these proposed goals. Twenty-one public meetings were held. Many attendees did not accept the deer estimates and dismissed proposed population goals. They opposed reducing the number of deer anywhere in Michigan. Approximately 61 percent of the 2,900 meeting attendees completed a survey; 97 percent were hunters. Deer hunting was rated more important by this group than by hunters responding to a similar statewide survey.

Survey participants from Alpena County placed less importance on deer health as a criterion for management, did not feel that deer health was an important issue in their area, and did not support the proposed goals. Despite heightened awareness of disease issues, hunters identified abundance of deer as the primary factor the DNR should consider. Little non-hunter input was provided regarding proposed deer goals. As a result of various concerns the Natural Resources Commission has not yet endorsed the proposed goals.

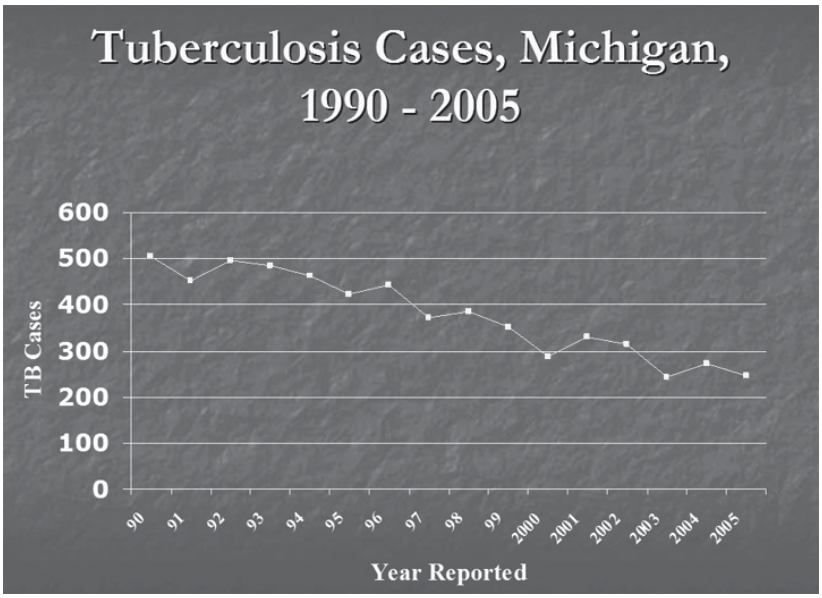
## Human Tuberculosis – Michigan Update

**Mary Grace Stobierski**, DVM, Infectious Disease Epidemiology Section Chief

Tuberculosis has been known since ancient times. Worldwide, more than two million deaths are attributed to tuberculosis, with eight 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. In Michigan, the number of human TB cases is decreasing, with 246 cases reported in 2005. Cases are clustered around Detroit and other larger cities, a pattern which is seen throughout the US. In 2005, 33 percent of cases were seen in Caucasians, 44 percent in African Americans, and 21 percent in Asian or Pacific Islanders. When compared to percent of Michigan's total population, African American, Hispanic (all races) and Asian have a disproportionate number of cases of TB.

In 2005, most Michigan cases in human TB involved lung infection (62 percent), while one-third of infections were outside the lungs. Of the 246 cases, almost 10 percent showed evidence of drug resistance. The course of drug therapy for TB is prolonged and completion of the entire course is important to eliminate the infection. In 2003 and 2004, 85 percent and 87 percent of patients with TB completed the entire course of therapy; this is somewhat lower than the national objective of 90 percent. Most of the 32 patients who did not complete the entire course of therapy moved (20 patients) , while six were lost to follow up, four refused and two died.

MDCH has also been involved in TB education and training. Two full time nurse educators are responsible for the education efforts: Gail Derkens RN, BS in southeast Michigan and Julie McCallum, RN, MPH outside southeast Michigan. TB training and education efforts include: 130 TB skin test-train the trainer classes, resulting in 336 trainers of the TB skin test class. In addition, 403 TB skin test classes resulted in 3,595 certified TB skin test participants. Training in contact investigation class (202 individuals); participation in case management class (114); fit testing for N-95 respiratory mask (416); and directly observed therapy class.



# MDCH TB Laboratory 2005 Activities Update

**Dale E. Berry**, TB/Mycology Laboratory Manager

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.

In 2005, there were 246 new cases of human TB diagnosed in Michigan. This represents 2.5 cases per 100,000 people. The vast majority of cases are due to *Mycobacterium tuberculosis*, not *Mycobacterium bovis,* the cause of bovine TB. Since 1995, 12 cases of human TB caused by *M bovis* have been diagnosed; two of these were identified as the same strain as Michigan's deer TB strain. 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.

**Michigan *M bovis* from Human Sources**

| Date | Sex | Age | Specimen | County |
|---|---|---|---|---|
| •1995* | Female | 28 | Sputum | Berrien |
| •1997 | Female | 74 | Lymph Node | Oakland |
| •1997 | Female | 75 | Spine | Kalamazoo |
| •1997 | Female | 71 | Knee Fluid | Oakland |
| •1998* | Female | 32 | Sputum | Kent |
| •1998 | Male | 42 | Abscess | Ingham |
| •2000 | Male | 62 | Neck | Oakland |
| •2002** | Male | 74 | Bronchial | Alpena |
| •2003* | Male | 19 | Sputum | Oakland |
| •2003 | Female | 79 | Lymph Node | Oakland |
| •2004** | Male | 29 | Hand Wound | Iosco |
| •2005* | Male | 34 | Lymph Node | Wayne |

*From Southwestern States **Same Strain as Michigan's Deer

The MDCH TB/Mycology Laboratory has 25 years experience in testing a variety of animals. The laboratory has provided testing services for and collaborated with the USDA, MDCH, National Veterinary Services Laboratory (NVSL), DNR and MDA. We look forward to continued cooperative efforts to eliminate tuberculosis from Michigan with these public health partners.

# The Michigan Model

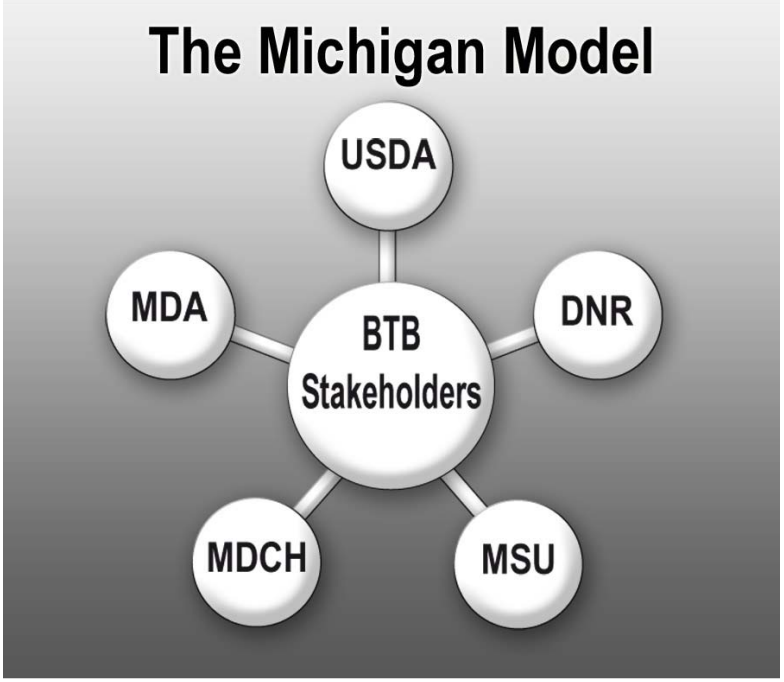
**Bridget Kavanagh-Patrick**, Bovine TB Eradication Project Coordinator

The Bovine TB Eradication Project is a multi-agency team effort consisting of experts from the Michigan Departments of Agriculture (MDA), Community Health (MDCH), and Natural Resources(MDNR); Michigan State University (MSU); and the U.S. Department of Agriculture(USDA). The team works collaboratively to eradicate TB from Michigan's cattle and wildlife. The Bovine TB Eradication Project was given specific tasks, define and implement a feeding ban in the five-county area, establish deer harvest quotas consistent with the eradication of bovine TB, eliminate contact between free-ranging wild deer and livestock, conduct comprehensive surveillance to evaluate trends, disseminate information, and identify a Bovine TB Eradication Coordinator in MDCH to work cooperatively with all agencies. The ultimate goals of the TB Eradication Project are to eliminate TB from domestic animals and wildlife and for Michigan to regain TB free status.

In the Michigan model, multiple agencies, commissions and divisions are involved in the eradication effort, making coordination and communication integral components for its success. Agriculture, wildlife, and human issues; research and education; and dissemination of information are included in the model. Communications efforts must occur at all levels and involve all agencies, stakeholders, elected officials, media, and community leaders. Social and economic issues must also be addressed, including both farming and hunting traditions and the economic impact of these practices on the surrounding communities and the state.

The 2000 USDA Veterinary Services Bovine TB Review stated that "The close cooperation between the MDA, MDNR, MDCH and MSU stands as a model to be emulated by any other state which may need to deal with a similar problem."

It is clear, however, that the success of this program can quickly lead to failure if momentum is lost. Maintaining the momentum is a high priority for the Michigan Bovine TB Eradication Project and the state of Michigan.



## USDA Tuberculosis Update

**Michael Dutcher,** Senior Staff Veterinarian
**Robert Meyer,** National TB Epidemiologist, USDA, APHIS, VS

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 has split state status; the majority of the state is accredited-free and a two-county area in eastern New Mexico has Modified Accredited Advanced (MAA) status. Texas has MAA status and will be eligible for upgrade at the end of September, 2006. Michigan has split state status, with the northeast corner of the Lower Peninsula classified as Modified Accredited (MA), southern Lower Michigan is classified as MAA, and the Upper Peninsula is TB Accredited Free.

In 2006, two beef herds in Minnesota were identified as bovine TB infected. One herd had 650 head and the other 1,000 head. Both were depopulated. Also in 2006, a 90 head beef herd in Texas was exposed to TB; the herd was depopulated. No tuberculosis was found in any of the animals depopulated. In 2005/2006, seven herds were diagnosed with TB in Michigan, five beef herds and two dairy herds. To date, all have been depopulated or depopulation is pending.

For the first half of 2005, slaughter surveillance has identified 15 cases of bovine TB. Approximately seven percent (one case) were adult cows and 93 percent (14 head) were feeders. Trace back showed that the adult came from a small beef herd in Texas (the same herd which was depopulated from the preceding paragraph) and 12 feeder cases were identified with official Mexican ear tags. Two cases are under investigation.

The new version of the Uniform Methods and Rules (UM&R) went into effect January 1, 2005. A revised rule is being drafted to strengthen the import requirements of roping steers. 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 a prevalence of 0.05 percent (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. For slaughter facilities, officials must implement a plan to collect critical surveillance data and document plant visits.

## Epidemiology of Newly Affected Herds and Gamma Interferon Testing Update

**Lawrence J. Judge**, Area Epidemiologist USDA, APHIS, VS – MI Area Office

The primary screening test for bovine TB is the caudal fold test (CFT). If there is no reaction, the test is called negative; if there is a reaction further testing is required. The gamma interferon has been used statewide when an animal responds to tuberculin on the caudal fold test. 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.

The main advantage of the gamma test is that a single tube of blood is taken at the time the CFT is read, making it more economical both from a time and money standpoint. In addition, the gamma test has a greater sensitivity than the CCT (meaning it finds more infected herds; that is fewer false negative results). It is also more objective than the CCT. The disadvantages are that it has less specificity than the CFT (more false positives) and there is a greater chance of test failure, usually due to sample handling. In addition, with the gamma test, results are not available for three to four days, whereas the CCT results are known immediately at the time of reading (three days after injection). Both regulatory and private practice veterinarians are trained to obtain samples for the gamma test. The gamma interferon test uses live white blood cells. To obtain useful test results, testing protocols must be followed and test samples must be received in the DCPAH laboratory by noon the following day.

Comparison of bovine TB tests

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

The majority of gamma interferon tests have been done in the Modified Accredited (MA) Zone. There appears to be a slight difference in specificity with this test between zones, with the specificity higher in the Modified Accredited Zone. Sensitivity cannot be calculated accurately since there have been only 22 true positives (TB infected) animals identified with the gamma test. Only 57 retests have been done (approximately 1.5 percent of all tests), with 45 percent retested positive and 55 percent retested negative.

When a herd is diagnosed with TB, cattle that have left that herd are traced back and if still alive they are tested. From this information it can be determined if there are known epidemiological linkages between TB Infected herds. For example, in Alpena County, a small cow-calf beef herd (approx. 80 head) was diagnosed with TB in December of 2005. This herd involved only 19 traces (five source herds), not including custom slaughter animals. The herd served a niche market, selling processed beef. In addition, the herd was a risk mitigation “demonstration” herd that had hay storage fencing and a “TB dog” on-site. However, investigation revealed that breaks in the mitigation plan occurred. The herd was located within five miles of two twice-infected farms. Eleven additional infected cattle were found at depopulation.

Another example is an Antrim county beef herd was diagnosed with TB in December of 2005.This large herd had both cow-calf and feedlot cattle and required many trace tests. There have been 130 source herd traces identified with this particular herd. No additional infected animals were found at depopulation of the herd.

# An Update of Activities to Reduce the Spread of Bovine Tuberculosis in Michigan

**Peter Butchko**, State Director, USDA, APHIS, WS

Wildlife Services has been involved in several aspects of the bovine TB eradication project. These include deer removal, small mammal trapping, wildlife observations on TB positive farms, wildlife risk evaluations, fencing and assistance with research.

Deer removal assistance is provided under landowner's Disease Control Permits issued by MDNR. These permits allow hunting of deer out of season, the meat is donated to charity, and the heads are submitted for TB testing. Since 2002, 206 deer have been removed from 15 farms under Disease Control Permits. The number of deer taken per farm ranges from 1 to 37; 54 percent of deer have been taken from farms in Alpena County. In 2006, eight farms submitted 61 small mammals for testing; 13 had lesions and one raccoon had lesions compatible with TB.

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 between producers, MDA, and USDA. Risk assessments are performed on TB infected and non-infected farms and the information may be used in 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.

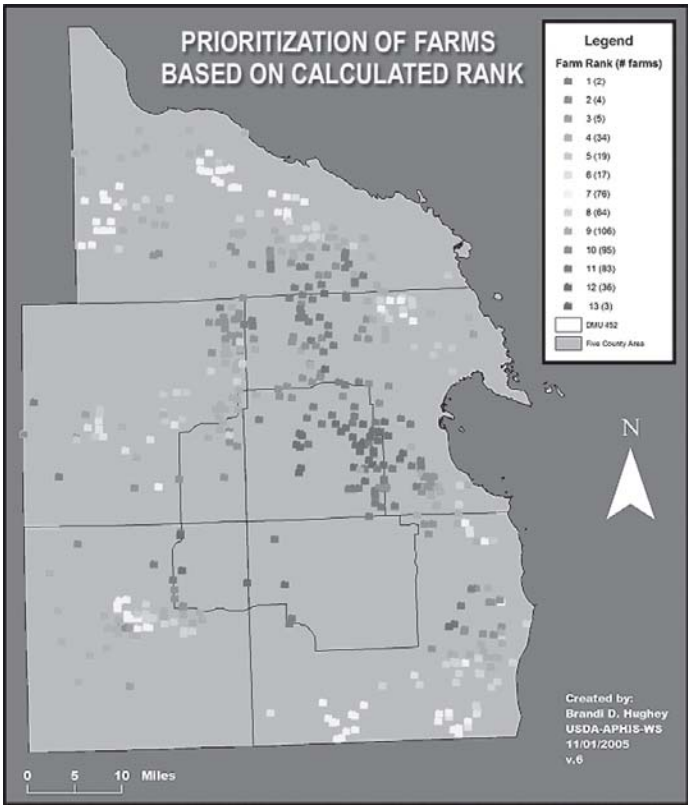
Therefore, fencing and proper feed storage may reduce risk of infection from deer via stored feed. Since 2001, Wildlife Services has constructed fences on 45 farms: 31 are woven wire, 10 electrobraid, and four other types. Approximately $390,000 has been spent to date on fencing, for an average of $9,783 per fence. The average length of fence is 1,170 feet and the average size is ¾ acre (range: 0.1 to 8 acres). Twenty-seven farms are on the wait list for fencing. After construction, the farm is responsible for maintenance and operation of fence. Wildlife Services conducts periodic fence evaluations. 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 occurs over a 24-month period and the average number of visits per farm is 15. So far the fences appear to be extremely effective, with one observed deer intrusion into woven wire and several deer intrusion through Electrobraid™ fencing.

# Application of an Agent-based Model as a Tool for Bovine TB

**Brandi D. Hughey,** USDA WS
**Marcus Daniels,** Los Alamos National Laboratory
**Thomas DeLiberto,** USDA WS

We use models everyday, perhaps without knowing it, to explain behavior or phenomenon. Models can also be used to guide management strategies and prioritize actions in a disease situation, for example bovine TB. An agent-based model can be used to simulate behavior of a complex system, allowing us to model locally but examine globally. Known information or data is entered into the model to predict certain behaviors, in this case prioritization of farms based on calculated rank. Based on what is known about deer populations, the TB disease component, and the cattle farms, predictions can be made. For example, if in the model we double the baiting behavior of deer we can predict how that will affect the number of deer of different age groups.

The model is called the TB SWARM and the main components are the deer population, the disease component, and cattle farms. The area being studied is the DMU 452. There are five farm rank categories: deer, TB+farm buffer, cattle feed storage, cattle winter feeding site, and cattle housing. These categories are given a number in the model, for example if the average number of intrusions on a farm by TB infected (TB+) deer is high, the model may call that a five; if the average number of intrusions is low it may be called a one. The same is true for the other rank categories. The model enables us to prioritize farms based on calculated rank. Basically the higher the rank the greater risk to that farm, and consequently those farms of higher rank should receive risk assessments and mitigation techniques sooner than those of lower rank. Thus, the model is a useful tool to determine strategy and action.



## Rapid Test for Bovine Tuberculosis in White-tailed Deer

**Konstantin Lyashchenko**, Chembio Diagnostic Systems

Growing the bacteria that causes bovine TB can take months, and while molecular techniques are very useful, they require certain equipment and conditions not found in the field or in field laboratories. It would be very useful to be able to diagnose TB in domestic and wild animals quickly using serum, plasma, or dried blood spots.

The tests we are developing depend upon detection of a rapid antibody response (IgM). In cattle experimentally infected with TB, the IgM response can be seen as early as four weeks after infection. Comparisons of results from plasma, serum, and whole blood, as well as dried blood suggest that all methods could be useful. Quantitative results can be obtained from the rapid test using the rapid test reader, which reduces the variability of visual assessment. The reader also improves quality control and test standardization.

## Vaccination of White-tailed Deer with *Mycobacterium bovis* BCG

**Mitch Palmer, Tyler C. Thacker, W. Ray Waters**,
National Animal Disease Center, Ames, Iowa

One of the oldest vaccines in use today is *M bovis* baccile Calmette-Guerin (BCG). It is the most widely used vaccine with approximately three billion doses given since 1920. BCG was developed in the early 1900s from *M bovis* isolated from a tuberculous cow. The vaccine has been modified and several genetically distinct strains exist today (Pasteur, Danish, Tokyo, etc). The vaccine is variably effective in humans (0 to 80 percent).

We have previously demonstrated that red deer vaccinated with BCG had no evidence of TB eleven weeks after a BCG booster. Two doses of vaccine protected against infection and disease, while one dose protected against disease but not infection.

The experiments with white-tailed deer involved three groups: deer vaccinated with one dose of BCG, deer vaccinated and boostered with BCG (two doses of BCG at six-week intervals), and unvaccinated controls. All deer were exposed to TB infection by a challenge with TB bacteria injected into the tonsil. Necropsy was done 77 to 130 days after challenge and comparisons were made between groups. Necropsy involved gross and microscopic examination and weight of lymph nodes and lungs. Animals were also categorized as uninfected (no gross or microscopic lesions, TB not isolated), infected (TB isolated but no microscopic lesions), and diseased (gross or microscopic lesion and TB isolated).

More unvaccinated animals had evidence of disease than either of the vaccinated groups. Two doses of BCG significantly decreased the severity of both gross and microscopic lesions. A single does of BCG decreased the number and severity of lesions in the lymph nodes. Vaccination with BCG may prevent the development of TB in white-tailed deer.

## Oral Bacille Calmette-Guerinin (BCG) Vaccination of White-tailed Deer Against Bovine Tuberculosis

**Pauline Nol, Mitch Palmer, W. Ray Waters, Tyler C. Thacker,** USDA/ARS
**Mike Dunbar, Jack Rhyan,** USDA/APHIS/VS
**Frank Aldwell, Bryce Buddle,** U Otago & AgResearch, New Zealand
**Mo Salman,** Animal Population Health Institute, Colorado State University

The ability to safely and efficiently vaccinate wildlife for bovine TB would greatly enhance our ability to eradicate the disease from both white-tailed deer and domestic cattle. Worldwide, the BCG vaccine has been used for decades in humans at risk for infection with bovine TB. If this vaccine could prevent infection or decrease shedding in infected animals, it could prove quite useful in reducing transmission of infection between wild white-tailed deer and cattle.

The objectives of this still ongoing study were to determine the efficacy of oral BCG in white-tailed deer against *M. bovis* infection and to assess the ability of oral BCG to reduce shedding of the bacteria The study involved 30 yearling deer given either a single dose of the BCG vaccine given (either orally or in the muscle) or a placebo control. Samples included blood, pharyngeal and nasal swabs, and feces for PCR and culture. Tissues were collected for gross pathology, histopathology, culture, and PCR. The control deer had significantly more gross lesions in the lungs and lymph nodes than the vaccinated group. Other results are pending. Preliminary data suggests that BCG may prove useful in the control of bovine in wild white-tailed deer.

## 2006 Update on Bovine Tuberculosis Activities at DCPAH, MSU

**Scott D. Fitzgerald**, Diagnostic Center for Population and Animal Health, MSU

The Diagnostic Center for Population and Animal Health, Michigan State University has been involved in the bovine TB eradication effort in service and research areas, as well as the education of graduate students and residents. Recent research investigated the influence of Johne's disease on TB skin test results. Because Johne's disease is caused by *Mycobacterium avium* subspecies paratuberculosis (MAP), a relative of bovine TB, it is possible that cows with Johne's disease would test false positive for TB. To test this hypothesis, formalin-fixed tissues from 394 cattle identified as TB suspects were examined. Of the 130 suspects on caudal fold test, three were positive for MAP. Of the 189 suspects on the comparative cervical test, all were negative for MAP. Of the 75 negative on caudal fold test, two were positive for MAP. It appears that Johne's disease plays a minor role in false positive TB reactors in Michigan cattle. Furthermore, while the caudal fold test does not screen out MAP infection, the comparative cervical test does an excellent job screening out MAP infection.

Another recent study, performed in collaboration with MDCH, surveyed the antibacterial susceptibility patterns in *M bovis* isolates from deer, cattle, carnivores, and a human. Nine antibiotics used to treat *M bovis* infection in people were tested. All *M bovis* isolates were susceptible to all nine antibiotics, suggesting that antibiotic resistance to the Michigan strain of *M bovis* is not currently an issue.

The mouse *M bovis* vaccine efficacy 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 *M bovis* given into the nose. BCG provided the best protection; the recombinant vaccine provided some protection; nonvaccinated mice had no protection.

Cats are susceptible to bovine TB and most cattle farms in Michigan have cats. Therefore, future research includes evaluating the efficacy of vaccinating cats and assessing the reliability of a blood test to detect *M bovis* infection in cats. An additional project involves evaluation of a new rapid *M bovis* antigen detection card. The card is applied directly to a suspicious lesion and the results are available within 20 minutes. Rapid field diagnosis would be useful in a variety of settings, including allowing hunters to rapidly determine if a lesion is TB in the field.

Recent publications:

O'Brien DJ, Schmitt SM, Fitzgerald SD, Berry DE, Hickling GJ: Managing the Wildlife Reservoir of *Mycobacterium bovis*: The Michigan, USA, Experience. Vet. Micro. 112:313-323, 2006.
Clarke KR, Fitzgerald SD, Hattey JA, Bolin CA, Berry DE, Church SV, Reed WM: Experimental Inoculation of Wild Turkeys (*Meleagris gallopavo*) with *Mycobacterium bovis*. Avian Dis. 50:131-134, 2006.
Daly M, Diegel KL, Fitzgerald SD, Schooley A, Berry DE, Kaneene JB: Patterns of Antimicrobial Susceptibility in Michigan Wildlife and Bovine Isolates of *Mycobacterium bovis*. J. Vet. Diagn. Invest. 18:401-404, 2006.

## Persistence of *Mycobacterium bovis* in the Environment

**Amanda Fine, John Kanenee, Carole Bolin**, Michigan State University

Bovine TB is a difficult organism to work with – it is not easy to grow in the laboratory, yet it may persist for a long time in the environment. Improved techniques to culture the organism would improve our understanding of the way the disease is spread. The overall goal of this project was to develop and evaluate new methods for isolation and culture of TB from the environment and to determine how long the bacteria persists in the environment under various conditions.

The first hypothesis tested was that *M bovis* can survive in the environment for sufficient lengths of time to serve as a source of infection for cattle and/or wildlife. We also hypothesized factors that influence the survival of the bacteria can be measured. This study involved three seasons: Fall/Winter (November -January), Winter/Spring (February - May) and Spring/Summer (May-August) and four different substrates (soil, water, hay, and corn). These substrates were chosen because they would likely be in the environment of TB infected cattle or deer. Each sample was inoculated with *M bovis* and placed in a biosecure area that was exposed to all the environmental conditions. Temperature, precipitation, wind speed, solar radiation, and humidity were recorded every 20 minutes 24 hours per day for the entire study period. Samples were collected over time to look for the growth of *M bovis*.

Results: When exposed to environmental conditions in Michigan, *M bovis* persists and can be cultured from all substrates tested. The number of recoverable bacteria falls off quickly, particularly in the summer, where it is difficult to culture bacteria after three days of environmental exposure. In winter, *M bovis* persist for one to two weeks. This suggests that the period of infectivity from environmental *M bovis* is limited, especially in the summer. We conclude that the period of time *M bovis* survives is influenced by environmental factors - increased temperature decreases survival while survival of *M bovis* may be prolonged in water.

## Developing an Integrated Epi-Econ TB Risk Calculator for On-farm Use

**John Kaneene, Renate T.E. van Dorp, Christopher Wolf, RoseAnn Miller**,
Michigan State University

If we could determine the specific bovine TB risks for individual farms, management strategies for prevention of TB transmission would be much easier to identify and accomplish. The goal of these projects is to develop a farm-based calculator for TB risk reduction strategies and an epidemiological predictive model for TB risk reduction strategies. The on-farm calculator uses farm management data and the cost associated with management factors to quantify risk and arrive at recommendations for management changes. The calculator tells us not only which investments to make, but also the order to implement changes. For example, fence cattle away from open water, then fence the hay away from deer, etc.

The epidemiological predictive model determines farm TB risk and is based on previous risk analysis of management factors and estimated contribution of individual risk factors. Due to differences in management there are separate models for dairy and beef. Data were collected from TB infected herds (case herds; 26 beef, seven dairy herds) based on TB investigation reports and noninfected control herds. Factors associated with increased risk of TB for both beef and dairy herds included: deciduous forest, prevalence of TB in cervids, presence of a pond or creek, and outside hay storage. Decreased risk for both beef and dairy was associated with open natural areas, lake plain areas, small square hay bales, and feeding grain. Silage was associated with increased risk of TB in dairy only, while housing indoors, hay protected, and feeding indoors reduced the risk. In beef herds the prevalence of TB in non-cervids, water outdoors, feeding outside, and fence line contact increased the risk, while confinement housing and supplement feeding decreased the risk.

The model was able to predict both positive and negative herds with a high degree of accuracy. The information from the model was used to select management practices for the economic model.

## Risk Mitigation at the Wildlife–Livestock Interface: A Preliminary Report from USDA/MDA Wildlife Risk Assessments

**Brett Nelson**, Wildlife Biologist, MDA
**Tim Wilson**, Wildlife Biologist, USDA WS

The goal of the wildlife bovine TB risk assessment program is to reduce the risk of TB transmission from wildlife to cattle. This is accomplished by increasing producer awareness of wildlife TB risk and assisting producers in identifying and reducing their farms' risk.

An educational campaign was started in 2005, with a series of staff and producer educational meetings, magazine coverage, brochures, television and radio spots. A risk assessment form was developed as a guide for on-farm risk assessments and to highlight areas for improvement. Goals of the risk assessment are to identify wildlife risk on the farm and to offer technical assistance to mitigate the risk. Risk assessments have been conducted at TB accredited farms, TB positive farms, and non-infected farms (on a voluntary basis). Risk assessments focus on feed storage areas, feeding practices, cattle management, deer activity and access, small mammals, and water sources.

Two hundred seven risk assessments have been completed (November, 2005 through May, 2006). While most producers use several methods to store their hay, more than 50 percent store some or all of their hay outside, while approximately 30 percent store some hay in the barn or behind fences. Most producers (60 -70 percent) feed near a building and the same number use hay rings or some other type of feeder. Deer consumption of cattle feed is minimized most by putting out only enough feed for one day, feeding closer to barns, using farm dogs, and shooting deer. Almost all participants use hunting as a means to control deer numbers. While all had a perimeter fence, less than one percent had a perimeter fence robust enough to exclude deer. All producers reported evidence of small mammal and rodent activity. Most farms had artificial water sources and watered near the barn. The information will be used to aid Wildlife Services in determining priority for fencing. Risk assessments have also proved useful to answer specific producer concerns and create herd plans for infected farms and TB accredited herds.

## Bovine TB Research Update: The Wildlife–Livestock Interface

**Michael R. Dunbar**, Project Leader for Rabies and Bovine TB Research, USDA WS

The National Wildlife Research Center has recently completed a five year bovine TB research project (2001 to 2005) evaluating wildlife-livestock interactions in Michigan. An additional three year project, involving nine studies, was initiated in October 2005.

The program is designed to: evaluate the role of coyotes and raccoons as reservoirs and/or vectors of TB; develop methods that decrease transmission of TB from wildlife to livestock using barriers and vaccines; and assess risk for transmission of TB among wildlife, livestock and humans.

A study was designed to determine the use of molecular techniques (PCR) to detect TB in coyote feces and to develop and optimize a molecular assay for detecting TB in fecal samples. Since culturing TB is a lengthy process, PCR could provide rapid and valuable information.

An additional study was designed to determine if coyotes can be used as a sentinel species to detect TB infection and to evaluate if infected, free-ranging coyotes are shedding *M bovis*. Coyotes will be trapped in the TB endemic area and evaluated for the presence of TB.

The next study was designed to evaluate the potential shedding of *M bovis* by free ranging raccoons and to determine the prevalence of TB in raccoons on recently infected farms. If raccoons shed TB, then the goal would be to determine the possible routes of infection for cattle and other wildlife.

Additional studies will evaluate risk factors associated with possible transmission of TB from white-tailed deer to cattle. This involves identifying daily and seasonal deer movements and locations near cattle farms in Northern Michigan. Deer interaction with farms will also be evaluated, involving trapping of 45 deer and attaching GPS radio collars. Locations will be recorded every hour for one year. This study will begin January, 2007. Infrared thermography will also be evaluated as a tool to detect TB. Thermography can detect heat associated with inflammation of infected lymph nodes of the head and neck region of white-tailed deer experimentally infected with TB.

## North Country Beef Producers

**Jim Chapman**, President, North Country Beef Producers

Beef producers in Northern Lower Michigan have faced serious economic, emotional and social challenges since the finding of bovine TB in wild white-tailed deer and cattle herds in the area. In response to these difficult times, progressive beef producers have formed a cooperative to increase marketability of their cattle, North Country Beef Producers (NCBP). Cooperative efforts include ongoing education, the use of similar genetics, common management practices, including pre weaning and conditioning calves, and group purchasing opportunities. In addition, a web site, e-mail addresses and advertising opportunities are available to members (www.northcountrybeef.com). The ultimate goal of NCBP is to help members maintain a viable livestock industry in the face of TB.

NCBP has engaged in many projects including educational trips to state of the art seed stock facilities, feedlot, bull test and sale facilities, backgrounding operations, a feed formulating facility, and a gate manufacturing operation. Two feedlot projects provided data and feedback on rate of gain, carcass quality, and other important information that can be used to improve productivity and product. NCBP has also provided a protocol for selling cattle under the title of NCBP, as well as working on direct marketing projects. There are ongoing educational seminars that cover topics from cattle handling to vaccination to identification. The calf feeding operation involved members consigning calves to the MSU Beef Research Center to be fed out to slaughter. Vaccine was provided for consigned calves and calves were tested for BVDV. Individual animal data was collected during the feeding period and carcass data collected at slaughter. Information from these trials will be used to improve productivity and product and to provide pilot data for grants.

Future projects include continuing the ongoing educational efforts, exploring grant opportunities to engage in more extensive projects, and examination of various and novel ways to market our product.

# Michigan's 2005 Bovine TB Education Campaign: How Working with a Focus Group Can Help You See the Point!

**Lana Kaiser**, MD,DVM, Michigan State University

One of the challenges when working with multiple agencies is to be able to rapidly and efficiently obtain input from all partners and incorporate their ideas into ongoing projects. We have developed a multi agency, rapid transit bovine TB eradication educational campaign using focus groups. Representatives from the Michigan Departments of Community Health, Agriculture, and Natural Resources, USDA Wildlife Services & Veterinary Services, and Michigan State University were involved in the bovine TB eradication educational campaign.

The goal of the focus groups was to develop an educational campaign that provided messages to Michigan farmers, hunters, & wildlife enthusiasts. The challenge: we had only eight weeks from the time we obtained funding until the educational campaign had to be completely finished! The process involved four focus group meetings where issues were discussed and ideas generated. A draft of a print message was developed; the message was then designed, approved and distributed.

The group started with a general idea. In the first case the message was ***"(Farmers) - Feed your hay to your cows, not the deer (please!)"***. The group was to decide if the message was clear? if it was the right message? if it the right target audience? And how they would change the message?

This process was used to develop the ***"Hay! Feed cows, Not deer"*** bumper sticker distributed throughout Michigan. The same message was used in print advertisements and articles in Michigan Cattlemen's Magazine, Farm Bureau News, Michigan County Lines, Farmer's Advance, Maine-Anjou Voice. A similar process was used to develop the anti feeding and baiting campaign ***"Help prevent bovine TB. Know the law. Feeding and baiting spreads disease. Be part of the solution"*** that were made into print ads and posters. This was featured in Northwood's Call, Michigan Out-of -Doors, and Alpena News and posters were distributed to every outlet in the seven county no-bait area that sells hunting licenses, grain elevators, feed supply stores, gas stations, and "Mom & Pop" stores. The same basic process was used in the development of public service announcements ( PSA) that were aired on Michigan Out-of-Doors TV, Michigan Farm Radio and Michigan Outdoor Radio.

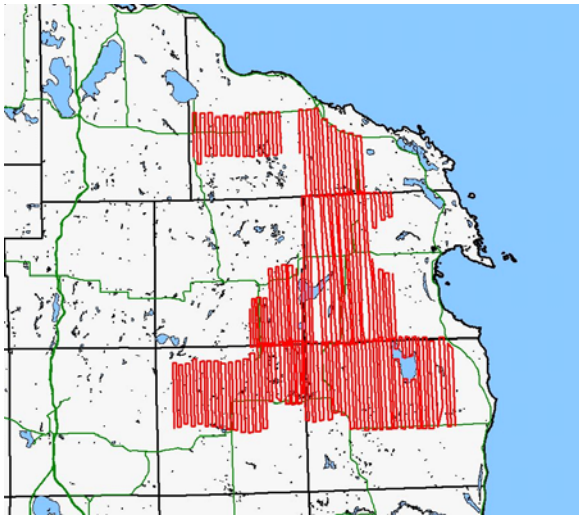
The focus groups resulted in several messages in multiple forms key to the TB eradication effort. The messages went out in print, brochures, newsletters, advertisements, articles, radio & TV spots, posters, public service announcements, and bumper stickers.

The beauty of the approach is that something from every member of the focus group is in the final product. This approach resulted in powerful positive messages that all participants felt they owned. The focus group mechanism may serve as a template for multi agency public relations/ communications emergency response.

## Update on Winter Feed Surveillance in Northeast Michigan

**Elaine Carlson**, Wildlife Biologist,DNR

Congregation of wild white-tailed deer at feed and bait sites results in transmission of bovine TB and an unhealthy deer population. Consequently, DNR is involved in efforts to decrease illegal feeding and baiting of deer, with the goal of decreasing unnatural congregation of deer, decreasing transmission of bovine TB, and enhancing deer health.



Flight lines – 2006 aerial feed site survey in portions of northeast lower Michigan

"Feed flights" - aerial surveillance to identify illegal deer feeding sights has been done in northeast Lower Michigan since 1997. In 1997, 235 sites were located, and in 1998, 350 sites were identified. Since 1999, however, less than 100 feed sites have been identified each year. Although some individuals have developed elaborate ways to hide their illegal sites, it appears there is a significant decrease in the number of sites.

DNR responds to complaints regarding sighting of illegal feed sites. There also appears to be some difficulty for the public to discern the difference between "normal agricultural practices" resulting in feed available for deer and illegal feed sites.

## Michigan Animal Identification on the Horizon: A Cooperative Program between USDA, APHIS, VS and MDA

**Kevin Kirk**, Special Assistant to the Director, 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 cattle officially identified. By March 1, 2007 all cattle in Michigan will be required to have electronic identification (radio frequency ID = RFID) prior to moving off the farm of origin. RFID tags will be issued to a premise only; tags will not be issued to individuals. Premises formerly registered will receive a new Premise Identification number (ex. H555555) replacing the old ID number (ex. MI55555). To obtain a premise ID and RFID tags producers must call the Michigan Department of Agriculture(1-866-870-5136). Generally, the "840" country code tags will be issued; other older RFID tags in use will be grandfathered in.

All cattle in the Modified Accredited zone are identified with RFID tags and all premises have been registered. Movement within and outside of the Modified Accredited Zone requires a permit, which can be obtained online. Total permits issued from July, 2002 to May 31, 2006 was 15,617, with a total of 82,721 head moved. As of May 31, 2006, 18,619 premises are identified and in the Michigan database (compared to 15,644 in 2005). RFID is used in 3,221 of these premises (1,945 in 2005), and 157,174 animals have been identified with RFID tags (compared to 120,024 in 2005). In addition, 11 animal markets through-out the state have been fitted with RFID readers, seven large and seven to ten small processors have RFID readers. The large plants have read 25,972 RFID tags, and the smaller processors 3,153. As of June 5, 2006 approximately 13,548 Michigan premises have been entered in the database; 840 RFID tags have been ordered by 1,009 livestock producers with 86,162 tags being delivered.

The goal of Michigan's system is to identify animals and premises in contact with a potential animal disease within 48 hours. The required components for this system are premise registration, animal identification and animal tracking.

# 2006 Bovine TB Conference: Brainstorming Session

After all formal presentations were completed, Dr. Steven Halstead, Michigan State Veterinarian, led a discussion with the audience and conference participants. The goal was to identify major issues and begin to develop solutions and strategies to address these issues.

1. The recent identification of sevenTB positive herds raised the question of why these herds were found within the last fiscal year, when there was so much time with no evidence of bovine TB in cattle in the Modified Accredited zone. It appears that we do not fully understand the components involved in transmission of bovine TB and sustaining the infection within a population. The solution proposed by the group was to invite an outside task force to study, using the current scientific and epidemiological data, the “big picture” and advise on focus areas.

2. The ongoing education campaign was deemed to be successful. The group felt, however, the campaign must continue. Discussion centered on how much information should be given to the public. Does continued publicity give a “black eye” to producers in the MA Zone? There was consensus that the education campaign should explain the science regarding risk and transmission, issues with vaccines, and information regarding laws and regulations. The “On Farm Reference Guide” was felt by extension, producers, and veterinarians in the MA Zone to be a useful addition to their resources.

3. Communication between government agencies, extension, and producers, as well as interagency communication was felt to be critical and could be improved. Consensus building and getting producers and hunters in the MA Zone to own the eradication of TB was thought to be critical. It was determined that MSU extension in the MA Zone was in a key position to disseminate the information and that the messages should be “grass roots” and not “government issue.” Other concerns expressed included: is politics prevailing over science in regards to disease eradication? With regard to feeding and baiting, do we need more laws? Higher fines? Or a more responsive and educated local judiciary?

4. There was also discussion about the use of vaccines for TB and the perspective by stakeholders and the public that it should be readily available and used. It was noted that an educational effort to describe the process for vaccine approval could be helpful with this issue. Also, what would be the legal and regulatory mechanism for vaccine approval?

5. There appears to be some confusion in the MA zone about what constitutes “Generally Accepted Agricultural and Management Practices (GAAMPs)” or “normal agricultural practices.” It appears these practices may, in some instances, actually promote congregation of deer and therefore promote disease. How these issues should be handled is unclear, since in many instances there is no alternative available to the current practice.

6. Questions arose regarding the role of other species of wildlife in the transmission of bovine TB. Although we cannot lose sight of the obvious (ie: white tailed deer) in the transmission of TB, we need to obtain more knowledge on the role of other animals.

7. It was generally agreed the deer population survey involved a skewed set of respondents. Therefore, efforts to obtain information from a broader group of individuals should be undertaken.

8. Finally, the approach other countries have taken in their eradication efforts could prove useful. These efforts were aimed at “encouraging” compliance with recommended risk mitigation strategies. In some instances the farm must present proof of compliance to do business with a slaughter facility and in others no indemnity is paid – can this push compliance? Some countries look to disease control not eradication, which is not really an option for Michigan.

## Biographies

### Doug Bergeson

Doug Bergeson is a Conservation Biologist with Parks Canada in Riding Mountain National Park. Doug has worked for Parks Canada for 15 years, of which the last four have been in Riding Mountain. Doug's primary responsibility in Riding Mountain is wildlife research and management.

### Dale E. Berry

Dale Berry has served as the manager of the Mycobacteriology/Mycology Laboratory with the Michigan Department of Community Health for the past 24 years.

### Dr. Carole Bolin

Dr. Bolin is a Professor at Michigan State University in the Department of Pathobiology and Diagnostic Investigation and the College of Veterinary Medicine.

### Peter Butchko

Peter Butchko is the State Director of USDA Wildlife Services in Michigan. Butchko directs the state's wildlife services programs, including wolf management activities, projects to reduce wildlife hazards to aviation, projects to reduce starling damage at dairies, and contributing to the eradication of bovine TB in wildlife

### Elaine Carlson, MS

Elaine Carlson, Wildlife Biologist in the Dept. of Natural Resources, graduated from Michigan State University with a Master's degree in Wildlife Biology in 1979 and has been employed by the DNR since then.

Carlson worked with the Deer Range Improvement Program, a wildlife habitat management strategy in the northern 2/3 of the state and assisted with turkey, elk, and black bear research projects. Presently she works out of Mio in Northeast Lower Michigan and centers on co-management of state forest lands in several counties of northeast Michigan with special emphasis on habitat for endangered Kirtland's warbler. Carlson coordinates field efforts for the DNR on the Bovine TB eradication program.

### Michelle Carstensen Powell, PhD

Michelle Carstensen Powell received her B.S. in Animal Science from Cornell University, and both her M.S. and PhD in Wildlife Conservation from the University of Minnesota. Prior to her graduate studies in wildlife, Michelle spent four years working as a research associate for the Institute for Local Self-Reliance, a non-profit organization that works on environmentally-sound economic development strategies.

In 1998, she began her graduate studies on nutritional and reproductive physiology of cervids; specifically effects of winter severity on body composition, reproduction and survival of white-tailed deer. Michelle officially joined the Minnesota Department of Natural Resources in 2004 and is currently the Wildlife Health Program Coordinator. She primarily works on emergent wildlife diseases in the state, including chronic wasting disease, bovine tuberculosis, and avian influenza.

## Jim Chapman

Jim Chapman is President of the North Country Beef Producers which was formed to explore new marketing opportunities, increase profitability and provide educational opportunities for members.

In addition to working to strengthen their business skills, the 40 members also are educating themselves about vaccination protocols, animal health and nutrition, genetics, and management practices for cow/calf producers as well as backgrounders and feeders.

## Michael R. Dunbar, MS, DVM

Dr. Dunbar is presently a Research Wildlife Biologist and Project Leader for Rabies and Bovine Tuberculosis Research at USDA/APHIS National Wildlife Research Center in Ft. Collins, Colorado.

## Michael (Mick) Dutcher, DVM

Dr. Dutcher is the Senior Staff Veterinarian, USDA-APHIS-VS in the Tuberculosis (TB) Eradication Program. He has been working for 1.5 years in this position in Riverdale, MD. Prior to that, Dutcher worked for two years as the Assistant Area Veterinarian in Charge (AVIC) at the Michigan Area Office with primary responsibility for oversight of the USDA's activities in Michigan's TB Eradication Program. He completed his Bachelor's degree at the University of Michigan and his Veterinary degree at Michigan State University. Dutcher has worked overseas with veterinarians in Zimbabwe and Poland. Prior to accepting a position as the Assistant AVIC in Michigan, he worked in private practice, then as a field Veterinary Medical Officer for USDA, and as an Import-Export officer for USDA.

## Scott D. Fitzgerald, DVM

Dr. Scott Fitzgerald is a Professor with the Department of Pathology and a Veterinary Pathologist with the Diagnostic Center for Population and Animal Health at Michigan State University. He has been with MSU for more than 12 years. Fitzgerald conducts research into pathogenesis of M. bovis in mammals and birds.

## Lt. Jeff Gaither

Lt. Jeff Gaither is the District Supervisor in the Michigan Department of Natural Resources Law Enforcement Division. He was hired as a Michigan Conservation Officer (CO) in 1980 and worked for 14 years as a CO in Gladwin County. He was promoted to Sergeant in Boyne City in 1995 and promoted to Lieutenant (Gaylord District Supervisor) in 2003. His district includes the Northern eight counties of the Lower Peninsula including four in the core TB area.

## Linda C. Glaser, DVM

Dr. Linda Glaser is a veterinarian with the Minnesota Board of Animal Health. She joined the Board in November of 2004. She is currently working on the bovine TB investigation and was previously the emergency planner at the Board. Dr. Glaser is a native of Minnesota and graduated from the University of Minnesota's College of Veterinary Medicine in 1985. She returned to Minnesota from Wisconsin where she worked for the U.S. Department of Agriculture Veterinary Services as an epidemiologist in the Area Office. Prior to her joining the USDA, she worked for the Wisconsin Division of Public Health coordinating surveillance for West Nile virus and for the U.S. Geological Survey's National Wildlife Health Center as a Wildlife Disease Specialist.

## Steven Halstead, DVM

Dr. Steven Halstead is a Michigan native with rural agricultural background, living in southwest Eaton County on 108 acres of farmland, woods, and muck with his family. Halstead graduated from Michigan State University College of Veterinary Medicine in 1982 and through 1984 was a private practice associate in Norway, Maine. He then moved back to Michigan as a private practitioner and was a Large Animal Surgery and Medicine Resident while concurrently enrolled in the microbiology Master's degree program at Michigan State University College of Veterinary Medicine. In 1990 he became a field veterinarian working on the pseudorabies eradication program for MDA. From 1994 through 2004 he was the MDA veterinarian for equine and companion animal programs. Since 2004 Halstead has been the State Veterinarian and MDA Animal Industry Division Director.

## Brandi D. Hughey, MS

Brandi Hughey is a biological science technician with USDA-Wildlife Services. She is a Michigan native with a rural agricultural background. Hughey received her BS and MS in Wildlife Management at Michigan State University. Her thesis topic was identifying hotspots of bovine TB in free-ranging white-tailed deer of Northeastern Michigan. She is currently assisting the National Rabies Program with spatial and statistical analyses.

## Lawrence J. Judge, DVM

Dr. Larry Judge graduated from veterinary school in 1987 and worked in private practice with dairy producers for seven years. He worked for MDA, Animal Industry Division on pseudorabies surveillance and in the bovine TB program. Judge is the USDA Veterinary Services area Epidemiologist in Charge of bovine TB.

## Dr. Lana Kaiser, DVM

Kaiser, originally from Buffalo, New York, is both a physician and a veterinarian and has practiced in both areas. Currently a Professor in the College of Human Medicine and College of Nursing, she has been a faculty member at MSU since 1984 involved in cardiovascular research.

Recently she has decreased her time commitment at MSU to focus on other things including raising registered Maine-Anjou cattle, bovine practice, and free lance writing for the Michigan Department of Agriculture, breed and agricultural publications.

## Bridget Kavanagh-Patrick

Bridget Kavanagh-Patrick became the bovine TB Eradication Project Coordinator in 2002. She started working as the eradication project's communications coordinator in 2000. Before her stint in civil service she worked for six years as a legislative assistant in the Michigan House of Representatives. Kavanagh-Patrick has a degree in Journalism from MSU; before free-lancing as a science writer and journalist she specialized in community relations and downtown revitalization as the Mason Main Street Project Manager.

## Konstantin Lyashchenko, PhD

Dr. Konstatin Lyashchenko was then Senior Research Scientist, in the Department of Molecular Immunology at the Institute of Biochemistry, National Academy of Sciences in Kiev, Ukraine until 1995. He came to the U.S. in 1995 and worked as Research Associate, at the Public Health Research Institute in New York City until 2001. He is presently Research Director at Chembio Diagnostic Systems, Inc., in Medford, New York.

## Brett Nelson

Brett Nelson, Wildlife Biologist with MDA Animal Industry Division working on issues related to wildlife-livestock interactions. Specifically focusing attention on mitigating TB infection risks from wildlife in northeastern Lower Michigan by working with TB Eradication Project partners and area producers. Received undergraduate wildlife degree at the University of Alaska Fairbanks and M.S. at Northern Michigan University.

## Pauline Nol, DVM

Pauline Nol is currently an APHIS Science Fellow at the USDA/National Wildlife Research Center in Fort Collins, Colorado, where she is working on developing oral vaccines against bovine tuberculosis and brucellosis in wildlife. She received her DVM at the University of Florida in 1997 and an MS with the Department of Animal Health and Biomedical Sciences at the University of Wisconsin-Madison in 2002.

## Mitchell Palmer, DVM

Dr. Mitchell Palmer serves as the Lead Scientist of the Bovine Tuberculosis Research Group at the USDA's National Animal Disease Center in Ames, Iowa, where he has been a Veterinary Medical Officer since 1992. Before joining USDA, Dr. Palmer worked as a large animal veterinarian in Lodi, WI. Dr. Palmer received his BS degree from Utah State University, a DVM from Purdue University and a PhD in veterinary pathology from Iowa State University. Dr. Palmer's research interests include diseases at the interface of wildlife and domestic livestock, such as tuberculosis and brucellosis.

## Al Rodriquez

Al Rodriquez is the Regulations Manager for MDA Animal Industry Division's (AID) Compliance Unit. His responsibilities include the coordination and implementation of regulatory enforcement activities for the AID. Rodriquez has been with the department for six years. In addition to his enforcement duties Rodriquez has been overseeing the operations of the Livestock and Plant Inspection Point, located at the Mackinac Bridge. Before coming to MDA, he worked with the Michigan Secretary of State as an inspector, and previously with the United States Marine Corps as both a Marine Security Guard and a Reconnaissance Marine. He received his BA degree from Michigan State University.

## Brent Rudolph

Brent Rudolph is a research biologist with the Michigan Department of Natural Resources, where he coordinates the Wildlife Division's deer research program. He has conducted research on white-tailed deer in suburban, agricultural, and forested settings, and his professional interests focus on addressing the biological and sociological challenges to managing wildlife on increasingly human-dominated landscapes.

## Stephen M. Schmitt, DVM

Dr. Stephen Schmitt has served as the Veterinarian-in-Charge at the Michigan Department of Natural Resources' Rose Lake Wildlife Disease Laboratory for 19 years. He is responsible for overall operation and function of the laboratory, including investigation, monitoring and research of diseases and other factors which affect the health and survival of wildlife of Michigan.

## Stephen Shine

Stephen P. Shine specializes in the conservation programs in the Michigan Department of Agriculture's Environmental Stewardship Division

## Todd Shury, DVM

Dr. Todd Shury, DVM is the Wildlife Health Specialist for Parks Canada in the Dept. of Veterinary Pathology at Western College of Veterinary Medicine. He received his B.S. in biology at the University of Lethbridge in Alberta and his DVM at the Western College of Veterinary Medicine in Saskatchewan.

Dr. Shury is currently working for Parks Canada as National Wildlife Health Specialist in Saskatoon, Saskatchewan. He previously worked with the Calgary Zoo and Banff National Park in addition to other wildlife agencies in western Canada as a contract wildlife veterinarian.

## Mary Grace Stobierski, DVM

Dr. Mary Grace Stobierski is Chief of the Infectious Disease Epidemiology Section, and State Public Health Veterinarian for the Michigan Department of Community Health. She has been with MDCH for 14 years, and has an adjunct appointment at the MSU College of Veterinary Medicine.

## Michael VanderKlok, DVM

Since 1995, Dr. Michael VanderKlok has been active in the Michigan Bovine Tuberculosis Eradication Program as an on-farm testing veterinarian, regional manager, and is currently the leader for the MDA TB program for livestock in Michigan.

## Renate T.E. van Dorp, PhD

Dr. Renate van Dorp is a research scientist at the Center for Comparative Epidemiology at Michigan State University. She is predominantly working on the epidemiology of bovine tuberculosis in northeast Lower Michigan, and investigating the effects of management practices and ecology on the risk of cattle herds becoming TB-positive.

## Timothy Wilson

Tim Wilson has been employed as a wildlife biologist with the USDA Wildlife Services program since 2001. His primary duty is assisting producers in Northeast Michigan reduce their risk of TB infection from potentially infected wildlife.

## Christopher A. Wolf, PhD

Christopher Wolf is an associate professor of agricultural economics at Michigan State University. His work focuses on farm and risk management.

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