

REPORT OF THE COMMITTEE ON TUBERCULOSIS

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Vice Chair: Beth Thompson, MN

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The Committee met on October 27, 2015 from 1:00 p.m. to 6:00 p.m at the 2015 USAHA meeting in Providence, RI. There were 69 members and 23 guests present. Dr. Oedekoven introduced himself, welcomed members and guests, and introduced the vice chair, Dr. Thompson.

The first presenter was Dr. Dustin Oedekoven, on behalf of Mitch Palmer. Dr. Oedekoven presented the Report of the Scientific Advisory Subcommittee (SAS.) A motion to accept the report of the SAS was made by Dr. Michael Gillsdorf and seconded by Dr. Dee Ellis. The motion was passed. The full text of the report is included in this report.

Dr. Chuck Massengill then presented the report of the Bi-National Committee (BNC.) Dr. Massengill, U.S. Coordinator for the U.S.A./Mexico Bi-National Committee for the Eradication of Bovine Tuberculosis and Brucellosis (BNC) began his report with an explanation of the purpose of the BNC. In 2015, the BNC discussed specific issues for cattle trade between Mexico and the US, including "M" brands, Sonora *Brucella* status, USDA capture of electronic data, documentation requirements, consistency at all ports, approved feedlots in Sonora and the long term plan for the port at Eagle Pass. Dr. Massengill also explained the importance of avoiding unintended consequences during regionalization in Mexico. The full text of the report is included in this report.

Dr. Mark Schoenbaum, USDA APHIS VS, presented the National Tuberculosis Program Update. Dr. Schoenbaum reported on the prevalence of TB in the US, for both cattle and cervids, and slaughter surveillance in cattle. There were 10 confirmed cattle cases in FY 2015. Herd plans for FY 2015 include both depopulation for some herds, and test and remove for other herds. Dr. Schoenbaum explained how the use of whole genome sequencing is providing a better understanding of the transmission of *M. bovis* in the US. Dr. Schoenbaum reported on other activities, including live animal testing, Bovine Interferon

Gamma tests, caudal fold response rates and cervid testing. Lastly, Dr. Shoenbaum spoke to an issue of low sensitivity with the Bovigam® test. The full text of the update is included in this report.

Dr. Alejandro Perera, USDA APHIS IS, presented the Mexico National Tuberculosis report on behalf of Dr. Castillo, Zoo-sanitary Campaign Director, SAGARPA/SENASICA. The report included an update on Mexico's campaign against bovine TB, testing, staffing and regulations. Dr. Perera also spoke about the differing TB status zones and approved laboratories within the country. Some states within Mexico have begun mandatory official identification of cattle, which is part of a national traceability system. The full text of the report is included in this report.

Kevin Stokes, PhD, USDA APHIS NVSL presented a Time Specific Paper, "Real time PCR used in US Slaughter Surveillance." The paper, in its entirety, is included in this report.

Dr. Scott Wells, Professor, Veterinary Population Medicine, U of MN, presented on Modeling Transmission of Bovine Tuberculosis in Uruguay using Dynamic Cattle Movement Networks-A Potential Model for the US. Dr. Wells explained that the basis of the model is the network of cattle movements, with an application of scoring methods for risk. In Uruguay, there is a complete electronic based traceability for cattle which can then be used for risk base analysis. The applicability in the US would be similar, using the movements of cattle to identify risk.

Dr. Alex. J. Räber, R&D Leader Animal Health, Thermo Fisher Scientific, discussed the OIE approved diagnostic claims of BOVIGAM™ – *Mycobacterium bovis* gamma interferon test kit for cattle. Dr. Räber explained the validation process stages for the test kit. There are a number of OIE approved diagnostic claims, including historical freedom and re-establishment of freedom after outbreak.

State presentation and/or written reports were received from the following:

California - Dr. Annette Jones

- 11 affected dairy herds in 11 years
- Eligible for "free" status in 2016
- Rely heavily on slaughter surveillance due to high dairy population
- Of 58 counties in CA, 52 had cases of *M. bovis* in humans

Texas – Dr. Andy Schwartz

The state report is made part of this report.

Michigan- Dr. James Averill

- 2 infected herds identified this past year, in Modified Accredited zone
 - 600 head dairy
 - Small hobby farm
- The state animal health officials continue to be involved in various research projects
- State will propose a MAAZ buffer zone, through new Memorandum of Understanding

Dr. Kay Backues from the Tulsa Zoo presented information on Elephant TB Testing Recommendations, current in 2015. Dr. Backues reports stakeholders support the 2015 modifications over 2010 guidelines. The recommendations use current and use science based information. Additionally, Dr. Backues included a discussion and recommendations for State Animal Health Officials on elephant TB testing.

As an addition to the agenda, Ken Olson presented an update of the Mycobacterial Diseases of Animals (MDA.)

Committee Business:

At the conclusion of formal presentations, Dr. Oedekoven determined there was a quorum.

Dr. Oedekoven reported on the status of the 2014 resolution.
Two resolutions were considered by the committee.

The first resolution is titled "Tuberculosis testing protocol for farmed cervidae." A motion was made to adopt, and was seconded. After discussion, a call for the question was made. The chair called for a show of hands; the resolution passed.

The second resolution is titled "Global Health Security Alliance – A New Initiative to Limit the Spread of Infectious Diseases Globally." A motion was made to adopt, and was seconded. After discussion, a call for the question was made. The resolution passed unanimously.

Each resolution was approved and forwarded to the Committee on Nominations and Resolutions.

One recommendation was considered by the committee.

BACKGROUND: Movement of animals is a known risk factor of disease transmission from farm to farm. Currently, interstate cattle movement data is not available in searchable format and intrastate movement information is not available from most states. This information is available in Michigan. In addition, Mexican cattle movements are not traced after they enter the country allowing for the possibility of exposure of native animals to tuberculosis. There is a growing movement in other countries in the world to capture complete electronically-available data on animal movements. If available, this movement information could be evaluated using social network analysis to improve strategies to target surveillance towards herds of highest risk.

RECOMMENDATION: USAHA encourages USDA/APHIS/VS support in capturing CVI and intrastate movement data from Michigan cattle and cervid herds, through collaboration of university and other partners, to evaluate the risks of disease related to movement data and to inform disease surveillance. Once in place, this system can be expanded to include Mexican cattle movements and other higher risk movements.

A motion to accept the recommendation was made and seconded. The recommendation passes by voice vote.

Other business:

A motion to adjourn was made, and seconded. The meeting adjourned at 5:30 p.m.

Report of the 2015 USAHA Bovine Tuberculosis

Scientific Advisory Subcommittee

Chairman: Mitchell Palmer, DVM, PhD

Four presentations were made at the 2015 TB SAS meeting.

1. Investigation of the cause of geographic disparities in IDEXX ELISA sensitivity in serum samples from *Mycobacterium bovis*-infected cattle

Brett Trost, University of Saskatchewan, Canada

The ability to accurately identify *Mycobacterium bovis*-infected cattle is a critical component of bovine tuberculosis prevention and control programs. One method for detecting infected cattle is an enzyme-linked immunosorbent assay (ELISA) developed by IDEXX laboratories, which detects antibodies in bovine serum or milk samples to two proteins produced by *M. bovis*, MPB70 and MPB83. The assay's sensitivity varies substantially by geographic region, with sensitivities of 77%, 45%, and 9% in serum samples collected from infected cattle in the United Kingdom, the United States, and Mexico, respectively. We hypothesized that geographically biased sequence variation in the genes encoding the above antigens (*mpb70* and *mpb83*), or in the genes encoding proteins that regulate the expression of *mpb70* and *mpb83* (*sigK* and *rskA*), may explain these differing sensitivities. This hypothesis was tested by comparing the sequences of the above genes in the genomes of 455 *M. bovis* strains isolated from cattle in the United Kingdom, the United States, and Mexico. For each of the four genes, a single, common sequence was found in most of the *M. bovis* genomes in all three countries. Additionally, 12 of the 455 strains were isolated from cattle on which the IDEXX ELISA was performed (seven ELISA-positive and five ELISA-negative). Five of the seven ELISA-positive genomes and three of the five ELISA-negative genomes contained the most common sequence of all four genes. Thus, it appears that sequence variation in *mpb70*, *mpb83*, *sigK*, and *rskA* does not explain the geographic disparities in IDEXX ELISA sensitivity.

2. Phage, a new tool for the investigation of bovine TB; rapid identification of bacteremia in the blood of SCCIT-positive cattle

Catherine Rees, School of Biosciences, University of Nottingham, UK

Bacteriophages are viruses that specifically infect bacteria. Like all viruses, they have a specific host range and require viable host cells for replication. For many years now bacteriophage-based methods have been developed for the rapid identification of viable bacteria in a variety of settings – from the food industry to human clinical samples. At Nottingham, we have recently focused on the development of tests that can be used to detect mycobacterial infections in livestock. First we showed that a bacteriophage-based method combined with PCR (phage-PCR) could be used to detect and identify viable pathogenic mycobacteria in the peripheral blood mononuclear cells (PBMCs) of animals suffering from Johne's disease. We have now adapted this method and shown that it can also be used to detect and identify viable *Mycobacterium bovis* in the blood of SCCIT-positive animals with a detection limit of approximately 10 cells per ml of blood, and with results gained within 24h. Interestingly a higher number of *M. bovis* cells were detected in cattle with visible lesions than those with non-visible lesions, suggesting that the bacterial load in blood increases as the disease progresses. These initial results indicate that this simple and rapid method can be used as a new tool to investigate the progress of bovine TB in naturally infected animals. In our studies of Johne's disease, we have found that *Mycobacterium avium* subsp. *paratuberculosis* can be detected in the blood before a positive ELISA result is achieved; if this holds true

for bovine TB there is a potential that this method may allow earlier identification of infected cattle. More recently the methodology has been improved, shortening the time to detection to within one working day and increasing the sensitivity of the method.

3. Laboratory evaluation of factors influencing unexpected gamma interferon results in TB affected herds

Jeffery T. Nelson, USDA, Animal and Plant Health Inspection Service, Veterinary Services, National Veterinary Services Laboratories, Ames, IA.

The National Veterinary Services Laboratories (NVSL), along with the USDA- Veterinary Services Cattle Health Center, worked collaboratively with state animal health laboratories to identify factors that increased false negative results of the gamma interferon assay from samples collected from known bovine TB affected cattle herds. Shipping temperatures and several different lots of gamma interferon assays were analyzed. Through the combination of several rounds of inter-laboratory testing, side by side comparisons of different PPD lots using samples from sensitized cattle at NVSL, and reviewing laboratory control data it was found that the most likely factor affecting the results was decreased activity of the most recent bovine PPD lot used in the stimulation phase of the gamma interferon assay. Laboratories that are approved to perform the gamma interferon assay are no longer using this lot of PPD. After the completion of a verification panel, the approved laboratories are now using an imported version of the gamma interferon assay used throughout the world. NVSL is continuing to work with the manufacturer to identify ways to improve comparison testing of different PPD lots so that consistent results are provided to their stakeholders.

4. Results of PolyBatics Assign bTB skin test and on site Bovigam stimulation

Suelee Robbe-Austerman, USDA, Animal and Plant Health Inspection Service, Veterinary Services, National Veterinary Services Laboratories, Ames, IA.

NVSL reported on studies evaluating synthetic peptides in the PPD and the gamma interferon. With the assistance of Michigan Department of Agriculture and Rural Development and the Texas Animal Health Commission, 2 herds were tested with the Assign bTB, a bead based delivery system for synthetic peptides. Results were highly variable between the 2 herds, with good specificity in the Michigan herd, but poor specificity in the Texas herd. When the Assign bTB was used in the gamma interferon assay, the results were very comparable to the commercially available synthetic peptides from Prionics. Because the bovine PPD was defective in the kit, further comparisons could not be made.

If further evaluations of the Assign bTB is warranted for skin testing, USDA will have to evaluate the use of multidose syringes due to the syringeability of the bead based product. Finally, it appears that clotting is occurring in the updated plastic heparin Vacutainer tubes. Adjustments may be needed in tube design or the heparin additive to improve the usability of blood tubes in the field.

Report from the U.S.-Mexico Bi-National Committee for the Eradication of Bovine Tuberculosis and Brucellosis.

Chuck Massengill, D.V.M., Coordinator

The U.S.-Mexico Bi-National Committee for the Eradication of Bovine Tuberculosis and Brucellosis (BNC) was formed in 1993 based on a recommendation by the USAHA. The BNC has responsibility to provide oversight on the eradication programs in each country and to provide recommendations for the minimum requirements for the exportation of cattle from Mexico to the United States. Each nation is equally

represented with voting members. The BNC meets during the NCBA and CNOG annual meetings. Topics include: surveillance programs, disease traceability, eradication program progress, research programs, region reviews, inter-state and inter-region movement control, legal and regulatory adequacy, and ongoing training. The voting members bring consensus items to the two federal agencies for discussion and clarification. This group has been very successful in promoting cooperation and information exchange between the respective border states, the industry and the federal agencies involved. There has been a remarkable reduction in the number of bovine tuberculosis cases discovered at slaughter in the U.S. since the BNC came into existence. The next meeting will be in conjunction to the NCBA annual meeting in San Diego, California in January 2016. Participation by State Animal Health Officials is welcomed and encouraged by the BNC.

U.S. Department of Agriculture

Animal and Plant Health Inspection Service (APHIS)

Veterinary Services

Annual Update for the State and Federal Cooperative

Bovine Tuberculosis (TB) Eradication Program

Fiscal Year (FY) 2015

Development of Proposed Brucellosis/TB Regulations

APHIS completed new regulations and supporting standards for the brucellosis and TB programs in FY 2012. Under the proposed approach, The *Code of Federal Regulations* will provide the regulatory authority for the programs while the details of the programs will be described in a program standards document. These new regulations and supporting standards were under departmental review during FY 2014-15. APHIS is hopeful that Proposed Rule and Program Standards will be published in 2015. Upon publication, APHIS plans to provide an extended comment period of 90 days.

Bovine State Status

As of September 30, 2015, 48 States, two Territories (Puerto Rico and the U.S. Virgin Islands), and one zone (Michigan) were TB accredited-free. California has modified accredited advanced (MAA) status. The MAA zone of Michigan was advanced to accredited-free status on September 10, 2014. With this advancement, Michigan has an accredited-free and a modified accredited (MA) zone.

Captive Cervid State Status

All States and territories have MA status.

TB Program Reviews

The Michigan TB program was reviewed in FY 2015.

TB-Affected Herds Identified in FY 2015

Five TB-affected cattle herds, including three Texas dairies, and a dairy and a small cattle herd in the MA zone of Michigan were identified during FY 2015. One Texas dairy and both Michigan herds will be

depopulated with Federal indemnity. Two Texas dairies are under a test-and-remove management plan. Two captive cervid herds in the Michigan MA zone remain under quarantine.

National TB Surveillance

Granuloma Submissions: For FY 2015, 6,177 granulomas from 163 federally inspected establishments were identified during postmortem slaughter inspection and submitted for diagnostic testing. In addition, 155 granulomas were submitted from 19 state inspected establishments for a total of 6,340 granuloma submissions. Overall, 2.2 granulomas were submitted per 2,000 adult cattle (culled dairy and beef cows and bulls) slaughtered, a decrease for the second consecutive year. The granuloma submission rate was 2.6 in FY 2014. TB slaughter surveillance during FY 2014 and 2015 have experienced the lowest submission rates since 2006. During FY 2006-13, the submission rate ranged from 2.9-3.5 per 2,000 culled adult cattle slaughtered. The minimum standard for slaughter surveillance is 1 granuloma submitted per 2,000 adult cattle slaughtered annually. Only 31 of the 40 highest volume adult cattle slaughter establishments met or exceeded the submission standard in FY 2015, compared to 37 in FY 2014. These 40 highest volume establishments slaughter approximately 95 percent of adult cattle processed with federal inspection in the United States.

Slaughter Cases: During FY 2015, a total of 12 granuloma submissions had histology compatible with mycobacteriosis, out of 6,340 granuloma submissions (0.2 percent). Of these, TB was confirmed in 10 (83.3 percent) cases. TB is confirmed by polymerase chain reaction (PCR) testing of formalin-fixed and direct PCR and culture of fresh tissue. Of the remaining two cases, other *Mycobacterium* species were identified for one case and one case could not be cultured because only formalin fixed tissue was submitted.

One of the ten confirmed cases occurred in an adult dairy cow over two years of age, and nine cases occurred in feeder cattle. The adult case led to the identification of two infected dairies in Texas. Of the ten fed cattle cases, three occurred in Mexican-origin cattle and six were in domestic origin Holstein steers. Traceback of the Holstein steers led to the identification of the third Texas affected dairy, which is a complex of two dairies and a heifer raiser/feedlot. This is the first time in many years that infected feeder cattle, rather than culled adult cattle, led to the identification of an infected herd. All ten cases were detected at Texas slaughter establishments.

The source of infection for the three Texas dairies is under investigation; however, the source of infection is often not identified for TB. Whole genome sequencing results indicate that the most closely related isolates for the first two dairies are a 2004 Texas and 2007 New Mexico affected dairies, while a 1997 *M. bovis* isolate from Mexico is the most closely related isolate to the isolate from the third Texas dairy.

Mexican-Origin Slaughter Cases: A total of three TB-infected animals identified through slaughter surveillance were determined to be of Mexican-origin. The official Mexican ear tags collected at slaughter indicated origin from the State of Nuevo Leon (one case). Two cases were from Mexico, though the state of origin could not be determined.

Animal Identification Collection for Slaughter Cases:

As a result of USAHA Resolution 29 (2013), the National Veterinary Services Laboratories (NVSL) developed a process to record information regarding the presence or absence of official animal ID on animals sampled for TB slaughter surveillance beginning in April 2014. During April 1, 2015 thru September 30, 2015, 3,985 of 7,578 (52.6 percent) submissions had official animal identification collected at the time of slaughter, 1,874 submissions (24.7 percent) had unofficial identification and 1,719 (22.7 percent) had no identification collected.

Live Animal Testing, Cattle:

Tuberculin skin testing in live animals is another component of national TB surveillance in cattle and bison. During October 1, 2014 through August 31, 2015, a total of 557,395 caudal fold tuberculin skin tests (CFT) of cattle and bison were reported, with 7,868 responders (1.4 percent, 46 states and one Territory reporting, data not available for four states). During FY 2014, 659,080 CFT tests of cattle and bison were reported, with 8,660 responders (1.3 percent, 50 States and 1 Territory reporting).

The gamma interferon test has been approved for use in cattle only as an official supplemental test in the TB program since 2003. Laboratories in seven States (California, Colorado, Michigan, Nevada, Pennsylvania, Texas, and Washington) and the NVSL in Iowa are approved to conduct gamma interferon testing. These laboratories completed approximately 8,000 tests for cattle residing in 20 states during FY 2015 (data incomplete for some laboratories).

Live Animal Testing, Cervids: Information for tuberculin skin testing in captive cervids for FY 2014-15 is not available at the time of this report.

The CervidTB Stat-Pak® and Dual Path Platform® (DPP) tests were approved for program use in elk, red deer, white-tailed deer, fallow deer, and reindeer. Official program testing began on February 2013. During FY 2015, a total of 15,486 cervid serological TB tests were completed. These samples were submitted from 12,735 white-tailed deer (82.2 percent), 2,275 elk (14.7 percent), 294 fallow deer (1.9 percent), 63 red deer (0.4 percent), and 119 reindeer (0.8 percent). Thirty-four animals with positive DPP test results were necropsied in FY 2015. Of these, laboratory tests and culture for *M. bovis* have been negative for 30 animals and are pending for four animals.

Statistical analysis was performed on DPP test performance for tests administered during FY 2013-15. The specificity of the first DPP test is 99.6 percent. The specificity after the second DPP test is 99.86 percent. Raising the DPP test cutoff would decrease sensitivity, while having very little effect on improving specificity; therefore, the DPP cutoff values will not be changed in FY 2016.

Collaborations with Mexico

In FY 2015, APHIS teams conducted reviews in Chihuahua, Coahuila, Durango, Sinaloa, and the Yucatan region consisting of Campeche, Quintana Roo, and Yucatan. APHIS and International Services staff assisted SAGARPA in conducting pre-certification reviews in Baja California and Baja California Sur.

TB Serum Bank APHIS continues to obtain well-characterized serum samples for both uninfected and infected animals. The serum bank contains 5,340 serum samples from cattle, of which 524 are from TB-infected animals, and 3,737 samples from cervids, of which 92 are from confirmed TB-infected animals. Serum bank samples continue to be available to researchers and diagnostic companies for serologic test development. States are encouraged to submit blood and tissue samples from potentially infected cattle and captive cervids, as well as blood samples from presumably uninfected cattle and cervid species from accredited-free States during FY 2015.

IDEXX® *M. bovis* Antibody Test Kit: The IDEXX® *M. bovis* Antibody Test Kit was approved for official TB program use in TB-affected cattle herds in FY 2013. Guidance for the use of the test can be found in VS Guidance 6702.1 - The IDEXX Antibody (Ab) Test Serological Test for Diagnosing Bovine

Tuberculosis (TB) in TB-Affected Cattle Herds. The serology test continues to be evaluated in affected herds, to determine if its use in conjunction with skin testing will reduce the risk of not detecting truly infected animals that are skin test negative. The test was used in TB affected herds in FY 2015, as part of the test and remove herd management plan.

Selected State Updates

Michigan: Two new affected herds were identified in FY 2015, including a dairy herd and a small beef herd located in the MA zone. Both herds were detected through annual herd testing. Three of nine total cattle in the beef herd had gross lesions and were confirmed infected with *M. bovis*. In addition, tissues from a goat in the same herd were compatible for mycobacteriosis and culture was positive for *M. bovis*. This is the first detection of *M. bovis* in a domestic goat since 1991. The affected dairy in the MA zone has an estimated within herd prevalence of nearly 10 percent. This herd will be depopulated, but completing the depopulating was delayed due to funding limitations and will be completed in early FY 2016. Two affected captive cervid herds that were detected in FY 2009 remain under quarantine in the MA zone.

Texas: Three infected dairies were identified in FY 2015. The first dairy was quarantined in October 2014 and was detected through slaughter surveillance. The estimated prevalence of TB based on gross lesions found was 5.9%, based on necropsy results of reactors from the second whole herd test. This dairy will be depopulated in early FY 2016. The second dairy was also quarantined in October 2014 and is under the same ownership as the first dairy, but is located on a geographically separate premises and had only three confirmed *M. bovis* infected cattle. This second dairy was managed by testing and will receive its quarantine release test in December 2015.

The third dairy identified as affected in Texas was quarantined in April 2015. This operation consists of three premises including two dairies and a heifer raiser/feedlot that were tested after TB was confirmed in six TB infected Holstein steers that traced back to the feedlot. The infected steers were detected by slaughter surveillance during December 2014 and January, April, and May 2015. Test and remove herd management is being used for these premises.

Gamma Interferon Testing Issue

In the course of tuberculosis testing the first Texas dairy quarantined in FY 2015, relatively lower sensitivity of the US gamma interferon assay (34% and 28%) for lesions of tuberculosis was noted on the first two herd tests. As a result of extensive investigation and study over several months with collaboration of the Cattle Health Center, National Veterinary Services Laboratories, and gamma interferon testing laboratories in Texas, Michigan, and California, a problem with lower activity of one of the lots of stimulating tuberculin in the gamma interferon assay was discovered. A notice from Veterinary Services revoked the official status of tests conducted with this particular lot after July 31, 2015. The notice described procedures to replace this testing with either the comparative cervical test or a gamma interferon assay that included a ROW (Lelystad) tuberculin for stimulation. All laboratories were verified as conducting gamma interferon assays with the ROW tuberculin by August 9, 2015.

. Summary: Presentation of the National Campaign against bovine Tuberculosis in Mexico

The Federal budget to operate the National Campaign against bovine tuberculosis in Mexico, in 2002 was \$44, 664,469.76 Mexican pesos, in 2015 Federal resources are \$234, 313,564.00 Mexican pesos, and this represents over these years an increase of 500%, with a positive impact in the operation of the Campaign.

The precedents of the Campaign in Mexico began 1910, when the Directorate General of Agriculture created the animal health program against bovine tuberculosis. Then, the National program against bovine tuberculosis was created in 1972. The next important date was when the first Law on Animal and Plant Health was published (1974), and by the year 1992, the skin diagnostics tests began in the states of Sonora and Chihuahua, and it was initiated the TB free herds Program in the northern border states; in 1993 was created the Mexico-United States Binational Committee for the eradication of bovine tuberculosis, and in 1996 was published in the Official Gazette, the NOM-031-ZOO-1995, National Campaign against Bovine Tuberculosis (*Mycobacterium bovis*). By 2000 there were already 10 states in Phase II and 9 States in Phase I, and initiate the process of recognition of zones by waiver; in 2007 the Memorandum 552.41 "Guide for Tuberculosis (TB) reviews for in Mexico is published; in 2008 an agreement was reached to have a Strategic Plan against bovine tuberculosis, by 2012 83% of the national territory under eradication is achieved, and in 2013 a second US-Mexico Strategic Plan for 2013-2018 was developed; in 2015 the regional review process began with the Yucatan Peninsula, which it consolidates successfully to be recognized by APHIS on Modified Accredited status. In May of this year, the Official Gazette NOM-001-SAG / GAN-2015 "National System of Animal Identification for cattle and beehives" was published, which is expected to consolidate the identification and traceability systems. In addition, in June the protocol for approved feedlots was modified, improving the criteria for monitoring and authorization.

Además de la normatividad nacional, existen acuerdos internacionales entre México y Estados Unidos (SENASICA/APHIS) como los Memorandos, Protocolos y el Plan Estratégico

Besides National regulation there are International Agreements between Mexico and United States (SENASICA – APHIS) as Memoranda, Protocols, and the Strategic Plan.

Hay dos modalidades de supervisión la Documental (dictámenes de prueba, reportes, expedientes, etc) y la Presencial (uniones ganaderas, rastros, corrales, etc.).

There are two methods of supervision: Documentary (tests charts, epidemiological investigations, reports) and In situ (cattle association, slaughterhouses, feedlots).

The performance indicators of the campaign are measured on a quarterly basis, June 2015 are as follows: National prevalence is 0.09%, to 253,959 herds with 1,385 infected herds (definitive quarantines) and 3,282 preventive quarantine; in the first half of 2015, 3,968 samples have been sent to different laboratories at the national level with an average of 3 days for the sample arrival the laboratory and 6 days for the issuance of Histopathology results and 36 days for bacteriology, it is 95.7% inspection on the slaughter plants, with a rate of 2.37 submission rate of samples for every 2,000 animals inspected. There are 3,996 TB free herds, 234 certified free herds and 62 approved feedlots. From January to June 7,050,827 animals have been tested and from this, 62,456 were responders to the tuberculin skin test with a response percentage of 0.89% of the animals.

Because of its economic importance to the country, exports of calves is a relevant factor for the livestock sector in the north, from 1993 to 2015 have been exported around 22.3 million head, in the last cycle 2014 to 2015, 955,896 heads were exported by the different border ports located in Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas, there were only one case reported by APHIS, which represents a rate of 0.11 cases per 100,000 animals exported.

The National System for Individual Identification of Livestock (SINIIGA) allows to set the basis for improving, strengthening and linking other information systems related to cattle, through the allocation of a single, permanent and unique numbering throughout the animal's life to form a central data bank:

Establish permanent individual identification of cattle in Mexico and form a dynamic database, to guide comprehensive actions that lead to raising the standards of traceability and competitiveness of Mexican livestock.

At this date it has 96% advance in the identification of cattle in the country, and it has an electronic system that allows the use of the database of identification to establish a reliable traceability by issuing mobilization guidelines with data of origin and the destination, watching the entire production chain (farm, gathering, feedlot, slaughterhouse); The system is known as Electronic Registration Mobilization (REEMO) and is currently operating in 10 states and is projected to increase coverage in 10 more in the rest of this year.

Due to the change in the regulation of the United States of America, the recognition of areas of low prevalence of bovine tuberculosis includes a new regionalization. During March 2015 the first regional review (Yucatan, Campeche and Quintana Roo) it was performed. At this date exist the proposal of 12 regions, one in Level "I", seven in Level "II" and four in Level "III".

It has agreed protocols with APHIS: approved feedlots which allow the mobilization of cattle from non accredited regions to accredited regions for fattening accredited under control measures; Free Herd Certificates in which the requirements for the mobilization of cattle from non accredited regions to accredited regions in order to improve livestock. Now 234 Herds reach this certification.

Some important challenges and issues of the Campaign are:

- Complete the National Identification System to form a National Traceability System that gives certainty in determining the origin of livestock for animal disease eradication program and security exports.
- Reduce underreported cases of Tb in respect of bad field trials conducted by private veterinarians.
- Increase the percentage of successful tracing and epidemiological investigation of cases and suspicions
- Advance in "not accredited" zones and in control.
- Increase surveillance of TB in municipal slaughterhouses and implementation of epidemiological surveillance of TB in wildlife.
- Finish research projects for the use of vaccines against TB in dairy herds and genetic characterization and distribution in Mexico strains of *Mycobacterium bovis*.

On the other hand there are prospects:

- Strategic Plan 2012-2018, in which all regions of beef cattle dual purpose cattle have a prevalence lower of 0.5% and dairy cattle less than 5%, based on a national system for identification and traceability.
- Updating the regulations, implementation of new technologies in research and diagnostics, maintenance of our exports and reduce risks to public health.

- Operating a control program Tb in specialized dairy cattle through the use of the vaccine against bovine TB in herds of high and low prevalence, under the scheme of infected herd (2018).
- Complete the genetic characterization of *Mycobacterium bovis* endemic strains.
- Increase surveillance of TB in municipal slaughterhouses and implement epidemiological surveillance in wildlife.
- Increase the percentage of successful tracing and epidemiological investigations.

Place holder for time specific paper: *“Real time PCR used in US Slaughter Surveillance.”*

Texas Bovine Tuberculosis Report

October 27, 2015

In fiscal year 2015, slaughter inspection in Texas disclosed two cases of TB in separate lots of feeder animals imported from Mexico, and seven cases of TB in dairy animals that initiated two separate dairy complex investigations.

2014 Dairy Complex:

Investigation of a lesioned cow at slaughter in October 2014 led to the quarantine of two large dairies and an associated feed/grower yard under the same owner.

Dairy #1 consisted of approximately 10,300 head, including associated heifers in the feed yard. All CFT responders were removed on a series of herd tests. TB has been confirmed in 300+ animals on this dairy and in the grower yard. Stochastic modeling by USDA indicated 19 or more removal tests would be needed to release this herd. Federal indemnity funds were requested early this year and made available in recent weeks. The appraisal process is currently underway. Once the numbers are agreed upon, the herd will be depopulated.

Dairy #2 consisted of approximately 12,000 head. Only one TB affected animal has been found on this dairy (November 2014), a heifer that had fairly recently moved from Dairy #1. Stochastic modeling by USDA indicated four removal tests would be needed for release of this herd. The fourth test was conducted in June 2015. An assurance test is scheduled for December 2015.

All replacement animals sold from these two dairies have been traced, including those going out of state. Tracing efforts continue on culled animals sold 3-5 years prior to the disclosure of TB. Culls in the past two years went directly to slaughter.

One additional feed yard under outside ownership remains under hold order until all exposed steers are fed out.

The genetic sequence of isolates from this herd do not match other outbreaks in the U.S., and the source of infection in the complex has not been identified.

2015 Dairy Complex:

Over a several month period earlier this year, 6 Holstein steers with lesions at slaughter were confirmed with TB. Subsequent investigation and testing led to the disclosure of two affected dairies (Dairy #3 and Dairy #4) and an associated feed/grower yard, all under the same owner (but different from the 2014 Dairy Complex). The first positive steer was from the same outside feed yard mentioned in the 2014 investigation. It was in a consignment with steers from 10 dairies, including animals from dairy #1 discussed above. Some of the subsequent positive steers had ID's that traced to Dairy #3. On initial whole herd tests, TB was not found in dairy #3 but was confirmed in one cow in dairy #4. (Due to delays in the indemnity process and negotiations over indemnity amounts, TB was not confirmed in this cow until after the herd was tested a second time.) Subsequent testing in Dairy #3 and Dairy #4 identified two histo-compatible cows and one histo-compatible cow, respectively. Cultures are pending. Tuberculosis was confirmed in 16 heifers in the feed yard on the initial test.

Genetic sequencing to date indicates all isolates in this operation are closely related to each other, but are not related to isolates from the 2014 Dairy Complex investigation. Again, there is no match with other outbreaks in the U.S. This same sequencing information indicates TB may have been introduced into the grower yard through purchased additions, then spread to the dairies. Trace-in investigation is being conducted.

Replacement heifers sold from the affected grower yard have gone to Texas dairies and to five other states. These states have been notified. Sales records of culls through traders and livestock markets in Texas and New Mexico are being compiled, which will lead to the identification of additional trace animals.