

DISEASE: Bovine Tuberculosis *Mycobacterium bovis* (TB, Bovine TB, M.bovis)

RATIONAL FOR SURVEILLANCE

Bovine tuberculosis (TB) is an infectious and communicable granulomatous disease caused by the acid-fast bacilli bacteria of *Mycobacterium bovis* (*M. bovis*). It is commonly a chronic, debilitating disease, but occasionally may assume an acute, rapidly progressive course. *M. bovis* is a widespread zoonosis that is global in magnitude and affects nearly all species of vertebrates (cattle, sheep, goats, pigs, bison, buffalo, and camelids.) Disease is spread by direct contact, inhalation of infected droplets expelled from infected lungs, and ingestion of contaminated feed or milk. In most countries, TB is a notifiable disease. Overall, TB has an important world-wide impact on animal industries and human health. Control measures are based on prevention and eradication. Surveillance is a key element for management of preventions and control programs.

Surveillance for TB serves the purpose of enabling Veterinary Services to obtain an accurate picture of the scope of the disease in the US livestock populations; in the event of a disease outbreak, the course TB follows in livestock and wildlife populations for a given area over time; and permits timely intervention if the trend observed deviates from what is expected.

GOALS

The objective of the national bovine tuberculosis program is to eradicate the disease from this country so that it no longer poses a threat to livestock, wildlife, and public health. The goals for surveillance system are:

1. detect last cases of the infection in domestic ruminants,
2. measure progress and effectiveness during/of eradication program,
3. demonstrate disease freedom or low risk for trading purposes,
4. rapidly detect bovine tuberculosis in the event that it is introduced to the US.

RECOMMENDED CASE DEFINITION

Clinical Description: Animals (cattle, bison, goats, and/or captive cervid) infected with *M. bovis* are difficult to diagnose on clinical signs alone, even in advanced cases. Clinical signs may mirror the extent and location of lesions in the animal, plus any underlying toxemia, and be actualized as progressive emaciation; lethargy; weakness; anorexia; and a low-grade, fluctuating fever. A respiratory form may be manifested as a bronchopneumonia with a chronic intermittent, moist cough with dyspnea and tachypnea. Also, superficial lymph node enlargement may be present.

An animal is diagnosed as infected with *M. bovis* based on:

1. positive response to an official tuberculin test or
2. necropsy examination by a USDA or State veterinarian performing or supervising the slaughter inspection or
3. histopathology examination by a veterinary pathologist or
4. positive culture of selected tissues for *M.bovis* or
4. decision by a designated tuberculosis epidemiologist (DTE).

Case Classification:

Negative: An animal (bovine, bison, goat, or captive cervid) not showing a response to the tuberculin test; or classified by the testing laboratory as "avian" or "negative" on the BTB test; or classified by the testing veterinarian based upon history, supplemental tests, examination of the carcass, and histopathology and culture of selected tissues.

Exposed: Any animal exposed to bovine tuberculosis by reason of associating with bovines, bison, goats, captive cervids, or other livestock from which *M. bovis* has been isolated.

Suspect: Any bovine, bison, or goat that shows a response to the caudal-fold tuberculin test and is not classified a reactor, or is classified suspect by a comparative cervical test.

Any captive cervid not negative to the SCT test or the CCT test, or classified by a testing laboratory as equivocal in response to the BTB test, and not classified as reactor by the testing veterinarian.

Reactor: An animal (bovine, bison, goat, or captive cervid) diagnosed as infected with *M. bovis* based on a positive response to an official tuberculin test and is classified a reactor by the testing veterinarian or DTE, or any suspect animal classified as a reactor upon slaughter inspection or necropsy after histopathology and/or culture of selected tissues by the USDA or State veterinarian performing or supervising the slaughter inspection or necropsy.

NGL: No Gross Lesion (NGL) - any reactor or suspect that does not reveal any detectable lesion(s) for TB upon necropsy or slaughter inspection. An animal

DIAGNOSTIC PROCEDURES

Laboratory Criteria for Diagnosis:

Isolation of *M. bovis* from clinical specimen.

Histopathology examination of tissue specimens compatible with pathological lesions.

PCR Polymerase chain reaction (PCR) assay detection of *M. bovis* in tissue specimens.

BTB Blood tuberculosis test (BTB):[captive cervids only] is a supplemental test for bovine TB in captive cervids used to establish the disease status of a herd.

Diagnostic Field Testing Criteria:

OTT Official tuberculin test (OTT): any test for bovine tuberculosis, approved by APHIS, applied and reported by an approved veterinarian in accordance with the UM&R*.

OTT for cattle, bison, and goats are the CFT, CCT and CT.

OTT for captive cervids are the SCT, CCT and BTB.

CFT Caudal-fold tuberculin test (CFT): an intradermal injection of 0.1 ml of USDA purified protein derivative (PPD) tuberculin (1 mg/ml PPD) into either side of the caudal fold with reading by visual observation and palpation 72 hours ((+/- 6 hr.) following injection. Cattle, bison, goats, or captive cervids must not be subjected to CFT retest at intervals of less than 60 days.

CCT Comparative cervical tuberculin test (CCT): an intradermal injection of biologically balanced USDA bovine PPD tuberculin and avian PPD tuberculin at separate sites on the mid-cervical area to determine the probable presence of *M. bovis* by comparing the response to the two tuberculins at 72 hours (+/- 6 hr.) following injection. An approved State or Federal veterinarian must do this test.

CT Cervical tuberculin test (CT): an intradermal injection of 0.1 ml of USDA bovine cervical PPD tuberculin (2 mg/ml PPD) into the cervical (neck) region with reading by visual observation and palpation 72 hours ((+/- 6 hr.) following injection. Results of the CT test can only be classified as reactor or negative. An approved State or Federal veterinarian must do this test.

SCT Single cervical tuberculin test (SCT):[captive cervids only] an intradermal injection of 0.1 ml of USDA bovine PPD tuberculin (1 mg/ml PPD) into the mid-cervical (neck) region with reading by visual observation and palpation 72

*Standard procedures and minimum requirements for classification of cattle, bison, goats, and captive cervids are listed in the Bovine Tuberculosis Eradication: Uniform Methods and Rules (UM&R) (1/22/99) under Part II, III, and IV Standard Procedures (Minimum Requirements).

SURVEILLANCE MODELS

Mandatory Surveillance:

Bovine tuberculosis is a national program disease that requires the reporting of all suspected tuberculosis cases by producers, veterinarians, slaughter establishments, and diagnostic laboratories.

Routine Surveillance:

Passive:

- Mandatory reporting of suspected TB cases by veterinarians and diagnostic laboratories.
- Show or exhibition test requirements.
- Change_of_ownership testing.

Active:

- Point Concentration Monitoring: Inspection and collection of tissue samples from cattle, bison, goats, and captive cervids at slaughter establishments.
- Interstate Movement Testing: animals not known to be infected or exposed to TB must be negative to an official tuberculin test within 30 days prior to interstate shipment. (Required for animals moving from nonmodified accredited states.)
- Pasteurized Milk Ordinance Testing: dairy cattle producing milk for pasteurization must be in herds located in at least a Modified Accredited Tuberculosis Area as determined by the USDA. Dairy herds located in areas that fails to maintain at least this status have to be accredited by the USDA as tuberculosis free or the herd must pass an annual tuberculosis test.

Outbreak Surveillance:

Area Testing: Official tuberculin testing of cattle, bison, goats, and captive cervids on-farm in wide area testing program.

Trace Testing: All animals cattle or bison herds or animals associated with an animals showing evidence of TB or due to movements of infected animals must be traced and tested.

Sentinel Surveillance:

Annual Herd Testing:

Accredited Herd

- Cattle, bison, goats: herd has passed at least 2 consecutive annual caudal-fold tuberculin test, has no other evidence of bovine TB, and meets the standards of the Bovine Tuberculosis UM&R. Status is maintained through annual herd testing around the anniversary date.
- Captive cervids: herd has passed at least 3 consecutive official tuberculosis test of all eligible animals conducted at 9- to 15-month intervals, has no evidence of bovine tuberculosis, and meets the standards of the Bovine Tuberculosis UM&R. Status is maintained through biennial herd testing around the anniversary date.

Qualified herd

- Captive cervids: herd has undergone at least one complete official negative test of all eligible animals within the past 12 months, has no evidence of bovine TB, and meets the standards of the Bovine Tuberculosis UM&R.

Monitored herd

- Captive cervids: herd for which identification records are maintained for animals 1 year of age and older that are slaughtered and inspected for tuberculosis at an approved State or Federal slaughter facility or an approved diagnostic laboratory, and animals classified negative to an official tuberculin test.

Parallel Surveillance Systems:

Brucellosis testing at slaughter: animal identification and owner data are collected at slaughter.

MINIMUM DATA ELEMENTS

Case-based Data for Investigation and Reporting:

Case classification (suspect/reactor), unique identification, backtag identification, species, breed, age, date reported, place discovered (e.g. slaughter establishment #), laboratory findings, owner, owner address, county, state, geographical location, estimated date of infection, date of reporting, exposure history, productive status, and animal/herd history.

Outbreak Data:

Number of cases by case classification (suspect/reactor), species, breed, sex, owner, owner address, state, geographical location, date of reporting, number of infected and exposed herds

Aggregated Data:

Number of cases (confirmed reactor), species, state, and geographical location

DATA ANALYSIS & PRESENTATION

- Graphs:** Number of reactor cases by species and state reported monthly.
Number of quarantined herds and exposed herds by species and state reported quarterly.
- Tables:** Number of reactor cases by species in county and state reported monthly.
Number and location of quarantined herds, exposed herds, and depopulated herds by species by state reported quarterly. Describe TB case findings and control program outcomes.
Number of inspected animals at slaughter from which tissue samples were collected and submitted.
- Maps:** State and county geographical location of reactor cases by species reported monthly.
State and county geographical location of quarantined herds and exposed herds by species reported monthly.

REPORTS

QUARTERLY REPORT OF TUBERCULOSIS ERADICATION PROGRAM ACTIVITIES

- Purpose:** This is a quarterly summary of state and national Tuberculosis program eradication activities, progress, and surveillance statistics.
- Data Source:** Report of Tuberculosis Eradication (VS FORM 6-2) or (VS FORM 6-2-R)
- Action:** **Area Level:** A quarterly VS FORM 6-2 report must be submitted for tuberculosis program eradication activities accomplished in a State. This will include the following: (a) reasons for and results of tuberculin testing in animals, (b) postmortem data on tuberculosis reactors and exposed non-reactor animals reported at slaughter, (c) swine tuberculosis information, and (d) summaries of testing results.
A VS FORM 6-2 must be completed by the 20th day in the first month following the end of the quarter (i.e., OCT. 20, JAN. 20, APR. 20, & JUL. 20). Copies of the completed VS FORM 6-2 for each State should be sent to the State Veterinarian's Office, the Regional Epidemiologist, and the Tuberculosis Program National Coordinator on the NAHP Staff.
National Level: A Quarterly Summary for Tuberculosis Eradication Activities in the United States will be compiled by the NAHP Staff using all data submitted on the VS FORM 6-2 reports from the States. This compiled summary should be completed by the last day of the first month following the end of the quarter (i.e., OCT. 31, JAN. 31, APR. 30, & JUL. 31) for each new quarter. Copies of this quarterly report will be sent to the Director of Animal Health Programs and VS Regional and Area Offices for distribution.

ANNUAL NATIONAL REPORT OF TUBERCULOSIS PROGRAM ACTIVITIES

- Purpose:** This is an annual national summary report for all tuberculosis eradication activities completed in the United States.
- Data Source:** Report on Herd Revealing Reactors to Tuberculin Test (VS FORM 6-4)
Report of Tuberculosis Eradication (VS FORM 6-2) or (VS FORM 6-2-R)
Accredited Area Surveillance for Tuberculosis (VS FORM 6-38)
And all tuberculosis data submitted for tuberculosis in the National Generic Database.
- Action:** **National Level:** This report is compiled by the NAHP Staff using all data entered for tuberculosis in the National Generic Database for the fiscal year. This will contain line item tracking data, level of disease eradication attained, surveillance data, national progress statistics, and summary information of the tuberculosis program. The Tuberculosis Program Coordinator on the NAHP Staff will work with the National Surveillance Coordinators on Headquarters Staff and at Centers for Epidemiology and Animal Health to produce an annual summary report of all using the data from the quarterly reports. This annual report is compiled for each fiscal year. Copies of the report are sent to state and industry cooperators, State Veterinarians, VS Area and Regional Offices, the APHIS Administrator, the Secretary of Agriculture, and Congress.

ANNUAL TUBERCULOSIS ACCREDITATION AREA CLASSIFICATION FOR A STATE

- Purpose:** This is a summary report of the tuberculosis program activities in a state, or a

designated area, and a request for accreditation or reaccreditation of tuberculosis status in regard to disease eradication and the degree of surveillance being conducted.

Data Source: Accredited Area Surveillance for Tuberculosis (VS FORM 6-38)

Action: **Area Level:** This summary report and application require specific statements about cattle populations and herd status, slaughter inspection, quarantined herds, test results of high risk herds, and tuberculosis surveillance testing in the State.

A completed VS FORM 6-38 report and request must be filed annually by VS Area Office for each State. The form request must be signed by both the State Veterinarian and the Area Veterinarian-in-Charge (AVIC.) The reporting period is for the fiscal year. The form should be submitted to the NAHP Staff for review by the end of the first month following the reporting period (i.e., due by November 1.)

National Level: The National Tuberculosis Program Coordinator on the NAHP Staff will review all VS FORM 6-38 applications to decide if the State meets the provisions set forth in the Uniform Methods and Rules for Tuberculosis Eradication. If the State meets all the necessary conditions, the National Tuberculosis Program Coordinator will approve the status for another year and issue a new reporting date in a letter to the AVIC, State Veterinarian, and Regional Epidemiologist.

PRINCIPAL USES OF DATA FOR DECISION MAKING

Surveillance Data:

- Estimate the magnitude of the problem in animals.
- Monitor the distribution of the disease in animals.
- Detect outbreaks in animal species.
- Monitor and evaluate impact of prevention, control, and eradication measures and activities on defined animal populations.

Investigation Data:

- Identify animal populations at risk
- Identify potentially infected animal sources (herds)
- Identify potentially exposed animals (herds)
- Identify potentially contaminated animal products (meat and milk)
- Identify potentially infected people (animal workers, caretakers, etc.)

Area/Field Level:

Ensure contact tracing is carried out, area outbreaks are recognized, and epidemiology is monitored.

Regional Level:

Monitor and report epidemiological findings in the states and performance of control and eradication programs.

National Level:

Monitoring and reporting epidemiology in the U.S. and performance of control and eradication programs, and planning for program activities (e.g. securing funds and regulation and UM&R updates)

International Level:

Examine disease trends over time and make regional comparisons with the intent of revising import protocols as necessary and coordinating control efforts across international borders (e.g. Mexico)

SPECIAL ASPECTS

The surveillance activities of the animal health sector and public health must be fully coordinated and integrated. Administrative arrangements between both sectors must be established to facilitate immediate cross notification of cases/outbreaks. Surveillance and control programs must be promoted in high risk production areas for cattle, bison, goats and captive cervids.

CONTACT INFORMATION

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Regional Tuberculosis Epidemiologist
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Veterinary Services Central Regional Office
Regional Tuberculosis Epidemiologist
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Area Offices:

http://www.aphis.usda.gov/vs/area_offices.htm

ADDITIONAL INFORMATION

The publication, **Bovine Tuberculosis Eradication: Uniform Methods and Rules (UM&R) (1/22/99)** contains the minimum standards of the Cooperative State–Federal Bovine Tuberculosis Eradication Program and minimum requirements for the intrastate and interstate movement of cattle, bison and goats with respect to tuberculosis. Also, it provides the minimum standards for certifying and maintaining tuberculosis-free accredited herds of cattle, captive cervids, bison, and goats; classifying States, regions, and areas; and detecting, controlling, and eradicating tuberculosis.

The **United States Code of Federal Regulations, Title 9, Animals and Animal Products**, Subchapter B, Part 50, and Subchapter C, Parts 71 and 77 contains the general and permanent rules covering regulatory areas for cooperative control and eradication of tuberculosis, interstate transportation and the restrictions on interstate movement of animals because of tuberculosis, and designations of tuberculosis areas.

The **Grade "A" Pasteurized Milk Ordinance** 1997 R-5 Revision is the milk sanitation program for the U.S. Public Health Service. Section 7, Animal Health, requires that all milk for pasteurization must be from herds that are located in at least a Modified Accredited Tuberculosis Area as determined by the U.S. Department of Agriculture. Dairy herds in areas that fails to maintain at least this status must be accredited by the USDA as tuberculosis free or must have passed an annual tuberculosis test.