

# Brucellosis



Public Health Branch

## 1. Case Definition

### 1.1 Confirmed Case:

Clinical illness\* with laboratory confirmation of infection:

- Isolation of *Brucella species* from an appropriate clinical specimen  
OR
- A significant (i.e., fourfold or greater) rise in *Brucella* agglutination titre between acute and convalescent serum specimens obtained two or more weeks apart and tested at the same laboratory (1)  
OR
- Positive *Brucella* PCR (Polymerase Chain Reaction) from any clinical specimen.

### 1.2 Probable Case:

- Clinical illness\* in a person who is epidemiologically linked to a confirmed animal case  
OR
- Clinical illness\* with supportive serology (*Brucella* agglutination test titre of 1:160 or higher in one or more serum specimens obtained after onset of symptoms) (1).

\*Clinical illness is characterized by insidious onset of fever, night sweats, undue fatigue, anorexia, weight loss, headache and arthralgia (1).

## 2. Reporting Requirements

### Laboratory:

- All positive laboratory results are reportable to the Public Health Surveillance Unit (204-948-3044 secure fax).
- Medical laboratories in Manitoba detecting *Brucella species* shall forward isolate subcultures or residual serum specimens to Cadham Provincial

Laboratory within seven days of the detection.

### Health Care Professional:

- Probable (clinical) cases are reportable to the Public Health Surveillance Unit (form available at [http://www.gov.mb.ca/health/publichealth/cdc/protocol/mhsu\\_0013.pdf](http://www.gov.mb.ca/health/publichealth/cdc/protocol/mhsu_0013.pdf) ONLY if a confirmatory positive lab result is not anticipated (e.g., poor or no specimen taken, person has recovered).

### Regional Public Health/First Nations Inuit Health Branch (FNIHB):

- Once the case has been referred to Regional Public Health/FNIHB, the *Communicable Disease Control Investigation Form* ([http://www.gov.mb.ca/health/publichealth/cdc/protocol/mhsu\\_0002.pdf](http://www.gov.mb.ca/health/publichealth/cdc/protocol/mhsu_0002.pdf)) should be completed and returned to the Public Health Surveillance Unit by secure fax (204-948-3044).

## 3. Clinical Presentation/Natural History

Disease onset can be acute or insidious (2). Manifestations are nonspecific and include fever, night sweats, weakness, malaise, anorexia, weight loss, arthralgia, myalgia, abdominal pain and headache (2). Malodorous perspiration is a prominent feature (3). Localized suppurative infections of organs, including liver and spleen may occur, as well as chronic localized infections; subclinical infection has been reported (4). Untreated brucellosis can last from several weeks to several years (5). Osteoarticular involvement is the most common complication seen in up to half of brucellosis cases (6). Rare complications in the course of brucellosis may involve the respiratory system (7). Neurological complications may also occur with frequent sequelae, despite treatment

(6). The case fatality rate of untreated brucellosis is 2% or less and usually results from endocarditis caused by *B. melitensis* infection (4). Relapse after treatment or chronic infection may occur (2).

**In Pregnancy:** Brucellosis complicates pregnancy in one-third to one-half of women infected while pregnant, particularly in the first two trimesters (6). Disease is linked to intrauterine infection, fetal death, spontaneous abortion, premature delivery and low birth weight in the neonate (6).

**Special Considerations:** The potential to infect humans and animals through aerosol exposure, combined with a low infectious dose of 10 -100 organisms, and its vague clinical characteristics defying rapid clinical diagnosis, makes *Brucella* species a potential biological weapon and bioterrorism agent (4, 8, 9).

## 4. Etiology

*Brucella* are small coccobacilli bacteria (2, 6). The four species pathogenic for humans are *Brucella melitensis*, *B. abortus*, *B. suis* and rarely *B. canis* (6). *Brucella ceti*, *B. pinnipedialis* and *B. inopinata* are recently identified species that are potential human pathogens (2). On the basis of biologic and serologic criteria, three of the species, *B. abortus*, *B. melitensis*, and *B. suis* are considered biovars (6). The most invasive and pathogenic for human brucellosis is *B. melitensis*, followed by *B. abortus* and *B. suis* (6).

## 5. Epidemiology

### 5.1 Reservoir and Source:

Brucellosis is a worldwide zoonosis of wild and domestic animals, mainly cattle (*B. abortus*), swine (*B. suis*), goats and sheep (*B. melitensis*)(6). The leading source of human brucellosis worldwide is sheep and goat milk contaminated with *B. melitensis* (6). Dogs are the primary host for *B. canis*, but can also become infected with

other *Brucella* species (10). *B. ceti* and *B. pinnipedialis* have been isolated from marine mammals (10). Rare cases of marine-associated human brucellosis have been reported (10). Any infected animal may carry *Brucella* for life (11). *Brucella* does not form spores but is relatively environmentally resistant (9).

Porcine and caprine/ovine brucellosis have never been reported in livestock or wildlife in Canada (11). In 1985, Canada was declared free of bovine brucellosis in livestock (11). Several isolated cases of bovine brucellosis in livestock were subsequently identified, with the last known case occurring in a cattle herd in Saskatchewan in 1989 (11).

The highest risk of acquiring brucellosis in Canada would be from wildlife, including marine animals (12). There are two wildlife brucellosis reservoirs in Canada:

- Bovine brucellosis in free-ranging bison herds in and around Wood Buffalo National Park, which straddles the border between Alberta and the Northwest Territories;
- Rangiferine brucellosis (*B. suis* biovar 4) is present in free-roaming caribou and reindeer in arctic and sub-arctic Canada (11).

### 5.2 Transmission:

Transmission occurs by inoculation through mucous membranes or cuts and abrasions in the skin, inhalation of contaminated aerosols, or ingestion of undercooked meat or unpasteurized dairy products contaminated with *Brucella* (2). Brucellosis is transmissible to humans by direct or indirect exposure to aborted fetuses or tissues or fluids of infected wild and domestic animals (2). Airborne infection has been reported in laboratory and slaughterhouse workers (4). Human-to-human transmission is rare; however, congenitally and sexually transmitted cases have been reported

(6), and infected mothers can transmit *Brucella* to their infants through breastfeeding (2). While uncommon, transmission of *Brucella* spp. may also occur through tissue transplantation or blood transfusions (10). In areas of endemicity, disease is usually acquired through the enteric route by consumption of contaminated unpasteurized dairy products (13). *Brucella* in milk-producing animals is not endemic in Canada (11). Although rare, transmission of *B. melitensis* from patients to medical personnel has been documented (13), and laboratory acquisition is well described.

### 5.3 Occurrence:

**General:** Brucellosis is the most frequent zoonotic infectious disease in the world, affecting more than 500,000 each year (14). Brucellosis is observed more frequently in developing countries (6). The highest recorded incidence of human brucellosis occurs in the Middle East and Central Asia (15). Sources of infection and responsible organism vary according to geographic area (4). In the United States of America, brucellosis occurs predominantly in California and Texas (3). International travel and the importation of exotic food from endemic areas account for a limited number of cases reported annually in brucellosis-free industrialized countries (9).

**Canada:** In 2015, ten cases of brucellosis were reported to the Public Health Agency of Canada (16). Four of the cases were in women and six in men (16).

**Manitoba:** As of March 13, 2018, 10 cases of brucellosis had been reported to Manitoba Health, Seniors and Active Living since 2000 inclusive. Seven cases were in females and three in males. At least six of the reported cases were travel related and of these, three were linked to consumption of unpasteurized cheese.

### 5.4 Incubation:

The incubation period varies from less than one week to several months but most people become ill within three to four weeks of exposure (2).

### 5.5 Risk Factors:

Individuals in occupations such as farming, ranching, and veterinary medicine, as well as abattoir workers, meat inspectors, and laboratory personnel are at increased risk (2). Brucellosis is among the most common laboratory-acquired bacterial infections (4). In areas of endemicity, persons consuming undercooked meat and unpasteurized dairy products from infected animals are at increased risk (4, 14). In Canada, hunters consuming meat from wildlife, including marine mammals such as whales and seals, are at greater risk (12). Medical personnel in endemic regions may be at risk when participating in activities characterized by gross exposures to contaminated fomites or tissues or massive bleeding, such as certain obstetric procedures (4).

### 5.6 Host Susceptibility and Resistance:

Severity and duration of clinical illness are subject to wide variation. Duration of acquired immunity is uncertain.

### 5.7 Period of Communicability:

Human-to-human transmission is rare (2).

## 6. Diagnosis

Diagnosis is made by appropriate isolation of the organism from blood, bone marrow, or other tissue or positive PCR from any clinical specimen. *Brucella* can also be cultured from pus, tissue samples, and cerebrospinal, pleural, joint, or ascitic fluid (17). Multiple cultures are recommended; prolonged incubation is necessary before being reported as negative. Diagnosis may also be made by serology when paired sera show a rise in antibody titre (refer to Case Definition

above). Interpretation of serologic findings is difficult in some chronic infections; therefore, the laboratory should be consulted. Specific serologic techniques are required for *B. canis* antibodies, which do not cross-react with the other species; relevant history is helpful.

Mark requisition clearly if brucellosis is suspected and phone laboratory prior to transporting (204-945-6805).

## 7. Key Investigations for Public Health Response

- History of raw (unpasteurized) milk or milk product consumption from animals (e.g., cow, goat, sheep, camel).
- History of travel or immigration from high-risk areas including the Mediterranean Basin (Portugal, Spain, Southern France, Italy, Greece and Turkey), Mexico, South and Central America, the Caribbean, Eastern Europe, Asia, Africa and the Middle East (18). The USA is still not brucellosis free and therefore, drinking unpasteurized milk in the USA can pose a risk.
- History of butchering or preparing meat or consuming undercooked meat from farmed or wild animals (e.g., elk, deer, bison, caribou, pigs, feral swine, marine mammals).
- History of assisting with animal births.
- History of working with dogs (e.g., veterinary, breeders, kennel workers).
- History of working with *Brucella* vaccines (*B. abortus* strain 19 or *B. melitensis* Rev-1)(e.g., needlestick exposure) or in a laboratory that handles *Brucella*.
- History of past infection as relapses can occur.

## 8. Control

### 8.1 Management of Cases:

Refer to Table 1 below for treatment recommendations.

#### Infection Prevention and Control Measures:

- Routine Practices. For cases in health care facilities, refer to the Manitoba Health, Healthy Living and Seniors document *Routine Practices and Additional Precautions: Preventing the Transmission of Infection in Health Care* available at: <http://www.gov.mb.ca/health/publichealth/cdc/docs/ipc/rpap.pdf> .

**Table 1: Treatment Recommendations (2)**

Patient	Antibiotic Regimen	Comments
Adults and Children > 8 years	<ul style="list-style-type: none"> <li>Preferred regimen is oral doxycycline (2 - 4 mg/kg, maximum 200 mg/day, in 2 divided doses) or oral tetracycline in combination with rifampin (15 -20 mg/kg, maximum 600-900 mg/day, in 1 or 2 divided doses) for a minimum of 6 weeks (gentamicin 5 mg/kg/day IM for 7 days may be used instead of rifampin).</li> </ul>	<ul style="list-style-type: none"> <li>Combination therapy with trimethoprim-sulfamethoxazole (TMP-SMZ) can be used if tetracyclines are contraindicated.</li> </ul>
Children < 8 years	<ul style="list-style-type: none"> <li>Oral TMP-SMZ (trimethoprim 10mg/kg per day, maximum 480 mg/day; and sulfamethoxazole, 50 mg/kg per day, maximum 2.4 g/day) divided in 2 doses for 4 to 6 weeks.</li> <li>Consider adding rifampin for combination therapy if not contraindicated.</li> </ul>	<ul style="list-style-type: none"> <li>Tetracyclines (such as doxycycline) should be avoided in children &lt; 8 years old.</li> </ul>
Pregnancy	<ul style="list-style-type: none"> <li>Consult obstetrician.</li> </ul>	<ul style="list-style-type: none"> <li>Tetracyclines are contraindicated in pregnancy.</li> </ul>
Complicated Cases (e.g., endocarditis, meningitis)	<ul style="list-style-type: none"> <li>Consult infectious diseases specialist.</li> </ul>	

## 8.2 Management of Contacts and/or Other Exposed Individuals:

- Contacts of human cases generally require no investigation unless a common exposure is suspected.
- If a common exposure is known or suspected (e.g., ate the same implicated food item), surveillance for clinical signs of disease should be conducted for at least six months (19).
- Workplaces working with *Brucella* (e.g., research or diagnostic laboratories, vaccine production facilities) are expected to have their own safety protocols. Facility specific protocols should be followed for laboratory and other occupational exposures.

## 8.3 Management of the Environment:

- If contact with local animals is implicated for the case, veterinarians should investigate and test animals. Brucellosis is a reportable disease under the *Health of Animals Act* and therefore *Brucella* positive animals need to be reported to the Chief Veterinary Office of Manitoba (204-945-7684) who will then contact and work jointly with the Canadian Food Inspection Agency (CFIA).
  - If a case of brucellosis is identified in livestock, those animals and any other infected/exposed animals are humanely euthanized. Contaminated areas are disinfected, and a trace out investigation is done to ensure no other contact with other animals.

- Dogs with *Brucella* are managed on a case by case basis by primary care veterinarians, with no oversight by the CFIA or other regulatory bodies.

## 8.4 Management of Outbreaks:

Recognizing outbreaks is challenging due to nonspecific symptoms and highly variable incubation period. An outbreak is defined as the occurrence of case(s) in a particular area and period of time in excess of the expected number of cases.

- As per case and contact management above.
- If common exposure to food is suspected:
  - If the food product originated in Manitoba, both the Director of Food Protection (204-788-6735) and the Chief Veterinary Officer (CVO) (204-945-7684) must be notified. The CVO is included because if the food product came from within Manitoba, then the animal that is the source needs to be investigated, and the CVO will link to the CFIA as brucellosis in animals is reportable to them.
  - If the food product originated outside of Manitoba, then the Director of Food Protection (204-788-6735) and the CFIA (204-797-4501) must be notified.
- Refer to the Manitoba Health, Seniors and Active Living *Enteric Illness Protocol* <http://www.gov.mb.ca/health/publichealth/cdc/protocol/enteric.html> .

## 8.5 Preventive Measures:

- Control of domestic animals and animal products in international trade and transport. Mandatory slaughter of all infected and exposed livestock (11).

- Pasteurization of dairy products for human consumption (2). Avoid raw milk and raw milk products including soft cheese, ice-cream and yogurt (18).
- Careful handling and disposal of afterbirths, especially in cases of animal abortions (20).
- Wear protective equipment when dressing or butchering wild animals potentially infected with *Brucella spp.* (21).
- Thoroughly cook all meat from any domestic or wild animal.
- Avoid contact with fluids and organs of wild game carcasses (18).

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