

Brucellosis

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To assist in the diagnosis and treatment of cases.
2. To identify potentially exposed health care and laboratory personnel and to provide counseling.
3. To identify sources of transmission (e.g., an infected animal or a contaminated unpasteurized dairy product) and to prevent further transmission from such sources.
4. To raise the index of suspicion of a possible bioterrorism event when no natural exposure source is identified.

B. Legal Laboratory Reporting Requirements

1. Health care providers: Notifiable to local health jurisdiction within 24 hours.
2. Health care facilities: Notifiable to local health jurisdiction within 24 hours.
3. Laboratories: *Brucella* species notifiable to local health jurisdiction within 24 hours; specimen submission required - cultures (2 business days). Any other specimens with results indicating *Brucella* infection should be submitted too (see Sections 3 and 4).
4. Veterinarians: Suspected human cases notifiable within 24 hours to the local health jurisdiction; animal cases notifiable to Washington State Department of Agriculture (see: <http://apps.leg.wa.gov/WAC/default.aspx?cite=16-70>).
5. Local health jurisdictions: Notifiable to DOH Communicable Disease Epidemiology Section (CDES) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. **If bioterrorism is suspected, immediately report the case to DOH: 1-877-539-4344 or 206-418-5500.**
2. Facilitate the transport of specimens to the Washington State Public Health Laboratories (PHL) for confirmatory testing.
3. Educate potentially exposed persons, including laboratory personnel, about signs and symptoms of disease; recommend antibiotic prophylaxis when needed.
4. Report all *probable* and *confirmed* cases to CDES (see definitions below). Complete the brucellosis report form (<http://www.doh.wa.gov/notify/forms/brucellosis.pdf>) and enter the data in the Public Health Issues Management System (PHIMS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Brucellosis is the illness caused by gram-negative bacteria in the genus *Brucella*. Species known to cause disease in humans include *Brucella abortus*, *B. melitensis*, *B. suis*, and

rarely *B. canis*. Cattle vaccines, attenuated strains of *Brucella abortus*, used in the United States in the late 1990s also caused human illness. Newer vaccines do not appear to have the same risk of infection.

B. Description of Illness

A systemic bacterial disease with acute or insidious onset, characterized by continued, intermittent, or irregular fever of variable duration; headache; weakness; profuse sweating; chills; arthralgia (joint pains); depression; weight loss; and generalized body aches. Involvement of the liver and spleen, including abscesses, can occur. Acute disease may last from days to weeks but chronic infections lasting months or more may occur if an acute infection is not adequately treated. Osteoarticular complications occur in 20–60% of cases, most commonly sacroiliitis. Genitourinary involvement occurs in 2–20% of cases, orchitis and epididymitis in particular. Involvement of the lymphoreticular, skeletal (arthritis and osteomyelitis), cardiac (endocarditis), and nervous systems are frequently seen in chronic *Brucella* infections. The case-fatality rate of untreated brucellosis is low, with rare deaths due to endocarditis caused by *B. melitensis*.

Subclinical infections detected by high levels of antibody but no symptoms can occur.

C. Brucellosis in Washington State

Although brucellosis has been eradicated from cattle in Washington since 1988, DOH receives 0 to 3 reports of human brucellosis infections each year usually due to the ingestion of raw milk products in foreign countries. Previously, veterinarians were occasionally exposed to a live vaccine used in animals. Newer vaccines (since 1996) do not pose as great a risk but contact Communicable Disease Epidemiology Section if a veterinarian reports a vaccine exposure.

D. Reservoirs

Predominantly cattle, goats, sheep and swine. Infection may occur in bison, elk, caribou and some species of deer. *B. canis* is an occasional problem in laboratory dog colonies and kennels, stray dogs, pet dogs with outdoor exposures, and coyotes.

E. Modes of Transmission

Infection results from contact (through breaks in the skin) with tissues, blood, urine, vaginal discharges, aborted fetuses and especially placentas, and by eating raw milk and unpasteurized dairy products from infected animals. Airborne infection can occur in laboratories and abattoirs. Clinical specimens and laboratory isolates can present a risk to health care or laboratory workers. In addition, *Brucella* can be weaponized to create an infectious aerosol which can be used in a bioterrorism event.

F. Incubation Period

Highly variable; usually 5–60 days; occasionally several months.

G. Period of Communicability

Direct person-to-person spread of brucellosis is extremely rare. Breast-feeding women may transmit the infection to their infants. Sexual transmission has also been reported.

H. Treatment

In general, persons with brucellosis should be treated with a combination of appropriate antibiotics for a prolonged period of time. Typically, treatment consists of doxycycline in combination with either rifampin or streptomycin for 6 weeks; however, refer to the Centers for Disease Control and Prevention guidelines for the most recent guidance (http://www.cdc.gov/ncidod/dbmd/diseaseinfo/brucellosis_g.htm#istreatment).

3. CASE DEFINITIONS

A. Clinical Case Definition

An illness characterized by acute or insidious onset of fever and one or more of the following: night sweats, fatigue, anorexia, myalgia, weight loss, headache, arthralgia, arthritis/spondylitis, meningitis, or focal organ involvement (endocarditis, orchitis/epididymitis, hepatomegaly, splenomegaly).

B. Laboratory Criteria for Diagnosis

Definitive:

1. Culture and identification of *Brucella* spp. from a clinical specimen, or
2. Evidence of a fourfold or greater rise in *Brucella* antibody titer between acute- and convalescent-phase serum specimens obtained two or more weeks apart.

Presumptive:

1. *Brucella* total antibody titer ≥ 160 by standard tube agglutination test (SAT) or *Brucella* microagglutination test (BMAT) in one or more serum specimens obtained after onset of symptoms, or
2. Detection of *Brucella* DNA in a clinical specimen by PCR assay.

C. Case Classification (2010)

Probable: a clinically compatible case with at least one of the following:

- Epidemiologically linked to a confirmed human or animal brucellosis case
- Presumptive laboratory evidence, but without definitive laboratory evidence of *Brucella* infection.

Confirmed: a clinically compatible illness with definitive laboratory evidence of *Brucella* infection.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Laboratory Diagnosis

Brucella can be isolated from blood, bone marrow, and other tissues/fluids. Brucellosis can also be diagnosed through acute and convalescent serological studies. A single convalescent specimen can be tested, but results may be inconclusive. Specific serologic techniques are needed for *B. canis* antibodies, which do not cross-react with other *Brucella* species. Recently, rapid diagnostic tests have been developed since *Brucella* is under surveillance for bioterrorism.

Confirmatory laboratory testing must be performed by a reference laboratory such as the Washington State Public Health Laboratories (PHL).

The organism is highly infectious and presents a risk to laboratory workers. Alert laboratory personnel when specimens are sent from a suspect brucellosis case. Laboratories should hold cultures for 30 days, as *Brucella* grows slowly, and use great caution to avoid exposure within the laboratory by aerosol.

B. Services Available at PHL

PHL identifies *Brucella* species from pure isolates as well as culturing clinical specimens. PHL also performs rapid diagnostic testing using nucleic acid amplification methods (e.g., polymerase chain reaction) in suspected bioterrorism situations.

PHL does not do serologic tests; serum samples will be forwarded to Centers for Disease Control and Prevention (CDC) for testing. Call Communicable Disease Epidemiology Section at 206-418-5500 for approval before collecting and shipping specimens.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

C. Specimen Collection

1. **Isolates:** Submit isolates or clinical specimens with a completed PHL Reference Bacteriology form (<http://www.doh.wa.gov/EHSPHL/PHL/Forms/Microbiology.pdf>). For additional questions regarding shipping and handling, clinical laboratories should contact PHL at 206-418-5400.
2. **Serology:** For serology collect 1–2 ml of both acute and convalescent sera. If the specimen is freshly collected or still refrigerated, then ship cold, not frozen, on regular cold packs. If the specimen is already frozen, keep it frozen during transport by shipping on dry ice. Serum specimens should be accompanied by a completed PHL serology submission form. (<http://www.doh.wa.gov/EHSPHL/PHL/Forms/SerVirHIV.pdf>).

5. ROUTINE CASE INVESTIGATION

Interview the case and others who might be able to provide pertinent information.

A. Evaluate the Diagnosis

Review the clinical presentation and laboratory results. **Confirmatory laboratory testing should be performed by a reference laboratory such as Washington State Public Health Laboratories (PHL).** Facilitate submission of laboratory specimens to PHL for confirmation. Proceed with investigation after preliminary or confirmatory laboratory results are available for sporadic cases. During an outbreak or a potential bioterrorism event, start the investigation before laboratory results are available.

B. Identify Potential Sources of Infection

Investigate possible exposures during the period 5 to 60 days before illness onset, including:

1. Travel to *Brucella* endemic areas (including the Mediterranean Basin, South and

- Central America, Eastern Europe, Asia, Africa, the Caribbean, and the Middle East);
2. Consumption of unpasteurized dairy products;
 3. Contact with potentially infected animals or their tissues, particularly postpartum fluid or tissues;
 4. Parenteral or mucous membrane exposure to *Brucella* vaccine;
 5. Work in a microbiology laboratory.

C. Identify Potentially Exposed Persons

1. Identify and contact persons who participated with the case in any of the activities listed above as well as any acquaintance or household member with similar illness. Inform ill persons (or their physician) of possible exposure, in order to facilitate proper diagnosis and therapy.
2. Identify laboratory workers who handled specimens or laboratory isolates. If cultures are still pending, lab workers should be reminded of appropriate handling of suspected *Brucella* cultures, i.e. do not work with cultures on an open bench.
3. See Section 6 “Management of Exposed Persons” for recommended antibiotic prophylaxis.

D. Environmental Evaluation

The DOH Environmental Health Zoonotic Disease Program (360-236-3385 or 1-888-586-9427) can assist in notifying other state agencies when necessary for environmental investigations.

1. If the exposure source appears to be domestic animals, notify Washington State Department of Agriculture for an animal disease investigation and testing if needed.
2. If the source of infection appears to be wild animals, notify the Washington Department of Fish and Wildlife.

6. CONTROLLING FURTHER SPREAD

A. Infection Control Recommendations / Case Management

Hospitalized patients should be cared for using standard precautions.

B. Contact Management:

None. *Brucella* is not commonly spread person-to-person.

C. Management of Exposed Persons

All laboratory handling specimens with confirmed *Brucella* should undergo a risk assessment to determine their need for post-exposure prophylaxis and follow-up. High-risk exposures include: handling specimens on an open bench (i.e. not under a hood) or being within 5 feet of this manipulation; having direct skin contact with the culture; having exposure to the culture through sniffing, mouth pipetting, inoculation, or spraying it into the eyes, nose, or mouth; or being present in the lab (within 5 feet) during any procedure that might result in aerosolization of the isolate, e.g. vortexing or catalase testing. Low-risk exposures include being present in the lab but not qualifying as a high

risk exposure. All exposed persons should be educated about the symptoms of illness and told to seek care if fever develops. Persons with high risk exposures should begin post-exposure prophylaxis (PEP) and serial serum titers should be assessed at 2, 4, 6, and 24 weeks following the exposure for all high-risk exposed persons. PEP and serial titers should also be discussed with persons who had low-risk exposures.

Additional details on risk assessment, post-exposure prophylaxis, and follow-up of laboratory personnel exposed to pathogenic *Brucella* species can be found at http://www.cdc.gov/ncidod/dbmd/diseaseinfo/brucellosis_g.htm#recommendations.

Call Communicable Disease Epidemiology Section to discuss the need for PEP for other persons exposed.

7. MANAGING SPECIAL SITUATIONS

A. Bioterrorist Event

Brucella has been classified as a "category B" agent for bioterrorism; it is moderately easy to disseminate by aerosol and can cause severe illness but has low mortality rates. An intentional release (bioterrorist event) should be suspected if unusual clusters are seen in otherwise healthy individuals or in people in buildings with common ventilation systems. **Call Communicable Disease Epidemiology Section immediately at 206-418-5500 if brucellosis is suspected.**

8. ROUTINE PREVENTION

A. Prevention Recommendations

1. **Avoid raw dairy foods.** Do not consume unpasteurized milk, cheese, or ice cream, especially during travel. If you aren't sure that a dairy product is pasteurized, don't eat it.
2. **Avoid contact with sick or dead animals.** If you hunt, wear gloves when handling dead animals. When skinning wild game keep gloves away from eyes and other mucous membranes. Thoroughly wash hands after handling wild game carcasses. Wild game meat should be cooked "well done" (to at least 74°C/165°F).
3. **Wear gloves.** Veterinarians, farmers, and hunters should wear gloves when handling sick or dead animals or when assisting an animal giving birth.
4. **Take safety precautions.** Laboratory workers should handle all specimens under appropriate biosafety conditions.
5. **Immunize domestic animals.** Although brucellosis vaccination is not mandatory, many farmers and ranchers vaccinate their herds, and milk is tested two to four times a year for signs of the bacteria.

For more information, see:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/brucellosis_g.htm#faqbrucellarb51

ACKNOWLEDGEMENTS

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UPDATES

June 2009: Treatment recommendations and laboratory forms updated.

January 2010: The clinical description was expanded in Section 3A .

January 2011: The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision. The reporting form link was corrected (Section 1). Additional details were added regarding alerting labs about suspected cases (Section 4A), specimen collection and shipping procedures (Section 4C), and managing lab exposures (Sections 5C and 6C).