

# Brucellosis

(Also Known as Bangs Disease, Undulant Fever,  
Malta Fever, and Mediterranean Fever)

## IMMEDIATELY REPORTABLE DISEASE

Per N.J.A.C. 8:57, healthcare providers and administrators shall immediately report **by telephone** confirmed and suspected cases of brucellosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. The health officer (or designee) **must immediately institute the control measures listed below in section 5, "Controlling Further Spread,"** regardless of weekend, holiday, or evening schedules. A directory of local health departments in New Jersey is available at <http://localhealth.nj.gov>.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609-826-5964 or 4872, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609-392-2020 during all other days and hours.



## 1 THE DISEASE AND ITS EPIDEMIOLOGY

### A. Etiologic Agent

Brucellosis is caused by infection with *Brucella* bacteria. The species of *Brucella* that infect humans are *B. abortus*, *B. melitensis*, *B. suis*, and, rarely, *B. canis*. Infection with *B. melitensis* occurs more frequently than do infections with the other species in general populations and has the highest prevalence in countries with a high incidence of brucellosis in sheep and goats (Argentina, Mexico, and Peru). Brucellosis is most common in the Mediterranean Basin; Mexico, South and Central America; Eastern Europe; Asia; Africa; the Caribbean; and the Middle East.

### B. Clinical Description

The signs and symptoms of brucellosis may be nonspecific, including sustained or irregular fever of variable duration, headache, weakness, sweats, chills, pain in muscles and joints, malaise, weight loss, depression, and generalized aching. Onset of illness may be acute or insidious. Localized infections of organs (including the liver and spleen) and chronic localized infections can occur. The disease may last for days, months, or occasionally longer if inadequately treated. Relapse is not uncommon. Complications affecting the joints are common, as is genitourinary involvement, including orchitis and epididymitis. The case-fatality ratio of untreated brucellosis is  $\leq 2\%$ . Death often results from endocarditis caused by *B. melitensis*.

### C. Reservoirs

Cattle, swine, goats, and sheep are the most common reservoirs. The United States and most European countries are free of bovine brucellosis but bison, elk, caribou, and some species of deer may harbor *Brucella* species. *B. canis* is an occasional problem in laboratory dog colonies and kennels and a small percentage of pet dogs. Coyotes have also been found to be infected with *B. canis*. Marine animals can be infected with *B. ceti* (whales, porpoises, and dolphins) and *B. pinnipedialis* (seals, sea lions, and walrus).

#### **D. Modes of Transmission**

Brucellosis is spread through direct contact of mucosal surfaces and cuts and abrasions of the skin with secretions of living or dead infected animals, including their tissues, blood, urine, vaginal discharges, aborted fetuses, and placentas. The most common mode of transmission is ingestion of raw milk and unpasteurized dairy products (e.g., cheese and yogurt) from infected animals. Airborne transmission may occur through inhalation of contaminated aerosols in animal enclosures and in laboratory settings. Persons who hunt or handle feral swine in the U.S. are at risk of exposure to *B. suis*. Persons may also be infected through accidental self-inoculation with live *Brucella* vaccine strain used for livestock (strain 19). Person-to-person spread is extremely rare, although it may transmit through breast-feeding, sexual transmission and contaminated tissue transplantation and blood transfusions.

#### **E. Incubation Period**

The incubation for brucellosis can range from five days to five months, but most people develop symptoms two to four weeks after exposure.

#### **F. Period of Communicability or Infectious Period**

Person-to-person transmission of brucellosis is extremely rare.

#### **G. Epidemiology**

Each year about half a million cases of brucellosis occur in humans worldwide and the worldwide incidence may be largely unrecognized and underreported. Humans are accidental hosts. The infection in animal reservoirs provides a key to its occurrence in humans. Argentina, Mexico, and Peru are the Latin American countries with the largest number of recorded cases. The same pattern holds true for Mediterranean countries, Iran, the former Soviet Union, and Mongolia. *B. abortus* and *B. suis* infections usually affect occupational groups; while *B. melitensis* infections occur more frequently than do other types in the general population. The greatest prevalence of brucellosis is found in countries with a high incidence of *B. melitensis* infection among sheep and goats, where it is commonly seen as an occupational disease in farmers, ranchers, veterinarians, and other people who work directly with animals. It may also be found in people who work in laboratories and slaughterhouses (e.g., meat inspectors). Sporadic cases and outbreaks may occur among consumers of raw (unpasteurized) milk and milk products, especially soft cheeses and yogurt.

The incidence rate of brucellosis in the United States is <0.5 cases per 100,000 population, primarily caused by *B. melitensis*. Most cases are reported from California, Florida, Texas, and Virginia. From 2011-2016, there were three probable cases of brucellosis identified in New Jersey residents two of the three cases had known or possible ingestion of unpasteurized dairy products while abroad.

## H. Bioterrorist Potential

*Brucella* species are considered potential bioterrorist agents and classified as a Select Agent. A purposeful release of *Brucella* could cause a serious public health challenge in terms of ability to limit the numbers of casualties, infection of wild and domestic animals and to control other repercussions from such an attack.

# 2 CASE DEFINITION

## A. New Jersey Department of Health (NJDOH) Case Definition

The NJDOH Zoonotic Disease Program follows the most current case definition as published on the CDC National Notifiable Disease Surveillance System (NNDSS) website.

Brucellosis Case Definition: <https://www.cdc.gov/nndss/conditions/brucellosis/>

Case definitions enable public health to classify and count cases consistently across reporting jurisdictions, and should not be used by healthcare providers to determine how to meet an individual patient's health needs. Every year, case definitions are updated using CSTE's Position Statements. They provide uniform criteria of nationally notifiable infectious and non-infectious conditions for reporting purposes. To search for other notifiable diseases' case definitions by name and by year, use the search tools on the left side of the NNDSS website: <http://www.cdc.gov/nndss/>

### 1. Clinical Description

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

### 2. Laboratory Criteria for Diagnosis

#### a. Definitive

- Culture and identification of *Brucella* spp. from clinical specimens

- Evidence of a fourfold or greater rise in *Brucella* antibody titer between acute- and convalescent-phase serum specimens obtained greater than or equal to 2 weeks apart

**b. Presumptive**

- Brucella total antibody titer of greater than or equal to 160 by standard tube agglutination test (SAT) or Brucella microagglutination test (BMAT) in one or more serum specimens obtained after onset of symptoms
- Detection of Brucella DNA in a clinical specimen by PCR assay

**3. Case Classification**

**a. Probable**

A clinically compatible illness 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

**b. Confirmed**

- A clinically compatible illness with definitive laboratory evidence of Brucella infection

## **3 LABORATORY TESTING AVAILABLE**

Two types of tests are primarily performed to diagnosis brucellosis: serology (ELISA or agglutination) or isolation by bacterial culture.

### **Agglutination Assay**

The Centers for Disease Control and Prevention (CDC) recommends that serologic testing for clinically suspected brucellosis, with an exposure history, be done using the agglutination assay. The NJDOH Public Health and Environmental Laboratories (PHEL) can forward serum to CDC for agglutination testing for *Brucella* species. Please contact the NJDOH Infectious and Zoonotic Disease Program (IZDP) to approve submission of serum for agglutination testing to PHEL by calling 609-826-5964 or 4872. All samples must be accompanied by a CDC 50.34 form, available at

<https://www.cdc.gov/laboratory/specimen-submission/form.html>

### Bacterial Isolation

The isolation and identification of *Brucella* can confirm a diagnosis of brucellosis. *Brucella* is most commonly isolated from blood cultures but can also be isolated from bone marrow, cerebral spinal fluid, wounds, purulent discharge and joint fluid. Suspected *Brucella* cultures shall be handled under strict bio-safety precautions as the organism can aerosolize easily and potentially infect laboratory workers. Clinical laboratories are required to immediately report all bacterial cultures resembling *Brucella* species to the NJDOH, which will arrange for confirmatory testing.

PHEL will provide testing services for referred isolates of suspected *Brucella* spp. from appropriate clinical specimens. Referred isolates of suspected *Brucella* spp. must be approved prior to submission to PHEL. All samples must be accompanied by a PHEL Lab-5 form, available at <http://www.state.nj.us/health/forms/lab-5.pdf>, and a CDC 50.34 form.

#### A. Purpose of Surveillance and Reporting

- To help identify the source of infection and prevent further transmission from this source (e.g., an infected animal, a contaminated unpasteurized dairy product).
- To identify cases and clusters of human illness that may be associated with laboratory exposure, an accidental release or a purposeful release/ bioterrorist event.

#### B. Laboratory Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.7) stipulates that laboratories **immediately report** (by telephone, confidential fax, or over the Internet using the confidential and secure Communicable Disease Reporting and Surveillance System [CDRSS]) any positive culture, test or assay result for *Brucella* to the local health officer having jurisdiction over the locality in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider or healthcare facility requesting the laboratory examination is located. If the health officer is unavailable, call IZDP at 609-826-5964 or 4872 during business hours or 609-392-2020 after business hours or on weekends and holidays.

The report shall contain, at a minimum, the reporting laboratory's name, address, and telephone number; the name, age, date of birth, gender, race, ethnicity, home address and telephone number of the person tested; the test performed; the source or type of specimen tested, the date the specimen was collected, and the date of testing; the test results; and the health care provider's name, address, and telephone number.

### C. Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (N.J.A.C. 8:57-1.4) stipulates that healthcare providers **immediately report** (by telephone, confidential fax, or over the Internet using CDRSS) any suspect or confirmed case of brucellosis to the local health officer having jurisdiction over the locality in which the ill or infected person lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located. If the health officer is unavailable, call IZDP. The report shall contain, at a minimum, the age, date of birth, gender, race, ethnicity, home address, and telephone number of the ill or infected person; date of onset of illness; clinical laboratory data (e.g., date of testing, test results, reporting laboratory's name, address, and telephone number); and the healthcare provider's name, address and phone number.

### D. Local Department of Health Reporting Requirements

N.J.A.C. 8:57-1.9 stipulates that the local health officer must report the occurrence of any case of brucellosis. Current requirements are that confirmed or probable cases be **immediately reported** to IZDP. A report can be filed electronically using CDRSS.

## 4 CASE INVESTIGATION

### A. Investigation

It is the health officer's responsibility to investigate the case by interviewing the patient, physician and others who may be able to provide pertinent information. The NJDOH Brucellosis Investigation Worksheet may be used to help guide the patient or physician interview. Upon learning of a suspect or confirmed case of brucellosis, or any suspected bioterrorist event, call the IZDP immediately.

IZDP will direct brucellosis case investigation of New Jersey residents. If a bioterrorist event is suspected, NJDOH in conjunction with CDC and other response authorities will work closely with local health officer(s) and provide instructions/information on how to proceed.

### B. CDRSS

Enter investigative data into the Communicable Disease Reporting and Surveillance System (CDRSS). The mandatory fields for all cases in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, case status, and report status. Once LHD completes its investigation and assigns a report status or "LHD CLOSED," IZDP staff will review the case and at the completion of the investigation the case status will be changed to "DHSS APPROVED." If additional information is received after a case has been placed in "DHSS APPROVED" status, LHD staff will need to contact IZDP to reopen the case. This should be done only if the additional information changes the case status of the report. Every effort should be made to complete the investigation report in CDRSS within 3 months of opening a case. Cases that

remain open for three months or more and have no investigational or update notes will be closed by IZDP.

### C. Other Reporting/Investigation Issues

Investigational worksheets DO NOT need to be mailed to IZDP if mandatory fields in CDRSS are completed and exposure notes are entered. Once an LHD completes its investigation and assigns a report status of “LHD CLOSED,” NJDOH will review the case, and when it is complete will change the report status to “DHSS APPROVED.” At this time, the case will be locked for editing. If additional information is received after a case has been placed in “DHSS APPROVED,” an LHD will need to contact NJDOH to reopen the case. This should be done only if the additional information changes the case status of the report.

Every effort should be made to complete the investigation within three weeks of opening a case. Cases that remain open for three months or more and have no investigation or update notes will be closed by IZDP and marked as “NOT A CASE.”

## 5 CONTROLLING FURTHER SPREAD

### A. Isolation and Quarantine Requirements

None. Person-to-person transmission of brucellosis is extremely rare.

### B. Protection of Contacts of a Case

There is no immunization or prophylaxis for contacts of brucellosis cases. Proper personal protective equipment (PPE) should be utilized to prevent contact with drainage or secretions if the case has draining lesions. Contaminated surfaces shall be immediately disinfected.

### C. Managing Special Situations

#### 1. Exposure of a Laboratory Worker

Brucellosis is one of the most common laboratory-acquired infections, primarily because aerosolization of the specimen is a mechanism of transmission in this setting. Consult with IZDP at 609-826-5964 or 4872 if laboratory workers may have been exposed to brucellosis (e.g., did not use the protection of a currently certified laminar air flow/biosafety hood). Laboratory workers in the room with the *Brucella* isolate will be assessed for exposure. IZDP staff will assist in identification and evaluation of laboratory workers of exposures.

**All workers in the laboratory while the specimen was handled** will be evaluated and categorized as not at risk, low risk or high risk for exposure.



Low and high risk individuals may be serologically monitored, monitored for development of disease, and/or receive post exposure prophylaxis.

**All *Brucella*-exposed workers** will be evaluated and categorized as not at risk, low risk or high risk for exposure.

Low and high risk individuals may be serologically monitored, monitored for development of disease, and/or receive post exposure prophylaxis

## D. Preventive Measures

### 1. Contaminated Food or Milk

If a patient is suspected to have been infected through the consumption of milk or other food products, the NJDOH Food and Drug Safety Program will work with IZDP to identify the implicated food item(s) and remove it from the environment.

### 2. Preventive Measures/Education

To prevent *Brucella* exposures,:

- Do not consume milk products made from raw (unpasteurized) milk (e.g., cheeses and yogurt imported from countries with a high incident of brucellosis).
- Workers at occupational risk (such as farmers, slaughterhouse workers, meat processors, or butchers) should reduce exposure to *Brucella*, by using proper PPE (e.g., gloves, clothing, eye protection), ventilating slaughterhouses and handling carcasses carefully. Placentas, fetuses, and/or discharges from animals should be carefully handled and be disposed of properly. Contaminated areas should be properly disinfected. For more information, refer to the United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS) website at <http://www.aphis.usda.gov/>.
- Hunters should use proper PPE (e.g., gloves, clothing, eye protection), when dressing wild pigs and burying the remains.
- If domestic livestock are implicated as a source of exposure, IZDP will consult with the New Jersey Department of Agriculture to identify and control exposure to any potentially infected animals.

# 6 OUTBREAK SITUATIONS

If the number of reported cases in an institutional setting or jurisdiction is higher than usual for the time of year, an outbreak might be occurring. In accordance with N.J.A.C. 8:57, IZDP should be contacted immediately at 609-826-4872 or 4874. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases.

## Communicable Disease Service Manual

If more than one case of brucellosis is reported or suspected in a city or town, or if an outbreak is suspected, investigate to determine the source of infection and mode of transmission. A common vehicle, such as unpasteurized milk products or infected animals, should be sought, and applicable preventive or control measures should be instituted (e.g., removing an implicated food item from the environment).

**NOTE: If a bioterrorist event is suspected, NJDOH and other response authorities will work closely with local health officers and provide instructions/information on how to proceed.**

### Additional Information

A Brucellosis Fact Sheet and Brucellosis Investigation Worksheet is available at the NJDOH Web site at <http://www.nj.gov/health/cd/topics/brucellosis.shtml>.

### References

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