BRUCELLOSIS

(Undulant Fever, Malta Fever, Mediterranean Fever, Bang's Disease)

REPORTING INFORMATION

- **Class B:** Report by the close of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
    - The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the Ohio Confidential Reportable Disease Form (HEA 3334, rev. 1/09 http://www.odh.ohio.gov/pdf/forms/hea3334.pdf)
- The CDC Brucellosis Case Report Form is required for completion by the local health department. Information collected from the form should be entered into ODRS **and** faxed to the Ohio Department of Health (ODH) Outbreak Response & Bioterrorism Investigation Team (ORBIT) 614-564-2456. The mailing address for this form is: ODH Outbreak Response & Bioterrorism Investigation Team (ORBIT), 246 N. High St., Columbus, OH 43215.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset, and all the fields in the Epidemiology module.

AGENTS

Brucella abortus, Brucella canis, Brucella ceti, Brucella melitensis. Brucella pinnepedialis, and *Brucella suis*.

CASE DEFINITION

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).

Laboratory Criteria for Diagnosis

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

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

Case Classification

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

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

SIGNS AND SYMPTOMS

Brucellosis is a systemic disease with acute or insidious onset, characterized by fever of variable duration, headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss and generalized aching. The fever may be continuous or intermittent. Localized suppurative infections of organs, including liver and spleen, may occur. Subclinical disease and chronic localized infections may occur. If not adequately treated, the disease can last for days, months, or occasionally for a year or more. Osteoarticular complications are seen in 20% - 60% of cases. Genitourinary involvement is reported in 2% - 20% of cases, with orchitis and epididymitis most commonly seen.

DIAGNOSIS

Blood Specimens

For culture, collect 20-30 ml blood in a tube containing SPS, in a biphasic bottle, or in commercial blood culture bottles (these bottles are not available through ODH Laboratory [ODHL], but should be available at area hospitals). The blood culture bottles should be sent to ODHL for isolation and identification of the organism. Ship blood at ambient temperature.

For serum testing, collect at least 10 ml of blood in red-topped tube. Serology requires 2-5 ml of serum. Ship refrigerated serum sample to ODHL, which will forward the specimen to CDC.

Interpretation of serologic tests: Acute-phase serum is seldom available. Titer of less than 1:160 does not exclude infection. Titer of 1:160 in absence of previously known infection is considered indicative of *Brucella* infection. Titer of 1:160 is of questionable diagnostic significance in groups repeatedly exposed, such as butchers and veterinarians. Serological results must be critically assessed along with clinical findings and occupational and other epidemiologic factors before a diagnosis is made.

For further details, see Clinical Specimen Collection and Transport Guideline, in the Microbiology Client Services Manual, Section 4 of the Infectious Disease Control Manual.

EPIDEMIOLOGY

Source

Reservoirs include cattle, swine, goats, sheep, dogs and various wildlife species infected with the organism. Wildlife species found infected include bison, feral hogs, elk, caribou, deer and coyotes.

Occurrence

Brucella occurs worldwide, especially in Mediterranean countries, the Middle East countries, India, Central Asia and Latin America. Over 100 cases are reported in the United States annually. From 2000-2009, there were 15 human cases documented in Ohio. Brucellosis infection in the United States is, for the most part, an occupational disease of stockyard, farm, and slaughterhouse workers, butchers and veterinarians.

Mode of Transmission

The infection is usually contracted by handling livestock fetuses and afterbirth or by contact with vaginal secretions, blood, urine and carcasses of infected animals. Infection can also be acquired by eating undercooked meat, or by the ingestion of raw milk or unpasteurized cheese from infected cows, sheep and goats. Airborne spread of the bacteria has also been documented. Transmission has occurred in the laboratory environment. Persons such as veterinarians, farmers and their assistants may be inadvertently inoculated with the *Brucella* organism when using the brucellosis vaccine to vaccinate cattle. Person-to-person transmission has been reported but is very rare.

Incubation Period

The incubation period is highly variable and difficult to ascertain. Usually 5-60 days, but may be several months.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Obtain information about the patient's occupation, history of travel outside the U.S., contact with animals (especially livestock or dogs) or their body fluids and consumption of raw milk or other unpasteurized dairy product. Infection may often be traced to a common or individual source, usually infected domestic goats, swine or cattle or raw milk or dairy products from cows or goats.

Treatment

A combination of doxycycline and either rifampin or streptomycin for at least six weeks. Relapses may occur due to sequestered organisms. Re-treatment with the same regimen is recommended for these cases. RB51, the bacteria strain used in livestock vaccines, is resistant to rifampin, so the doxycycline/rifampin combination is not effective in these cases.

Isolation and Follow-up Specimens

Standard precautions. No isolation required. If diagnosis is made by blood sample, two blood samples should be collected two weeks apart.

Public Health Significance

There is no evidence of person-to-person transmission. Educate public and livestock handlers in handling infected tissues of dogs or livestock and the importance of consuming only pasteurized dairy products.

Contacts

There is no evidence of person-to-person disease transmission. Travel companions or coworkers may have had the same exposure as an identified case and should be advised to seek medical attention if ill.

Prevention and Control

Advise travelers and educate the public to consume only pasteurized dairy products. Boiling milk is a safe alternative to pasteurization. Educate farmers, butchers, and others handling animals and carcasses about how to reduce their exposure. Exercise care in handling afterbirths and any aborted fetus of livestock, wildlife, and dogs. Consult the Ohio Department of Agriculture (see below) for advice on vaccinating and testing livestock in Ohio.

Vaccination

There are no effective vaccines for humans, but there is a vaccine for livestock. Brucella vaccine, RB51, can produce brucellosis if unintentionally injected into a human.

Follow-up Specimens

If *Brucella canis* is diagnosed, determine possible exposure of patient. Dogs are the primary reservoir. Brucellosis is more common in stray or population-housed dogs, but pet dogs can also carry the disease. Routine testing can be performed by a veterinarian. Note that there is no antibiotic treatment regimen for dogs that guarantees elimination of the carrier state. Public health authorities should work with the owner and the owner's veterinarian. Measures taken will depend on the situation. Euthanasia might be best in households with children or immunocompromised individuals: neutering and regular veterinary monitoring and taking personal precautions may be reasonable in low risk situations.

If the source of the organism is determined to be domestic livestock, contact the Ohio Department of Agriculture (ODA), Division of Animal Industry, 8995 East Main Street, Reynoldsburg, Ohio 43068, 614 728-6220. ODA will assist with animal testing and removal of reactors.

When dairy products are suspected, advise the ODA Dairy Division, 8995 East Main Street, Reynoldsburg, Ohio 43068, 614 466-5550, which can follow-up on the suspected dairy product source. If voluntary recall or embargo of suspected food product is necessary, the Dairy Division will alert the ODA Food Safety Division 614 728-6250 for the necessary action. The Food Safety Division notifies the FDA if the food product crosses state lines.

Additional Information

See: http://www.cdc.gov/brucellosis/index.html

What is brucellosis?
Brucellosis in humans is known as undulant fever due to the recurrent severe fevers that can be seen with this disease. It may also be called Malta fever after the place it was first recognized. Brucellosis is caused by a group of bacteria which typically infect cattle, bison, swine, sheep, goats, dogs, and humans. Wild rabbits and rodents have been known to transmit the disease to livestock, especially swine.

Brucella occurs worldwide, especially in Mediterranean countries, the Middle East, India, Central Asia and Latin America where animal disease control programs have not effectively reduced the incidence of brucellosis in animals. Over 100 cases are reported in the United States annually. In Ohio, a median of one case per year has been reported from 2004 to 2013 (range 0-4).

How do people and animals get brucellosis?
Brucella bacteria are found in the blood and milk of infected animals as well as in male and female reproductive organs. Occasionally, Brucella is passed in urine or feces. In animals, transmission can occur through sexual or other direct contact with infected animals or through contact with environments contaminated with the blood, milk, urine, or reproductive fluids of infected animals.

In humans, transmission generally occurs by one of three methods: eating or drinking contaminated foods, breathing in the organism, or having the bacteria enter the body through skin wounds. The most common way to be infected is by eating or drinking contaminated milk products, including unpasteurized milk, ice cream, or cheese.

Who is most at risk for contracting brucellosis?
Brucellosis infection in the United States is, for the most part, an occupational disease of stockyard, farm, and slaughterhouse workers, butchers and veterinarians. Anyone exposed to birth-related fluids and tissues including aborted fetuses from livestock or dogs should take precautions to prevent disease transmission. Hunters may be exposed while field dressing infected deer, elk, moose, or wild pigs. People consuming unpasteurized dairy products are also at higher risk.

Can brucellosis be spread from person to person?
Direct person-to-person spread of brucellosis has not been confirmed. However, it is suspected that infected mothers who are breast-feeding could transmit the infection to their infants. Although uncommon, transmission may also occur via contaminated tissue transplantation.

How long after exposure before symptoms appear?
Symptoms generally appear within 5 to 60 days, but may take up to a year.

What are the symptoms in humans?
The most common symptom is fever often accompanied by chills, sweating and weakness. Other symptoms may include insomnia, sexual impotence, headache, lack of appetite, and painful joints. Enlarged lymph nodes, spleen, and liver can also occur. If untreated these symptoms may last from months to several years. In severe cases, infections of the central nervous systems or lining of the heart may cause serious health complications.

How is brucellosis diagnosed?
Brucellosis can be diagnosed in a laboratory by finding the bacteria in samples of blood or bone marrow. Blood tests can also be done to detect antibodies against the bacteria. If this method is used, two blood samples should be collected two weeks apart.

Can brucellosis in humans be treated?
An extended course of antibiotics, typically Rifampicin and Doxycycline, have been effective in treating cases of human brucellosis. Relapses are not common but may occur.

Does past infection with brucellosis make a person immune?
Relapses of the original infection may rarely occur, but it is unlikely that an individual will be re-infected.

What are the symptoms in large animals?
The primary symptoms in livestock include spontaneous abortion, infertility, and decreased milk production. Infected horses often develop a draining wound on the head or withers known as "poll evil" or "fistulous withers".

What are the symptoms in dogs?
Dogs often develop reproductive problems such as abortion. They may have no symptoms of the disease, yet continue to be a carrier.

Can brucellosis in animals be treated?
Reliable testing is available to determine if an animal is infected. But there are no treatments known to completely eliminate the bacteria from infected animals.

Can I get brucellosis from my infected dog?
Brucella species that infect dogs have occasionally been transmitted to humans. The risk of transmission is very low unless a person was to come into contact with semen, blood, or afterbirth. Treatments for dogs do exist, but they do not prevent re-infection. Immunocompromised persons (cancer patients, HIV-infected individuals, or organ transplant recipients) should not handle dogs known to be infected with brucella.

Can I get brucellosis from eating meat or drinking dairy products?
Brucella bacteria are not normally found in muscle tissue, but they can be found in blood. Thorough cooking kills the organisms. Eating undercooked meat or organs or unpasteurized milk products including milk, cheese, and ice cream can present a risk of infection to humans and animals.

More information about brucellosis can be found at the following links:
USDA Brucellosis Facts:
http://www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/

CDC Brucellosis Information: http://www.cdc.gov/brucellosis/index.html