

Q Fever

Coxiella Burnetii

(Also Known as Query Fever)

DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of Q Fever to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. 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 8:00A.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

Q Fever (QF) is caused by the gram-negative bacteria, *Coxiella burnetii*. It is extremely infectious for humans; a single viable organism can cause an infection. Organisms are excreted in milk, urine, and feces of infected animals and, most important, high numbers of organisms are shed in placental tissues and amniotic fluids. The organisms are resistant to heat, drying, and many common disinfectants; thus, the bacteria may survive in the environment for an extended period.

B. Clinical Description and Laboratory Diagnosis

Only about one half of all people infected with *C. burnetii* show signs of clinical illness. Most acute cases of QF begin with sudden onset of one or more of the following: high fever (up to 105°F), severe headache, general malaise, myalgia, confusion, sore throat, chills, sweats, nonproductive cough, nausea, vomiting, diarrhea, abdominal pain, and chest pain. Fever usually lasts for one to two weeks. Thirty to fifty percent of patients with a symptomatic infection will develop pneumonia. Additionally, most patients have abnormal liver function tests and some will develop hepatitis. In general, most patients will recover to good health within several months without any treatment. Only 1% to 2% of people with acute QF die of the disease.

Chronic QF, characterized by infection that persists for more than six months, is uncommon but is a much more serious disease causing significant mortality, reaching 65%. Patients who have had acute QF may develop the chronic form as soon as one year or as long as 20 years after initial infection. A serious complication of chronic QF is endocarditis. Most patients who develop chronic infection have preexisting valvular heart disease or history of vascular graft.

Routine laboratory tests may show thrombocytopenia. Laboratory diagnosis is made by demonstration of the presence of antibodies to *C. burnetii* antigens using indirect immunofluorescence assay (IFA) methods. Organisms can also be identified in the tissues using immunohistochemical staining (IHC) or DNA detection methods.

C. Reservoirs

C. burnetii has been identified in arthropods, fish, birds, rodents, marsupials, and livestock. Cattle, sheep, and goats are the most common animal reservoirs of *C. burnetii*. A variety of other animals such as horses, camels, water buffalo, cats, rabbits, dogs, wild animals (bandicoots and many species of feral rodents), birds (pigeons, ducks, geese, turkeys, and several other species of wild birds), and ticks are natural reservoirs of *C. burnetii*. Infected animals do not usually develop clinical disease, although abortion in goats and sheep has been linked to infection. Most ruminants are seropositive if tested, but finding positive animals does not equate to an infectious disease risk by shedding the bacteria.

D. Modes of Transmission

Infections of humans usually occur by inhalation of contaminated barnyard dust and aerosols originating from dried placental material, birth fluids, and excreta of animals in establishments processing infected animals or their by-products and in necropsy rooms. Transmission can occur through direct contact with infected animals and other contaminated materials such as wool, fertilizer, and clothing. Ingestion of contaminated raw milk, exposure to infected parturient cats, and skinning infected wild rabbits are also modes of QF transmission to humans. Direct transmission by blood or marrow transfusion has been reported. Person-to-person spread and transmission through tick bites are rare.

E. Incubation Period

The incubation period of QF depends on the number of organisms that initially infect the patient. Most patients become ill within two to three weeks after exposure.

F. Period of Communicability or Infectious Period

Person-to-person transmission is rare; however, contaminated clothing may be a source of infection.

G. Epidemiology

QF is a zoonotic disease of worldwide distribution. Humans are accidental hosts. In the United States outbreaks in humans have resulted mainly from occupational exposure involving veterinarians, meat processing plant workers, sheep and dairy workers, livestock farmers, and researchers at facilities housing sheep. Fewer than 120 cases per year are reported in the United States. Cases are infrequent in New Jersey. Most human cases in the United States are sporadic rather than outbreak-associated.

H. Bioterrorism Potential

C. burnetii is a highly infectious category B select agent that is rather resistant to heat and drying. It can become airborne and inhaled by humans. A single *C. burnetii* organism may cause disease in a susceptible person. This agent could be developed for use in biological warfare and is considered a potential terrorist threat. If acquired and properly disseminated, *C. burnetii* could cause a serious public health challenge in terms of ability to limit the numbers of casualties and 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.

Q Fever Case Definition: <https://wwwn.cdc.gov/nndss/conditions/q-fever/>

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://wwwn.cdc.gov/nndss/>

Clinical Description – Acute Q Fever

Acute fever usually accompanied by rigors, myalgia, malaise, and a severe retrobulbar headache. Fatigue, night-sweats, dyspnea, confusion, nausea, diarrhea, abdominal pain, vomiting, non-productive cough, and chest pain have also been reported. Severe disease can include acute hepatitis, atypical pneumonia with abnormal radiographs, and meningoencephalitis. Pregnant women are at risk for fetal death and abortion. Clinical laboratory findings may include elevated liver enzyme levels, leukocytosis, and thrombocytopenia. Asymptomatic infections may also occur.

Note: Serologic profiles of pregnant women infected with acute QF during gestation may progress frequently and rapidly to those characteristic of chronic infection.

Clinical Criteria – Acute Q Fever

Acute fever and one or more of the following: rigors, severe retrobulbar headache, acute hepatitis, pneumonia, or elevated liver enzyme levels.

Laboratory Criteria for Diagnosis – Acute Q Fever

Laboratory confirmed:

- Serological evidence of a fourfold change in immunoglobulin G (IgG)-specific antibody titer to *C. burnetii* phase II antigen by indirect immunofluorescence assay (IFA) between paired serum samples, (CDC suggests one taken during the first week of illness and a second 3-6 weeks later, antibody titers to phase I antigen may be elevated or rise as well), OR
- Detection of *C. burnetii* DNA in a clinical specimen via amplification of a specific target by polymerase chain reaction (PCR) assay, OR
- Demonstration of *C. burnetii* in a clinical specimen by immunohistochemical methods (IHC), OR
- Isolation of *C. burnetii* from a clinical specimen by culture.

Laboratory supportive:

- Has a single supportive IFA IgG titer of $\geq 1:128$ to phase II antigen (phase I titers may be elevated as well) OR
- Has serologic evidence of elevated phase II IgG or immunoglobulin M (IgM) antibody reactive with *C. burnetii* antigen by enzyme-linked immunosorbent assay (ELISA), dot-ELISA, or latex agglutination.

Case Classification – Acute Q Fever

Probable

A clinically compatible case of acute illness (meets clinical evidence criteria for acute Q fever illness) that has laboratory supportive results for past or present acute disease (antibody to Phase II antigen) but is not laboratory confirmed.

Confirmed

A laboratory confirmed case that either meets clinical case criteria or is epidemiologically linked to a lab confirmed case.

Clinical Description – Chronic Q Fever

Infection that persists for more than 6 months. Potentially fatal endocarditis may evolve months to years after acute infection, particularly in persons with underlying valvular disease. Infections of aneurysms and vascular prostheses have been reported. Immunocompromised individuals are particularly susceptible. Rare cases of chronic hepatitis without endocarditis, osteomyelitis, osteoarthritis, and pneumonitis have been described.

Clinical Criteria – Chronic Q Fever

Newly recognized, culture-negative endocarditis, particularly in a patient with previous valvulopathy or compromised immune system, suspected infection of a vascular aneurysm or vascular prosthesis, or chronic hepatitis, osteomyelitis, osteoarthritis, or pneumonitis in the absence of other known etiology.

Laboratory Criteria for Diagnosis – Chronic Q Fever

Laboratory confirmed:

- Serological evidence of IgG antibody to *C. burnetii* phase I antigen $\geq 1:800$ by IFA (while phase II IgG titer will be elevated as well; phase I titer is higher than the phase II titer), OR
- Detection of *C. burnetii* DNA in a clinical specimen via amplification of a specific target by PCR assay, OR
- Demonstration of *C. burnetii* antigen in a clinical specimen by IHC, OR
- Isolation of *C. burnetii* from a clinical specimen by culture.

Laboratory supportive:

- Has an antibody titer to *C. burnetii* phase 1 IgG antigen $\geq 1:128$ and $<1:800$ by IFA

Case Classification – Chronic Q Fever

Probable

A clinically compatible case of chronic illness (meets clinical evidence criteria for chronic Q fever) that has laboratory supportive results for past or present chronic infection (antibody to Phase I antigen).

Confirmed

A clinically compatible case of chronic illness (meets clinical evidence criteria for chronic Q fever) that is laboratory confirmed for chronic infection.

3 LABORATORY TESTING SERVICES AVAILABLE

The Division of Public Health and Environmental Laboratories does not provide testing for QF. Commercial testing is available.

C. burnetii exists in two antigenic phases called phase I and phase II. In acute cases of QF, the level of antibodies to phase II antigens is usually higher than the level of antibodies to phase I antigens, often by several orders of magnitude, and generally is first detected during the second week of illness. In chronic QF, the reverse situation is true. Antibodies to phase I antigens of *C. burnetii* generally require longer to appear and indicate continued exposure to the bacteria. Thus, high levels of antibody to phase I in later specimens in combination with constant or falling levels of phase II antibodies and other signs of inflammatory disease suggest chronic QF. Antibodies to phase I and II antigens have been known to persist for months or years after initial infection.

IgM-specific antibody tests are not strongly supported for use in serodiagnosis of acute disease, as the response may not be specific for the agent (resulting in false positives) and the IgM response may be persistent. For acute testing, CDC uses in-house IFA IgG testing (cutoff of > 1:128), preferring simultaneous testing of paired specimens, and does not use IgM results for routine diagnostic testing.

Serologic test results must be interpreted with caution, because baseline antibodies acquired because of historical exposure to QF may exist, especially in rural and farming areas. Healthy asymptomatic individuals may have IgG phase II titers of 1:128 or below and would not be considered case-patients.

Chronic QF is confirmed by elevated phase I IgG antibody (>1:1024 and is typically higher than phase II IgG and an identifiable persistent focus of infection (e.g. endocarditis)

Note: Samples from suspected chronic patients should be evaluated for IgG titers to both phase I and phase II antigens.

4 DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify cases and clusters of human illness that may be associated with a bioterrorist event.
- To determine whether the source of infection may be a major public health concern (e.g., contaminated food, infected livestock) and stop transmission from such a source.
- To identify where QF occurs in New Jersey.
- To focus preventive and control measures.

B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.8) stipulates that laboratories report (by telephone, by confidential fax, or in writing) any positive culture, test or assay result of QF 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 requesting the laboratory examination is located. The healthcare provider must report all cases of QF to the local health officer having jurisdiction over the locality in which the patient lives.

NOTE: Because of the rarity and potential severity of QF, the New Jersey Department of Health (NJDOH) requests that information about any suspect or known case of QF, or any suspected exposure to *C. burnetii* that may be bioterrorist in nature, be immediately reported to the local health officer where diagnosed. If this is not possible, call the NJDOH Infectious and Zoonotic Diseases Program (IZDP) at (609) 826-5964 during business hours; (609) 392-2020 after business hours and on weekends and holidays. Such telephone report shall be followed up by a written or electronic report within 24 hours of the initial report.

C. Local Health Departments Reporting and Follow-Up Responsibilities

1. Reporting Requirements

NJAC 8:57-1.9 stipulates that each local health officer must report the occurrence of any case of QF as defined by the case definition in section 2A above. A report can be filed electronically over the Internet using the confidential and secure Communicable Disease Reporting and Surveillance System (CDRSS).

2. Case Investigation

1. If the LHD receives the lab or provider report, the LHD should investigate the case by contacting the patient or a family member or the healthcare provider and enter the information into CDRSS as instructed below.
2. If the lab or provider report is received by NJDOHNJDOH and includes the patient's address, the report will be entered into CDRSS and not mailed to the LHD.
3. If the lab or provider report received by NJDOH does not include the patient's address, the report will be returned to the sending laboratory or healthcare provider or they will be telephoned to obtain a complete address. Once it is received, the report will be entered into CDRSS as "PENDING."
4. An epidemiologic investigation to identify the source of infection should be initiated. 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 Q Fever Investigation Worksheet may be used to help guide the patient or physician interview. Specifically, focus on the period beginning about two weeks before onset of disease date back to approximately three weeks before onset for the following exposures:
 - a. Animal contact: Ask the patient about potential direct or indirect residential, or recreational exposure to cattle, sheep and goats.
 - b. Food consumption: Ask the patient about the consumption of raw milk and unpasteurized soft cheeses.
 - c. Occupational: Ask the patient if they work on a farm or in a bacteriologic laboratory.
 - d. Travel history: Determine the date(s) and geographic area(s) outside North America visited by the patient.

Include any additional comments regarding the case in the "Comments" section.

3. Other Reporting/Investigation Issues

1. Institution of disease control measures is an integral part of case investigation. It is the local health officer's responsibility to understand and, if necessary, institute the control guidelines listed in section 5, Controlling Further Spread.
2. It is not always possible to obtain all the information necessary to determine the case status of a patient. A minimum of three attempts (not necessarily to the same person, not at the same time during the day, and only one attempt through a letter/form by mail) should be made to obtain necessary information. If at this time information is not acquired, the case should be entered into CDRSS with as much information as is known, with attempts (dates and results of attempts) documented in the "Comments" section and the case status changed to "Not a Case" and report status to "LHD Closed."

3. Every effort should be made to complete the investigation within three months of opening a case. Cases that remain open for three months or more and have no investigation or update notes will be closed by NJDOH and marked as “Not a Case.”
4. 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.

5 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements

None.

B. Managing Special Situation

1. Reported Incidence is Higher than Usual/Outbreak Suspected

If more than one case of QF is reported or suspected in a city or town, or if an outbreak is suspected, NJDOH IZDP should be notified immediately at (609) 826-5964. IZDP staff will help to investigate to determine the source of infection and mode of transmission. A common vehicle, such as infected animals or unpasteurized milk products, should be sought and applicable preventive or control measures should be instituted (e.g., removing implicated items from the environment). IZDP staff can also help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and therefore be difficult to identify at a local level.

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

2. Exposure of a Laboratory Worker

Laboratory workers exposed to *C. burnetii* (e.g., did not use the protection of a currently certified laminar air flow/biosafety hood) should be observed for symptoms and treated if they become ill. Consult with NJDOH IZDP at (609) 826-5964.

C. Preventive Measures

1. Environmental Measures

Implicated food items must be removed from the environment. A decision about testing implicated food items can be made in consultation with IZDP and the Food and Drug Safety Program (FDSP). FDSP can help coordinate pickup and testing of food samples. If a commercial product is suspected, FDSP will coordinate follow-up with relevant outside agencies (e.g., Food and Drug Administration, U.S. Department of Agriculture). FDSP can be reached at 609.826.4935

NOTE: The role of FDSP is to provide policy and technical assistance with the environmental investigation such as interpreting the New Jersey Food Code, conducting a hazardous analysis and critical control points risk assessment, initiating enforcement actions, and collecting food samples.

2. Preventive Measures/Education

To prevent future exposures, advise the following:

- Educate the public on sources of infection.
- Educate workers at occupational risk (such as farmers, slaughterhouse workers, or laboratory workers) about the symptoms of the disease, how it is spread, and the risks of handling infected animal carcasses and products. They should know the proper ways to reduce exposure, such as use of personal protective equipment (PPE), ventilation of slaughterhouses or careful handling of laboratory specimens. Advise the public to not consume raw (unpasteurized) milk or milk products, such as homemade cheese.
- Educate anyone who handles or disposes of placentas, fetuses, and/or discharges from facilities housing goats and sheep to use PPE, carefully handle the tissues and disinfect contaminated areas.
- Restrict access to barns and laboratories used in housing potentially infected animals.
- Counsel persons at highest risk for developing chronic QF, especially persons with preexisting cardiac valvular disease or individuals with vascular grafts.
- Vaccinate (where possible) individuals engaged in research with pregnant sheep or live *C. burnetii*. A vaccine for QF has been developed; however, this vaccine is not currently commercially available in the United States.

Additional Information

A Q Fever Fact Sheet and Q Fever Investigation Worksheet is available at the NJDOH Web site at <http://www.state.nj.us/health/cd/topics/qfever.shtml>

References

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