August, 2013

Q Fever

Surveillance Protocol

WEST VIRGINIA Department of Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Provider Responsibilities

1. Report suspected and confirmed cases of Q fever to the local health department within 24 hours of diagnosis by phone. Follow up with a faxed copy of the laboratory confirmation and complete demographic and clinical information on the patient as requested by the local health department.
2. Refer to CDC guidelines for patient diagnosis and management. See: http://www.cdc.gov/mmwr/PDF/rr/rr6203.pdf

Laboratory Responsibilities

1. Report cases of Q fever to the local health department by phone within 24 hours of result. Follow up with a faxed copy of the laboratory report.

Public Health Action

1. Contact the provider to collect clinical data for case ascertainment. Record data on the WVEDSS form.
2. Contact the patient for risk factor information.
3. Consult DIDE if:
    a. There is evidence of occupational exposure; or
    b. The patient knows other people with a similar illness; or
    c. The patient appears to be part of an outbreak of Q fever.
4. For outbreaks of Q fever, see outbreak investigation protocol. Anticipate that the outbreak investigation will include:
    a. Interviews of cases to identify risk factors, including:
        i. Occupation
        ii. Exposure to animals, especially parturient animals
        iii. Exposure to birth products (placenta, amniotic fluid, fetuses)
        iv. Exposure to environments that might be contaminated with *C burnetii,* such as: farms, laboratories, research facilities, slaughterhouses, etc.
        v. Exposure to unpasteurized milk or cheese or other animal products
    b. Hypothesis testing might include any of the following:
        i. Evaluation of suspected source animals, including serological testing;

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ii. Evaluation suspected source of exposure (i.e., site visit and possible environmental sampling or sampling of animal products)
iii. Case-control or retrospective cohort studies
iv. Trace-back studies

c. During field investigation, anticipate the need for occupational health protections commensurate with the environment, e.g.:
   i. In farm environments, follow WV Department of Agriculture protocols.
   ii. Seek expert consultation for field investigation of a laboratory or research facility exposure.

State Health Department Responsibilities

1. Review reported cases and submit to CDC (standard notification) after assuring that case ascertainment is correct and an adequate risk factor investigation has been completed.
2. Assist with outbreak investigation, to include:
   a. Liaison with West Virginia Department of Agriculture, USDA and CDC to assure that animal investigation can be completed as required.
   b. Serve as primary lead on design of epidemiological studies, if needed.
   c. Development of questionnaires and line lists.
   d. Assist with site visits and laboratory testing to evaluate exposure hypotheses.
   e. For suspected or confirmed deliberate exposure events, liaison with law enforcement and CDC.

Disease Prevention Objectives

- Reduce risk through educating the public to:
  - Consume only pasteurized dairy products.
  - Practice hand hygiene appropriately after contact with animals and animal products
  - Have animal illness evaluated promptly by a veterinarian

Disease Control Objectives

- In the event of an outbreak, reduce the number of cases by:

- Identifying point source of infection and removing it. Examples of possible point sources include: infected herd animals, laboratory contamination, contaminated animal products, etc.

Surveillance Objectives

- Rapidly detect cases and outbreaks of Q fever
- Identify demographic characteristics of persons with Q fever.
- Characterize and describe risk factors for Q fever.

Public Health Significance

Q fever was first described in Australia as “Query Fever” because the causative agent was not known. Q fever became a nationally notifiable disease in the United States in 1999, but reporting is not required in many other countries. Because the disease is underreported, it is not known how many cases of Q fever have actually occurred worldwide. Many human cases are inapparent.

Human outbreaks can result from the inhalation of aerosolized organisms, especially from barnyard dust contaminated by bacteria from animal urine, feces and birth products. Sporadic cases occur in people who are occupationally exposed, affecting veterinarians, meat workers, sheep and occasionally dairy workers, and farmers. Epidemics have occurred among workers in stockyards, meatpacking and rendering plants, and laboratories, and in medical and veterinary medical centers that use sheep, especially pregnant ewes, in research. Individual cases may occur, however, where no direct animal contact can be demonstrated.

One hundred thirty-two cases of Q fever were reported with onset in 2008, the most recent year where data is available. Of these, 117 were acute Q fever and 15 were chronic Q fever. Cases of Q fever are most frequently reported from western and plains states where ranching and rearing of cattle are common. Seven states (California, Colorado, Illinois, Kentucky, Missouri, Tennessee, and Texas) have accounted for more than half (52%) of all cases since human Q fever became notifiable. Cases of Q fever are reported less frequently in the eastern United States.

The causative agent, *Coxiella burnetii*, is resistant to heat, drying, and many common

disinfectants. These features enable the bacteria to survive for long periods in the environment. That, coupled with the facts that humans are often very susceptible to the disease, very few organisms are required to cause illness, and the organism is highly infectious by the aerosol route, make *C. burnetii* a possible biological warfare agent.

Clinical Description

Q fever is often asymptomatic or mild. Over 20% of U.S. veterinarians, for example, have antibodies for Q fever. Many persons with Q fever antibodies do not recall a severe illness.
Among recently infected persons, clinical signs vary greatly. The most common manifestation is a self-limited flu-like syndrome characterized by high (104°F) fever lasting 1-3 weeks, fatigue, headache and myalgias. Atypical pneumonia, when recognized, is often mild, with a case fatality rate of 0.5 to 1.5%. Hepatitis is also very common. Elevated liver function tests are found in 85% of patients. Overt jaundice is rare. Other acute syndromes include acute pericarditis and/or myocarditis or meningoencephalitis. Clinical laboratory findings may also include elevated thrombocytopenia, elevated sedimentation rate, and abnormal chest film findings. Many persons with acute Q fever recover spontaneously and do not require treatment. However, persons with risk factors for chronic infection (heart valve or vascular defect) should be monitored closely per reference 2.

Chronic infection develops insidiously over many months to years in less than 5 % of patients with acute infection. Untreated, mortality rate is 100%. Endocarditis is the primary form of chronic disease. Aortic aneurysms and infections of the bone, liver, or reproductive organs may also occur. Chronic Q fever usually occurs in immunosuppressed persons or those with valvular heart disease or vascular grafts.

In pregnant women, Q fever may result in spontaneous abortion, fetal death, placentitis or thrombocytopenia. Q fever in pregnant women may present as subclinical or nonspecific febrile illness; or atypical pneumonia, hepatitis or other serious manifestations. Q fever can also recur during later pregnancies. Pregnant women with Q fever should be treated because of the high risk of fetal complications.

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West Virginia Bureau for Public Health
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Etiologic Agent

Q Fever is caused by *Coxiella burnetii*, a species of highly pleomorphic coccobacillus with a gram negative cell wall. The bacteria have two morphological forms, one of which can survive under harsh environmental conditions. The bacteria also have two antigenic phases: phase I and phase II. In acute Q fever, antibodies to phase II antigens predominate; and in chronic Q fever, phase I is the predominant antigen expressed.

Reservoir

Sheep, cattle and goats are the most common reservoir species; however the bacteria have been found in arthropods (ticks), fish, birds, rodents, marsupials, livestock and domestic animals. Infected pregnant animals can build up high concentrations of organisms in the placenta, aborted fetuses and amniotic fluid. Environmental contamination can occur readily when an infected animal gives birth. Environmental contamination can persist for an extended period of time in barnyard soil and pools of standing water.

Mode of Transmission

Organisms are excreted in milk, urine, and feces of infected animals. Most importantly, during birth, the organisms are shed in high numbers within amniotic fluid and the placenta. Infection of humans usually occurs by inhalation of aerosols generated during birth of an infected animal or inhalation of airborne barnyard dust contaminated by dried placental materials, birth fluids, and excreta of infected herd animals. The desiccated bacteria or spores can travel over a wide area on wind currents carrying dust contaminated with birth products. Because of the ease of transmission over long distances, Q fever is viewed as a possible agent of bioterrorism. Transmission can also occur in establishments processing infected animals or their by-products, and in necropsy rooms. Ingestion of contaminated milk is a less common mode of transmission.

Incubation Period

Acute symptoms usually present within 2-3 weeks of exposure; range 3 to 30 days.

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Chronic infection develops months to years after acute infection.

Infectious Period

Person-to person transmission does not occur from casual contact, however infection can occur when organisms are present in the following situations:

- Intrauterine transmission can occur.
- Small outbreaks have occurred among healthcare personnel attending birth from an infected mother because organisms can be spread by droplets generated during delivery.
- Sexual transmission occurs in animals and may also occur in humans.
- Transmission can occur from blood transfusion and bone marrow transplantation.

Outbreak Recognition

Naturally occurring Q fever outbreaks have included the following:

- Outbreaks have occurred among healthcare personnel attending birth from an infected mother or farmers and veterinarians attending birth of an infected animal.
- Outbreaks have also been associated with consumption of unpasteurized milk
- There is a large ongoing outbreak in the Netherlands from Q fever associated with an epizootic in herd animals. This outbreak demonstrated that airborne transmission of Q fever from infected herds can occur at extended distances (miles).
- An outbreak of atypical pneumonia was reported among US troops stationed in Iraq. Possible sources included: births of dogs and sheep in the area and tick bites.
- An outbreak of influenza like illness occurred among students of a boarding school in Israel. Samples from the school ventilation system were PCR positive for C burnetii and numerous feral cats surrounding the school were seropositive for C burnetii. It is unknown how the infection occurred, however, it was noted that the air intake on the roof could be accessed by 'animal secretions.'

It is thought that *C burnetii*, if weaponized, would most likely be disseminated by aerosol, likely causing influenza like illness and pneumonia, followed by emergence of

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chronic infections. Because of the zoonotic nature of *C. burnetii*, the variable clinical manifestations, and difficult diagnosis, it is possible that a small deliberate release might go unrecognized. *C. burnetii* should be considered as a possible etiology for a large influenza like illness and pneumonia outbreak outside of influenza season.

Case Definition

Acute

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

Chronic

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

Laboratory Diagnosis

Because the signs and symptoms of Q fever are not specific to this disease, it is difficult to make an accurate diagnosis without appropriate laboratory testing.

Laboratory diagnosis of Q-Fever is made by finding:

- Fourfold or greater change in antibody titer to *Coxiella burnetii* Phase I or Phase II antigen in paired serum specimens ideally taken 3-6 weeks apart, or
- Isolation of *C. burnetii* from a clinical specimen by culture, or
- Demonstration of *C. burnetii* in a clinical specimen by detection of antigen or

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nucleic acid.

Recovery of the infectious agent from blood is diagnostic, but poses a hazard to laboratory workers. Q fever *Coxiella* organisms may be identified in tissues by immunostains and electron microscopy.

Preventive Interventions

Prevention of occupational exposure

- Workers in biomedical research facilities are at higher risk and should be educated and monitored.
- Laboratorians should use bio-safety level-3 containment when working with *C. burnetii.*

Agricultural prevention and control

- Because of the pervasive environmental contamination during a zoonotic, agricultural prevention and control is highly challenging. West Virginia Department of Agriculture should be consulted about management of animal disease
- In some jurisdictions, contaminated bedding and other high risk materials, such as aborted fetuses are buried with lime or incinerated. Other agricultural control measures include: treating manure from infected herds with lime or calcium cyanide before disposal; and isolation of infected animals.
- Pasteurization of milk is important for prevention.

Secondary Prevention

Reference 2 has detailed recommendations for monitoring acute Q fever patients at highest risk for developing chronic Q fever, especially persons with preexisting cardiac valve disease or individuals with vascular grafts, cancer, the immunosuppressed and pregnant women. Providers should use their judgment and use the most appropriate tools to rule out heart valve defects and pregnancy.

Treatment

Doxycycline is the mainstay of treatment for Q fever, regardless of age. Pregnant

women should be treated with trimethoprim/sulfamethoxazole. For further information about treatment, visit http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6203a1.htm.

Surveillance Indicators

- Time between suspicion of Q fever and first report to public health.
- Completeness of investigation, including risk factor and exposure data collection.

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