Q FEVER

Disease Overview

Q fever is caused by the rickettsia (a bacterium) *Coxiella burnetii* (C. burnetii) and is found worldwide.

Symptoms

There are two types of Q fever infections: Acute and Chronic.

An acute infection may be asymptomatic in up to half of infections; it may also present as a mild febrile illness, or may be a serious illness with complications including pneumonia, hepatitis, myocarditis, or neurological symptoms. The most common symptoms in acute illness are rapid onset of fever, severe sweats, headache, muscle pain, chest pain, and cough. Additional symptoms include fatigue, chills, anorexia, joint pain, nausea or vomiting.

A very small percentage of people (less than 5 out of 100) develop chronic Q fever. Chronic Q fever may present many years after initial infection; endocarditis is the major presentation. People with endocarditis may experience night sweats, fatigue, shortness of breath, weight loss, or swelling of their limbs. A healthcare provider will need to perform a series of tests to diagnose endocarditis. Chronic Q fever is serious and can be deadly if not treated correctly.

Women infected during pregnancy may also be at risk for developing chronic Q fever.

Reservoir

The natural reservoir is a number of animal species, particularly sheep, goats, and cattle. The organism is found in high concentrations in biological excretia of infected animals; such as milk, urine, feces and especially birth products including amniotic fluid and placenta. Most infected animals are asymptomatic although abortions may occur.

Mode of Transmission

Shedding of C. burnetii by the infected animals may be intermittent, and environmental contamination may persist for prolonged periods in products such as hides or wool (organisms are extremely hardy and resistant to drying, heat and many common disinfectants).

Human infection is usually via inhalation of dust or aerosols from premises contaminated by placental tissues, birth fluids and excreta from infected animals, or from establishments processing infected animals or their products. Infectious airborne particles can be carried downwind for long distances (one kilometer or more). Transmission can also occur from direct contact with infected animals or contaminated fomites such as wool and straw. C. burnetii can also spread from room to room easily in farm buildings and laboratories housing infected animals.

Rarely, Q fever has been spread through blood transfusion, from a pregnant woman to her fetus, or through sex. Infection via raw milk or from human to human transmission has occurred but is rare.

Incubation period

Usually 2-3 weeks for acute Q fever (range 3-30 days). Incubation period varies with infective dose. Chronic Q fever can develop within a few weeks of acute Q fever, and up to years after an initial infection.

Period of communicability

C. burnetii is extremely resistant to physical stresses, including heat, disinfectant chemicals and desiccation and can survive in the environment for months to years. Direct person to person transmission occurs rarely, contaminated clothing may be a source of infection.

Risk Factors

Increased risk for acquiring/severe illness:

- Occupational exposure (those who work with animals or animal products including livestock farmers, abattoir workers, dairy workers, veterinarians, laboratory staff, and researchers at facilities housing sheep and goats.)
- Exposure to farm and farm animals (sheep, cattle, goats and other farm animals).
- Pregnant, immunocompromised and those with heart valve disease or vascular defects are at higher risk of chronic Q fever.

Surveillance Case Definition

Confirmed Case

Clinical illness (acute cases) and laboratory confirmation of infection:

- Seroconversion or significant change (fourfold or greater) in antibody titer to *C. burnetii* in paired serum specimens taken 3-6 weeks apart

OR

- Isolation of *C. burnetii* from an appropriate clinical specimen

OR

- Demonstration of *C. burnetii* in an appropriate clinical specimen by detection of nucleic acid

In the context of chronic (or persistent) Q fever: evidence of chronic clinical illness and serological demonstration of a single specific IgG antibody titre to C. burnetii phase I antigen ≥ 1:1024.

Probable Case

Clinically compatible signs and symptoms in a person with supportive laboratory evidence (serological demonstration of a specific IgG antibody titre to C. burnetii phase II antigen ≥ 1: 256).

Diagnosis and Laboratory Guidelines

Turnaround time is approximately two weeks. Diagnosis of Q fever is done in a few different ways:

- detection of antibodies (Serology)
- detection of *C. burnetii* DNA in a PCR test

Serology:

The lifecycle of C. burnetii includes two distinct antigenic phases, phase I and phase II, based on changes that occur in the lipopolysaccharides located in the bacterial cell envelope or wall. These phase variations have implications for bacteria virulence as well as Q fever diagnostic strategies. Indirect immunofluorescence (IFA) is the test commonly used by reference laboratories to obtain phase I and phase II titres for diagnostic purposes. The significance of these two phases is that antibodies to phase II antigens are made during the early stages of the infection, but antibodies to phase I antigens predominate if the organism persists longer.

In acute infection, an antibody response to C. burnetii phase II antigen is predominant and is higher than antibody levels to phase I antigen; the chronic infection is associated with a rising phase I IgG titer that may be higher than phase II IgG. IgM antibodies usually rise at the same time as IgG, near the end of the first week of illness, and remain elevated for months or longer; therefore, provide limited diagnostic value on their own. It is important to note that the IgM antibodies have a much lower specificity than IgG and have higher rates of cross-reactivity. As such, false-positive IgM results can be observed.

Antibodies to Q fever may remain elevated for months or longer after the disease has resolved. If only one sample is tested it can be difficult to interpret the findings. Paired samples taken 3 to 6 weeks apart demonstrating fourfold or greater rise in antibody titre provides the best evidence for a correct diagnosis. In most cases of Q fever, the first IgG IFA titer is typically low (or negative) and the second typically shows a fourfold or greater increase in IgG antibody levels. A negative test during the first week of illness does not rule out Q fever as a cause of illness.

The human serological response to C. burnetii and its phase variants is complex; therefore, Public Health staff should discuss the findings with the Medical Officer of Health before initiating an investigation

Acute Q fever symptoms may last several weeks, though generally less than 2 months. Chronic Q fever has a clinical evolution with symptoms lasting longer than six months.

Polymerase chain reaction (PCR) test:

During the acute phase of illness, a sample of whole blood (or serum) can be tested by PCR assay to determine if a patient has Q fever. This is most sensitive in the first week of illness (before the appearance of C. burnetii-specific antibodies), and rapidly decreases in sensitivity following the administration of antibiotics. Although a positive PCR result is helpful, a negative result does not rule out the diagnosis.

PCR has low sensitivity in patients with chronic Q fever endocarditis.

Reporting

Per Policy 2.2 Disease and Event notification to OCMOH and Disease and Event Reporting section

- Routine surveillance (RDSS) for all confirmed cases.

Case Management

Education

Case or relevant caregiver should be informed about:

- Nature of infection, length of communicable period, mode of transmission and disease ecology.
- Pasteurization of milk.
- Educate high-risk occupations on source of infection, adequate hygiene practices, and necessity for adequate disinfection and disposal of placental tissues, birth fluids and excreta from infected animals and animal products.

Investigation

Check for exposures.

Potential contacts of a common source exposure should be sought and identified. They should be informed of clinical signs and symptoms of Q fever and to seek medical attention if they develop symptoms.

Exclusion/Social Distancing

Not applicable.

Treatment

Antibiotics.

Immunization

Not applicable.

Contact Management

Education

Not applicable

Investigation

Contacts of cases are not at risk as there is no person-to-person transmission.

Exclusion/Social Distancing

Not applicable.

Prophylaxis

Not applicable.

Outbreak Management

Activate the local outbreak plan when an outbreak is declared.