PUBLIC HEALTH REFERENCE SHEET
Q Fever

Name	*Coxiella burnetii*
Reservoir & Transmission	Sheep, cattle, and goats are primary reservoirs, also in multiple vertebrate species including cats, dogs, wild mammals, birds, ticks Inhalation of aerosols or dust contaminated with dried birth fluids or excreta from infected animals; ingestion of contaminated unpasteurized dairy products; human-to-human transmission via sexual contact is rare
Incubation Period	2–3 weeks; shorter after exposure to large numbers of organisms
Common Symptoms	Self-limiting febrile illness, fatigue, severe headache, chills or sweats, malaise, myalgia, nausea, vomiting and diarrhea, abdominal pain Hepatitis or pneumonia associated with more severe acute infections Endocarditis and endovascular infections in chronic disease
Gold Standard Diagnostic Test	Serologic evidence of a four-fold rise in phase II IgG by indirect fluorescent antibody (IFA) test between paired acute and convalescent serum samples collected 3–4 weeks apart
Risk Groups	Animal handlers, butchers, farmers, meat packers, veterinarians, and seasonal or migrant farm workers; travelers to rural areas or farms with cattle, goats, sheep, or other livestock; people that consume unpasteurized milk
Geographic Significance	Worldwide, except New Zealand

What is Q fever?
Q fever is an acute and chronic febrile disease caused by a highly infectious gram-negative intracellular bacterium *Coxiella burnetii,* which commonly infects animals such as goats, sheep, and cattle.

Q fever was first recognized as a human disease in Australia in 1935 and in the United States (U.S.) in the early 1940s. Q fever was made a nationally notifiable disease in the U.S. in 1999. The “Q” is for “query” which was used in the 1940s when the cause of illness was unknown.

What is the occurrence of Q fever?
C. burnetii has a worldwide distribution but is absent from New Zealand. *C. burnetii* prevalence is greatest in Africa and countries in the Middle East. Reported rates of human infection are higher in France and Australia than in the U.S. Per the Centers for Disease Control and Prevention (CDC), the largest known Q fever outbreak involved 4,000 human cases during 2007–2010 in the Netherlands. In 2019, the U.S. reported 178 acute Q fever cases, as well as 34 chronic Q fever cases. The number of cases of Q fever per million persons varies by state, with cases most frequently reported from western and plains states where ranching and rearing of livestock are common. More than one-third of cases (36%) are reported from three States (California, Texas, and Iowa). Most cases of reported illness begin in the spring and early summer months, peaking in April and May, which is also the peak of birthing season for cattle, sheep, and goats.

How is Q fever transmitted?
C. burnetii is most commonly transmitted through inhalation of aerosols or dust contaminated with dried birth fluids or excreta from infected animals, usually cattle, goats, or sheep. *C. burnetii* is highly infectious and persists in the environment. Infections via ingestion of contaminated

unpasteurized dairy products and human-to-human transmission via sexual contact have been reported, but rarely.

Who is at risk for Q fever?
Occupational exposure to infected animals, particularly during parturition, poses a high risk for infection among butchers, farmers, meat packers, veterinarians, and seasonal or migrant farm workers. Examples of travel-acquired Q fever include cases in Soldiers deployed to rural areas, travelers with livestock contact and consumption of unpasteurized milk, and travelers obtaining treatments that involved the injection of fetal sheep cells.

What are the signs and symptoms of Q fever?
Per CDC, the incubation period is typically 2–3 weeks but can be shorter after exposure to large numbers of organisms. Estimates suggest that over half of acute infections are mild or asymptomatic. The most common clinical presentation of acute infection is a self-limiting febrile illness, with hepatitis or pneumonia associated with more severe acute infections. Chronic infections occur primarily in patients with preexisting cardiac valvulopathies, vascular abnormalities, or immunosuppression. Without proper treatment, infection during pregnancy poses a risk for adverse pregnancy outcomes. The most common manifestations of chronic disease are endocarditis and endovascular infections. Chronic infections might become apparent months or years after the initial exposure.

What are potential complications of Q fever?
- Most people with acute Q fever infection recover completely; however, some may experience serious illness with pneumonia, granulomatous hepatitis, myocarditis, or central nervous system complications.
- Women who are infected during pregnancy may be at risk for miscarriage, stillbirth, pre-term delivery, or low infant birth weight.
- Although most people with acute Q fever recover completely, post-Q fever fatigue syndrome has been reported to occur in up to 20% of patients with acute Q fever. This syndrome is characterized by constant or recurring fatigue, night sweats, severe headaches, photophobia, pain in muscles and joints, mood changes, and difficulty sleeping. No consensus has been reached in the medical community on the pathogenesis or treatment of post-Q fever fatigue syndrome.
- Chronic Q fever occurs in <5% of acutely infected patients and can be fatal if not treated correctly with a combination of antibiotics over several months. Endocarditis is the most common manifestation of chronic Q fever and is fatal if untreated.

How is Q fever diagnosed?
- Serologic evidence of a four-fold rise in phase II IgG by indirect fluorescent antibody test between paired acute and convalescent serum samples collected 3–4 weeks apart is the gold standard for diagnosis. Consider a single high serum phase II IgG titer (>1:64) in conjunction with clinical evidence of infection as indicative of probable acute Q fever. PCR testing of serum or whole blood is useful for confirmation of acute Q fever if samples are taken ≤14 days after symptom onset.
- Per CDC, chronic Q fever diagnosis requires a phase I IgG titer >1:512 and clinical evidence of persistent infection (e.g., endocarditis, infected vascular aneurysm, osteomyelitis). Identifying *C. burnetii* in whole blood, serum, or tissue samples by PCR, immunohistochemical staining, or isolation can be used to confirm chronic disease. Further

information about diagnostic testing is available at CDC's Q Fever webpage https://www.cdc.gov/qfever/public-health/index.html.

How is Q fever treated?

- Per CDC, doxycycline is the most frequently used and most effective treatment for acute Q fever. For pregnant people, children aged <8 years with mild illness, and patients allergic to doxycycline, trimethoprim-sulfamethoxazole is an alternative treatment option. Treatment for acute Q fever is not recommended for asymptomatic people or for those whose symptoms have resolved.
- Chronic *C. burnetii* infections require long-term combination therapy, and the combination of doxycycline and hydroxychloroquine for ≥18 months provides the best treatment outcomes. Alternative treatments include trimethoprim-sulfamethoxazole and fluoroquinolones, but these are less effective.
- Treatment of Q fever also might involve surgery to remove infected tissue.

How can Q fever be prevented?

- Q fever vaccines are not available in the U.S. The only commercially available vaccine for humans is in Australia; Q-VAX® Q Fever Vaccine and Skin Test; and is useful for those in hazardous occupations, including those carrying out medical research with pregnant sheep.
- Research workers using pregnant sheep or goats should be identified and enrolled in a health education and surveillance program. Animal-holding facilities should be away from populated areas, and measures should be implemented to prevent airflow to other occupied areas.
- Educate persons in high-risk occupations on sources of infection and the necessity for adequate disinfection and disposal of animal birth products.

What are some public health considerations?

- When reporting Q fever in the Disease Reporting System, internet (DRSi)—
    - Specify the clinical form of the disease. Report acute and chronic separately.
    - Document the source of the infection, if known.
    - Document the circumstances under which the case patient was exposed including duty exposure, occupational activities, environmental exposures, or other high-risk activities.
    - Document any relevant travel and deployment history within the incubation period.
- *C. burnetii* is listed as category B bioterrorism agent.

References:

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