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Q Fever

Mona Z Zaghloul*

Microbiology Unit, Department of Clinical Pathology, Ain Shams University Hospitals, Cairo, Egypt

Q fever is a worldwide disease caused by *Coxiella burnetii*. The bacterium is gram-negative obligate intracellular named by Edward Derrick who described the illness in 1937 as Q (query) fever [1]. Cattle, sheep, and goats are the primary reservoirs although a variety of species may be infected. Phylogenetic analysis based mainly on 16S rRNA sequence has shown that the Coxiella genus belongs to the *gammaproteobacteria* [2]. Organisms are excreted in milk, urine, and feces of infected animals [3]. Transmission to humans occurs primarily through inhalation of aerosols from contaminated soil or animal waste. Other rare modes of transmission include tick bites, ingestion of unpasteurized milk or dairy products and human-to-human transmission. *C. burnetii* infections may be acute or chronic. The incubation period has been estimated to be approximately 20 days [4]. The 3 main clinical presentations in acute infection are: a self-limited influenza like illness accompanied by headache, myalgia, chills, fatigue and sweats, atypical pneumonia and hepatitis with mild elevation of transaminases [5]. Acute disease is usually self-limiting while chronic Q fever develops in people who have been infected for more than 6 months. Endocarditis is the main clinical presentation of chronic Q fever, usually occurring in patients with preexisting cardiac disease including valve defects, rheumatic heart disease, and prosthetic valves [6]. Infections in pregnancy may lead to spontaneous abortions or premature delivery [7]. The risk of acute Q fever patients developing chronic Q fever was estimated to be 2% [8]. People who are exposed to livestock (farm animals) and animal products have a higher risk of developing Q fever, also people who have: heart valve disease, blood vessel abnormalities as aneurysms and weakened immune systems are at high risk of developing deadly form of Q fever [9].

Doxycycline for 2 weeks is the treatment of choice for adults and children aged ≥ 8 years with acute Q fever. While trimethoprim/sulfamethoxazole is preferred in children aged <8 years with uncomplicated illness. Pregnant women with acute Q fever should be treated with trimethoprim/sulfamethoxazole throughout the duration of pregnancy. Chronic Q fever is difficult to treat, so for endocarditis a combination of doxycycline and hydroxychloroquine is used for at least 18 months to eradicate any remaining *C. burnetii* and prevent relapses [10].

The greatest challenge to clinicians is diagnosis at the acute phase of infection because without proper treatment acute Q fever will develop into chronic Q fever, and death may result. The best tests for diagnosis based mainly on direct detection of bacteria. They include human embryonic lung fibroblasts (HEL cells) grown in shell vials, PCR amplification, and immunodetection with tissue biopsy specimens. All these techniques require a level 3 biosafety laboratory and trained personnel due to the extreme infectivity of *C. burnetii*. So antibody based tests can be used as a suitable alternative such as indirect immunofluorescence (the reference method) using *C. burnetii* antigen performed on paired serum samples to demonstrate a significant (four-fold) rise in antibody titers, complement fixation, and enzyme-linked immunosorbent assay (ELISA) [11-13]. Significant titers may take 2-4 weeks to appear. Pulsed field gel electrophoresis was able to classify *C. burnetii* isolates into different groups [14]. DNA restriction fingerprints and separation by Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis (SDS-PAGE) differentiated six genomic groups [15]. The analysis of the sequences of certain genes such as *com1*, *icd* or *mucZ* has been used for differentiating *C. burnetii* isolates [16-19]. More recently, Multiple Locus Variable Number Tandem Repeats Analysis (MLVA) [16-18] and Multispacer Sequence Typing (MST) [19,20] proved to be reliable techniques, reproducible, and with a high discriminatory power. Also Pan et al., [21] developed a Loop-Mediated Isothermal Amplification (LAMP) assay of the *htpAB* gene to identify *C. burnetii* rapidly and sensitively.

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***Corresponding author:** Mona Z Zaghloul, Microbiology Unit, Department of Clinical Pathology, Ain Shams University Hospitals, Cairo, Egypt, Tel: 02-24023494; E-mail: monazaki_810@hotmail.com

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