

## COMMENTARY

# Q Fever: A Neglected Disease in the Middle East

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## ABSTRACT

Q fever is a neglected zoonotic disease caused by the bacterium *Coxiella burnetii* that can be found in bodily fluids, such as urine, feces, milk, and amniotic fluid, of infected animals. Inhalation of dust that has been contaminated by infected bodily fluids is the most common route of exposure for humans who develop Q fever. Endemic to the Middle East, this preventable disease remains largely neglected with few resources being directed towards research and public health interventions. Authors reviewed available data regarding Q fever in the region to identify areas needing further research and attention. An appropriate response to this disease should include vaccination strategies to decrease exposure and to boost immunity, reinforcement of surveillance activities to ensure the detection of the disease and to estimate the magnitude of the problem, addition of this disease to World Health Organization's health topics list, and further capacity building around identification and management the disease.

**Key Words:** Q fever, *Coxiella burnetii*, Middle East, surveillance, public health

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Q fever is a worldwide zoonotic disease caused by the Gram-negative intracellular coccobacillus *Coxiella burnetii* (*C. burnetii*).<sup>1</sup> In 1937, Edward Derrick described the disease and named it Q fever, for “query”, as the causative agent was unknown at that time.<sup>2</sup> Between 2007 and 2010 the largest ever Q fever outbreak occurred in the Netherlands, resulting in more than 3,700 human cases.<sup>3</sup> Although the current prevalence of Q fever in the Middle East is unknown, a variety of reports suggest that the disease is endemic in the region. In Turkey, the first outbreak of Q fever was reported in 1948.<sup>4</sup> In 2010, a study in Turkey found that 13.5% of 407 participants were seropositive for *C. burnetii*, including 8.1% with evidence of past infection, 4.2% with acute Q fever, and 1.2% with chronic Q fever.<sup>5</sup> In 1956, Q fever was reported in animals in Lebanon.<sup>6,7</sup> In Saudi Arabia, serological evidence of the disease was first reported during 1960s.<sup>8,9</sup> Seroepidemiological surveys have shown that 18.3% of blood donors in Morocco, and 26% in Tunisia had anti-*C. burnetii* antibodies.<sup>10</sup> In Egypt, variable seroprevalence rates have been reported: 20% among adult Egyptian blood donors in the Suez Canal area, 16% in the Nile Valley,

and 10% in the Nile Delta.<sup>11</sup> Q fever is endemic in Iraq, demonstrated by the many cases that were reported among US military personnel who served in that country.<sup>12,13,14</sup> In a seroepidemiologic study of deployed US military populations in 2005, the incidence rate among soldiers deployed in Iraq was 10.6 seroconversions per 1,000 person-months.<sup>15</sup> In a 2010 study in Iran, Immunoglobulin M (IgM) antibodies were detected in up to 36% of patients.<sup>16</sup> On the basis of these data, Q fever is endemic in the Middle East.

In humans, and especially among children, the majority of cases of Q fever are asymptomatic. Only 40% show clinical signs that range from acute flu-like illness to hepatitis, pneumonia and endocarditis.<sup>17</sup> The disease poses an occupational hazard for veterinarians, abattoir workers, dairy farmers, and people in regular contact with livestock or their products, because the bacterium is found in both farm animals and pets and is easily transmitted to humans.<sup>13</sup> The infection can be acquired through inhalation or direct contact with skin.<sup>3</sup> Human-to-human transmission has been reported in the literature, the routes of which include blood exposure (through contact with human placenta or blood transfusions) and sexual transmission.<sup>18,19</sup> In animals, the bacterium's DNA (Deoxy Ribonucleic Acid) is usually detected by polymerase chain reaction (PCR) testing.<sup>16</sup> In humans, however, most cases are diagnosed based on detection of phase I and II antibodies.<sup>3</sup> Serosurveys suggest that many cases go unrecognized and/or unreported,<sup>20</sup> so despite the existence of diagnostic modalities, it is very challenging to confirm

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the diagnosis. About 2% of symptomatic acute cases progress to chronic Q fever, which has a high morbidity and mortality rates.<sup>21</sup> The definition of the chronic form of the disease and criteria for its diagnosis are poorly defined. Antibiotic treatment with doxycycline is effective in interrupting the transmission of the disease for both adults and children with severe illness.<sup>3</sup> Unfortunately, antibiotic resistance has developed against doxycycline,<sup>22</sup> which might represent a serious impediment for treating and controlling of the disease in the near future.

Q fever does not appear on the World Health Organization's (WHO) health topics list,<sup>23</sup> and merits more attention, particularly in the Middle East. As with other preventable diseases, such as measles, polio, and tuberculosis, gaps in the provision and accessibility of services for the population persist in many countries in the region. Over the last several decades, conflicts and political upheavals have hampered most national and international health programs, which has led to the scarcity of interventions in disease prevention. Health systems frequently come under direct attack by the parties involved in these armed conflicts, which hinders healthcare access and delivery.<sup>24</sup> In addition, the lack of capacity to address the public health challenges in the region prevents improved surveillance and effective interventions. The epidemiology of Q fever in the Middle East is ill-defined, but the aforementioned studies suggest that enhanced monitoring and determination the burden of the disease is possible.

So what should be done to address Q fever in the Middle East? One obvious response is to design public health frameworks and interventions based on current knowledge of risk factors and best practices in the prevention and control of Q fever. Based on the magnitude of its prevalence and its association with various clinical manifestations, Q fever is a relevant infectious disease that should receive attention from public health systems in the region. The Center for Disease Control (CDC) Infectious Disease Framework's elements and priorities,<sup>25</sup> which is a roadmap to improve the ability to prevent known and recognize and control rare infectious diseases, can be adapted and tailored to be implemented in the region. The three main elements are strengthening public health fundamentals, identifying and implementing high-impact public health interventions, and developing and advancing policies to prevent, detect, and control infectious diseases. Designing and utilizing such a framework is critical for disease prevention and improvement of health services delivery in the region. There is a need for increased accessibility to vaccines, diagnostic tests and medical providers, which will improve the management of control programs. Specific measures such as vaccination campaigns, decreased workplace exposure to *C. burnetii*, and increased awareness about the disease among the population and health work force are crucial to disease control and eradication. A mixture of these strategies was implemented in the Netherlands and was effective in controlling the epidemic from 2012

onwards.<sup>26</sup> Among these strategies were mandatory rigorous hygiene protocols for all dairy goat and sheep farms, mandatory vaccination campaigns in high-risk areas, and issuing transport animal and visitors bans from all Q fever positive farms.

Research efforts to understand the burden of disease should be prioritized, so that effective and sustainable interventions can be implemented in the near future. Application of comprehensive and systematic approaches to control the infection in the region will reduce morbidity and mortality. This will contribute to the prevention of Q fever not only in the Middle East but around the world as well. Researchers and scholars in the region should be encouraged to investigate and address this disease further and develop best practice recommendations.

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