Q Fever in Military Firefighters during Cadet Training in Brazil

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Abstract. We report five cases of Q fever among cadets during a training program for Military Firefighters Academy in the state of Rio de Janeiro, Brazil. This cluster confirms the significance of Coxiella burnetii as an infectious agent in Brazil, where the occurrence of this zoonosis is poorly documented and highlights the potential risk for Q fever transmission in rural areas or farms with infected animals.

Q fever is a zoonosis caused by Coxiella burnetii, an intracellular bacterium that infects several animals, including humans. After an incubation period of 14–37 days, most human infections are asymptomatic but can present as a flu-like illness, pneumonia, or hepatitis. Hepatitis and endocarditis or fatal cases depend on the patient’s risk factors and the virulence of the bacterial strain. The infection is transmitted to humans from infected animals through contact with and inhalation of secretions, particularly birth products from domestic ruminants.

Coxiella burnetii was first reported in Australia in 1937 and has emerged in several regions of the world in the last decade. Thus, Q fever has become an important public health concern in the northern hemisphere, particularly in European countries, where cases have been reported in areas where Q fever was previously nonendemic, such as the Netherlands. Outbreaks and sporadic human cases are reported around the world, but there is little knowledge about Q fever in Africa and South America. In Brazil, the first serological evidence of C. burnetii infection was described in 1953. However, only recently, a few rare cases have been identified in the southeast region. Curiously, an annual incidence of 150 cases/100,000 people was observed in 2005 in French Guiana, which borders the northern region of Brazil. Thus, this disparity with Brazil suggests that the occurrence of Q fever may be underreported.

We describe a cluster of Q fever cases among cadets enrolled in a training program at the Pedro II Military Firefighters Academy (MFAPRJ) in Rio de Janeiro, Brazil.

In October 2016, five cadets with acute febrile illness were evaluated at the Central Hospital of MFAPRJ (Table 1). All patients were male, aged between 20 and 25 years, and had a history of camping during military survival training, with more than 42 cadets (total of 47) in the region of Ribeirão das Lajes (22°41′28″S 43°51′49″W) in the state of Rio de Janeiro from September 29 to October 13, 2016. They reported numerous tick bites, and 45 cadets participated directly in slaughtering animals for their own consumption (including a goat) under field survival conditions.

One of the cadets had severe pneumonia associated with respiratory failure. Laboratory findings and a chest radiograph were available from medical records and are reported in the table. Because of the possibility of diseases associated with ticks, 200 mg/day of doxycycline were administered after collecting blood samples from the patients and bronchoalveolar lavage (BAL) from the one patient who progressed to respiratory failure. All patients recovered and were discharged.

An indirect immunofluorescence assay (IFA) (Focus Diagnostics, Cypress, CA) for antibodies against C. burnetii was performed with a titer cutoff of 64. Sequential serum samples were collected from the patients, and in all cases, paired serum samples showed a > 4-fold increase of immunoglobulin G (phases II) specific to C. burnetii. Blood and BAL samples were analyzed using polymerase chain reaction (PCR) for a fragment of IS1111 gene—a transposon-like repetitive region, as reported previously. Coxiiella burnetii DNA was detected in BAL from patient 4, and the sequence fragment revealed 99% sequence identity with the homologous gene fragment of the htpAB transposase gene from C. burnetii strains RSA331, RSA439, and RSA443 (GenBank accession no. MF447442).

In December 2016, serum samples from the 42 healthy military cadets who participated in the training program were analyzed, and all were nonreactive. Considering that the probable source of infection was the goat, a field investigation was also carried out on a commercial shop where the cadets purchased the animal. Blood and anal swab samples collected from 12 goats were analyzed using IFA and PCR. The results revealed an absence of C. burnetii infection. Unfortunately, given the nature of most small ruminant markets in Brazil, it was not possible to identify the rural property that supplied the goat to the commercial place.

Previous studies have identified C. burnetii as one of the pathogens for outbreaks of influenza-like illness and pneumonia among military personnel. Military personnel are a high-risk occupational group that is often exposed to several infectious agents. This is the first report of a Q fever outbreak among military personnel in Brazil, where autochthonous cases have mainly been reported in the states of Rio de Janeiro and São Paulo.

All five patients in this study had contact with the goat, and their estimated incubation periods ranged from 18 to 31 days.
Table 1
Clinical and laboratorial findings of Q fever in cadets in Brazil, 2016

| Case number | Date of collection | Clinical manifestations | Hemogram | PCR | Blood culture |
|-------------|-------------------|------------------------|-----------|-----|---------------|
|             |                   |                        |           |     |               |
| 1 (2)       | October 17        | Fever (38°C), dry cough, myalgia, headache, and abdominal pain | 18        | 142,000 leukocytes, < 64 (October 27) 128 (November 01) 1,024 (November 07) 2,048 (November 18) 16,384 (November 30) | NEG | Non-hospitalized patient |
|             |                   |                        |           |     |               |
| 2 (2)       | October 21        | Fever (38.4°C), dry cough, myalgia, headache, and abdominal pain | 22        | 7,700 leukocytes, < 64 (October 27) 512 (November 01) 4,096 (November 07) 4,096 (November 18) | NEG | Hospitalized patient |
|             |                   |                        |           |     |               |
| 3 (2)       | October 23        | Fever (38°C), dry cough, myalgia, headache, and abdominal pain | 31        | 178,000 platelets, < 64 (October 27) 128 (November 01) 1,024 (November 07) | POS | Patient hospitalized in intensive care |
|             |                   |                        |           |     |               |
| 4 (2)       | October 23        | Fever (38°C), dry cough, myalgia, headache, and abdominal pain | 24        | 194,000 platelets, < 64 (October 27) 128 (November 01) 1,024 (November 07) | NEG | Hospitalized patient |
|             |                   |                        |           |     |               |
| 5 (2)       | October 29        | Fever (38.1°C), dry cough, myalgia, headache, and abdominal pain | 30        | 7,900 leukocytes, < 64 (November 11) 128 (November 16) | NEG | Hospitalized patient |

NA = not available; NEG = negative; IFA = indirect immunofluorescence test; PCR = polymerase chain reaction; POS = positive; S = sample. Normal ranges: leukocytes 4,000–11,000, platelets 150,000–450,000.

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