Suspected Person-to-Person Transmission of Q Fever Among Hospitalized Pregnant Women

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We report a case of suspected patient-to-patient transmission of Q fever among pregnant women in a high-risk pregnancy unit, presumably via aerosolization of vaginally excreted infectious placental particles. This case questions whether current infection control guidelines are sufficient for Q fever–infected women in similar settings.

**Keywords.** Q fever; person-to-person transmission; nosocomial cross-infection.

Q fever is a zoonosis caused by *Coxiella burnetii*, a small Gram-negative bacterium that undergoes a phase variation from a virulent intracellular replicating form expressing phase I antigens, to a nonviral form expressing phase II antigens. *Coxiella burnetii* is highly contagious and mostly spreads via inhaled aerosolized pseudospores, which are very stable in various environmental conditions and may be transmitted long distances by the airborne route. Although domestic ruminants are probably the main reservoir, many vertebrate species may also be infected (eg, cats and dogs, rodents, birds). Infective particles are found in extremely high numbers in birth products and to a lesser extent in saliva, feces, urine, and milk [1, 2]. Person-to-person transmission of Q fever has been described, yet is exceedingly rare. Published cases include infection via sexual contact, infected blood and bone marrow, infected breast milk, clustered familial cases, and nosocomial infection during delivery or autopsies [3–8]. Whereas acute Q fever may be asymptomatic or may result in a mild, self-limited disease, chronic endovascular infection and pregnancy complications are prominent examples of its possible severe sequelae. Q fever in pregnancy is either asymptomatic or may present with fever of unknown origin, pneumonia, hepatitis, or endocarditis [8, 9]. Because placent al inoculation may ensue, pregnancy may be severely complicated by intrauterine growth restriction, stillbirth, preterm delivery, intrauterine fetal death, oligohydramnion, and chronic placental abruption [8, 9]. Here we report a case of suspected person-to-person Q fever transmission between pregnant women in a hospital setting.

A healthy 32-year-old woman was admitted to the high-risk pregnancy (HRP) unit at 23 weeks of gestation due to repeated episodes of vaginal bleeding presumed to present chronic placental abruption. Serologic analysis for Q fever (performed in the national reference laboratory, Ness-Ziona, Israel), which was ordered due to impaired liver function tests, showed Q fever phase II immunoglobulin M (IgM) titers <1:100, phase II immunoglobulin G (IgG) titers 1:12 800, phase I IgM titers 1:100, and phase I IgG titers 1:1600, consistent with recently acquired acute Q fever. A complement fixation test for Q fever performed on 2 blood samples taken 25 days apart showed an 8-fold increase, from 1:1024 to 1:8200. Detailed history revealed that the patient had participated in the delivery of her domestic dog 1 month prior to admission. The dog was later phlebotomized and found seropositive for Q fever. Notably, numerous studies have documented Q fever in dogs. Moreover, a study from the Netherlands, the host of a recent large outbreak of Q fever, implied dog placentas as a possible reservoir for Q fever [10]. Treatment with trimethoprim-sulfamethoxazole was initiated, yet despite treatment, at 28 weeks of gestation, after 6 weeks of hospitalization with intermittent vaginal bleeding, the patient developed painful contractions and progressed to active labor. A viable male infant weighing 1200 g was born. Macroscopic placental examination revealed near-complete placental abruption, and pathology demonstrated severe placentitis. Polymerase chain reaction (PCR) from placental tissue and from breast milk was positive for Q fever, and the baby tested negative for phase II and phase I IgM and *C. burnetii* PCR.

During the patient’s lengthy hospitalization, another healthy 32-year-old woman at 26 weeks of gestation of a twin pregnancy was admitted due to impending preterm labor. Unsuspecting a contagious disease, she was roomed with the above-mentioned patient, both women sharing a single toilet. Following the development of severe preeclampsia, an uneventful emergency
cesarean section was performed at 32 weeks of gestation. Two healthy male infants weighing 1500 and 1150 g were born. One week postpartum, the patient was readmitted to the hospital due to fever of up to 38.9°C, accompanied by very mild cough. Physical examination revealed minimal crackles at lung bases. Blood tests showed a normal complete blood count and chemistry. Chest radiography was within normal limits, and a computed tomography scan exhibited an infiltrate and a small consolidation in the right lower lobe interpreted as pneumonia. Owing to the hospital staff's awareness of her previous roommate's infectious diagnosis, serology for Q fever was obtained, revealing phase II IgG titers of 1:400 and phase II IgM titers of 1:100, with negative phase I antibodies, consistent with acute Q fever. A second blood test taken 3 weeks later showed an increase of phase II IgG titers to 1:800. Notably, apart from sharing a room and a toilet with the infected patient during hospitalization in the high-risk pregnancy unit, the patient denied any risk factors for Q fever infection. Moreover, the patient was hospitalized in the high-risk pregnancy unit for 6 weeks prior to her delivery, a period exceeding the usual incubation period of Q fever; thus, preadmission infection is highly unlikely.

Therefore, we strongly suspect Q fever cross-infection by sharing a living space and a toilet with an infective patient via transfer of aerosolized infectious particles, possibly vaginally excreted placental products. We speculate that toilet flushing may have promoted infectivity by aerosolization of secretions as described for other pathogens. Experiments performed using air and surface sampling following flushing of a soiled domestic toilet have demonstrated the role of flush-driven aerosolization in the spread of enteric bacteria and spores [11, 12]; however, we are not aware of a similar transmission route with Q fever.

This type of plausible infectious route is of cardinal importance in populations at risk for Q fever infection. According to the Centers for Disease Control and Prevention guidelines from 2013, specific precautions are required for handling Q fever–infected patients, their excreta, and belongings [13]. These range from airborne precautions and eyewear in a patient with acute Q fever undergoing potentially aerosol-producing procedures to standard precautions, face mask, and eyewear for potential splashing during delivery of such patients. This case presented questions as to whether these guidelines are sufficiently inclusive for the prevention of Q fever transmission in the setting described. Conception products carry an extremely high inoculum of C. burnetii [1, 2]. Thus, to minimize chances of cross-infection, we suggest that in Q fever–endemic areas, hospitalized pregnant women with repeated episodes of vaginal bleeding should be specifically inquired regarding environmental, behavioral, and occupational risk factors for Q fever infection. In cases of suspected or confirmed Q fever, vaginal excreta pre- and postpartum, as well as conception material, should be considered infective both by direct contact and the airborne routes. Therefore, standard precautions, as well as eyewear and airborne precautions (ie, that healthcare personnel wear an N95 respiratory mask or similar, and that the patient be placed in an airborne infection isolation room) should be advised for these patients until complete cessation of bleeding or until Q fever infection is ruled out. Further considerations regarding cleaning and disinfection should be made, as these bacteria are highly resistant to various environmental stressors [1, 2, 13].

Note

Potential conflicts of interest. All authors: No reported conflicts. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References