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Tickborne Relapsing Fever in a Mother and Newborn Child—Colorado, 2011

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TICKBORNE RELAPSING FEVER (TBRF) IS a bacterial infection caused by certain species of *Borrelia* spirochetes and transmitted through the bite of *Ornithodoros* ticks. Clinical illness is characterized by relapsing fever, myalgias, and malaise. On May 10, 2011, CDC and the Colorado Department of Public Health and Environment were notified of two patients with TBRF: a young woman and her newborn child. This report summarizes the clinical course of these patients and emphasizes the importance of considering a diagnosis of TBRF among patients with compatible clinical symptoms and residence or travel in a TBRF-endemic area. Pregnant women and neonates are at increased risk for TBRF-associated complications and require prompt diagnosis and treatment for optimal clinical outcomes. Public health follow-up of reported TBRF cases should include a search for persons sharing an exposure with the patient and environmental investigation with remediation measures to prevent additional infections.

On May 2, 2011, a previously healthy woman aged 24 years sought treatment at a local emergency department in Colorado after 1 week of fever, nausea, headache, stiff neck, and occasional blurred vision. Approximately 20 hours earlier, she had delivered a newborn (at 39 weeks' gestation) in a mountain cabin, without medical attendance. She had received limited prenatal care. Delivery was notable for amniotic fluid discoloration consistent with meconium. Physical examination revealed an ill-appearing and afebrile woman with hypotension (blood pressure: 70/40 mmHg). Gynecologic examination was unremarkable. A complete blood count revealed an elevated white blood cell count of 18,000/µL (normal: 4,500-10,000/µL), a decreased hematocrit of 30% (normal: 37%-47%), and a decreased platelet count of 42,000/µL (normal: 130,000-400,000/µL). Blood chemistries were remarkable for an elevated creatinine of 1.6 mg/dL (normal: 0.6-1.3 mg/dL), elevated aspartate aminotransferase of 61 IU/L (normal: 15-37 IU/L), and elevated alkaline phosphatase of 422 IU/L (normal: 50-136 IU/L). She was admitted and treated empirically using intravenous piperacillin with tazobactam for postpartum sepsis and fluid resuscitation for hypotension. Antibiotics were changed to oral amoxicillin after 48 hours. A blood culture drawn at admission revealed no growth, and the patient remained afebrile during hospitalization. Because of worsening anemia, she was transfused with packed red blood cells on May 3. Her condition improved, and she was discharged on May 5.

The newborn female accompanied her mother to the emergency department on May 2. Although physical examination was normal, the newborn was admitted for observation. An initial complete blood count was unremarkable, and blood culture collected at admission had no growth after 5 days. The patient developed neonatal jaundice on May 4 and remained hospitalized. On May 7, she became febrile with a temperature of 101.2°F (38.4°C) and had a platelet count of 34,000/µL (normal: 130,000-400,000/µL). Blood chemistries revealed an elevated alkaline phosphatase of 196 IU/L (normal: 50-136 IU/L) and a decreased albumin of 2.4 g/dL (normal: 3.4-5.0 g/dL). Treatment for sepsis was initiated with administration of gentamicin, ampicillin, and acyclovir. Subsequently, her platelet count decreased further to 14,000/µL. A review of the peripheral blood smear to evaluate the newborn's thrombocytopenia incidentally revealed spirochetes consistent with TBRF (FIGURE). A 10-day course of intravenous penicillin-G and platelet transfusions for progressive thrombocytopenia were initiated. The newborn recovered and was discharged on May 20. Because of the newborn's spirochetemia, the mother was presumptively treated for TBRF with doxycycline.

What is already known on this topic?

Tickborne relapsing fever (TBRF) is a spirochetal infection transmitted to humans through the bites of soft ticks. TBRF infection is endemic to the western United States and often acquired by patients lodging in rodent-infested rustic dwellings at elevations >2,000 feet.

What is added by this report?

This report describes the sixth reported case of acute neonatal TBRF infection associated with maternal TBRF illness in the United States. It highlights the incidental diagnosis of two TBRF infections, indicating that TBRF might not be considered initially for clinically compatible illnesses even in TBRF-endemic areas.

What are the implications for public health practice?

TBRF should be considered among the differential diagnoses of patients with unexplained or recurrent fever, especially those with a history of travel or residence in areas where TBRF is endemic. Pregnant women and neonates are at increased risk for severe TBRF illness and require prompt diagnosis and treatment for optimal clinical outcomes. Public health follow-up of reported TBRF cases should include a search for additional illnesses and environmental assessment with remediation measures to prevent further infections or reinfection.

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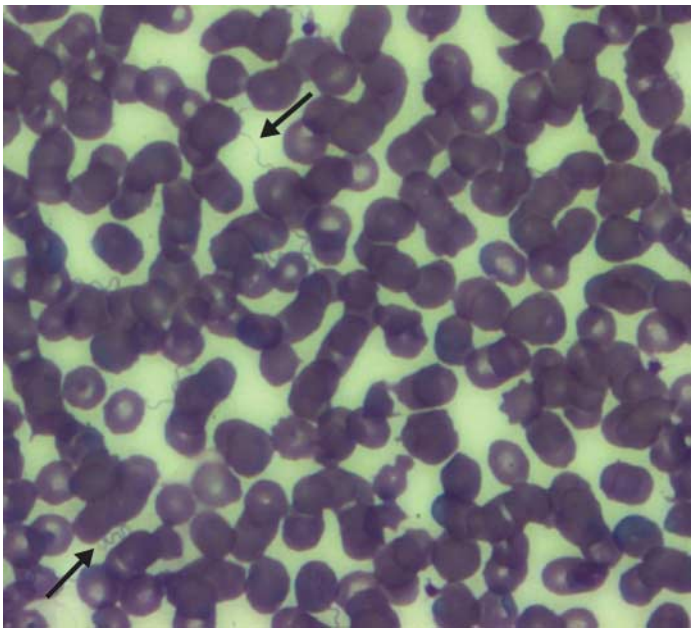
FIGURE. Stained thin smear of a newborn's peripheral blood, showing the presence of numerous spirochetes (indicated by black arrows) at 63X magnification — Colorado, 2011



Photo/CDC

Blood and serum samples from the mother and her newborn were tested by CDC's Bacterial Diseases Branch, Fort Collins, Colorado. Presence of spirochetes was visually confirmed from the newborn's blood smear prepared May 7; a whole blood sample collected the same day yielded evidence of relapsing fever *Borrelia* species by polymerase chain reaction. Sequencing of polymerase chain reaction targets revealed 100% match to *Borrelia hermsii*. Testing of the newborn's serum also obtained May 7 did not detect *B. hermsii* antibodies by either enzyme immunoassay (EIA) or immunoglobulin M (IgM) and immunoglobulin G (IgG) Western immunoblots. A sample collected from the newborn 3 days later had equivocal results by EIA and three bands visible on IgM immunoblot and one band visible on IgG immunoblot. Serum collected from the mother on May 13 produced a positive *B. hermsii* EIA, >10 bands by IgM immunoblot, and 10 bands by IgG immunoblot. The mother's clinical history and dominant IgM antibody response supported acute maternal *B. hermsii* infection acquired during the weeks preceding delivery; the limited antibody response by the newborn also supported a diagnosis of acute TBRF infection.

The mother was not employed and had moved from a densely populated urban area in Colorado to the previously vacant cabin 18 days before delivery. This rural Colorado cabin was situated near the base of a mountain range within a juniper and piñon tree forest at an approximate elevation of 8,800 feet. The single-room structure lacked electricity and running water. An environmental assessment indicated no ongoing rodent activity, and no ticks were recovered. The cabin owner declined to permit access to internal wall spaces to search for rodent nests.

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CDC Editorial Note: *B. hermsii* is the most frequent cause of TBRF in the United States. This spirochete is transmitted to humans by the soft tick *Ornithodoros hermsi*, which usually is associated with the nests of chipmunks and other wild rodents.[1] Unlike hard ticks, *O. hermsi* transmit spirochetes through a brief (<30 minutes' duration) and painless nocturnal bite. Humans typically are exposed to these ticks during an overnight stay in rodent-infested dwellings at elevations >2,000 feet.

After an average incubation period of 7 days (range: 2-18 days), TBRF symptoms include fever, headache, myalgias, nausea, and chills with a median duration of 3 days (range: 2-7 days) alternating with afebrile periods of a median duration of 7 days (range: 4-14 days).[1] Febrile periods can recur ≤10 times without treatment. Moderate to severe thrombocytopenia is typical during acute TBRF illness.[1] As occurred in the newborn's illness, spirochetes are not detected by automated blood cell counts but can be observed on direct examination of stained (Wright's or Giemsa) blood smears, with sensitivity approaching 70% during febrile episodes.[2] Blood smears most often reveal spirochetes during acute infection and before antibiotic treatment. Alternatively, serologic testing for TBRF can be used for diagnosis but is not widely available. Antibiotics recommended for treatment include penicillin, doxycycline, and erythromycin. Patients with TBRF infection should be monitored for ≥2 hours after initial antibiotic dose for a Jarisch-Herxheimer reaction, an acute worsening of symptoms that can be life-threatening.* One case series documented such reactions among 54% of patients, demonstrating that this reaction is common.[3]

TBRF infection can pose serious risks for mothers and neonates. Only 12 TBRF infections among pregnant women have ever been reported in the United States, including the one in this report.[1,3-9] Among these cases, serious maternal complications of TBRF infection have been documented and include adult respiratory distress syndrome, Jarisch-Herxheimer reaction, and precipitous or premature delivery.[4-6] Among newborns born to these TBRF-infected mothers, six (55%) of 11 had a documented perinatal TBRF infection; two (33%) died despite treatment.†

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Potential routes of perinatal TBRF infection include transplacental transmission or acquisition during delivery; however, studies have been limited.

The findings in this report are subject to at least two limitations. First, transmission route for the newborn was not determined, but possibilities include transplacental, during birth, or during residence in the cabin. Second, the cabin remains the most likely site of exposure for the mother on the basis of arrival date and acute nature of her illness; however, no rodent nests or ticks were identified within the structure to provide more substantial evidence.

TBRF should be considered a potential diagnosis among febrile patients who reside in or have traveled to the western United States, especially those inhabiting rustic housing. Cases should be reported immediately to public health officials to facilitate identification of other potentially exposed persons and to evaluate and treat those persons for TBRF infection. Additionally, TBRF is a reportable disease in 12 western U.S. states.‡ An environmental investigation should be undertaken to search for rodent nests. Reinfection and additional TBRF illnesses can occur in housing previously linked to TBRF cases.[10] Remediation efforts should include rodent-proofing and treatment of structures with pesticides (particularly crack- and crevice-type) by pest control specialists to reduce risk for continued tick exposure.

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REFERENCES

10 Available.

*A Jarisch-Herxheimer reaction is characterized by hypotension, tachycardia, chills, rigors, diaphoresis, and elevated body temperature and can occur after initial antibiotic therapy for infections caused by spirochetes, including relapsing fever.[1]

†One woman with TBRF infection elected to terminate her pregnancy.

‡Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, Texas, Utah, and Washington.

Ectopic Pregnancy Mortality—Florida, 2009-2010

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1 table omitted

ECTOPIC PREGNANCY OCCURS WHEN A fertilized ovum implants on any tissue other than the endometrial lining of the uterus. Approximately 1%-2% of pregnancies in the United States are ectopic[1,2]; however, these pregnancies account for 3%-4% of pregnancy-related deaths.[3] The ectopic pregnancy mortality ratio in the United States decreased from 1.15 deaths per 100,000 live births in 1980-1984 to 0.50 in 2003-2007.[4] During 1999-2008, the ectopic pregnancy mortality ratio in Florida was similar to the national rate, 0.6 deaths per 100,000 live births, but increased abruptly to 2.5 during 2009-2010. Florida's Pregnancy-Associated Mortality Review (PAMR) identified ectopic pregnancy deaths during 1999-2010 through its routine process of identifying all pregnancy-related deaths. A multidisciplinary investigation committee reviewed the ectopic pregnancy deaths for cause of death, risk factors, and prevention opportunities. This report summarizes the investigation results, which identified 11 ectopic pregnancy deaths from 2009-2010 and 13 deaths from the 10-year period 1999-2008. The increase in ectopic mortality appears to be associated with illicit drug use and delays in seeking health care. The findings underscore the importance of ongoing, state-based identification and review of pregnancy-related deaths. Such reviews have the potential to identify emerging causes of deaths and associated risk factors, such as ectopic pregnancy deaths among women who use illicit drugs. Efforts to prevent ectopic pregnancy deaths need to ensure early access to care, promote awareness about early pregnancy testing and ectopic pregnancy risk, and raise public awareness about substance abuse health risks, especially during pregnancy.

In 1996, the Florida Department of Health initiated PAMR to improve surveillance of pregnancy-related deaths in Florida. PAMR was formed to highlight gaps in health care, identify systematic service delivery problems, and make recommendations to facilitate improvements in the overall systems of care. The PAMR process begins by identifying pregnancy-associated deaths. A pregnancy-associated death is defined as occurring during or within 1 year after the end of pregnancy; the association is purely temporal. Pregnancy-associated deaths occurring within the previous year are identified through a quarterly review, using a computer algorithm examining linked data files from (1) death certificates of females aged 8-61 years, (2) statewide prenatal risk screenings for high-risk pregnancies, (3) certificates of live birth, and (4) fetal death certificates. The pregnancy-associated death certificates identified through this computer algorithm are reviewed by a PAMR subcommittee to determine if the death is pregnancy-related and to assign an underlying cause of death. A pregnancy-related death is defined as a pregnancy-associated death resulting from (1) complications of the pregnancy itself, (2) a chain of events initiated by the pregnancy that led to the death, or (3) aggravation of an unrelated condition by the physiologic or pharmacologic effects of the pregnancy that resulted in death. The PAMR subcommittee identified 470 pregnancy-related deaths that occurred during 1999-2010.

In late 2010, the PAMR subcommittee identified a potential increase in ectopic pregnancy deaths in 2009. A retrospective review of the identified pregnancy-related deaths from 1999-2009 confirmed this increase. Ectopic pregnancy deaths in 2010 were iden-

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