Unexplained Fever After a Camping Trip in the American Southwest

Kareem W. Shehab and Niaz Banaei

1Division of Pediatric Infectious Diseases, Department of Pediatrics, and 2Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, California

Corresponding Author: Kareem W. Shehab, 300 Pasteur Dr, Rm G312 Stanford, CA 94305. E-mail: kshehab@stanford.edu.

Received March 31, 2012; accepted May 15, 2012; electronically published June 22, 2012.

Case Presentation

An 8-year-old girl was evaluated for fevers of 39.4°C that developed 10 days after returning from a family camping trip. She complained of diffuse headache, nausea, and occasional emesis. Before her illness, 3 transient erythematous papules resembling insect bites on her abdomen were noted. Sore throat, cough, conjunctivitis, diarrhea, arthralgias, and myalgias were absent. Her symptoms, including fever, resolved after 5 days.

Five days later, the child presented for outpatient evaluation with new fevers, headache, and nausea. Her review of systems was otherwise negative. Her past medical history was notable for allergic rhinosinusitis, for which she was taking antihistamines. Her immunizations were up to date, and she had no known drug allergies. She resided in a suburb of the San Francisco Bay Area with her parents and younger brother. The family had visited national parks throughout southern Utah and northern Arizona during the spring in the weeks before the onset of illness, where they had hiked and waded into freshwater streams. They stayed in hotels, with the exception of a lodge at Bryce Canyon National Park, and drank only bottled water. There were no indoor or outdoor animal exposures, nor were there ill contacts. There was no history of arthropod bites.

Vital signs included a temperature of 38°C, pulse of 104 beats per minute, blood pressure of 110/58 mm Hg, and respirations of 20 per minute. Her physical examination was unremarkable. Electrolytes, liver function tests, and creatinine were normal. The white blood cell count was 12,400/μL with 67% neutrophils (>20% bands), 12% lymphocytes, and 20% monocytes. The hemoglobin was 11.7 (range, 11.5–15.5 g/dL) and the platelet count was normal. An erythrocyte sedimentation rate was 90 mm/hour, and the C-reactive protein level was 6.9 mg/dL (range, 0–0.9 mg/dL). A heterophile antibody was positive.

Given her recurrent fever, headaches, and history of travel, leptospirosis, tick-borne relapsing fever (TBRF), Colorado tick fever, Epstein-Barr virus, and sequential viral infections were considered. A Giemsa-stained peripheral blood smear is shown in Figure 1.
Diagnosis: Tick-Borne Relapsing Fever–Caused *Borrelia hermsii*

A Giemsa-stained peripheral smear revealed spirochetes (Figure 1), a finding that was sufficiently suggestive of TBRF to warrant specific therapy. Other infections causing relapsing febrile illnesses include leptospirosis, dengue, rat-bite fever, malaria, and sequential viral infections.

The child was admitted for observation. She was given doxycycline and promptly developed fevers to 39.5°C, tachycardia, and systolic hypotension (90 mm Hg) with rigors, emesis, and myalgias. Antipyretics and fluids were administered, with rapid resolution of symptoms and normalization of vital signs. She was discharged home the next day and completed a course of doxycycline without complications. *B. hermsii* immunoglobulin (Ig) M was 1:64 (range, <1:16), and IgG was 1:64 (range, <1:64).

There are 25 documented cases of TBRF annually in the United States, commonly in the spring and summer months. Clusters of cases of *B. hermsii* have been reported at Lake Tahoe and the north rim of the Grand Canyon, usually associated with lodging in rodent-infested cabins [1]. Other species that cause TBRF in the United States include *Borrelia turicatae* (Texas) and *Borrelia parkeri*. Infection is transmitted to humans by soft-bodied ticks of the genus *Ornithodoros*. *Ornithodoros* ticks are nocturnal feeders, are drawn to exhaled breath, have a painless bite, and remain attached briefly (5–30 minutes). Thus, a history of tick bite is often not elicited, as in this case.

Fever, headache, nausea, myalgias, and arthralgias are typical symptoms of TBRF [2]. Findings on physical examination are variably present, including hepatosplenomegaly and rash. Thrombocytopenia is common. The initial febrile episode lasts 2–7 days, ending abruptly, and is followed by an afebrile period ranging from days to weeks. During the initial episode, circulating organisms can exceed 100,000/mm³, approaching normal platelet concentrations. Antibodies directed at surface proteins cause defervescence and resolution of clinical symptoms. However, organisms residing in reticuloendothelial organs undergo genetic reassortment, resulting in alteration of surface antigens [3]. This allows for escape from immune recognition, recurrent spirochtemia, and relapse of fever. Febrile episodes are shorter and less frequent with each recurrence.

Diagnosis is established on examination of Giemsa- or Wright-stained peripheral blood smears. The sensitivity of smears approaches 70% during the initial febrile phase [4] and can be enhanced with the use of acridine orange or fluorescent microscopy. A finding of spirochetes on peripheral smear is specific for the causative agents of TBRF, which are thicker, have a higher avidity for routine stains, and circulate in higher numbers than other spirochetes. Serologic tests are useful in suspected cases when spirochetes are not visualized, but they are confounded by cross-reactivity with *Borrelia burgdorferi*, *Leptospira* spp, and *Treponema pallidum*.

Therapy for TBRF consists of a 7–10 day course of doxycycline [2]. In children less than 8 years and pregnant women, penicillin or erythromycin can be used [4]. As in this case, antimicrobial therapy for TBRF can precipitate a Jarisch-Herxheimer reaction with acute fever, headache, myalgias, and occasionally hypotension. Although this generally resolves within hours with supportive care, close monitoring is warranted during the first several hours of therapy.

TBRF is generally self-limited, but it may be fatal if untreated in certain populations, such as young infants, pregnant women, and the elderly.

Acknowledgments

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