



Communicable Disease Case Reporting and Investigation Protocol

BORRELIOSIS

(Other than Lyme disease)

I. IDENTIFICATION AND DEFINITION OF CASES

A. Clinical Description:

Members of the bacterial genus *Borrelia* are divided into two main disease groups, the Lyme disease group and the relapsing fever group, and can be transmitted to humans by ticks and lice. Worldwide, at least 14 *Borrelia* species cause tickborne (endemic) relapsing fever, including *B. hermsii*, *B. turicatae*, and *B. parkeri* in North America. Typically, tickborne relapsing fever (TBRF) is transmitted through the bite of an infected soft-bodied tick of the genus *Ornithodoros*. In the U.S., TBRF most commonly occurs in western states, with infections being transmitted most frequently in California, Washington, and Colorado. Another *Borrelia* species closely related to the relapsing fever group is *B. miyamotoi*, which is known to occur in Asia, Europe, and North America. Unlike other relapsing fever group bacteria, *B. miyamotoi* is transmitted by hard-bodied ticks, in particular the blacklegged tick (*Ixodes scapularis*) in North America. Of the relapsing fever group bacteria, *B. miyamotoi* is the only species known to be transmitted locally in Wisconsin.

In North America, *B. miyamotoi* infection is rare and is maintained in the environment by rodents (reservoir) and blacklegged ticks (vector). With a shared tick vector and mammalian reservoirs, individuals at risk for Lyme disease may also be at risk for *B. miyamotoi* infection. The most common clinical manifestations of *B. miyamotoi* infection are fever, fatigue, headache, chills, myalgia, arthralgia, and nausea. Full clinical characterization of *B. miyamotoi* infection is still unknown; however, relapsing febrile illness is rarely reported among affected patients.

TBRF transmitted by soft-bodied ticks is a rare infection linked to sleeping in rustic cabins, particularly cabins in mountainous areas of the western U.S. The main symptoms of TBRF are high fever (e.g., 103°F), headache, and muscle and joint aches. Symptoms can reoccur, producing a telltale pattern of fever lasting roughly three days, followed by seven days without fever, followed by another three days of fever. Each febrile episode ends with a sequence of symptoms collectively known as a “crisis.” During the “chill phase” of the crisis, which has a typical duration of 10 to 30 minutes, patients develop very high fever (up to 106.7°F) and may become delirious, agitated, tachycardic, and tachypneic. This phase is followed by the “flush phase,” characterized by drenching sweats and a rapid decrease in body temperature. During the flush phase, patients may become transiently hypotensive. Overall, patients who are not treated will experience several episodes of fever before illness resolves. Mortality rates range from 4% to 10% in untreated TBRF.

Findings on physical exam vary depending on the severity of illness and when the patient seeks medical care. Regardless, there are no findings specific for TBRF. Patients typically appear moderately ill and may be dehydrated. Occasionally a macular rash or scattered petechiae may be present on the trunk and extremities. Less frequently, patients may have jaundice, hepatosplenomegaly, meningismus, and photophobia. Although less common than other TBRF-causing bacteria, infection with *B. turicatae* is especially likely to result in neurologic involvement.

B. Laboratory Criteria:

- **Confirmatory lab evidence includes at least one of the following:**
 - Detection of relapsing fever group *Borrelia* species DNA in a clinical specimen by polymerase chain reaction (PCR).
 - Isolation of relapsing fever group *Borrelia* species in culture from a clinical specimen prior to antibiotic treatment.
 - Evidence of seroconversion between acute and convalescent specimens, including but not limited to fourfold or greater change in serum antibody titer to relapsing fever group *Borrelia* species by enzyme immunoassay (EIA) or Western immunoblot analysis between paired acute (collected within seven days on onset) and convalescent (collected at least 21 days after onset) specimens.

- **Supportive laboratory evidence includes at least one of the following:**
 - Direct observation of spirochetes suggestive of relapsing fever group *Borrelia* species in a peripheral blood smear.
 - Elevated levels of IgG or IgM antibodies to relapsing fever group *Borrelia* species.

Note: Serologic testing for TBRF is not standardized and results may vary by laboratory. Patients with TBRF may have false-positive tests for Lyme disease because of the similarity of proteins between the two organisms.

C. Wisconsin Surveillance Case Definition:

Clinically compatible illness: Any reported acute onset of fever or chills and one or more of the following: headache, myalgia, arthralgia, fatigue, rash, abdominal cramps, nausea, vomiting, diarrhea, dizziness, confusion/altered mental status, photophobia, leukopenia, thrombocytopenia, or elevated aminotransferase levels.

- **Confirmed:** A clinically compatible illness with confirmatory laboratory evidence of infection.
- **Probable:** A clinically compatible illness with only supportive laboratory evidence of infection.
- **Suspect:** A supportive or confirmatory laboratory result in the absence of clinical information.

II. REPORTING

- A. **Wisconsin Disease Surveillance Category II —Methods for Reporting:** This disease shall be reported to the patient’s local health officer or to the local health officer’s designee within 72 hours of recognition of a case or suspected case, per Wis. Admin. Code § [DHS 145.04 \(3\) \(b\)](#). Report electronically through the Wisconsin Electronic Disease Surveillance System (WEDSS), or mail or fax a completed Acute and Communicable Disease Case Report ([F-44151](#)) to the address on the form.
- B. **Responsibility for Reporting:** According to Wis. Admin. Code § [DHS 145.04\(1\)](#), persons licensed under Wis. Stat. ch. [441](#) or [448](#), laboratories, health care facilities, teachers, principals, or nurses serving a school or day care center, and any person who knows or suspects that a person has a communicable disease identified in [Appendix A](#).
- C. **Clinical Criteria for Reporting:** Acute onset of fever or chills AND one or more of the following: headache, myalgia, arthralgia, fatigue, rash, abdominal cramps, nausea, vomiting, diarrhea, dizziness, confusion/altered mental status, photophobia, leukopenia, thrombocytopenia, or elevated aminotransferase levels.
- D. **Laboratory Criteria for Reporting:** Confirmatory or supportive laboratory findings.

III. CASE INVESTIGATION

- A. **Responsibility for case investigation:** It is the responsibility of the local health department to investigate or arrange for investigation of suspected or confirmed cases as soon as is reasonably possible. A case investigation may include information collected by phone, in person, in writing, or through review of medical records or communicable disease report forms, as necessary and appropriate.
- B. **Required Documentation:** Complete the WEDSS disease incident investigation report, including appropriate disease-specific tabs. Upon completion of investigation, set WEDSS disease incident process status to “Sent to State.”

IV. PUBLIC HEALTH INTERVENTIONS AND PREVENTION MEASURES

- A. In accordance with Wis. Admin. Code § [DHS 145.05](#), local public health agencies should follow the methods of control recommended in the current editions of *Control of Communicable Diseases Manual*, edited by David L. Heymann, published by the American Public Health Association, and the American Academy of Pediatrics’ *Red Book: Report of the Committee on Infectious Diseases*, unless otherwise specified by the state epidemiologist.
- B. Obtain a detailed travel history for the month preceding onset of symptoms to determine the site of probable exposure.
- C. Patient education as needed to minimize future tick exposure.

V. CONTACTS FOR CONSULTATION

- A. Local health departments and tribal health agencies: <https://www.dhs.wisconsin.gov/lh-depts/index.htm>
- B. Bureau of Communicable Diseases, Communicable Diseases Epidemiology Section, vectorborne epidemiologists: 608-267-9003
- C. Wisconsin State Laboratory of Hygiene: 800-862-1013

VI. RELATED REFERENCES

- A. Heymann DL, ed. Relapsing Fever. In: *Control of Communicable Diseases Manual*. 20th ed. Washington, DC: American Public Health Association, 2015: 510-513.
- B. Kimberlin DW, ed. *Borrelia* Infections Other than Lyme Disease (Relapsing Fever). In: *Red Book: 2018-2021 Report of the Committee on Infectious Diseases*. 31st ed. Itasca, IL: American Academy of Pediatrics, 2018: 252-255.
- C. Centers for Disease Control and Prevention TBRF website: <https://www.cdc.gov/relapsing-fever/index.html>
- D. Centers for Disease Control and Prevention *B. miyamotoi* website: <https://www.cdc.gov/ticks/miyamotoi.html>