

Relapsing Fever

Signs and Symptoms	<ul style="list-style-type: none"> Occurs as tickborne (usually <i>Borrelia hermsii</i>) or louseborne (<i>B. recurrentis</i>) Fevers lasting 2–7 days and terminating abruptly (crisis) alternating with afebrile periods of 4–14 days. There is a risk for premature birth or pregnancy loss. May be shaking chills, sweats, headache, muscle and joint pain, nausea or rash. Less frequently, patients may have jaundice, hepatosplenomegaly, meningismus, and photophobia 	
Incubation	Typically 7 days, range 2 to 18 days	
Case classification	Clinical criteria: relapsing pattern of fever $\geq 100.5^{\circ}\text{F}$ (38.0°C), chills, headache, and myalgia. Typically occurs following exposure in a rural setting.	
	<table border="1"> <tr> <td>Confirmed: identification of spirochetes microscopically OR isolation of <i>Borrelia</i> from blood OR clinically consistent with epi link to a confirmed case</td> <td>Probable: clinically consistent without laboratory confirmation AND without epi link to a confirmed case</td> </tr> </table>	Confirmed: identification of spirochetes microscopically OR isolation of <i>Borrelia</i> from blood OR clinically consistent with epi link to a confirmed case
Confirmed: identification of spirochetes microscopically OR isolation of <i>Borrelia</i> from blood OR clinically consistent with epi link to a confirmed case	Probable: clinically consistent without laboratory confirmation AND without epi link to a confirmed case	
Differential diagnosis	Multiple agents depending on presentation and exposure including viral hepatitis, mononucleosis, leptospirosis, rickettsial infections, vasculitis, ehrlichiosis, tularemia	
Treatment	Tetracycline, erythromycin, or parenteral ceftriazone (if central nervous system illness). A Jarisch-Herxheimer reaction can occur so monitor patients closely, particularly during the first 4 hours of treatment.	
Duration	1 to 10 relapses if untreated; not communicable person to person.	
Exposure	<p>Tickborne: wild rodent reservoir. Vectors most commonly nymphal or adult soft tick species <i>Ornithodoros hermsii</i> and <i>O. turicata</i>, mainly in central and eastern parts of Washington. Bites are often unnoticed due to rapid night feeding and small size of the tick. Ticks may occur in rustic cabins or woodpiles with rodent infestation.</p> <p>Louseborne: human reservoir in other parts of the world. Vector is the body louse (<i>Pediculus humanus</i>).</p>	
Laboratory testing	<p>Local Health Jurisdiction (LHJ) and Communicable Disease Epidemiology (CDE) can arrange testing for suspected cases.</p> <ul style="list-style-type: none"> Washington State Public Health Laboratories do microscopy on blood smears. Serum can be tested at CDC (not case-defining). Best specimens: blood smear collected during febrile period; acute serum within 7 days and convalescent serum after at least 21 days Keep blood smears at ambient temperature, serum cold, ship with Microbiology form https://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf Specimen Collection and Submission Instructions https://www.doh.wa.gov/Portals/1/Documents/5240/SCSI-Para-Blood-V1.pdf 	
Public health actions	<p>LHJ can consult with CDE 877-539-4344 for investigation and to arrange testing</p> <ul style="list-style-type: none"> Identify potential exposures Educate persons who shared exposures, particularly women who are pregnant Educate the property owner about rodent control measures Determine if the person donated blood or tissues recently and if so notify CDE <p><i>Infection Control:</i> standard precautions for tickborne, contact precautions while removing initial clothing of a louseborne case; infested clothing should be bagged</p>	

Relapsing Fever

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To educate potentially exposed persons about signs and symptoms of disease to facilitate early diagnosis and treatment.
2. To inform owners of potentially tick-infested property (e.g., a vacation cabin) how to reduce their risk of exposure.
3. To identify endemic geographic areas within Washington state.

B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 24 hours.
2. Health care facilities: notifiable to local health jurisdiction within 24 hours.
3. Laboratories: *Borrelia hermsii* or *B. recurrentis* notifiable to local health jurisdiction within 24 hours. Specimen submission is on request only. Submission of specimens for other *Borrelia* species that cause relapsing fever may also be requested.
4. Local health jurisdictions: notifiable to Washington State Department of Health (DOH) Office of Communicable Disease Epidemiology (CDE) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. Begin follow-up investigation within one working day.
2. Educate other persons exposed about the signs and symptoms of disease.
3. Provide education to eliminate the source of infection.
4. Report all *confirmed* and *probable* cases (see definitions below) to CDE. Complete the relapsing fever case report form (<https://www.doh.wa.gov/Portals/1/Documents/5100/210-045-ReportForm-Relaps.pdf>) and enter the data into the Washington Disease Reporting System (WDRS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Tick-borne relapsing fever is most commonly caused by *Borrelia hermsii*, but can be caused by at least 14 other *Borrelia* species. In louse-borne disease, *B. recurrentis* is the only etiologic agent.

B. Description of Illness

Relapsing fever is a systemic spirochetal disease in which periods of fever lasting 2–7 days alternate with afebrile periods of 4–14 days; the number of relapses varies from 1 to 10 without treatment. Febrile periods are often associated with shaking chills, sweats, headache, muscle and joint pain, and can be associated with a rash. Each febrile period terminates by a

crisis (abrupt symptom change). Symptoms can be severe. Acute respiratory distress syndrome (ARDS) may occur in patients with tick-borne relapsing fever.*

Optimal management of tick-borne relapsing fever requires both prompt diagnosis and careful observation during the initial phases of treatment. With treatment the mortality rate is very low for relapsing fever. The mortality rate without treatment is estimated at 5–10%. Tick-borne relapsing fever contracted during pregnancy can cause spontaneous abortion, premature birth, and neonatal death.

*Centers for Disease Control and Prevention. Acute Respiratory Distress Syndrome in Persons with Tickborne Relapsing Fever --- Three States, 2004–2005. MMWR 2007;56:1073–76. Available at: <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5641a1.htm>.

C. Relapsing Fever in Washington

Tick-borne relapsing fever is among the most common tick-borne illnesses contracted in Washington State. One to 12 cases are reported annually, with rare reports of pregnancy loss due to maternal infection. Exposures are frequently associated with overnight stays in rural cabins in mountainous areas, and usually but not always during summer months.

The louse-borne form of this disease is not endemic to the United States and it would be rare even in travelers returning to Washington State.

D. Vectors and Reservoirs

In tick-borne relapsing fever, the vector is a soft tick. In the United States, the soft tick species *Ornithodoros hermsii*, *O. turicata*, and *O. parkeri* most commonly transmit the infection. Locally, *O. hermsii* is typically found at higher altitudes (1500 – 8000 feet) in the eastern part of Washington State, and the most common reservoirs appear to be wild rodents, such as deer mice, squirrels, chipmunks, and rats. *Ornithodoros* ticks tend to live for many years and take infrequent blood meals, but once infected from feeding on a wild rodent they harbor the pathogen for life. Either the nymphal or adult stage tick can transmit the infection. Females pass the infection to their progeny.



The body louse (*Pediculus humanus*) is the vector for louse-borne relapsing fever. Lice become infected 4-5 days after feeding on infected humans and remain infective for their lifespan of several weeks.

E. Modes of Transmission

In tick-borne disease, people are infected by bites of soft ticks. Unlike hard ticks, soft ticks usually feed at night. The bites are usually unnoticed since they generally occur at night and are not painful. In addition, the ticks are small (approximate 3 mm), feed quickly (5–20 minutes) and then leave the host. In western states including Washington, ticks may be present in rustic cabins and woodpiles with rodent infestation. The ticks live in rodent nests, which may be under flooring or between walls. If rodents are scarce or nests are disturbed the ticks may bite other warm-blooded animals, including humans, for their blood meals. Tick-borne relapsing fever is not directly transmitted from person-to-person, but theoretically might be transmitted by blood transfusion.

Louse-borne relapsing fever is not endemic to the United States but may occur in travelers. It is acquired by crushing an infected louse so that it contaminates the bite wound or mucous membranes.

F. Incubation Period

The incubation period is usually about 7 days but can range from 2 to 18 days.

G. Period of Communicability

Tick-borne relapsing fever is not directly transmitted person to person. Tick-infested cabins may be difficult to decontaminate; ticks may also be reintroduced from wood piles or firewood brought indoors.

H. Treatment

Relapsing fever is treated with appropriate antibiotic therapy including tetracycline or erythromycin, with parenteral ceftriazone used for central nervous system illness. Antibiotic treatment can cause a Jarisch-Herxheimer reaction (i.e., severe chills, increased temperature, and decreased blood pressure), so patients should be monitored closely during therapy, particularly during the first 4 hours after antibiotics are administered.

3. CASE DEFINITIONS

A. Clinical Criteria for Diagnosis

A febrile illness with temperature $\geq 100.5^{\circ}\text{F}$ (38.0°C). A typical clinical presentation occurs following exposure in a rural setting and is characterized by a relapsing pattern of fever, chills, headache, and myalgia.

B. Laboratory Criteria for Diagnosis

1. Identification of spirochetes by dark field microscopy, or Giemsa-, Wright-, or acridine orange-preparations of peripheral blood, bone marrow, or cerebral spinal fluid (CSF).
2. Isolation of *Borrelia* species from blood using special media.

C. Case Definition (DOH)

1. *Probable*: A case with the typical clinical presentation that is not laboratory confirmed and is not epidemiologically linked to a confirmed case.
2. *Confirmed*: A case that is laboratory confirmed, or that meets the clinical case definition and is epidemiologically linked to a confirmed case.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

Diagnosis of tick-borne relapsing fever is most commonly made by identification of spirochetes on a peripheral blood smear (either by dark field microscopy or microscopic examination of a stained thick or thin blood film). Spirochetes can typically be visualized when a person has a fever, so blood smears should be done during a febrile period. Diagnosis is less commonly made by examining other clinical specimens microscopically or through blood culture using special media.

Although not valuable for making an immediate diagnosis, serologic testing is available through the Centers for Disease Control and Prevention (CDC). Patients with tick-borne relapsing fever may have false-positive tests for Lyme disease because of the similarity between the two organisms. More information regarding serologic testing can be found at: <https://www.cdc.gov/relapsing-fever/clinicians/#labtest>.

B. Services Available at the Washington State Public Health Laboratories (PHL)

On request PHL will review slides for spirochetes in peripheral blood smears and will forward specimens to the CDC if additional tests are needed. Serologic testing is available through the CDC but is not case defining. All requests sent to PHL must have approval from the local health jurisdiction, which will make arrangements with Communicable Disease Epidemiology.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date. For details see: <https://www.doh.wa.gov/Portals/1/Documents/5240/SCSI-Para-Blood-V1.pdf>

C. Specimen collection

- 1. Blood smear:** any hospital or commercial laboratory can provide review.

Blood smears do not need to be submitted to PHL, but if additional examination is requested, a completed PHL microbiology form must be submitted with the slides (<https://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf>). PHL can issue a preliminary confirmation of spirochetes then forward the slides to CDC.

- 2. Serum**

Acute serum should be taken within 7 days of symptom onset and convalescent serum should be taken at least 21 days after symptoms start. Specimens should be refrigerated and transported cold on regular cold packs. Avoid repeated freeze-thaw cycles. If specimens are already frozen, transport on dry ice. Specimens should be submitted to PHL with a completed PHL serology submission form (<https://www.doh.wa.gov/Portals/1/Documents/5230/302-017-SerVirHIV.pdf>).

5. ROUTINE CASE INVESTIGATION

Interview the case and others who might provide pertinent information.

A. Evaluate the Diagnosis

Using the case form, collect clinical information (e.g., onset, signs, and symptoms) about the patient. Review laboratory tests performed.

B. Identify Potential Sources of Infection

Ask whether the patient slept outside, in a cabin, or in other places with evidence of rodents in the 18 days prior to onset. Ask about tick or insect bites, or the potential for soft tick exposure, including carrying firewood from a wood pile indoors or sitting outside at night in areas where there could be mouse habitation.

C. Infection Control

1. Persons hospitalized for tick-borne relapsing fever should be cared for using standard precautions.
2. Persons with louse-borne relapsing fever should also be cared for using standard precautions. Staff should wear a gown and gloves when removing initial clothing of a louse-infested patient to prevent louse transmission. Infested clothing should be bagged.
3. Cases do not need to be restricted from work or child care.

D. Identify Potentially Exposed Persons

Identify persons who shared the exposure with the case (i.e., slept in the same cabin) and educate them about symptoms and treatment of relapsing fever. Determine whether any women who shared the exposure with the case are pregnant. Educate all potentially exposed persons about symptoms of relapsing fever to facilitate early diagnosis. Refer potentially exposed pregnant women to their doctor immediately to discuss prophylactic antibiotics.

Determine if the case donated blood, tissues or organs during the recent past. If so, contact Communicable Disease Epidemiology immediately and inform the blood or tissue bank of the potential exposure.

E. Environmental Evaluation

Notify local environmental health program and/or vector control of locally acquired cases. If the case was exposed on public property or in a building used by the general public, evaluate the site for evidence of rodent infestation. Work with the agency that oversees the site and make recommendations to decrease rodent and tick infestation on the site (see “Environmental Measures” below), recognizing that tick-infested rustic cabins may be difficult to decontaminate.

If the site of exposure is determined to be a tick and rodent infested human habitation, provide the following information to the owner of private property or the agency overseeing public property:

- Educate the owner about the ecology of tick-borne relapsing fever (see above).
- Recommend the removal of woodpiles from under/around the cabin to prevent rodent infestation outside the cabin.
- Recommend sealing the home (including roof, walls, doors, windows, around pipes, etc.) to prevent rodents from entering.
- Recommend placing all food in secondary containers to keep rodents from entering the cabin in search of food.
- Recommend the owner hire a professional pest control company to provide soft tick control.

Warn the owner that rodent-proofing without implementing tick control might increase the risk for tick-borne relapsing fever since the ticks can be left in the property after the rodents are removed.

6. MANAGING SPECIAL SITUATIONS

Determine if the case is associated with or potentially associated with an outbreak.

If an outbreak is suspected, notify Communicable Disease Epidemiology immediately: 1-877-539-4344.

7. ROUTINE PREVENTION

A. Immunization Recommendations: None

B. Prevention Recommendations for Tick-borne Relapsing Fever

1. Persons should avoid sleeping in rodent infested buildings.
2. Persons should rodent-proof structures to prevent future colonization by rodents and their soft ticks.
 - **Inspect** structures on a regular basis for signs of rodent activity.
 - **Eliminate** rodent nesting areas from your structure.
 - **Use** food and waste-handling practices that eliminate food sources for rodents.
 - **Rodent-proof** your cabin as follows:
 - Seal all holes in foundation and walls.
 - Place heavy gauge metal screens on windows, vents, and other openings to prevent entry of rodents.
 - Place an 18" perimeter border of gravel around the cabin. This can help prevent the movement of rodents and ticks into the cabin.

ACKNOWLEDGEMENTS

This document is a revision of the Washington State Guidelines for Notifiable Condition Reporting and Surveillance published in 2002 which were originally based on the Control of Communicable Diseases Manual (CCDM), 17th Edition; James Chin, Ed. APHA 2000. We would like to acknowledge the Oregon Department of Human Services for developing the format of this document.

UPDATES

January 2010: In Section 2D, additional vector information was added.

January 2011: The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision. The laboratory services at PHL and submission form links were updated in Section 4B.

December 2013: The former Controlling Further Spread section was combined into section 5.

March 2017: Front page added, general updates