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TICKBORNE DISEASES: Tickborne Relapsing Fever (TBRF)

Introduction

This series of Epi News articles aims to bring awareness and education about tickborne diseases including identification, diagnosis, and treatment in human populations.

Relapsing Fevers

There are three types of relapsing fevers: tickborne relapsing fever (TBRF), louseborne relapsing fever (LBRF) and *Borrelia miyamotoi* disease, sometimes referred to as hard tick relapsing fever.<sup>1</sup> This Epi News focuses only on TBRF.

Epidemiology of Tickborne Relapsing Fever

Most of the species of tick that can spread TBRF are soft-bodied ticks of the *Ornithodoros* species. The primary tick responsible for TBRF cases in the United States is the *Ornithodoros hermsi* species [Figure 1].

Figure 1: Soft Tick Species, *Ornithodoros hermsi*



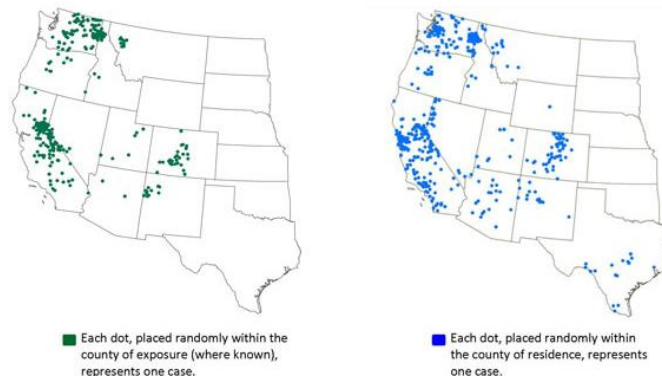
Source: Pacific Southwest Regional Center of Excellence in Vector-Borne Diseases. *Argasidae*. Accessed June 2021: <https://pacvec.us/soft-ticks/>

The *O. hermsi* tick prefers coniferous forests in altitudes between 1,500 to 8,000 feet and typically feeds on tree squirrels and chipmunks instead of being found on outdoor vegetation. This species of tick can also be found in dark, cool places including rodent nests, shaded wood piles or between walls or floorboards inside buildings.<sup>2</sup>

Soft-bodied ticks feed for about 15 to 90 minutes, usually at night. This feeding duration is shorter than other hard-bodied tick species, so people are often not aware when they have been bitten.<sup>3</sup> Due to possibility of transmission from rodents, it is important to avoid rodent infested buildings and deter ticks from biting by using DEET containing repellent for skin and repellent containing permethrin for clothing and equipment.<sup>2,4</sup>

Unlike many other tickborne diseases in the U.S., TBRF occurs most frequently in 14 states in the west including Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming [Figure 2].

Figure 2: Cases of Tickborne Relapsing Fever, United States, 1990-2011



Source: <https://www.cdc.gov/relapsing-fever/distribution/index.html>

Tickborne relapsing fever is caused by one of three *Borrelia* bacterium: *Borrelia hermsii*, *B. parkeri*, and *B. turicatae*. If exposed in western states, TBRF is usually caused by *Borrelia hermsii* and in southern states, is more commonly caused by *Borrelia turicatae*.<sup>5</sup> Of note, *Borrelia parkeri* has been identified in ticks in central California.<sup>6,7</sup>

Signs & Symptoms

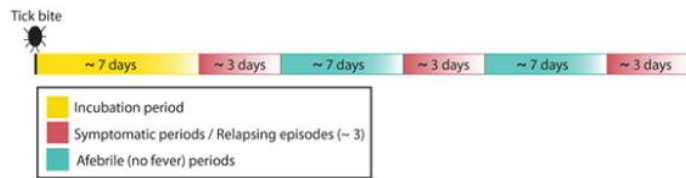
The incubation period for TBRF is between 2 to 28 days, with a mean of approximately one week (7 days). Those who have been infected typically experience recurrent high fevers (>103°F) lasting anywhere from 2 to 7 days, then experience spontaneous resolution for several days to weeks, before fevers and symptoms appear again.<sup>3</sup>

Symptoms may include headache, nausea, diarrhea, muscle and joint pains, as well as non-specific symptoms. During the febrile state, cases may be delirious, agitated, tachycardic and tachypneic for 10 to 30 minutes, followed by drenching sweats and rapid decrease in body temperature. Less frequently, a macular rash will appear on the trunk and petechiae of the skin and mucous membranes will occur.<sup>3,5</sup>

Symptoms can be severe in those who are pregnant and can result in spontaneous abortion, preterm birth, stillbirth or neonatal infection.<sup>3</sup>

If left untreated, this cycle may occur up to 13 or more times.<sup>3</sup>

**Figure 3: Approximate Timeline of TBRF Relapse Intervals**



Source: <https://www.cdc.gov/relapsing-fever/symptoms/index.html>

## Diagnosis & Testing

*Borrelia* is a spiral-shaped (spirochete) bacterium which can reach high concentrations in persons infected with TBRF, especially during the febrile stages in early cycles.<sup>3</sup> Since there is no standardized serological testing method for TBRF, the most effective way to confirm diagnosis is through direct microscopic observation using dark-field microscopy or stained peripheral blood smears.<sup>3,5</sup>

Additional testing may include convalescent serum samples, with a fourfold increased titer, however the serologic tests do cross-react with other *Borrelia* species and early treatment may interfere with testing.<sup>3,5</sup>

## Treatment

There is a 4% to 10% mortality rate observed in untreated cases of TBRF, which is reduced to less than 5% when treated. The spirochetes causing TBRF can be treated with a 5 to 10-day regimen of doxycycline (or other beta-lactam antibiotics), while penicillin and erythromycin are preferred for those who are pregnant or when tetracyclines are contraindicated.<sup>3,5</sup>

Detailed treatment options can be located here:

<https://www.cdc.gov/relapsing-fever/clinicians/index.html>

## Reporting

The list of reportable communicable diseases and reporting forms can be found at:

<http://tinyurl.com/WashoeDiseaseReporting>

**Report all tickborne diseases to the Washoe County Health District. To report a communicable disease, please call 775-328-2447 or fax your report to the WCHD at 775-328-3764.**

## Acknowledgement

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## References

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- 5 The Centers for Disease Control and Prevention. Relapsing Fever - Clinicians. Accessed June 2021 from <https://www.cdc.gov/relapsing-fever/clinicians/index.html>
- 6 Barbour, A. & Campeau Miller, S. (2014). Genome Sequence of *Borrelia parkeri*, an Agent of Enzootic Relapsing Fever in Western North America. *Genome Announcements*, 2(1) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3924360/>
- 7 Osborne, C.J, Corsbie, P.R. & Van Laar, T.A. (2019). *Borrelia parkeri* in *Ornithodoros parkeri* (Ixodida: Argasidae) Collected Using Compact Dry Ice Traps in Madera County, California. *Journal of Medical Entomology*, 56(2), 579-583. <https://doi.org/10.1093/jme/tiy213>