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TICKBORNE DISEASES: Pacific Coast Tick Fever caused by *R. philipii* (“Rickettsia 364D”)

Introduction

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

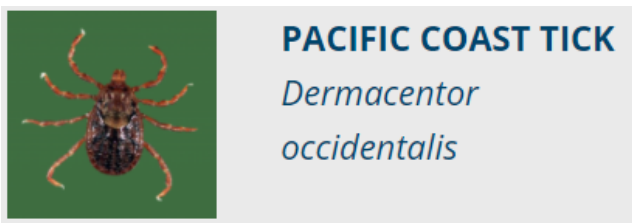
Spotted Fevers

Spotted fevers are diseases caused by the closely related spotted fever group (SFG) species of bacteria, *Rickettsia*, which are transmitted through the bites of infected mites and ticks.¹ In the United States, the SFG includes Rocky Mountain spotted fever (RMSF), *Rickettsia parkeri* rickettsiosis, Rickettsialpox, and Pacific Coast tick fever (PCTF). These diseases can be difficult to tell apart.² This Epi News focuses only on PCTF, as exposure may occur in California and other regions in close proximity to Washoe County.

Epidemiology of Pacific Coast Tick Fever

The bacteria *R. philipii* (referred to as “*Rickettsia* 364D”) is the cause of PCTF. Humans can be infected through bites from infected Pacific Coast ticks, *Dermacentor occidentalis* [Figure 1].³

Figure 1: Pacific Coast Tick



Source: Pacific Southwest Regional Center of Excellence in Vector-Borne Diseases. Hard Ticks, *Ixodidae*. Accessed July 2021: <https://pacvec.us/hard-ticks/>

The *D. occidentalis* tick is a hard tick found along the western coastline of the United States, including California, Oregon, and Washington, and can be found as far south as Mexico [Figure 2].³ It prefers shrublands and chaparral (thickets of shrubs and dwarf trees), but can be found along trails on the West Coast.⁴ It is the most common tick in California, but is not typically found in drier regions (e.g. Central Valley and desert regions in southeastern California) and prefers livestock and larger animals, rather than humans.^{4,5} In 2008, *R. philipii* (*Rickettsia* 364D)

caused the first known human case of PCTF.^{2,6} A total of 14 cases were reported through 2016. All cases had reported tick exposure in California, mostly from northern California. Over 50% of the reported cases were pediatric cases.^{2,6}

Figure 2: Pacific Coast Tick Geographic Distribution



Source: Pacific Southwest Regional Center of Excellence in Vector-Borne Diseases. Hard Ticks, *Ixodidae*. Accessed July 2021: <https://pacvec.us/hard-ticks/>

Limited study has shown that the nymphal and larval stages of the *D. occidentalis* tick may be the primary vectors of transmission of *R. philipii* to humans [Figure 3] with peak transmission occurring in late summer (July and August).⁶ A study conducted by the California Department of Public Health sampled 5,601 ticks from 2009 to 2015 and found the prevalence of *R. philipii* to be 2.1% in adults, 0.9% in nymphs and 0.4% in larvae.⁶ This is a higher prevalence compared to *R. rickettsia* (through 2014 only three ticks in California had ever tested positive), which may indicate a comparatively higher risk of PCTF than RMSF on the western U.S. coast.⁶

Figure 3: Pacific Coast Tick Life Stages



Source: Tick Safety. Accessed July 2021 <https://ticksafety.com/tick-identification/pacific-coast-tick>

Signs & Symptoms

PCTF is an emerging tick-borne disease.⁶ Symptoms of PCTF include development of one or more eschars (a dark, crusted cutaneous ulcer or necrotic wound) [Figure 4], followed by fever, regional lymphadenopathy, headache, myalgia, and fatigue.²

Figure 4: Eschars Identified on Three Laboratory-confirmed Pacific Coast Tick Fever Patients, California



Source: Padgett, K.A, Bonilla, D., & Eremeeva, M.E. (2016). The Eco-epidemiology of Pacific Coast Tick Fever in California. *PLOS Neglected Tropical Diseases*, 10 (10) e0005020. doi:10.1371/journal.pntd.0005020

Rash is less common in PCTF compared to other spotted fevers.^{2,6} It is important to note, *R. philipii* is genetically similar to *R. rickettsia*, the cause of RMSF, and both bacteria cause diseases with similar clinical presentation.⁶ However, PCTF typically presents as a more mild disease compared to RMSF and includes a presence of a localized eschar without petechial rash.⁶

Diagnosis & Testing

PCTF can be difficult to diagnose due to 1) non-specific signs and symptoms early in the illness; 2) varying in symptoms from patient to patient; 3) resemblance of symptoms to other more common diseases; and 4) cross reactivity in testing among SFG *Rickettsia*.⁶

Serologic assays are the most frequently used testing method, utilizing the indirect immunofluorescence antibody (IFA) assay, but are dependent on detection of antibodies, so will frequently result negative if conducted during the first 7-10 days of illness.² If serology is used, diagnosis is confirmed with a four-fold or greater rise in antibody titer between acute and convalescent-phase serum, collected 2-4 weeks apart.²

Molecular testing methods are also an option for providers. Polymerase chain reaction (PCR) assays, or immunohistochemical (IHC) assays can be performed on a skin biopsy specimen of an eschar or alternatively, a PCR of a swab of the eschar exudate can be performed.² Furthermore, PCR or culture can be performed on whole blood as species of SFG infect the endothelial cells that line

blood vessels, but results may appear negative for the first several days of illness.²

Treatment

Treatment should begin upon clinical suspicion while diagnostic testing is pending.² Empiric treatment with doxycycline is recommended in patients of all ages and is most effective at preventing severe illness when started within the first 5 days of symptoms.² Treatment is usually recommended to continue at least 3 days past the resolution of fever, with a minimum course of 5-7 days.² Post-tick bite antibiotic prophylaxis is not recommended to prevent infection.² More information on treatment options can be located here:

https://www.cdc.gov/mmwr/volumes/65/rr/rr6502a1.1.htm?s_cid=rr6502a1_w

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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