



Lyme disease and Other Tick-borne Diseases



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Alameda County Department of Environmental Health

Lyme Disease

What is Lyme disease?

Lyme disease is an infectious disease caused by the bacterium *Borrelia burgdorferi* and is transmitted to humans through the bite of infected ticks. Lyme disease was first recognized in Old Lyme, Connecticut in the 1970s. The first case of Lyme disease reported in California was from Sonoma in 1978.

What are the symptoms?

Early flu-like symptoms occur days to weeks after the tick bite. They can include watery eyes, sore throat, stiff neck, fever, headache, fatigue, muscle aches, or a skin rash called erythema migrans (EM). If delayed or untreated, patients may develop joint pains, heart palpitations, Bell's palsy (facial paralysis) and other neurological problems (numbness, tingling, sharp pains, sensitivity to light and sound, depression and difficulties with memory, concentration, learning and speech).

How do people get Lyme disease?

People become infected when they are bitten by infected Western black-legged ticks in California. Both nymphs and adults of the Western black-legged tick can transmit the disease. They can attach to clothing when people walk through bushes along the trails or over leaf litters and logs in wooded areas.

In California, the infection rate in adults is 1 to 5% and in nymphs 3 to 15%. Nymphs are very small, about the size of a poppy seed, and difficult to see, thus they play a greater role in transmitting Lyme disease in California.

Where do you find Lyme Tick in California?

The Western black-legged tick, vector of Lyme disease, has been found in 56 of the 58 counties in California. They are common in the coastal areas and on the western slope of the Sierra Nevada mountain ridge.

In Alameda County, they are commonly found in the outskirts of urban areas, and particularly woodland areas with a mixture of blue oak, California bay, coastal live oak, redwood and sycamore trees.

Other Tick-borne Diseases

Babesiosis

Babesia is a protozoan parasite that infects human red blood cells. People get infected with the parasites through a tick bite or blood transfusion (rarely).

Babesia microti transmitted by deer ticks is common in Northeastern United States. In California, people infected with a different *Babesia duncani* parasite by the bite of Western black-legged tick.

Symptoms varies from mild to severe, and fatal cases may occur for patients have weak immune system or without a spleen. Flu-like symptoms (fatigue, fever, sweats, and muscle aches) usually develop within one to four weeks after the tick bite or blood transfusion.

Human Granulocytic Anaplasmosis (HGA)

Anaplasma phagocytophilum is a bacterial infection of white blood cells of granulocytes and is transmitted by the bites of Western black-legged tick in California.



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Most individuals infected with HGA have no or mild flu-like symptoms (fever, headache, muscles aches, fatigue, nausea, cough, or a rash). Elder patients with weak immune system may develop severe symptoms and require to be hospitalized.

Human cases are rare in California. The infection rate of Western black-legged tick in California ranges from 0 to 6.9%.

Western black-legged ticks have tested positive for HGA in recent years in Alameda County. The infection rate was low at 1.3%.

Human Monocytic Ehrlichiosis (HME)

HME is a bacterial infection of white blood cells of monocytes.

Most HME cases occur in the Southcentral United State, and the vector is Lone star tick (*Amblyoma americanum*). It is very rare in California, only three cases have been confirmed. The tick vector in California has not been identified.

Patients infected with HME may not show symptoms or with mild flu-like illness (fever, headache, fatigue, muscle aches, coughing, nausea, vomiting) and rash. Severe symptoms may occur in elderly or immune compromised patients.

Rocky Mountain spotted fever (RMSF) - *Rickettsia rickettsii*

RMSF is the most common spotted fever disease in California. The bacterial infection can be transmitted to humans and dogs by the bites of Pacific coast tick (*Dermacentor occidentalis*), American dog tick (*Dermacentor variabilis*) and brown dog tick (*Rhipicephalus sanguineus*)*. Persons or dogs can be infected if crushed tissues or feces from the infected tick enter a break in the skin or through mucous membranes.

Most RMSF cases occur in the Southeastern and Southcentral United States between April and September. In California, only a few cases reported each year.

Symptoms include sudden onset of moderate to high fever, two days to two weeks after a tick bite. If

untreated, the fever can last for two to three weeks and develop to other flu like-symptoms (fatigue, muscle pain, headache, chills, blood-shot eyes, abdominal pain) and over 50% of the patients develop rashes to much of the body, characteristically in palms of the hands and soles of the feet. Fatalities can be up to 25% without medical treatments.

*Brown dog tick recently implicated as the primary vector of Rocky Mountain spotted fever outbreaks in Southwest United States and California.

Pacific Coast Fever- *Rickettsia philipii*

Pacific coast fever is a recently identified spotted fever group of bacterial infection. It is transmitted by the bites of infected Pacific coast tick (*Dermacentor occidentalis*). Symptoms appear to be similar to RMSF but milder. *Rickettsia philipii* infection may cause a small open wound about 1/4 inch in size that turns into a dark scab (eschar).

Treatment and prevention measures are the same as with RMSF.

Tick-borne Relapsing Fever (TBRF) - *Borrelia hermsii*

TBRF is a bacterial infection caused by the bites of soft ticks. Most of the cases are people staying in cabins/buildings with rodent infestations up in the foothills and mountainous regions in California.

Soft ticks are found in mountains above 3,000 feet. They live closely with rodents in the rodent nests or wood piles outside buildings, inside walls or attics and beneath floorboards inside buildings.

Soft ticks prefer to feed on rodents (woodrats, squirrels, chipmunks, mice). They feed on humans only when their preferred rodent hosts are not available. Most soft ticks take a quick blood meal from a person and return to their protected nests. As such, in most cases the person develops symptoms without knowing they have been bitten.

Patients with TBRF develop a sudden fever and flu-like symptoms (chills, headache, muscle aches, stomach pain, nausea, vomiting and a rash) a week after the tick bite. These symptoms last three to five



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days, and then disappear. If untreated, the symptoms reappear again, may continue relapse for several weeks. The patients should seek for medical treatment immediately.

Antibiotic treatments are very effective, long term problems or fatalities are rare.

Another bacterial infection closely related to TBRF - *Borrelia miyamotoi*

Borrelia miyamotoi is a spiral-shaped bacteria related to Tick-borne Relapsing Fever (TBRF) and is transmitted through the tick bite of Deer tick (*Ixodes scapularis*) in East Coast, and Western black-legged tick (*Ixodes pacificus*) in California.

Patients develop flu-like symptoms (fever, chills, headache, body and joint pain, and fatigue) similar to Lyme disease, but rash (erythema migrans) was not common. Infection can be treated with antibiotics.

This is a disease recently identified in United States and California. Low infection rate (0.4%) of *Borrelia miyamotoi* was detected from Western black-legged ticks in Alameda County.

Tularemia (Rabbit Fever, Deer-fly Fever)

Tularemia is an infection caused by bacteria (*Francisella tularensis*), and is most commonly transmitted through direct contact with or ingestion of the meat of infected wild animals (rabbits, deer). Tularemia also can be transmitted through the bites of Pacific coast tick (*Dermacentor occidentalis*), American dog tick (*Dermacentor variabilis*) and Deer flies (*Chrysops discalis*). Rarely, people can get infected through contact with contaminated water, and breathing air with aerosolized tularemia organisms.

Flu-like symptoms (chills, fever, headache, body ache, cough chest pain/tightness) appear about three to five days after the infection. An ulcer may occur at the bite or wound site.

Antibiotics are very effective to treat Tularemia patients.

Tick Paralysis

Many tick species possess a chemical in their saliva that can stop the normal function of the nerves and muscles and induce paralysis when they bite a person or animal.

Rocky mountain wood ticks (Northwest and Rocky Mountain states), American dog ticks and Lone star ticks, Gulf coast ticks and deer ticks (eastern and southern states) are associated with human tick paralysis cases. However, anyone bitten by a tick can be at risk for this condition.

The first symptom is weakness in the arms and legs, two to seven days following a tick bite. Hours to days later, patients become unable to move their arms and legs. If untreated, patients may become unable to speak or even to breathe. The condition of the patient depends on the number of biting ticks and how long they remain attached.

Locating and removing the attached tick(s) is the only necessary treatment. Ticks are often found attached on the scalp, particularly at the hairline. Normal nerve and muscle functions return within hours of removing the tick.

Additional information is available from California Department of Public Health

<https://www.cdph.ca.gov/HealthInfo/discond/Pages/TickBorneDiseases.aspx>



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