



The Grazer's Gazette

A Newsletter about Livestock, Pastures and Rangeland

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Lyme Disease in California

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What is Lyme disease?

Lyme disease is the most significant tick-transmitted disease in North America. There are an estimated 10,000 human cases annually in the U.S., with California averaging about 150 diagnosed cases per year.

The Lyme disease agent, *Borrelia burgdorferi* (a type of bacterium called a spirochete), is transmitted to humans by the western black-legged tick, *Ixodes pacificus*. Throughout their range, these ticks are most prevalent during fall and winter. In nature, the disease is maintained by other tick species in a reservoir population consisting of various rodents, especially the dusky-footed woodrat (*Neotoma fuscipes*), kangaroo rat (*Dipodomys californicus*), and the deer mouse (*Peromyscus maniculatus*). These rodents are not made ill by the bacteria, allowing them to carry the disease and pass it along to ticks that feed on them.

Ixodes pacificus is a three host tick, meaning that each feeding stage (i.e. larva, nymph, adult) requires one vertebrate blood meal for its development. Each stage attaches to a vertebrate host, feeds to repletion, detaches, drops from the host, and molts to the next stage. Typically the larvae feed on small

rodents, and thus pick up the Lyme disease spirochete from infected rats. The next stage, the nymph, may feed on rodents (thus increasing its chance of being infected) or larger mammals. Adult ticks typically feed on large hosts such as dogs, deer, horses or humans.

The western black-legged tick is active year round in many areas of the state, but highest numbers are encountered from November to May, reflecting the species' affinity for higher humidity. *Ixodes pacificus* has been collected in almost every California county, but is most prevalent along the coast and western range of the Sierras. Hikers in all regions frequently encounter these ticks.

What are Lyme disease symptoms?

Initially, Lyme disease produces symptoms similar to those of the flu, with muscle aches, low-grade fever, headaches and general malaise. These symptoms usually go away within a few days. But months to years later more severe symptoms occur. If the Lyme disease bacteria migrate to the heart, chronic heart problems can result. If the bacteria move into the central nervous system, various mental problems can result, from memory loss to dementia or paralysis. The most common long term Lyme disease consequence is joint involvement, producing severe arthritis and swelling of the knees, elbows, or other joints.

Clinically, Lyme disease often (50-80% of cases) manifests itself as a skin lesion, popularly known as the "bull's-eye" rash, a red circle enclosing a lighter center that over a



period of days expands in diameter. Initial symptoms include fever, fatigue and muscle aches. Subsequently the joints, cardiovascular system, and central and peripheral nervous systems may be involved. Lyme arthritis is characterized by severe pain and swelling of the joints, typically occurring weeks to months following tick exposure. In rare cases vision and kidney function may be impaired.

Can Lyme disease be cured?

If diagnosed and treated in time, Lyme disease can be cured by antibiotics. This is why it is important that any suspicious symptoms be brought to your physician's attention, especially if there is a history of previous tick exposure.

How can I protect myself and my family?

Common sense practices such as wearing light-colored (so ticks can be seen) long pants with the cuffs tucked into the socks or boots (to prevent ticks crawling under the pants leg) can reduce exposure to ticks.

Avoid tick habitats. Ticks live in leaf litter and duff, so don't sit on the ground in areas where ticks are found. If you're going to be out in tick-infested areas, use a repellent containing either DEET or permethrin (read and follow label instructions scrupulously).

Ticks are more commonly found on the uphill side of mountain trails, so when hiking in steep terrain, avoid brushing against vegetation along the uphill side of the path.

And when you return from these excursions, perform a "tick check." Parents should examine their children for ticks, with particular attention to the scalp and hairline, where ticks often lodge. Attachment for at least 24 hours is required before the tick can transmit Lyme disease, so if the tick is removed before it begins feeding, infection can be prevented.

Do pesticides help?

Insecticide application is counter-productive because it kills off the predators (ants, beetles, etc.) that help keep tick numbers down. Additionally, the ticks that transmit Lyme disease are not found around California homes, but are more likely encountered in camping and hiking areas. If an area supports populations of woodrats and kangaroo rats, it is suitable for Lyme disease ticks. The following table¹ shows the ranking for Lyme disease by county in California and the chance of getting human Lyme disease. Notice that Mendocino and Lake counties are ranked two and three, respectively.

Lyme Disease Rank	California Counties	Chance of human Lyme case is 1 in
1	Trinity	159
2	Mendocino	562
3	Lake	1,193
4	Sonoma	1,658
5	Humboldt	1,668
6	Mono	2,100
7	Plumas	2,250
8	Siskiyou	2,444
9	Butte	2,729
10	Del Norte	3,056
11	Nevada	3,111
12	Glenn	3,814
13	El Dorado	5,565
14	Marin	6,653

¹Based on data supplied by the California Department of Health Services, Division of Communicable Disease.

15	Yuba	6,722
16	Santa Cruz	6,960
17	Lassen	8,163
18	Tehama	9,067
19	Napa	9,154
20	Calaveras	9,225
21	Modoc	10,000
22	Tuolumne	10,320
23	Shasta	11,550
24	Placer	11,622
25	Mariposa	15,950
26	Santa Barbara	20,721
27	Monterey	24,013
28	Sutter	24,867
29	Tulare	25,257
30	San Mateo	26,846
31	San Luis Obispo	28,838
32	Contra Costa	29,263
33	Alameda	36,892
34	Yolo	38,125
35	San Benito	44,000
36	Kern	44,579
37	San Francisco	45,188
38	Merced	49,600
39	Riverside	49,761
40	Santa Clara	51,197
41	Madera	55,150
42	Fresno	59,208
43	Stanislaus	59,786

44	San Bernardino	63,704
45	Imperial	70,600
46	Sacramento	70,756
47	San Joaquin	76,171
48	San Diego	86,932
49	Solano	93,100
50	Ventura	102,114
51	Orange	105,992
52	Kings	115,700
53	Los Angeles	335,586

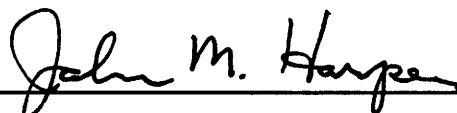
People are most at risk in spring and early summer, when nymphal ticks are most abundant. Adult ticks are most active in cooler weather, especially in winter.



Ixodes pacificus, western black-legged tick: Larva, nymph, male, and female (top to bottom) Actual-size silhouette of adult female shown for scale. From R.S. Lane, Department of Entomological Sciences, UC Berkeley.

The nymph is about 1/25 inch long in its unfed state, as big as the head of a pin. It has eight legs, a dark brown plate on its back, and a light colored abdomen. The unfed adult female is reddish brown with eight dark brown or black legs, and is about 1/10 inch long, about the diameter of a wooden matchstick, Attached females may stretch to 3/8 inch or longer while feeding. At 1/12 inch male adults are somewhat oval and brownish black.

Livestock owners should always be careful while working outside to minimize contact with ticks. Knowing what to look for will prevent a lot of problems.



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