



## LYME DISEASE

CRUDE DATA	
Number of Cases	4
Annual Incidence <sup>a</sup>	
LA County	0.04 <sup>b</sup>
California <sup>c</sup>	0.2
United States <sup>c</sup>	9.6
Age at Diagnosis	
Mean	35.8
Median	38
Range	7-56

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Rates calculated based on less than 19 cases or events are considered unreliable.

<sup>c</sup>Calculated from Final 2008 Reports of Nationally Notifiable Infectious Disease. MMWR 58(31);856-857;859-869.

### DESCRIPTION

Lyme disease (LD) is caused by a bacterium, *Borrelia burgdorferi*, which is transmitted to humans by the bite of *Ixodes* ticks; the vector in the Pacific coast states is the western blacklegged tick (*Ixodes pacificus*). This disease is rarely acquired in Los Angeles County (LAC), and most reported cases have been acquired outside of LAC from known endemic regions in the United States (US). The most common clinical presentation is a distinctive circular rash called erythema migrans (EM). If there is no rash, other early symptoms such as fever, body aches, headaches, and fatigue are often unrecognized as indicators of LD. If untreated, patients may develop late stage symptoms such as aseptic meningitis, cranial neuritis, cardiac arrhythmias and arthritis of the large joints. Early disease is treated with a short course of oral antibiotics, while late symptom manifestations may require longer treatment with oral or intravenous antibiotics. Currently, there is no vaccine.

For purposes of surveillance, the Centers for Disease Control and Prevention (CDC) requires a confirmed case of LD to have documented EM diagnosed by a healthcare provider that is at least 5cm in diameter or at least one late manifestation of LD with supporting laboratory results. Laboratory criteria for case confirmation

include the isolation of *B. burgdorferi* from a clinical specimen or demonstration of diagnostic IgM or IgG to *B. burgdorferi* in serum or cerebral spinal fluid. If indicated, a coalition of several public health and medical organizations recommends a two-step serologic testing procedure for LD: an initial enzyme immunoassay (EIA) or immunofluorescent antibody (IFA) screening test, and if positive or equivocal, followed by IgM and IgG Western immunoblotting<sup>1</sup>.

Avoiding tick bite exposure is the primary means of preventing Lyme disease. The risk of acquiring infection with LD increases when the tick has attached to the body for at least 24 hours. Tips for preventing exposure to tick bites include checking the body regularly for prompt removal of attached ticks; wearing light-colored clothing so that ticks can be easily seen; wearing long pants and long-sleeved shirts and tucking pants into boots or socks, and tucking shirts into pants; using tick repellent and treating clothing with products containing permethrin; staying in the middle of trails when hiking to avoid contact with bushes and grasses where ticks are most common; and checking for and controlling ticks on pets.

### 2009 TRENDS AND HIGHLIGHTS

- Even as the national incidence increases (from 6.3 per 100,000 in 2000 to 9.6 per 100,000 in 2008), the incidence in LAC (0.04 per 100,000) has remained relatively stable and well below the national rate (Figures 1 and 2).
- All cases in 2009 (n=4) reported a travel history to an endemic area outside of LAC.
- One case (25%) recalled a tick bite prior to onset of rash.
- Onset of symptoms continues to be limited to the summer months of June through August (Figure 3).

<sup>1</sup>Notice to Readers: Recommendations for Test Performance and Interpretation from the Second National Conference on Serologic Diagnosis of Lyme Disease. MMWR August 11, 1995/44(31);590-591. <http://www.cdc.gov/mmwr/preview/mmwrhtml/00038469.htm>.



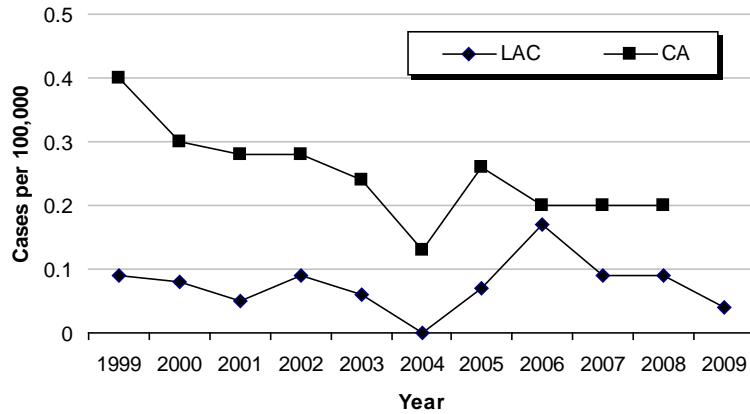
**Reported Lyme Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA  
 Los Angeles County, 2005-2009**

	2005 (N=7)			2006 (N=17)			2007 (N=8)			2008 (N=9)			2009 (N=4)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Age Group</b>															
<1	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0	0
1-4	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	2	22.2	0.4	0	0	0
5-14	1	14.3	0.1	3	17.6	0.2	2	25.0	0.1	1	11.1	0.1	1	25.0	0.1
15-34	2	28.6	0.1	7	41.2	0.3	3	37.5	0.1	1	11.1	0.0	0	0	0
35-44	1	14.3	0.1	2	11.8	0.1	0	0.0	0.0	1	11.1	0.1	2	50.0	0.1
45-54	1	14.3	0.1	2	11.8	0.2	2	25.0	0.2	3	33.3	0.2	0	0	0
55-64	1	14.3	0.1	1	5.9	0.1	0	0.0	0.0	0	0.0	0.0	1	25.0	0.1
65+	1	14.3	0.1	1	5.9	0.1	1	12.5	0.1	1	11.1	0.1	0	0	0
Unknown	0	0.0		1	5.9		0	0.0		0	0.0		0	0	
<b>Race/Ethnicity</b>															
Asian	1	14.3	0.1	1	5.9	0.1	1	12.5	0.1	0	0.0	0.0	0	0	0
Black	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0	0
Hispanic	4	57.1	0.1	1	5.9	0.0	1	12.5	0.0	0	0.0	0.0	0	0	0
White	0	0.0	0.0	13	76.5	0.5	3	37.5	0.1	9	100.	0.3	4	100	0.1
Other	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0	0
Unknown	2	28.6		2	11.8		3	37.5		0	0.0		0	0	
<b>SPA</b>															
1	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0	0
2	2	28.6	0.1	6	35.3	0.3	2	25.0	0.1	2	22.2	0.1	1	25.0	0.0
3	0	0.0	0.0	0	0.0	0.0	1	12.5	0.1	0	0.0	0.0	0	0	0
4	1	14.3	0.1	5	29.4	0.4	2	25.0	0.2	1	11.1	0.1	0	0	0
5	2	28.6	0.3	2	11.8	0.3	2	25.0	0.3	4	44.4	0.6	1	25.0	0.2
6	0	0.0	0.0	1	5.9	0.1	0	0.0	0.0	0	0.0	0.0	1	25.0	0.1
7	0	0.0	0.0	1	5.9	0.1	1	12.5	0.1	0	0.0	0.0	0	0	0
8	2	28.6	0.2	1	5.9	0.1	0	0.0	0.0	2	22.2	0.2	1	25.0	0.1
Unknown	0	0.0		1	5.9		0	0.0		0	0.0		0	0	

\*Rates calculated based on less than 19 cases or events are considered unreliable.

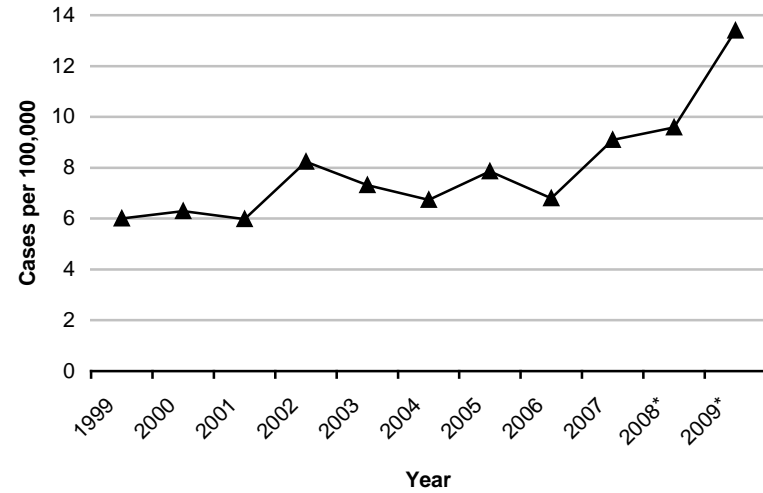


**Figure 1. Incidence Rates of Lyme Disease  
 LAC\* and CA, 1999-2009**



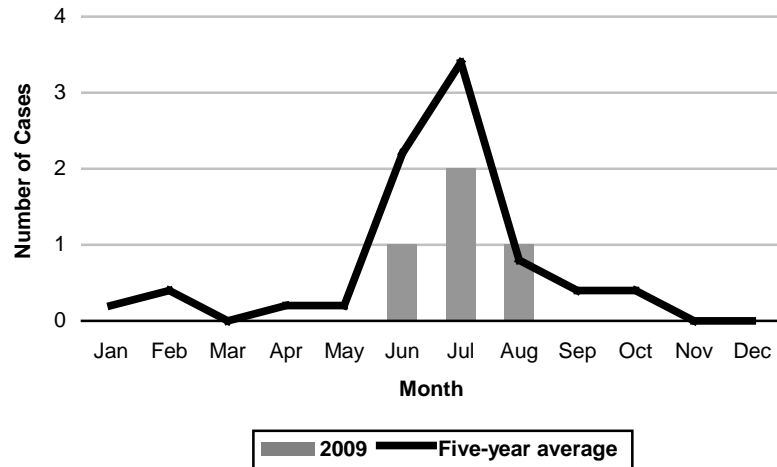
\*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 2. Incidence Rates of Lyme Disease  
 US, 1999-2009**



\*Includes probable cases.

**Figure 3. Reported Lyme Disease Cases by Month of Onset  
 LAC, 2009**





## LYME DISEASE

CRUDE DATA	
Number of Cases	9
Annual Incidence <sup>a</sup>	
LA County	0.09 <sup>b</sup>
California <sup>c</sup>	0.20
United States <sup>c</sup>	9.6
Age at Diagnosis	
Mean	31.4
Median	43
Range	3-65

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Rates calculated based on less than 19 cases or events are considered unreliable.

<sup>c</sup>Calculated from Final 2008 Reports of Nationally Notifiable Infectious Disease. MMWR 58(31);856-857;859-869.

### DESCRIPTION

Lyme disease (LD) is caused by a bacterium, *Borrelia burgdorferi*, which is transmitted to humans by the bite of *Ixodes* ticks; the vector on the Pacific coast states is the western blacklegged tick (*Ixodes pacificus*). This disease is rarely acquired in Los Angeles County (LAC), and most reported cases have been acquired outside of LAC from known endemic regions in the United States (US). The most common clinical presentation is a distinctive circular rash called erythema migrans (EM). If there is no rash, other early symptoms such as fever, body aches, headaches, and fatigue are often unrecognized as indicators of LD. If untreated, patients may develop late stage symptoms such as aseptic meningitis, cranial neuritis, cardiac arrhythmias and arthritis of the large joints. Early disease is treated with a short course of oral antibiotics, while late symptom manifestations may require longer treatment with oral or intravenous antibiotics. Currently, there is no vaccine.

For purposes of surveillance, the Centers for Disease Control and Prevention (CDC) requires a confirmed case of LD to have documented EM diagnosed by a healthcare provider that is at least 5cm in diameter or at least one late manifestation of LD with supporting laboratory results. Laboratory criteria for case confirmation

include the isolation of *B. burgdorferi* from a clinical specimen or demonstration of diagnostic IgM or IgG to *B. burgdorferi* in serum or cerebral spinal fluid. If indicated, a coalition of several public health and medical organizations recommends a two-step serologic testing procedure for LD: an initial enzyme immunoassay (EIA) or immunofluorescent antibody (IFA) screening test, and if positive or equivocal, followed by IgM and IgG Western immunoblotting<sup>1</sup>.

Avoiding tick bite exposure is the primary means of preventing Lyme disease. The risk of acquiring infection with LD increases when the tick has attached to the body for at least 24 hours. Tips for preventing exposure from tick bites include checking the body regularly for prompt removal of attached ticks; wearing light-colored clothing so that ticks can be easily seen; wearing long pants and long-sleeved shirts and tucking pants into boots or socks, and tucking shirts into pants; using tick repellent and treating clothing with products containing permethrin; staying in the middle of trails when hiking to avoid contact with bushes and grasses where ticks are most common; and checking for and controlling ticks on pets.

### 2008 TRENDS AND HIGHLIGHTS

- Even as the national incidence increases (from 6.3 per 100,000 in 2000 to 9.1 per 100,000 in 2007), the incidence in LAC (0.09 per 100,000) has remained stable and well below the national rate (Figures 1 and 3).
- All cases in 2008 (n=9) reported a travel history to an endemic area outside of LAC.
- Fifty-six percent (n=5) recalled a tick bite prior to onset of rash.
- Onset of symptoms continues to be limited to the summer months of June through August (Figure 2).

<sup>1</sup>Notice to Readers Recommendations for Test Performance and Interpretation from the Second National Conference on Serologic Diagnosis of Lyme Disease. MMWR August 11, 1995/44(31);590-591. <http://www.cdc.gov/mmwr/preview/mmwrhtml/00038469.htm>.



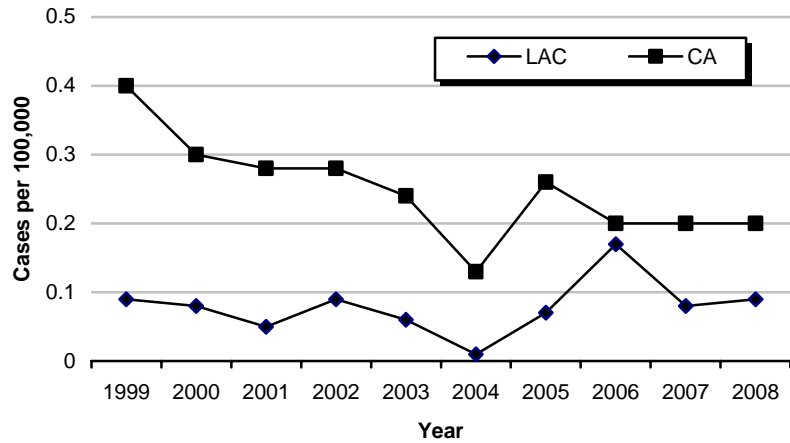
**Reported Lyme Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA  
Los Angeles County, 2004-2008**

	2004 (N=1)			2005 (N=7)			2006 (N=17)			2007 (N=8)			2008 (N=9)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Age Group</b>															
<1	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
1-4	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	2	22.2	0.4
5-14	0	0.0	0.0	1	14.3	0.1	3	17.6	0.2	2	25.0	0.1	1	11.1	0.1
15-34	1	100.	0.0	2	28.6	0.1	7	41.2	0.3	3	37.5	0.1	1	11.1	0.0
35-44	0	0.0	0.0	1	14.3	0.1	2	11.8	0.1	0	0.0	0.0	1	11.1	0.1
45-54	0	0.0	0.0	1	14.3	0.1	2	11.8	0.2	2	25.0	0.2	3	33.3	0.2
55-64	0	0.0	0.0	1	14.3	0.1	1	5.9	0.1	0	0.0	0.0	0	0.0	0.0
65+	0	0.0	0.0	1	14.3	0.1	1	5.9	0.1	1	12.5	0.1	1	11.1	0.1
Unknown	0	0.0		0	0.0		1	5.9		0	0.0		0	0.0	
<b>Race/Ethnicity</b>															
Asian	0	0.0	0.0	1	14.3	0.1	1	5.9	0.1	1	12.5	0.1	0	0.0	0.0
Black	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Hispanic	0	0.0	0.0	4	57.1	0.1	1	5.9	0.0	1	12.5	0.0	0	0.0	0.0
White	1	100.	0.0	0	0.0	0.0	13	76.5	0.5	3	37.5	0.1	9	100.	0.3
Other	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Unknown	0	0.0		2	28.6		2	11.8		3	37.5		0	0.0	
<b>SPA</b>															
1	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
2	0	0.0	0.0	2	28.6	0.1	6	35.3	0.3	2	25.0	0.1	2	22.2	0.1
3	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	1	12.5	0.1	0	0.0	0.0
4	0	0.0	0.0	1	14.3	0.1	5	29.4	0.4	2	25.0	0.2	1	11.1	0.1
5	1	100.	0.2	2	28.6	0.3	2	11.8	0.3	2	25.0	0.3	4	44.4	0.6
6	0	0.0	0.0	0	0.0	0.0	1	5.9	0.1	0	0.0	0.0	0	0.0	0.0
7	0	0.0	0.0	0	0.0	0.0	1	5.9	0.1	1	12.5	0.1	0	0.0	0.0
8	0	0.0	0.0	2	28.6	0.2	1	5.9	0.1	0	0.0	0.0	2	22.2	0.2
Unknown	0	0.0		0	0.0		1	5.9		0	0.0		0	0.0	

\*Rates calculated based on less than 19 cases or events are considered unreliable.

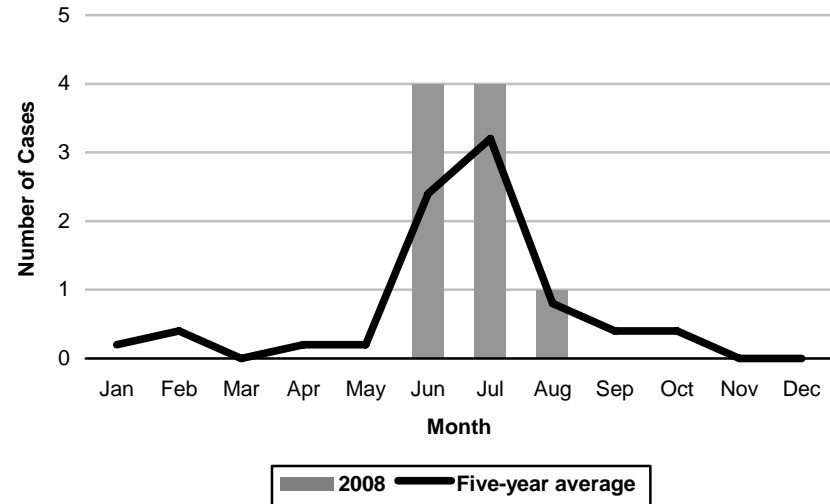


**Figure 1. Incidence Rates of Lyme Disease  
LAC\* and CA, 1999-2008**

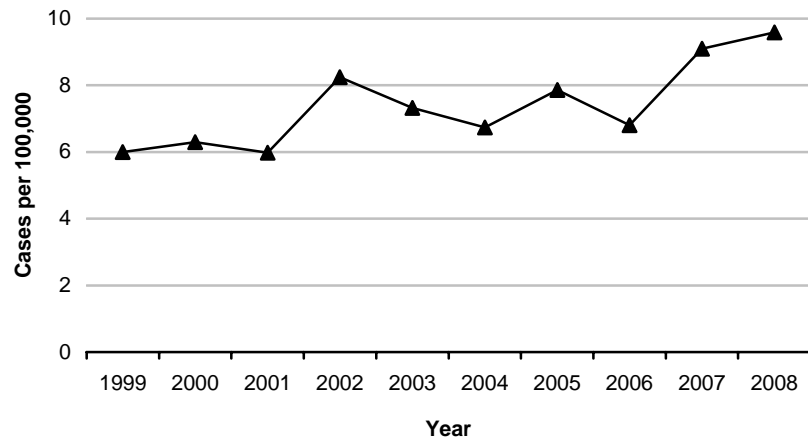


\*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 2. Reported Lyme Disease Cases by Month of Onset  
LAC, 2008**

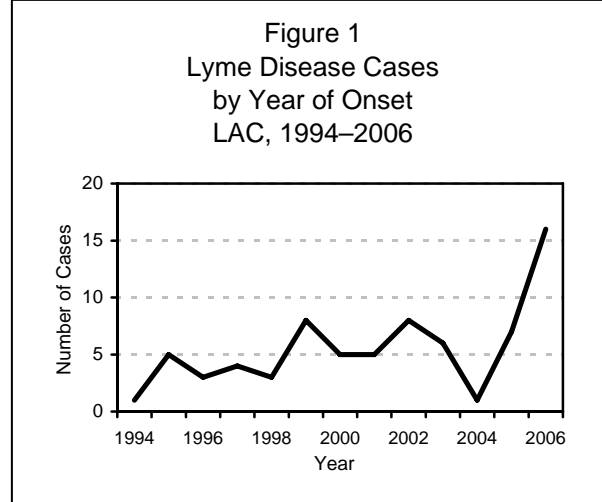


**Figure 3. Incidence Rates of Lyme Disease  
US, 1999-2008**



## LYME DISEASE

CRUDE DATA	
Number of Cases	16
Annual Incidence <sup>a</sup>	
LA County	0.17 <sup>b</sup>
California	0.24 <sup>c</sup>
United States	6.72 <sup>c</sup>
Age at Diagnosis	
Mean	33
Median	28.5
Range	8–69 years



<sup>a</sup> Cases per 100,000 population. Exposure may have occurred outside of indicated jurisdiction.

<sup>b</sup> Incidence rates based on counts less than 19 are unreliable.

<sup>c</sup> Calculated from 2007 Summary of notifiable diseases issue of MMWR (56:853-863).

### DESCRIPTION

Lyme disease (LD) is caused by a bacterium, *Borrelia burgdorferi*, which is transmitted to humans by the bite of the western blacklegged tick (*Ixodes pacificus*). This disease is not common in Los Angeles County (LAC). From 1996 through 2005, the LAC incidence of LD was estimated at 0.05 per 100,000 persons—equivalent to one case for every 2 million residents per year [1]. Most of these cases were acquired outside of LAC from known endemic regions in the United States (US); each year only 0 to 5 cases report possible tick exposure within LAC. In contrast, the incidence in Connecticut, one of the most endemic states in the US, was 51.56 per 100,000 in 2005 [2,3]. Nevertheless, LD has been well documented to occur in counties throughout the state of California (CA) — Trinity County in northern California reported an incidence of 19.23 per 100,000 in 2005 [1] — and has been a reportable disease in the state since 1989.

The reservoir is small rodents, with deer as a secondary reservoir. Ticks that feed from infected rodents or deer may then transmit the disease to humans, who are accidental hosts. The most common clinical presentation is a distinctive circular rash called erythema migrans (EM) that usually appears at the site of the bite within 3-32 days of a tick bite exposure. EM resembles a rapidly expanding red bull's eye and occurs in 60-90% of cases. If there is no rash, other early symptoms such as fever, body aches, headaches, and fatigue are often unrecognized as indicators of LD. If untreated, patients may present with late stage symptoms such as aseptic meningitis, cranial neuritis, cardiac arrhythmias and arthritis of the large joints. Early disease is treated with a short course of oral antibiotics, while late symptom manifestations may require longer treatment with oral or intravenous (IV) antibiotics. Currently, there is no vaccine.

Because the EM rash is unique to LD and can distinguish it from other diseases with similar early symptoms, its presentation precludes the need for further testing. For purposes of surveillance, the Centers for Disease Control and Prevention (CDC) requires a confirmed case of LD to have documented EM that is at least 5cm in diameter or at least one late manifestation of LD diagnosed by a healthcare provider with supporting laboratory results. Laboratory criteria for case confirmation include the isolation of *B. burgdorferi* from a clinical specimen or demonstration of diagnostic IgM or IgG to *B. burgdorferi* in serum or cerebral spinal fluid. Currently available serological tests, however, are often not sensitive,

specific or consistent; and LD should primarily be diagnosed by a healthcare provider's consideration of the clinical presentation and history of tick exposure. If indicated, the CDC, Food and Drug Administration, the Association of State and Territorial Public Health Laboratory Directors, and the American College of Physicians currently recommend a two-step serologic testing procedure for LD: an initial enzyme immunoassay (EIA) or immunofluorescent antibody (IFA) screening test, and if positive or equivocal, followed by IgM and IgG Western immunoblotting [4].

## DISEASE ABSTRACT

- In 2006, there was a 129% increase in reported cases that met CDC surveillance criteria; most likely due to increases of LD seen in the eastern US.
- The majority of cases (81%) in 2006 reported exposure outside the county. The prevalence of probable LAC-acquired infection remains low and consistent with surveillance data from the previous 13 years.

**Trends:** The number of cases has increased by nearly 129% from 7 confirmed cases in 2005 to 16 in 2006 (Figure 1). This number is twice as high as any year in which LAC has recorded incidence of LD. However, the number of cases reported with a possible exposure within LAC (n=3) remains similar to previous years. Since 1994, cases with possible exposure within LAC has ranged from 0 to 5.

**Seasonality:** There was a peak number of cases occurring in the summer months of June (n=6) and July (n=4) (Figure 2). A similar peak occurred in 2005 in July (n=2) and August (n=2). Ticks may be active at any time of the year but the highest risk of infection occurs from March through August. The seasonal peak may be a reflection of both tick activity and human outdoor activity.

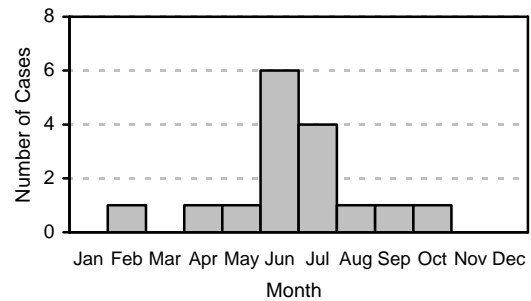
**Age:** The average age of cases in 2006 was 33, the median was 28.5, and the ages ranged from 8–69 years old. Nationally, LD is most common among persons aged 5–19 years and 30 years and older.

**Sex:** The male to female ratio was 0.78:1. Nationally, LD occurs more commonly among males.

**Race/Ethnicity:** Of those cases in which race/ethnicity were known, most were white (n=11, 78%). There were two Latinos (14%) and one Asian (7%).

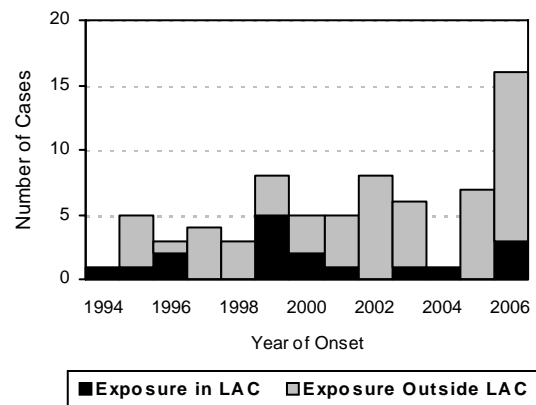
**Location:** LD does not commonly occur in ticks in LAC, most cases were likely exposed to infected ticks while outside of the county. However, three cases (19%) reported no history of travel outside of LAC within three months of their onset of EM rash (Figure 3). These cases occurred among residents from SPAs 2, 5, and 8.

Figure 2  
Lyme Disease Cases  
by Month of Onset\*  
LAC, 2006



\*Previous 5-yr average not available.

Figure 3  
Lyme Disease Cases  
by Location of Exposure  
LAC, 1994–2006



**Disease Severity:** Most cases (n=13, 81%) demonstrated EM. Rash sizes ranged from 5–20cm, with a mean of 10.25cm and median of 10cm. Five cases (31%) experienced swelling of one or a few joints, a symptom characteristic of late LD, two of them in combination with EM. One case experienced an additional late symptom: a facial nerve palsy consistent with a cranial neuropathy.

**Risk Factors:** Many of the cases (n=10, 63%) recalled a tick bite within three months of their onset. Thirteen cases (81%) reported travel outside of LAC prior to their onset of symptoms (Figure 3). Of the thirteen, nine (69%) recalled incurring the tick bite during their travels. The remaining either denied or could not recall a tick bite. However, published studies show that few patients - only about one third – can recall being bitten by a tick [5]. All traveled to areas where LD is known to be highly endemic: 11 to the eastern US and 2 to Europe – Sweden, in particular. Of the three that remained within LAC, one had traveled to northern California, where LD is more common, over three months before the onset of her EM rash. She could not recall a tick bite. Only one case with no history of travel recalled a tick bite near her residence - a rural area of the San Fernando health district (SPA 2).

## PREVENTION

Since GlaxoSmithKline Pharmaceuticals removed the LYMERix<sup>®</sup> vaccine off the market in February 2002, avoiding tick bite exposure is the primary means of preventing Lyme disease. The risk of acquiring infection with LD increases when the tick has attached to the body for at least 24 hours. Tips for preventing exposure from tick bites include checking the body regularly for prompt removal of attached ticks; wearing light-colored clothing so that ticks can be easily seen; wearing long pants and long-sleeved shirts and tucking pants into boots or socks, and tucking shirts into pants; using tick repellent and treating clothing with products containing permethrin; staying in the middle of trails when hiking to avoid contact with bushes and grasses where ticks are most common; and checking for and controlling ticks on pets.

## COMMENTS

Each year only 20 to 30 suspected LD cases from LAC residents are reported to LAC DPH by clinicians and laboratories. Many of these reports do not meet the CDC definition for a confirmed case because laboratory tests are often ordered for patients with vague symptoms not consistent with LD. Indeed, the number of cases eventually confirmed in LAC has ranged from none to eight cases a year. However, in 2006 twice the number of confirmed cases typically seen in a single year in LAC was reported. It is likely that this increase reflects increases in LD in the ten states where it is most prevalent (located in the northeastern, mid-Atlantic, and north-central areas of the US), occurring since it became a nationally notifiable disease in 1991 [3]. During the period of 2003–2005, these ten states accounted for 93% of cases nationwide and had an average annual incidence rate per 100,000 persons of 29.1 in 2003, 26.8 in 2004, and 31.6 in 2005. A considerable proportion of cases from LAC, 69% during 2006, reported travel to these highly endemic areas. The number of cases confirmed with possible exposure within LAC remains similar to previous years.

Furthermore, changes in reporting processes may have increased the number of suspected cases reported to LAC DPH. In 2005, Lyme disease became a laboratory reportable disease in California. As soon as March of that year, a commercial laboratory began reporting positive LD results to LAC through an automated electronic reporting system. A second commercial laboratory was added to the automated reporting system in February 2006. The magnitude at which laboratory and electronic reporting may have affected reporting and confirmation of LD in LAC is unknown and will require further study.

The increase in confirmed cases highlights the complicated issues in the diagnosis and surveillance of LD that can result in both overdiagnosis and underreporting. One challenge to surveillance is the misdiagnosis of EM, which occurs even in the highly endemic eastern states [6]. One might expect that the misdiagnosis of EM could be even greater in non-endemic or low endemic areas of the country such as LAC where clinicians have not had as much clinical experience with LD. Not only do the early and late symptoms of LD resemble those of many other diseases, but also the laboratory tests available are often inaccurate in diagnosing LD. Laboratory diagnostic tests may not reliably detect the infection early in the

course of disease or can be interpreted incorrectly. Despite this, the surveillance of LD in LAC is heavily based on positive laboratory reports; and reports are confirmed only after consultation with the healthcare provider as well as the patient regarding symptoms and tick exposure. The response rate of healthcare providers in requests for confirmation has not been fully investigated; it most likely varies from year to year and could affect the trends in confirmed LD cases.

## REFERENCES

1. California Department of Health Services. 2005 Annual Report. Report available at: [www.dhs.ca.gov/ps/dcdc/disb/disbindex.htm](http://www.dhs.ca.gov/ps/dcdc/disb/disbindex.htm)
2. CDC. Lyme disease statistics. Report available at: [www.cdc.gov/ncidod/dvbid/lyme/ld\\_statistics.htm](http://www.cdc.gov/ncidod/dvbid/lyme/ld_statistics.htm)
3. CDC. Lyme disease--United States, 2003--2005. *MMWR* 2007; 56(23):573-576.
4. Fritz CL, Vugia DJ. Clinical issues in Lyme borreliosis: a California perspective. *Infect Dis Rev* 2001; 3(3):111-122.
5. Gerber MA, Shapiro ED, Burke GS, Parcels VJ, Bell GL. Lyme disease in children in southeastern Connecticut. *N Engl J Med* 1996; 335(17):1270-1274.
6. Feder HM, Whitaker DL. Misdiagnosis of erythema migrans. *Am J Med* 1995; 99(4):412-419.

## ADDITIONAL RESOURCES

More information about Lyme disease is available from the CDC at:  
[www.cdc.gov/ncidod/dvbid/lyme/index.htm](http://www.cdc.gov/ncidod/dvbid/lyme/index.htm)

A brochure on Lyme disease from the California Department of Public Health is available at:  
[www.cdph.ca.gov/healthinfo/discond/Documents/Lyme/LymeDiseaseBrochure2005.pdf](http://www.cdph.ca.gov/healthinfo/discond/Documents/Lyme/LymeDiseaseBrochure2005.pdf)

## PUBLICATIONS

1. Nadelman RB, Wormser GP. Lyme borreliosis. *Lancet* 1998; 352(9127):557-565.
2. Barbour AG. Lyme Disease: The Cause, the Cure, the Controversy. Baltimore, MD: The Johns Hopkins University Press; 1996.
3. Steere AC. Lyme disease. *N Engl J Med* 2001; 345(2):115-125.
4. Sood SK. Lyme disease. *Pediatr Infect Dis J* 1999; 18(10):913-925.
5. Shapiro ED, Gerber MA. Lyme disease. *Clin Infect Dis* 2000; 31(2):533-542.

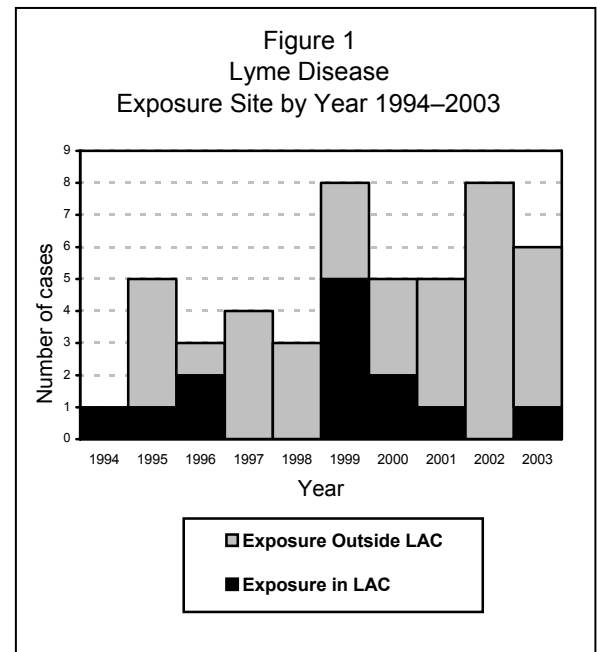


## LYME DISEASE

CRUDE DATA	
Number of Cases	6
Annual Incidence <sup>a</sup>	
LA County	--- <sup>b</sup>
California	0.25
United States	7.39
Age at Diagnosis	
Mean	37
Median	31
Range	6–55 years
Case Fatality	
LA County	0.0%
United States	N/A

<sup>a</sup> Cases per 100,000 population.

<sup>b</sup> Rates based on fewer than 20 cases are unreliable.



### DESCRIPTION

Lyme disease is caused by a bacterium, *Borrelia burgdorferi*, transmitted to humans by the bite of the western blacklegged tick (*Ixodes pacificus*). This disease is not common in LAC. The reservoir is in small rodents, with deer as a secondary reservoir. Ticks that feed from infected rodents or deer may then transmit the disease to humans, who are accidental hosts. The classic rash is called erythema migrans, an expanding “bull’s eye” rash, which is the first sign in about 60–90% of patients (usually at the site of the tick bite.). The incubation period is from 3–32 days. However, early symptoms (e.g., fever, body aches, headaches and fatigue) are often unrecognized and patients may present with later manifestations. These include aseptic meningitis, cranial neuritis, cardiac arrhythmias and arthritis of the large joints. Early disease is treated with a short course of oral antibiotics, while later manifestations may require longer treatment with oral or intravenous (IV) antibiotics. Currently, there is no vaccine.

The diagnosis of Lyme disease may be difficult because other diseases can cause early symptoms of fever, body aches, headaches, and fatigue. Laboratory tests are available, but they are often not sensitive, specific or consistent.

Lyme disease may be cured by early diagnosis and treatment with antibiotics. Untreated disease causing long-term illness and complications may occur, requiring longer treatment with oral or IV antibiotics.

### DISEASE ABSTRACT

- In 2003, 6 reported cases met CDC surveillance criteria. Four were male and two were female.
- All cases except 1 reported exposure outside LAC. The reported one LAC Lyme case noted tick exposure in Malibu.



## COMMENTS

Lyme disease is now the most frequently reported vectorborne disease in the US; however, it is reported infrequently in LAC. Since Lyme disease became reportable in 1989, 48 reported cases have met the CDC surveillance criteria. Sixteen cases (28%) were exposed to ticks inside LAC. Although transmission of Lyme disease does occur in LAC, it is believed to be rare because the western blacklegged tick is not the most common tick in LAC, and only 1–2% of western blacklegged ticks in California are infected with the bacterium that causes Lyme disease. The tick must be attached for a minimum of 48 hours for transmission to occur. Although DHS has been testing ticks and reservoir animals for the past eleven years, 1999 was the first year for which ticks were confirmed to carry *B. burgdorferi* by culture.

When a case of Lyme disease is reported to the DHS, an investigation is initiated by ACDC, which includes collection of information from the physician and the patient. Vector Management staff determine the probable site of tick exposure and initiate field studies. Field studies include collection of ticks and samples from animals to test for Lyme disease.

Although Lyme disease occurs rarely in LAC, personal protective measures are recommended to prevent tick bites. These include: using insect repellents containing DEET, wearing long pants and long-sleeved clothing, wearing light-colored clothing (so that ticks can be spotted more easily) and walking in the center of a trail to avoid overhanging grass or brush.

## Future Directions

The vaccine made by SmithKline Beecham (LYMERix) was taken off the market in 2001 due to poor sales and possible side effects and complications. Efforts are being made to develop a new vaccine.

## ADDITIONAL RESOURCES

More information about Lyme disease is available from the CDC at:  
[www.cdc.gov/ncidod/dvbid/lyme/index.htm](http://www.cdc.gov/ncidod/dvbid/lyme/index.htm)

A brochure regarding Lyme disease is from the California DHS is available at:  
[www.dhs.ca.gov/ps/dcdc/disb/pdf/Lyme%20Disease%20brochure%20final.pdf](http://www.dhs.ca.gov/ps/dcdc/disb/pdf/Lyme%20Disease%20brochure%20final.pdf)

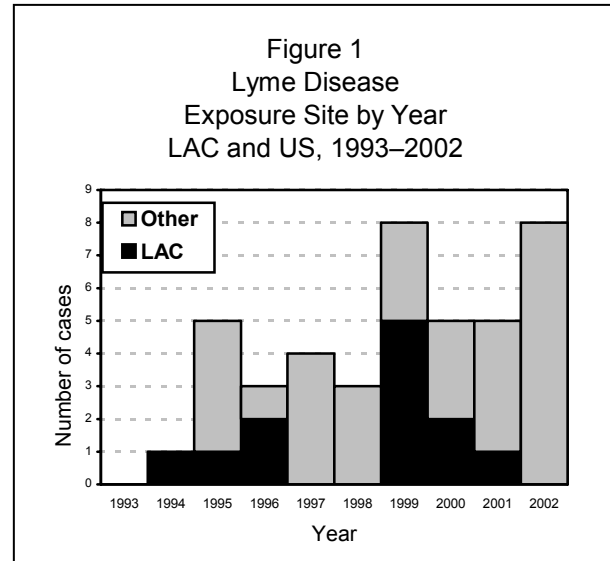
### Publications:

- Nadelman RB and Wormser GP. Lyme borreliosis. *Lancet*. 1998; 352: 557–65.
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## LYME DISEASE

CRUDE DATA	
Number of Cases	8
Annual Incidence <sup>a</sup>	
LA County	--- <sup>b</sup>
California	0.3
United States	8.4
Age at Diagnosis	
Mean	37
Median	36
Range	7–67 years
Case Fatality	
LA County	0.0%
United States	N/A



<sup>a</sup> Cases per 100,000 population.

<sup>b</sup> Rates based on fewer than 20 cases are unreliable.

### DESCRIPTION

Lyme disease is caused by a bacterium, *Borrelia burgdorferi*, transmitted to humans by the bite of the western blacklegged tick (*Ixodes pacificus*). This disease is not common in LAC. The reservoir is in small rodents, with deer as a secondary reservoir. Ticks that feed from infected rodents or deer may then transmit the disease to humans, who are accidental hosts. A distinctive rash (erythema migrans) is present in most patients (about 60–90%) at the site of the tick bite. The incubation period is from 3–32 days. However, early symptoms (e.g., fever, body aches, headaches and fatigue) are often unrecognized as indicators of Lyme disease. Patients may present with later manifestations such as aseptic meningitis, cranial neuritis, cardiac arrhythmias and arthritis of the large joints. Laboratory tests are available, but they are often not sensitive, specific or consistent. Early disease is treated with a short course of oral antibiotics, while later manifestations may require longer treatment with oral or intravenous (IV) antibiotics. Currently, there is no vaccine.

### DISEASE ABSTRACT

- In 2002, 8 reported cases met CDC surveillance criteria. Most (n=6, 75%) were female.
- All cases reported exposure outside LAC.

### COMMENTS

Lyme disease is now the most frequently reported vectorborne disease in the US. Lyme disease is reported infrequently in LAC. Since Lyme disease became reportable in 1989, 48 reported cases have met the CDC surveillance criteria. Sixteen cases (28%) were exposed to ticks inside LAC. Although transmission of Lyme disease does occur in LAC, it is believed to be rare because the western blacklegged tick is not the most common tick in LAC, and only 1–2% of western blacklegged ticks in California are infected with the bacterium that causes Lyme disease. The tick must be attached for a minimum of 48 hours for transmission to occur. Although DHS has been testing ticks and reservoir



animals for the past eleven years, 1999 was the first year for which ticks were confirmed to carry *B. burgdorferi* by culture.

When a case of Lyme disease is reported to the DHS, an investigation is initiated by ACDC, which includes collection of information from the physician and the patient. Vector Management staff determine the probable site of tick exposure and initiate field studies. Field studies include collection of ticks and samples from animals to test for Lyme disease.

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### **Future Directions**

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### **ADDITIONAL RESOURCES**

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- Sood SK. Lyme disease. *Pediatr Infect Dis J*. 1999; 18:913–25.