

## Lyme Disease in Texas

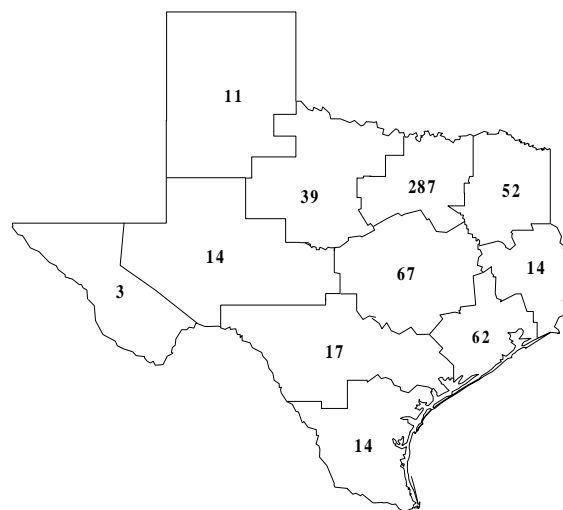
*Lyme disease, caused by various strains of the spirochete *Borrelia burgdorferi*, is the most common tick-borne disease worldwide. In Texas 1,682 possible cases of Lyme disease were reported from 1990 through 1998; 580 (35%) met the CDC's current case definition (physician diagnosed erythema migrans (EM) at least 5 cm in diameter or rheumatologic, cardiac or neurologic manifestations with a positive laboratory test). The majority of Texas cases have occurred in patients from the north central portion of the state (Figure 1).*

The signs and symptoms of Lyme disease often occur in two stages: early (ie, acute) and disseminated. The latter stage can be further divided into early or chronic disseminated Lyme disease. Onset of acute Lyme disease, characterized by erythema migrans (EM) and/or flu-like symptoms, occurs 3 to 30 days after a bite by an infective tick. EM has been reported in 29% of Texas patients. These lesions, pathognomonic for Lyme disease, usually develop at the site of a tick bite. Flu-like symptoms include fever, headache, stiff neck, fatigue, and muscle and joint aches.

Neurologic, rheumatologic, cardiac, and/or dermatologic abnormalities associated with disseminated disease may emerge days, weeks, months, or years after the acute illness. Neurologic disorders, common in Texas patients, may be the most significant complications of Lyme disease. They include mild meningitis, meningoencephalitis, cranial or peripheral neuropathy, acute radiculoneuritis, and various neuropsychiatric syndromes. Patients may complain of short term memory loss, disorientation, difficulty concentrating, and emotional lability. Bell's palsy is somewhat common; from 1990 through 1998, Bell's palsy was reported for 55 Texas patients. Unilateral Bell's palsy was reported for 37 patients and bilateral for 17 patients. Late neurologic manifestations may include encephalopathy, chronic radiculoneuropathy, and encephalomyelitis. A syndrome consistent with multiple sclerosis has also been reported.

Rheumatologic abnormalities consist of severe migratory joint pain (very common in Texas patients) and/or an arthritis involving large and small joints. In severe cases, erosion of

**Figure 1. Lyme Disease Cases by Public Health Region, 1990-1998**



cartilage and bone can cause permanent joint disability. Cardiac complications include atrioventricular block and myocarditis. Such manifestations are not often reported in Texas. Rarely reported, too, are secondary annular skin lesions and acrodermatitis chronica atrophicans (ACA). The ACA lesion, usually found on an extremity, begins insidiously as a swollen area of bluish-red discoloration. It may last for years, leading to gradual atrophy of the skin. *B. burgdorferi* has been cultured from ACA as long as 10 years after onset of infection, illustrating the spirochete's ability to persist.

### Diagnosis

If EM is present, Lyme disease can be diagnosed immediately. If the skin lesion is absent or atypical in appearance, serologic testing can be performed. However clinical judgement is necessary to interpret laboratory

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results correctly because false-positive and false-negative results are common. Intrathecal antibody is uncommon in neurologic Lyme disease and is not necessary for diagnosis.

An enzyme linked immunosorbent assay (ELISA/EIA) can be performed at the Texas Department of Health (TDH) Laboratory for a charge of \$12. Serum drawn in a red top tube may be submitted at room temperature along with a G-1 form requesting Lyme serology to Texas Department of Health Laboratory 1100 West 49<sup>th</sup> Street, Austin, TX 78756

### Treatment

Antibiotics are the mainstay of therapy. Early infection may be treated with oral antibiotics such as amoxicillin or doxycycline. The duration of therapy should depend on clinical response. Intravenous antimicrobials, including ceftriaxone or cefotaxime, may be indicated for central nervous system disease or for those patients who have not responded to oral therapy.

Interestingly, patients often have a symptomatic flare, resembling the Jarisch-Herxheimer reaction, with initiation of therapy. Severe myalgias, arthralgias, headaches, dyspnea, diarrhea, and fever have been reported. With oral antibiotics, the Jarisch-Herxheimer reaction begins on the fourth or fifth day of therapy; with intravenous therapy, on the first to third day. The reaction lasts from one to two weeks. Antibiotic therapy may need to be interrupted for one to three days for those patients who experience severe reactions.

No reliable laboratory test to indicate when *B. burgdorferi* has been eliminated is currently available. Further, it is not clear whether chronic symptoms result from persistent infection, permanent tissue damage, or an immune complex reaction. Thus, the decision to stop therapy must largely be based on clinical factors.

In Texas chemoprophylaxis of tick bites is probably not warranted for two

reasons. First, since only 1% to 2% of ticks harbor spirochetes, the risk of acquiring of Lyme disease is relatively low. Second, other tick-borne diseases, such as Rocky Mountain spotted fever (RMSF), are endemic in the state. Rather than avert RMSF, chemoprophylaxis may only lengthen the incubation period. Patients seeking chemoprophylaxis for tick bites should be educated regarding the signs and symptoms and prevention of various the tick-borne diseases.

### Epizootiology

Lyme disease transmission is most often associated with tick exposure, although a small percentage of reported cases have been linked to flea (or other blood-sucking arthropod) exposure. Lyme disease and other tick-borne disorders are more easily understood when one knows the fundamentals of tick biology. Ticks are nonpermanent obligate bloodsucking arthropods. There are more than 800 different types of ticks, but relatively few species feed on humans. Those that do include species in the genera *Amblyomma*, *Dermacentor*, and *Ixodes*.

These ticks take no more than 3 blood meals during their lifetime. Larvae, tiny ticks that have just emerged from eggs, feed for about 3 days before dropping from their host and eventually molting. Nymphs also feed for three days and molt. Adult females will feed for 7 to 9 days. Mating occurs on the host animal before the engorged female drops off and lays eggs. Deer and, to a lesser extent, other large mammals are crucial hosts for maintaining ticks that transmit Lyme disease.

Epidemiologic and laboratory data suggest that *Amblyomma americanum*, the lone star tick, is the primary vector of tick-borne diseases in Texas. This tick species, very common throughout the south-central US, readily feeds on humans. The adults are about the size of a watermelon seed; the adult female is distinguished by a white dot on the middle of her back. In Texas, *B. burgdorferi* has

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been detected in *Amblyomma* sp. ticks (Figure 2). It is estimated that only 1% to 2% of the state's lone star ticks harbor spirochetes. Patients generally become infected April through June, months when *A. americanum*, the lone star tick, is most active.

*Ixodes scapularis*, the black-legged tick, is a cool-weather tick that is the vector of the Lyme disease agent in the north-eastern United States. Although this tick species is found in Texas, it bites humans infrequently.

### Other Vectors of Lyme Disease Agents

A small percentage of reported Lyme disease cases have been linked to exposure to fleas (or other blood-sucking arthropods). Transmission of Lyme disease agents by vectors other than ticks is probably not common. It is conceivable, though, that atypical vectors—such as fleas, mosquitoes, and biting flies—could begin feeding on an infected animal, be brushed off that animal, and immediately seek another host. In this way, the atypical vector could mechanically transfer spirochetes from one animal to another.

### Prevention

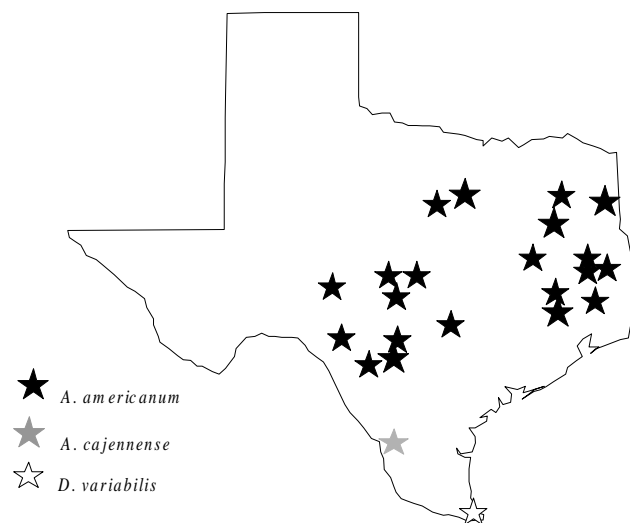
Human-biting ticks feed on humans of all ages; they will attach from head to toe. The best way to prevent Lyme (or other tick-borne) disease is to avoid ticks. It is imperative that people who do venture into tick habitats examine themselves every few hours and remove attached ticks promptly. Diligence is required or larvae and nymphs may be missed—they are small and not easily seen. Remember, disease prevention often is easier than struggling with diagnosis and treatment after infection.

Use tweezers, if possible, to remove attached ticks. If tweezers are not available, use a tissue to protect your fingers as exposure to the tick's body fluids may lead to transmission of disease. Grasp the tick at the point of attachment and pull with a steady motion. Live ticks may be submitted for identification and testing to the TDH Laboratory.

Call Glenna Teltow at (512) 458-7615 for information on proper submission methods.

People can also protect themselves by wearing clothing that will prevent arthropods from gaining access to the skin and using insect repellents that contain DEET or permethrin. (Follow package instructions.) Dogs and cats should be inspected for ticks regularly. Besides bringing ticks into the home environment, these household pets can acquire Lyme disease.

**Figure 2. *Amblyomma* and *Dermacentor* Ticks Positive for *Borrelia*, 1993-1998**



LYMERix, a vaccine developed by SmithKline Beecham to protect against Lyme disease, is available for persons 15 through 70 years of age. The vaccine is given on a 0, 1, and 12 month schedule. Vaccine trials showed that when this schedule is used, the vaccine has an efficacy of 78%. Shorter and more flexible dosing schedules, to ensure rapid and convenient immunization, are being investigated. Unpublished data suggest that LYMERix elicits comparable immune responses on a 0, 1, 2 or 0, 1, 6 or 0, 1, 12 month schedule. Adverse reactions associated with the Lyme disease vaccine include redness and swelling at the injection site, arthralgias, and myalgias. Most reactions are mild-to-moderate in severity and transient in duration.

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LYMERix has a unique mechanism of action. It stimulates antibody to an outer surface protein (OSP A) that is expressed by *B. burgdorferi* while the organism resides in a tick, but down-regulated after tick attachment. To be effective, high levels of vaccine-induced antibody must be taken up by the tick while it is feeding so that it can react with the spirochete before transmission.

### **Research**

Lyme disease has not been fully characterized in Texas. To that end, a CDC scientist is attempting to isolate and identify spirochetes from skin biopsy specimens and determine phylogenetic relationships among the *Borreliae*. *To submit biopsy samples or for more information, call Julie Rawlings at (512) 458-7228.*

### **Reporting**

Since 1986 Texas law has required that Lyme disease cases be reported. Cases should be reported to the local health department by calling (800) 705-8868.

### **Suggested Reading**

Coyle PK. *Borrelia burgdorferi* infection: clinical diagnostic techniques. *Immunol Invest* 26(1-2):117-28, 1997.

Fallon BA, Kochevar JM, Gaito A, Nields JA. The Underdiagnosis of Neuropsychiatric Lyme Disease in Children and Adults. *Psychiatr Clin North Am* 21(3):693-703, 1998.

Weber K, Pfister H-W. Clinical management of Lyme borreliosis. *Lancet* 343:1017-1020, 1994.



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