

# Tick Bites and Lyme Disease

## The Need for Timely Treatment

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### KEYWORDS

• Tick • Lyme • Vector-borne • Bite • Bacterium

### KEY POINTS

- Lyme disease can be prevented with early detection of tick attachment, removal, and treatment.
- Treatment of choice is doxycycline (100 mg twice daily, 10–21 days, orally).
- Prevention includes teaching about the life cycle of ticks, how ticks detect a host, transmission of bacteria, proper removal, when to seek treatment, and necessity of time.

### INTRODUCTION

The 6th most common nationally notifiable disease in the United States in 2011 was Lyme disease, also identified as the most reported vector-borne illness.<sup>1</sup> In the United States, 30,158 people were reported as having contracted Lyme disease during 2010.<sup>1</sup> Over an 8-year period (2003–2010), the average number of persons contracting Lyme disease was 26,947 (**Fig. 1**).<sup>2</sup> The initial diagnosis of Lyme disease occurred after an outbreak of arthralgias in a group of pediatric patients in 1977 in and around Lyme, Connecticut. Today, Lyme disease remains a public health concern in 2 main portions of the United States, the northeast and north-central states; 96% of the cases in 2011 were reported from the following 13 states: Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and Wisconsin.<sup>1</sup>

**Fig. 1** shows the incidence of reported cases of Lyme disease over an 8-year period in the United States.

### NATURE OF PROBLEM

Tick bites are considered a vector-borne disease. Bacterium the tick can transmit while attached may result in disease. The bacterium is transmitted to humans by ticks.

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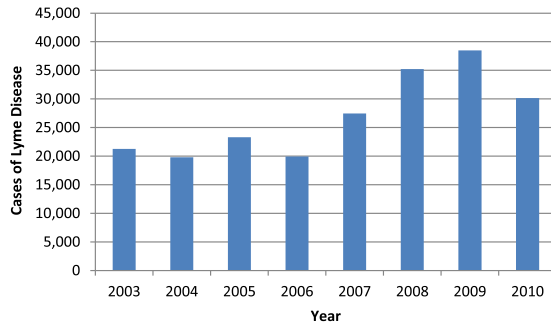
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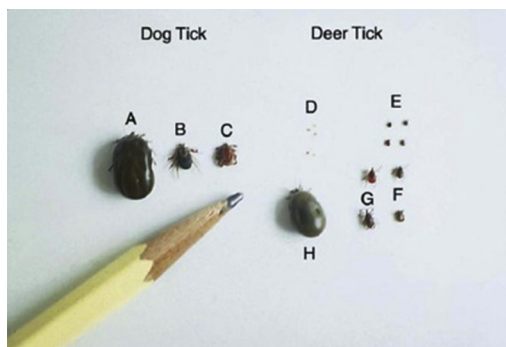


**Fig. 1.** Cases of Lyme disease in the United States by year. (Data from Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Report. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5953a1.html>. Accessed February 21, 2013.)

There are typical times during the life cycle of the tick when the probability of infectious bacterium pathogen transference is higher; thus, it is important to consider the life cycle of the tick. The tick life cycle involves 3 stages: larva, nymph, and adult (**Fig. 2**). During any of these stages, the tick can become infected with bacterium and may transmit bacterium to humans. Approximately 90% of contracted cases are transmitted during the nymph stage of the tick life cycle.<sup>3,4</sup> The nymph's virulence results primarily from the length of time attached to the host: mammals, birds, reptiles, and amphibians are all sources of blood for ticks.<sup>4</sup> A nymph is approximately 2 mm in diameter; therefore, a person may not be aware of a tick's attachment, and the tick may be allowed to feed for an extended period. Time of attachment has become a critical factor in several aspects of Lyme disease. Prolonged attachment allows time for bacterium to move from tick to human.<sup>3,5,6</sup> If a tick is infected, the chance of transmission increases with time attached: 12% at 48 hours, 79% at 72 hours, and 94% at 96 hours of attachment.<sup>7</sup>

### SYMPTOMS AND STAGES OF LYME DISEASE

Typically, symptoms of Lyme disease present in 1 of 3 stages (**Fig. 3**). Patients may experience some or all of the symptoms in each stage and may fluctuate in and out



**Fig. 2.** Tick size during life cycle. Dog (wood) ticks and deer (black-legged) ticks compared with a pencil. Dog ticks: A, engorged female; B, female; and C, male. Deer ticks: D, larvae; E, nymphs; F, males; G, females; and H, engorged female.

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