The most commonly reported arthropod-borne illness in the United States is Lyme disease. As described in Chapter 24 (Figure 24.20, p. 749), a tick is the vector for this disease. The deer tick, *Ixodes scapularis*, is the culprit in the northeastern and north central states, where Lyme disease is most prevalent. The actual pathogen or cause of Lyme disease is the bacterium *Borrelia burgdorferi*. This bacterium does not affect the deer tick, but in humans it can trigger a variety of symptoms, ranging from a bull’s-eye-shaped rash around the tick bite to more serious problems such as arthritis, headache, fever, meningitis, cognitive disorders, and heart block.

**DEER TICK LIFE CYCLE**

The deer tick goes through three distinct stages in its two years of life, and they only feed once in each of these stages. Larvae hatch in summer and attach to small mammals such as mice or chipmunks. A larva will feed for several days, and will ingest the bacterium *Borrelia* if the host animal is infected. The larva then drops from the host, molts into a nymph, and lies dormant for nearly a year. The nymph will feed again from another host during the following spring or summer. After feeding, the nymph drops from the host, molts into an adult, and then attaches to a larger mammal for the third and final feeding of its life, in the fall of the same year. After that, female ticks lay eggs that will hatch the following summer. While it appears that women who are infected with Lyme disease can pass it to their unborn children, deer ticks do not pass the disease on to their offspring.

It is in the larval and nymph stages that the bacterium *Borrelia* can be acquired by the deer tick. As nymphs and adults, the tick can transmit the bacterium, which survives in the tick’s gut, to its vertebrate hosts. If the host is human, he or she may develop Lyme disease.

**THE ROLE OF DEER**

White-tailed deer are a common host of adult ticks, meaning they are the last stop of the deer tick before reproduction and death. In recent years many people thought that the rise of Lyme disease was directly correlated with the exploding population of white-tailed deer in the eastern and north central United States. But most humans are infected with the Lyme disease bacterium from nymph deer ticks, which are more abundant and less easily detected than the adults because they are only 1 mm long. Recent research suggests that it is the populations of the small mammals that are host to deer tick larvae and nymphs—as well as the quantity of acorns, their favorite food—that is strongly correlated with deer tick population density and incidence of Lyme disease. In the near future, forecasts of the severity of Lyme disease outbreaks in any given year may be based on the quantity of acorns two years before and the population of chipmunks and white-footed mice one year before.

1. On a separate piece of paper, draw the life cycle of the deer tick. Note how and when they feed, and how the species functions as a vector for Lyme disease.
2. Of the four states listed in the table, which one experienced the most dramatic percent increase in Lyme disease incidence (cases per 100,000 people) between 2001 and 2002? By what percentage did it increase? Which state had the second highest increase? By what percentage did it go up?

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3. Imagine you are the head of the Department of Environmental Management in Rhode Island. After several consecutive years of increasing incidence of Lyme disease, the citizens want you to take action to reverse this trend. Given what you know about the ecology of the deer tick and Lyme disease, what would you suggest as a method for reducing the number of deer ticks? Why?

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4. Imagine that you decide to call for a large increase in the number of deer that hunters are allowed to take in the fall of this year. Then, in the following summer, the incidence of Lyme disease goes up yet again. The public asks, “Why didn’t the incidence drop?” Respond.

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