

## LYME DISEASE FROM A PEDIATRICIAN'S PERSPECTIVE

By LouAnn Maffei-Iwuc, Maj, CAP  
Medical Officer  
Massachusetts Wing, Civil Air Patrol

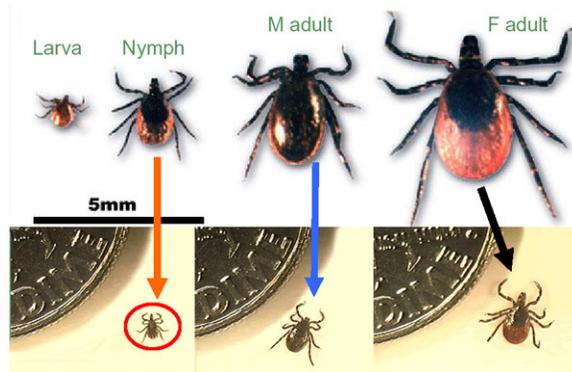
A fourteen year old female was seen in a Cape Cod hospital emergency room in August 2010 with a rash on her abdomen. The parents thought she had Lyme disease, but the attending physician disagreed. She was treated with a ten day course of cephalexin (versus what would have been a 21 day course of another antibiotic). This same adolescent was seen in February 2011 at our urgent care site with left elbow swelling. There was no history of injury, no history of fever, and no redness or increased warmth of the joint. X rays were normal. She wore a sling for several days and the swelling went away. One month later, she arrived at my office. Her left knee was markedly swollen. There was no known injury, no fever, no redness or increased warmth. Labs were drawn, her joint was tapped by an orthopedic associate, and, as suspected, she had Lyme arthritis. She was placed on a four week course of oral antibiotics.

A four year old male came into the office during the summer of 2009 with a four day history of high fever, headache, and lethargy. On exam, he did not have an ear or throat infection, nor did he have nasal congestion or stiff neck. There was no history of rash or known tick bite. He appeared ill. Labs are drawn, and he was referred to the emergency room for a spinal tap. He was admitted to the hospital, subsequently diagnosed with Lyme meningitis and was discharged home several days later with a PIC (percutaneous intravenous catheter) line, allowing a visiting nurse to administer daily antibiotics to complete a six week course.

A seventeen year old female left her home in St. John, U.S. Virgin Islands to visit friends in Rhode Island for one week in June. She returned home and one month later developed migraine headaches and a sore neck. There was no known history of tick bite or rash. Pain medication was prescribed by a local island clinic. Still not feeling well one week later, she returned to the clinic and a blood count was drawn. It was abnormal. Upon her request, I called the clinic and asked them to run a series of tests, including Lyme. The clinic did not have the capability to run Lyme titers. The headaches subsided, but she developed intermittent eye inflammation. Several weeks later, she flew to Boston accompanied by her mother and grandmother. While driving to UMass Medical Center in Worcester, it was evident that her eyes were notably inflamed. After obtaining a thorough history and exam, the pediatric infectious disease specialist ordered laboratory studies and immediately referred her to a corneal specialist. "If she had come one week later, I don't know if we could have saved

her vision,” was the ophthalmologist’s quote. She was diagnosed with Lyme meningitis and Lyme infection of her corneae. The Student Health Center at her chosen university needed to learn new skills in order to provide care for this newly matriculated student, as she required a six week course of daily intravenous antibiotics via a PIC line.

*Borrelia burgodoferi*, a corkscrew-shaped (spirocete) bacterium, is the culprit, folks! It is the causative agent for Lyme disease. The principle reservoir of infection is *Peromyscus leucopus*, commonly known as the white-footed mouse. The primary vector, or carrier, in New England is a nasty little tick called *Ixodes dammini*, the deer tick.

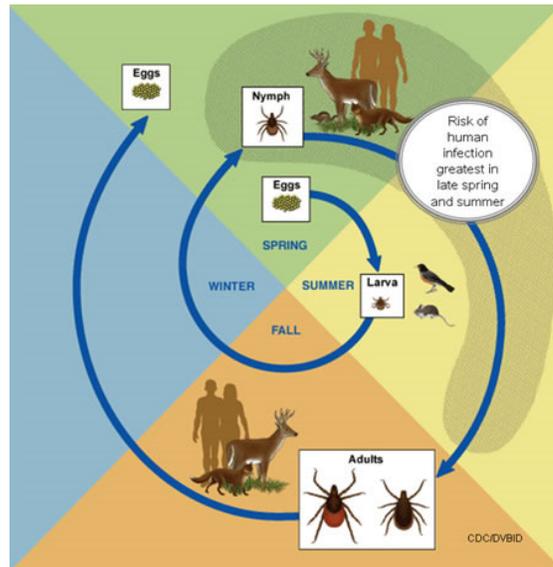


Representation of the deer tick at various stages of growth by CapeK9Cardio™<sup>1</sup>

The lifespan of a deer tick averages two years. Adult ticks lay eggs on the ground in the spring. The eggs hatch as larvae during the summer, and the larvae feed on mice, other small mammals, and birds from summer until early autumn. If the ingested blood meal is infected with *Borrelia burgodoferi*, the tiny tick is infected for life. There is a period of dormancy when the larvae grow into nymphs. Searching for blood meals in order to grow into adults, the still tiny nymphs feast primarily on rodents. Yet nymphs are the most common stage of tick to bite dogs, cats, and humans as well. The peak season for humans and their pets to get infected with Lyme disease is May, June, and July, when the nymphs are most active.

So, where does “deer” come into the picture? The adult ticks have not vanished, folks! They feed on large mammals such as deer (and, sigh, us as well!) and are most prevalent in the spring and autumn. The deer do not become infected by *Borrelia burgodoferi*. They just serve up yummy blood for the deer tick, sustaining the tick population and transporting these lovely critters throughout the woods and fields. It is possible to get infected with Lyme disease during the winter, as adult deer ticks will emerge in search of blood meals if the temperature rises above freezing. Below is a drawing of the life cycle

of the deer tick, courtesy of the United States Centers for Disease Control (CDC):



Life Cycle of Blacklegged Ticks<sup>2</sup>

Lyme disease is the number one arthropod-borne illness in the United States.<sup>3</sup> The majority of cases in the United States occur in New York, Massachusetts, Connecticut, Rhode Island, and New Jersey.<sup>4</sup> There are cases of Lyme disease in other parts of the nation, transmitted by *Ixodes scapularis* in the South and *Ixodes pacificus* along the Pacific coast. The actual percentage of deer ticks infected by *Borrelia burgdorferi* ranges from 2 to 90% and varies from species to species, from state to state and even from county to county.<sup>5</sup>



"Studies have shown that an infected tick normally cannot begin transmitting the spirochete [*Borrelia burgdorferi*] until it has been attached to its host about 36-48 hours..."<sup>6</sup> Seventy to eighty percent of infected humans will develop a circular rash at the site of the bite within three to thirty days of being bitten. The erythema migrans rash can be a solid area of redness (erythema), can have a bull's eye appearance, or can look like a bruise in darker-skinned individuals. If untreated, over the next several days to weeks the area of rash will expand, reaching a diameter of up to twelve inches in some cases.<sup>7</sup> In this early localized stage, the individual may also have achy joints, chills, fever, and/or fatigue. The photo to the left is courtesy of the U.S. CDC.<sup>8</sup>

In early disseminated Lyme disease, other areas of rash may develop away from the initial tick bite site. The individual may have one or several of a constellation of symptoms: fever, fatigue, swollen

glands, headaches, migrating large joint aches, neck pain or stiffness, swollen glands, visual changes, tingling or numbness of extremities, or a form of facial paralysis termed Bell's Palsy. "In up to 8% of patients, ... Cardiac complications of Lyme disease generally occur in this early phase and include conduction system disturbances, myopericarditis and congestive heart failure."<sup>9</sup> Those with cardiac involvement can present with shortness of breath, irregular heart rate, chest pain, light-headedness and/ or fainting episodes.

If left untreated, late stage Lyme disease sets in from weeks to months, and in some cases even over a year, after the initial tick bite. The most common presentation is swelling of one or more large joints (arthritis), with the knee being the most commonly affected joint. The patient can present with symptoms of severe headache and sore or stiff neck if they have developed meningitis. Neurologic involvement can also be signaled by confusion, decreased concentration, disorientation, poor short term memory or mental fog.<sup>10</sup>

So, given the pervasiveness of deer ticks, what can we do to protect ourselves from getting Lyme disease? We can attempt to avoid areas of woods, shrubs, leaf debris, and tall grasses but that is not easy in New England. If we do go into these areas, particularly in the months of May, June, and July, it is wise to wear light clothing complete with hat, long sleeved shirt tucked into long pants, pant legs tucked into socks, and preferably boots instead of sneakers or sandals. Stay on the trails to minimize contact with shrubs and grasses. Wear insecticide. You can apply 20-50% N-N-diethyl-meta-toluamide (DEET) to clothing and exposed skin. Permethrin, a chemical which kills ticks on contact, can be applied to shoes, clothing, tent surfaces, mosquito netting, and gear. It cannot be applied to skin. Treat your pets with veterinary-approved products such as Front Line™ or Advantage™, to minimize their exposure to ticks. Check them and yourselves before entering the home, to avoid transport into the home. DAILY tick checks are essential, as ticks need to be attached to the host for a minimum of twenty-four hours in order to transmit infection.<sup>11</sup> These tiny critters attach to unusual places such as armpits, belly buttons, buttocks, and groin. A trusted friend needs to literally "CHECK YOUR BACK."

There are specific recommendations for children in regards to insect repellents. Never apply insecticides on infants under the age of two months. "Oil of lemon eucalyptus products are not approved for children under three years of age... When using repellent on a child, apply it to your own hands and then rub them on your child. Avoid children's eyes and mouth and use it sparingly around their ears. Do not apply repellent to children's hands. (Children tend to put their hands in their mouths.) Do not allow young children to apply insect

repellent to themselves; have an adult do it for them. Keep repellents out of reach of children. Do not apply repellent under clothing. If repellent is applied to clothing, wash treated clothing before wearing again. (May vary by product, check label for specific instructions.)”<sup>12</sup>

Okay, you’ve done the tick check and have found an embedded tick. EGAD! Panicked parents call our office in a panic. Fathers yank off the ticks with aplomb, only to find residual mouth parts. YIKES! They dig and dig, and then the child comes in with a skin infection from the vigorous attempts at removing every last vestige of *Ixodes dammini*. I think that the Center for Disease Control’s recommendations for tick removal are clear and concise:

“There are several tick removal devices on the market, but a plain set of fine-tipped tweezers will remove a tick quite effectively. Prompt and proper tick removal is very important for preventing possible disease transmission.

### **How to remove a tick:**

1. Use fine-tipped tweezers and protect your fingers with a tissue, paper towel, or [preferably non-] latex gloves. Avoid removing ticks with your bare hands.
2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Don’t twist or jerk the tick; this can cause the mouth-parts to break off and remain in the skin. If this happens, remove the mouth-parts with tweezers. If you are unable to remove the mouth easily with clean tweezers, leave it alone and let the skin heal.
3. After removing the tick, thoroughly disinfect the bite and your hands with rubbing alcohol, an iodine scrub, or soap and water.



Avoid folklore remedies such as “painting” the tick with nail polish or petroleum jelly, or using heat to make the tick detach from the skin. Your goal is to remove the tick as quickly as possible—not waiting for it to detach.”<sup>13</sup>

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