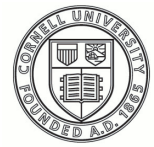

1-14-2019

Lyme Disease and the Workplace

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Abstract

{Excerpt] Lyme disease, an infection by the bacterium Borrelia burgdorferi, was named after a Connecticut town where a group of arthritis cases in children appeared in the early 1970s. These bacteria are carried by infected blacklegged ticks and are transmitted to humans through tick bites. While deer feed ticks and spread them around — actually mice infect the majority of ticks carrying Lyme in the Northeast. A mouse might have dozens of ticks covering its ears and face and can infect up to 95% of those ticks. Climate change is part of the surge in Lyme disease cases, but a big factor has been the history of land use in the Northeast. When the area was first settled, early farmers clear-cut nearly all of the forests to plant crops and raise livestock, as well as cutting down trees for commercial use and for firewood. While a lot of forest has come back, today it's broken up by roads, farms, and housing developments. Mice tend to thrive in these fragmented landscapes because their predators -- foxes, hawks, owls -- need big forests to survive.

Keywords

Lyme disease, infection, workplace

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01/14/2019
Pamphlet for COEM-WNY

What is Lyme disease? Lyme disease, an infection by the bacterium *Borrelia burgdorferi*, was named after a Connecticut town where a group of arthritis cases in children appeared in the early 1970s. These bacteria are carried by infected blacklegged ticks and are transmitted to humans through tick bites. While deer feed ticks and spread them around — actually mice infect the majority of ticks carrying Lyme in the Northeast. A mouse might have dozens of ticks covering its ears and face and can infect up to 95% of those ticks. Climate change is part of the surge in Lyme disease cases, but a big factor has been the history of land use in the Northeast. When the area was first settled, early farmers clear-cut nearly all of the forests to plant crops and raise livestock, as well as cutting down trees for commercial use and for firewood. While a lot of forest has come back, today it's broken up by roads, farms, and housing developments. Mice tend to thrive in these fragmented landscapes because their predators -- foxes, hawks, owls -- need big forests to survive.

Typical symptoms of Lyme disease include fever, headache, fatigue, body aches, facial paralysis, arthritis, and a characteristic skin rash called erythema migrans. Most cases of Lyme disease can be treated successfully with a few weeks of antibiotics in the early stages of infection; people usually recover rapidly and completely. If left untreated, infection can spread to joints, heart, and nervous system. Lyme disease transmission is unlikely before 36 hours of tick attachment, but is especially a problem at more than 48 hours -- thus prophylactic antibiotic treatment after 2 days could be highly effective for persons bitten by a tick. <u>There are many tickborne diseases, so it is important to be alert for any illness that follows a tick bite.</u>

Sometimes, a person treated with antibiotics for Lyme disease may have lingering symptoms. In a small percentage of cases, these symptoms can last for more than 6 months. Although sometimes called "chronic Lyme disease," this condition is properly known as "Post-treatment Lyme Disease Syndrome" (PTLDS). Prolonged antibiotic therapy does not appear to help – the risks outweigh the benefits. The exact cause is not yet known, but it may be residual damage from the infection; for example, the reactivity of nervous system antibodies differs in those who develop PTLDS. Fortunately, people with PTLDS almost always get better with time, although it can take months to feel completely well.

How do you get infected with Lyme disease? Ticks climb onto vegetation and stick out their front legs which have little hooks – as animals or humans brush against vegetation, they snag the ticks. In the Northeast, most people catch Lyme while gardening, playing in the backyard, or mowing the lawn. For 2000 – 2016, 227 confirmed cases were reported in Erie County; with a record number of cases, 186, reported in in 2016. (These numbers represent confirmed cases according to the CDC; actual case numbers may be much higher.) Although no cases of Lyme disease have been linked to blood transfusion, Lyme disease bacteria can live in blood from a person with an active infection, so that person should not donate blood until after completing

antibiotic treatment. (The Red Cross provides additional information on the most recent criteria for blood donation.) Lyme disease is not spread through sexual contact; but, since ticks are very small and easily overlooked, sexual partners living in the same household might both become infected through tick bites.

How do you know if you have Lyme disease?
Diagnosis is based on symptoms, physical findings (such as the skin rash), and the possibility of exposure to infected ticks. A tick bite may cause a localized infection that resembles a "bull's eye" skin lesion in 3 – 32 days after exposure; sometimes secondary rash sites may appear. Lyme disease can be difficult to diagnose early in infection because labs test for antibodies which take time to reach detectable levels – so patients should be treated without antibody results. The Centers for Disease Control (CDC) currently recommend a two-step lab test on a blood sample: results are considered positive only if both steps are positive. Sometimes ticks can be infected with more than one disease-causing microbe and this also makes diagnosing Lyme disease difficult. Recent research was able to differentiate between Lyme disease and Southern Tick-Associated Rash Illness (STARI) -- two tick-borne diseases that have similar early symptoms and often are confused by patients and physicians. Several investigators are working on the development of a new, rapid, point-of-care diagnostic test; but currently no such tests are available. Research to improve early-stage diagnosis involves measuring biomarkers (other than antibodies) that could accurately indicate Lyme disease in many blood samples that would test negative on a two-stage antibody test.

If you are pregnant, contact your physician immediately as untreated Lyme disease may lead to infection of the placenta and possible stillbirth. Thankfully, no serious effects on the fetus have been found in cases where the mother receives appropriate antibiotic treatment. While treatment for pregnant women is similar to that of non-pregnant adults, certain antibiotics are not used because they can affect fetal development (for example, amoxicillin may be preferred over doxycycline). There are no reports of Lyme disease spread through breast milk; your doctor can prescribe an antibiotic that's safe for use when breastfeeding.

How prevalent is Lyme disease? The CDC has conducted two studies to find out how many people are actually diagnosed with Lyme disease each year. One study surveyed clinical laboratories to see how many specimens tested positive for Lyme; the other study looked at medical claims from an insurance database. These studies suggest that the number of people diagnosed with Lyme disease each year in the United States is around 300,000. Most infections occur in the following areas typical for the blacklegged tick (*Ixodes scapularis* or *Ixodes pacificus*) that is infected with *Borrelia burgdorferi*:

- Northeast and mid-Atlantic, from northeastern Virginia to Maine
- North central states, mostly in Wisconsin and Minnesota
- West Coast, particularly northern California

So, Lyme disease cases are concentrated in the Northeast and upper Midwest, with 14 states accounting for over 96% of cases reported to CDC. Maps showing the distribution of Lyme

disease are based on where people live, which may not be where they became infected. Cases are sometimes diagnosed and reported from an area where Lyme disease is not expected, but these are almost always travel-related.

What can you do to avoid infection? Wear light-colored clothing -- ticks can be more easily seen and removed before attachment occurs. Wear long-sleeved shirts, high boots or closed shoes that cover the entire foot, and tuck pant legs into socks or boots. Wear a hat. Spray insect repellents (DEET) on exposed skin and clothing, excluding the face. Using permethrin pesticide on clothes will kill ticks on contact. Make sure you add a tick check to your daily routine. When you've been outdoors in tick season, check yourself when you come indoors for the presence of ticks. Take a shower soon after coming indoors and, when you're in the shower, check your body for tiny ticks, especially the places they like to hide: the scalp, behind the ears, the armpits, behind the knees, and in the groin area. Remove the tick with fine-tipped tweezers as quickly as possible -- the longer an infected tick stays on your skin, the greater the chance it will pass the Lyme bacteria to you. Blacklegged ticks need to be attached for at least 24 hours before they can transmit Lyme disease. Then, be on the lookout for Lyme symptoms — like a red rash or a fever. It anything crops up, go see a doctor immediately. Don't wait: the earlier you get treated, the better chance you'll have for a full recovery. (Fine-tipped tweezers are a good item to stock in a first-aid kit, at work or at home.)

Some recent research has identified effective, easily-implemented methods to rid clothing of ticks after spending time out-doors. Placing clothing directly in a dryer and drying for a minimum of 6 minutes on high heat will effectively kill ticks. If clothing is soiled and requires washing first, it should be washed with hot water (temperature ≥54◦C or ≥130◦F) to kill nymphs and adult ticks. Ticks survive warm and cold water washes.

What about a Lyme disease vaccine?
LYMErix, a Lyme disease vaccine licensed by the FDA in 1998, was voluntarily withdrawn by GlaxoSmithKline (GSK, formerly SmithKline Beecham) in 2001. LYMErix was given to people in three doses and was found to be about 80 percent effective in preventing Lyme disease. Not long after its release, reports of adverse reactions surfaced and a class action lawsuit was brought by over a hundred people who claimed they had experienced adverse reactions to the vaccine. Although studies conducted by the FDA failed to reveal that any reported adverse events were vaccine-associated, GSK discontinued manufacturing the vaccine due to "low public demand." Research on Lyme disease and vaccines is also approaching the problem from new angles:

- oral "bait" vaccines to prevent mice from becoming infected
- targeting proteins in tick saliva that are critical for disease transmission
- "anti-tick vaccine" to block tick proteins that enhance survival of Lyme bacteria in vertebrate hosts

What about preventing tick exposure indoors in the workplace?
Checking for signs of mice and their droppings is helpful. A black light can be used to check for rodent urine in and around the building, also to find places where mice are entering the

building. Seal pipe chases to prevent mice moving through the building. Prevent their entrance with better door seals, by repairing screens on air intakes and exhausts, by preventing access to food or water, or by using traps. Store food in solid containers such as glass, plastic, or metal, rather than plastic bags or cardboard – mice chew through those. Repair water leaks and condensation as these provide drinking water for mice. Humane trap designs using tunnel-shaped containers with trap doors can work very well.