

# Ticks

## Introduction

- ❑ Bear attacks are extremely rare, snake bites and spider bites are relatively rare... ticks and their associated problems are downright ubiquitous on the AT.
- ❑ Every thru-hiker will confront the swarms in Maryland, Pennsylvania, and Connecticut, especially if they are NOBOs hiking in these areas during the summer (as tends to happen).
- ❑ Ticks are not only present in these states, however, and growing scientific evidence is suggesting that tick species once thought to be endemic to only the Northeast are moving out across much of the United States, which is a problem because of a general lack of knowledge concerning tick-borne diseases on the part of both the afflicted and medical authorities.
  - ❑ While this is tangential to the topic at hand, it is both interesting and sobering. A (pseudo)documentary was made about (purported) sufferers of Lyme disease from states not generally thought to have black-legged ticks, the carriers of Lyme. I do not take a side on the debate in my covering of Lyme, but be warned that [the documentary](#) is not very complimentary of big pharma and medical politics (it is a somewhat slanted presentation). Parts are rather disturbing; this is not for the faint of heart.
  - ❑ If you have the time, the documentary will serve to introduce to you the reason why ticks are problematic on the AT: the bacteria that they carry. If you are really interested, you can read the full text of [this](#) article. The article is much less biased than the documentary, in my opinion.

## Black-Legged Ticks

- ❑ Deer ticks (aka black-legged ticks, formally *Ixodes scapularis*) are the best known vectors (transmitters) of Lyme disease, though *Ixodes pacificus*, the west coast counterparts, also carry the disease (as do several other similar *Ixodes* species other places in the world). You'll be dealing with the first species on the AT.<sup>1</sup>
- ❑ These ticks can transmit things other than Lyme disease, such as babesiosis, human anaplasmosis, and human granulocytic ehrlichiosis (HGE), but it is most certainly Lyme that gives them their infamy.<sup>1,2</sup>
  - ❑ Vector-borne pathogens are not mutually exclusive (you can be infected by multiple things simultaneously). Coinfections complicate treatment immensely and can make diagnosis difficult since symptoms can interfere with each other.<sup>3</sup>
- ❑ Black-legged ticks go through three distinct life stages, and feed only three times over the course of their existence (two times for males— male adults feed sparingly, if at all). Because source 2 is academically referenced (i.e., is published by a university and backed

by research) and does a very good job of explaining the tick life cycle, the content under this heading is a paraphrase of said source. It can be found [here](#) if you would like to see the original content (the URL is also included in its citation under “references”).

- ❑ In June and July, eggs deposited earlier in the spring hatch into miniscule six-legged larvae. Larval activity peaks in August, when larvae attach and feed on a wide variety of mammals and birds, primarily on white-footed mice (*Peromyscus leucopus*). These mice, along with other small mammals, provide the “reservoir” from which ticks acquire Lyme disease (i.e., larvae do **NOT** possess the spirochete bacterium that causes Lyme upon hatching).
- ❑ After feeding for three to five days, the larvae, now engorged with blood, drop from the host to the ground where they remain for the duration of the winter.
- ❑ In May, larvae molt into nymphs, which feed on a variety of hosts for three to four days. Hosts for nymphs can be much larger than those for larvae, meaning that this is the first stage at which a tick becomes dangerous to humans.
- ❑ Because the larvae had the possibility of feeding on infected hosts before they molted, **BLACK-LEGGED TICK NYMPHS CAN BE CARRIERS OF LYME DISEASE**. If the nymphs are not already infected, they can also acquire Lyme from the feeding between nymphal and adult, meaning that the adults would be transmitters.
- ❑ After feeding on their host, blood-engorged nymphs detach and drop to the forest floor where they molt into the adult stage, which becomes active in October.
- ❑ Adult ticks remain active through the winter on days when the ground and ambient temperatures are above freezing. Adult female ticks feed for five to seven days while the male tick, as previously mentioned, does not really feed at all.
- ❑ Adult ticks feed on large mammals, primarily upon white-tailed deer (*Odocoileus virginianus*). Beginning in May, engorged adult females typically lay between 1000 to 3000 eggs on the forest floor at the site where they detached from their hosts. The cycle then repeats itself.
- ❑ Something important to note is that the ticks do **NOT** jump, fly, or tactically fall out of trees to attach to their hosts. The most advanced movement (and cognition) they are capable of is crawling up vegetation off of the ground.<sup>4</sup> Ticks primarily get on us humans when we brush against tall grasses or other plants. Ticks on higher parts of the body did not come from above, rather, they got on your clothing and crawled up until they reached skin.
- ❑ As follows from common sense, there are more adult ticks infected with Lyme than nymphal ticks because they have had a second stage to feed on possibly infected hosts. However, **THERE ARE STILL NYMPHAL TICKS THAT ARE INFECTED**. You will understand why the emphasis is necessary shortly.

## Transmittance of Diseases

- ❑ Transmittance of pathogens from ticks to humans occurs during the feeding process. Black-legged ticks, if left undisturbed, will feed for as long as 5 days.<sup>4</sup> Most of the time, at least for us humans, we notice the tick before then.
- ❑ If the black-legged tick is infected, it must be attached for 24-48 hours before it transmits Lyme disease, and at least 12-24 hours to transmit human anaplasmosis.<sup>4</sup>
  - ❑ This means that the tick does not have to be attached for **any more than a day** for you to become infected with pathogens.
- ❑ Human exposure to black-legged ticks is greatest during the summer months when high nymphal activity and human outdoor activity coincide. Their small size, their vastly greater abundance over the adult stages, and the difficulty in recognizing their bites make nymphs the most important stage to consider for reducing transmittance of vector born diseases.<sup>2</sup>
- ❑ While nymphs are somewhat dangerous because of their relative prevalence, it is the ability to go unnoticed that makes them so problematic for hikers. It wouldn't matter how many of them were on us if we actually noticed they were on us— we would pull them off long before a day had passed.
- ❑ As it is though, nymphal black-legged ticks **are only about the size of the head of a needle or a poppy seed**.<sup>4</sup> Pictures are presented below to help illustrate this visually.
- ❑ Adult ticks are usually noticed despite the fact that we often cannot feel the bite; ticks secrete painkillers called kininases in their saliva when feeding that numb the bite area.<sup>5</sup> Adult ticks, though still small, are large enough that we catch them more often than not before a critical time has been reached.



Image 1:  
Black-Legged  
Tick Nymph



Image 2:  
Black-Legged  
Tick Size  
Comparison

### **Pathogenicity of *Borrelia burgdorferi***

- ❑ While black-legged ticks do transmit diseases other than Lyme, Lyme will be the main focus because it is both the most common and the most dangerous. According to the CDC, the number of reported cases of Lyme yearly is 30,000, while the CDC's official estimate is closer to 300,000; that is far more than more publicized diseases such as HIV/AIDS.<sup>6</sup>
- ❑ Unlike bears, snakes, et al. that have the potential to kill, Lyme disease is rarely if ever fatal (unless complications arise). Instead, if untreated for a long period, it can leave you crippled for the rest of your life, with potentially permanent neuropathy, arthritis, seizures, and a whole slew of other effects. The faster Lyme is treated, the fewer symptoms you are likely to have. If you catch it promptly, the really nasty ones can be avoided altogether.
- ❑ Lyme is caused by *Borrelia burgdorferi*, a spirochete bacterium that is the not so distant cousin of the bacterium that causes Syphilis. The implications of this relationship shall be explored after more general symptoms are explained.
- ❑ Symptoms of "early stage" Lyme include fever, headache, stiff joints, fatigue, and a characteristic "bull's-eye" rash, known to medical community as erythema migrans (or EM).<sup>7</sup>
  - ❑ The unfortunate thing for thru-hikers is that all of the symptoms of early Lyme happen to also be symptoms common to long distance hiking, and the "characteristic" rash is absent in approximately 20% of cases.<sup>8</sup> You can have Lyme without ever having the rash.
  - ❑ If a thru-hiker stopped for blood tests every time joint-pain or fatigue was experienced, they would never make it 2200+ miles, much less several hundred. What this means is that Lyme disease can progress much farther for thru-hikers than it would for an ordinary person because thru-hikers tend to be macho and chalk up their symptoms to trail life instead of a disease..
  - ❑ Treatment can thus become more complicated as the bacteria count gets out of control and as more severe symptoms (described below) manifest themselves. By the time hikers realize they are actually sick with Lyme instead of just tired and achy from walking 20 miles a day, permanent effects may have already set in and antibiotics may not actually knock out the disease as easily as the CDC and NIH say they will.
- ❑ If left untreated, Lyme progresses to "late stage" and symptoms can increase in severity, including permanent damage to the joints, the central nervous system, and the heart. Death is uncommon, but symptoms can be extremely debilitating.

- ❑ Late stage arthritic consequences normally show themselves as chronic joint pain and swelling, similar to the manifestations of rheumatoid arthritis.<sup>7</sup>
- ❑ Late stage deleterious consequences in the nervous system include meningitis (inflammation of the layers lining the brain), encephalitis (inflammation of the brain itself), facial palsy (paralysis of some or all of the face, sometimes accompanied by involuntary tremors), and radiculoneuritis (inflammation of sensory nerves).<sup>8</sup>
- ❑ Cardiac effects in late stages of the disease, though rarer, are still quite potent. They include: atrioventricular block (a barrier in communication between the atria and ventricles of the heart), myopericarditis (inflammation of the tissues surrounding the heart), or cardiomegaly (inflammation of the heart itself).<sup>8</sup>
- ❑ An astute observer will note that the symptoms of late Lyme coincide closely with the symptoms of progressed Syphilis. If you recall from earlier, when I briefly mentioned it, the *Borrelia burgdorferi* bacterium is a spirochete and related to the bacterium that causes Syphilis. It is this shared helical “spiral” structure that enables these diseases to manifest themselves in so many systems of the body (nervous, muscular/skeletal, circulatory, etc.). The CDC maintains that Lyme is not transmittable sexually, but a [recent study](#) cast some doubt on that (relatively unsubstantiated) assertion.
- ❑ Speaking of casting doubts on medical authorities, the documentary from the introduction is half fear-mongering and half truth. The scientific community does not know the full pathogenesis of Lyme, and much is still not understood (namely, why 10%-20% of people treated for Lyme have chronic symptoms that persist after the disease is “cured”, see [here](#)).
- ❑ There **IS** a problem of doctors believing that Lyme is always treatable by a three week stint of antibiotics. There are patients who are sent to psychologists and psychiatrists because they are told “it is not possible, it is all in your head.” The current “strict” definition and (somewhat) high probabilities of errors on blood tests can sometimes make it difficult for people with Lyme to actually get diagnosed if the doctor has no experience with the disease.
- ❑ There **IS NOT** evidence that alternative medicine and novel treatments are effective or even safe. Positive outcomes from even the most useless treatment could be caused by the placebo effect or any number of other confounding variables. The plurality of anecdote is still anecdote, not scientific evidence.
- ❑ The issue of “chronic Lyme” (what the CDC calls “Post-Treatment Lyme Disease Syndrome”, or PTLDS) is quite a hot topic among medical circles. Because there is no scientific consensus, I tried to stay ambivalent on the topic and present both sides in a neutral light.



Image 3:  
Erythema Migrans  
or "The Bull's-Eye  
Rash"

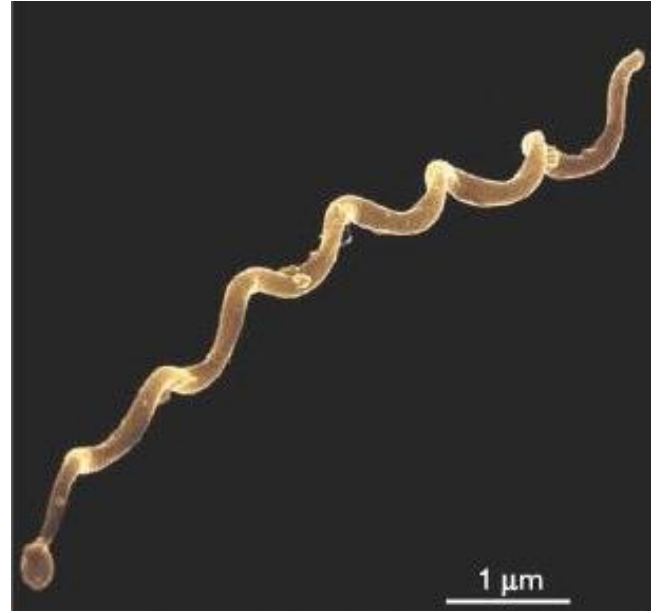


Image 4:  
*Borrelia  
burgdorferi*  
Bacterium

### Preventative Measures and Removal

- ❑ There are four different things that can help prevent the transmittance of Lyme disease: your choices (of clothing, of behavior, etc.), bug repellent, tick checks, and antibiotics. All will be covered in somewhat condensed specificity.
  - ❑ As with most things in life, there are good decisions, and there are bad decisions. Heading out into the brush with bare legs and a nonchalant attitude is a bad decision. Brushing up against every stalk of grass when you are out there is an even worse decision.
    - ❑ Avoid high grass and bushy areas as much as possible. If you recall, ticks do not sneakily ambush you from trees, they only get on you if you touch them first. Do not be so paranoid as to scream every time a shrub touches you, but try to stay on the white blazed trail and avoid unnecessary trips through what is obviously tick-infested vegetation.<sup>9</sup>
    - ❑ Wear long pants and long-sleeved shirts to minimize skin exposure to ticks. Tuck your pants into your socks to form a barrier to keep ticks out.



Wear light-colored clothing so that you can easily see ticks on your clothing and knock them off before they reach skin.<sup>9</sup>

- ❑ Bug repellent comes in two forms on the trail: skin-applied and clothes-applied.
  - ❑ The repellent used on clothes is called permethrin, and it hails from the pyrethroid class of pesticides.
  - ❑ Some people have concerns about its safety, but large national studies have not showed it to be dangerous. The EPA has approved it, and writes about it [here](#).
  - ❑ Permethrin is applied to clothes and gear (it should **NOT** be applied directly to skin) and will kill ticks and mosquitoes that come into contact with it. It is a fairly potent chemical, and will dissolve any thermoplastics that it touches—care should be taken around water bottles and any synthetic tents.
  - ❑ The repellent used directly on the skin is N,N-diethyl-meta-toluamide, more commonly known as DEET.
  - ❑ Just like permethrin, some people are fearful of safety factors. Also just like permethrin, the EPA approves its use and writes about it [here](#).
  - ❑ While permethrin actually kills the bugs that come into contact with it, DEET just repels bugs. The exact mechanism for repulsion is still somewhat contested in scientific circles.
  - ❑ By applying permethrin to your clothes and DEET to any uncovered skin, you make yourself a much harder target for the ticks that get on you. Don't get complacent though: you still ought to do tick checks at least once a day.<sup>9</sup>
- ❑ Tick checks are mandatory if you are anywhere north of Virginia (i.e., in the Northeast), but it doesn't hurt to start earlier than that. Other species of tick (the dog tick, e.g.) are endemic to lower regions of the trail and can carry diseases separate from the ones already mentioned. They are much bigger however, so if you go into black-legged country cucky because you can find the enormous dog tick adults, kick the conceit.
  - ❑ As was talked about, black-legged nymphs are **TINY**. Anything that looks like a spot of dirt or new freckle should be checked closely. Also keep an eye out for the bigger adults, but don't worry quite as much about them as they're easier to spot.
  - ❑ Give up any notions of retaining complete self-dignity if you want to be as safe as possible. If you are in a group, have other members check locations that are harder to see (back of your neck, lower back) and do the same for them. It is worth giving up a little privacy to avoid Lyme.

- ❑ Make a daily tick check a ritual just as ingrained as brushing your teeth. No exceptions; no ands, ors, or buts. Proper clothing/behavior and proper use of repellents will significantly decrease your chances of acquiring some unwanted passengers, but I am willing to bet money that a couple will get through despite your best efforts. 5 minutes every night for a couple of months, or possibly permanent health consequences... hard choice.
- ❑ Non-prescription antibiotics as a group compose a dark horse treatment of sorts: nobody “knows” about them since possession of them is not technically legal, but they have a 100% success rate.
  - ❑ Doctors don’t just hand out prescriptions to broad spectrum antibiotics (e.g., doxycycline, amoxicillin) without a good excuse. If you want to carry antibiotics as a precaution, most of the time you are either using an outdated refill or antibiotics that are not officially prescribed to you.
  - ❑ Doxycycline is used commonly in 3 situations: urinary tract infections, acne, and malaria prevention. While the exact same logic is used to obtain it for malaria (“I’m going somewhere where I have the distinct possibility of contracting a serious illness”), doctors will not prescribe you medication because you are afraid of getting Lyme on the trail (which seems arbitrary and stupid to me, but I digress).
  - ❑ I am not advocating you do illegal things. I am not saying all doctors won’t give you antibiotics if you explain your motivation. All I am saying is that antibiotics are a 100% effective way to prevent yourself from getting Lyme without relying on a doctor you don’t know and blood tests that can toss out random false negatives. It is a possibility for people who want complete assurance of their health.
  - ❑ If you are really interested, see [here](#). I believe that good sense and the following of other preventative methods render Lyme a small threat if you are responsible (as in, I would not personally do this). Partake at your own risk of prosecution.
- ❑ Removing black-legged ticks is fairly simple.
  - ❑ Use fine-tipped tweezers and firmly grasp the tick close to the skin. Avoid touching the tick with your bare hands.<sup>9</sup>
  - ❑ With a steady motion, pull straight up until all parts of the tick are removed. Do not twist or jerk the tick. Do not be alarmed if the tick’s mouthparts stay in the skin. Once the mouthparts are removed from the rest of the tick, it can no longer transmit the Lyme disease bacteria.<sup>9</sup>
  - ❑ After removing the tick, you should wash the area with soap and water and keep an eye on it to make sure no rash appears.



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