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Lyme Disease

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Ahhh, summertime. Lightning bugs and lemonade with a twist of Lyme: What all outdoorsy Texans should know about Lyme disease…

You may have heard that Lyme disease is not an issue for Texans. I think a lot of people have been told this, maybe by a medical doctor. A Texas doctor once told me that Lyme disease only lasts a few days: you would get a rash if you contracted it, and that once you have had an antibiotic the Lyme is gone. A young woman who had recently worked with the state health department in zoonoses research told me that we can't have Lyme in Texas because we don't have *blacklegged ticks* (*Ixodes scapularis*), also called deer ticks, in Texas.

As a Lyme sufferer for almost four decades I've educated myself about it as much as possible, and I want you to understand that all of the above is incorrect. First, we definitely have blacklegged ticks in Texas. Their present range covers roughly the eastern half of the state, and they do carry Lyme. In 2014, Dr. Teresa P. Feria-Arroyo of University of Texas-Pan American and her colleagues published results of a study in which they collected ticks from Texas and northern Mexico and tested them for a variety of pathogens. Of the blacklegged ticks they collected from Texas, 45 percent tested positive for the agent that causes Lyme disease. This confirms what many Texans have already discovered – it's easier to contract Lyme in Texas than most people realize.

Blacklegged Tick Life cycle

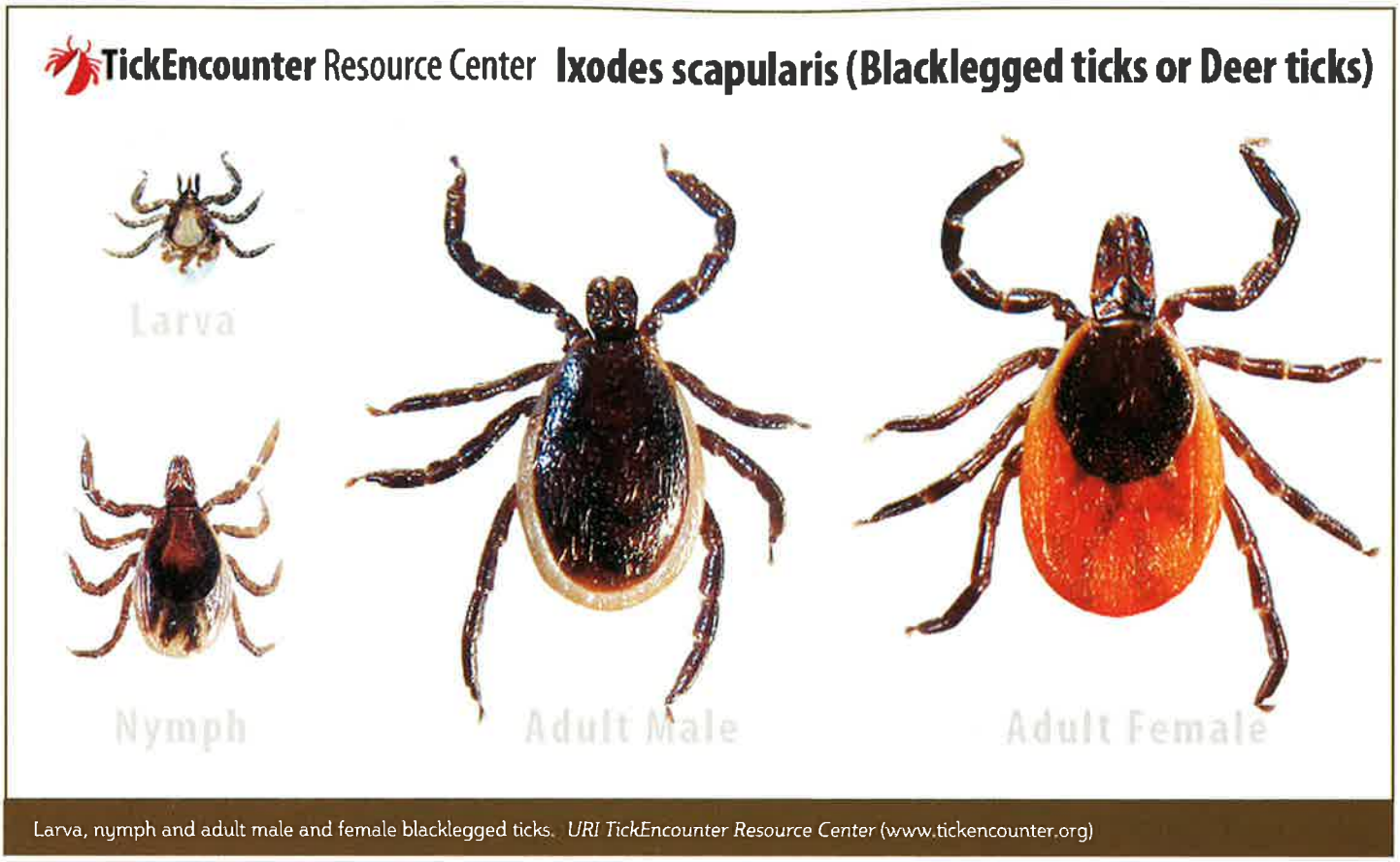
Lyme disease is caused by a spirochete named *Borrelia burgdorferi*, which is carried by blacklegged ticks if they have had a blood meal from an infected animal. According to the CDC the blacklegged tick life-cycle lasts roughly two years and has four stages (www.cdc.gov/lyme/transmission/index.html). The first stage is the egg, which hatches during spring or summer into a six-legged larva about the size of the period at the end of this sentence. Larvae aren't very mobile, and they must have a blood meal in order to grow and molt into an 8-legged nymph. Their preferred hosts are small mammals or birds. After molting, the blacklegged tick nymph is about the size of a poppy seed, and it may feed on one of a number of animals, including humans. If a nymph tick had received a pathogen during its larval feeding it may pass it on to its host during this feeding. Many Lyme patients were likely infected by nymphs because they are so small they may not be seen right away or even at all. After the nymph has a blood meal it will lie dormant until the next spring when it must feed again to grow and molt into an adult. Adults are about the size of a sesame seed with females being larger and redder than the darker males. An adult female must have another blood meal before laying her eggs. While an adult male may also attach himself to a host to find a mate, he won't feed or transmit Lyme. In this life cycle if an adult feeds on you she has had two previous hosts from which she could have received *B. burgdorferi* spirochetes to pass on to you.

What is a Spirochete?

I'll bet you remember something called a spirochete from high school biology. Simply put, it's a bacteria shaped like a corkscrew. But to describe *B. burgdorferi* simply as a spirochete is, well, too simple. I am increasingly impressed by the tenacity of this organism the more I learn about it. It has the ability to hide from your immune system in ways that are currently not well understood, making it difficult to get rid of once it has become established. Dr. Maria Esteve-Gassent of the College of Veterinary Medicine and Biomedical Sciences at Texas A&M University reports that *B. burgdorferi* changes its outer-surface proteins to match that of your own and migrates to organs with decreased vascularization to evade detection by your immune system. According to a recent book titled, "Why can't I get better?" by Lyme expert, Dr. Richard Horowitz, the spirochete can easily drill into and live inside your own cells to evade detection, and even form cysts of dormant spirochetes which allow it to persist during antibiotic treatments. Those dormant cells can then be called into active duty when the host environment is more favorable. Finally, a recent study indicated that *B. burgdorferi* may form biofilms which also allow it to evade immune system and antibiotic attacks.

Is Lyme Becoming More Prevalent?

In 2013 the CDC revised its estimate of



Larva, nymph and adult male and female blacklegged ticks. *URI TickEncounter Resource Center* (www.tickencounter.org)

the number of cases of Lyme diagnosed each year in the United States. Based on results of three studies the CDC estimated the actual number of Lyme cases diagnosed each year is 300,000 – fully 10 times higher than their previous estimate based on what is reported to them. In 2010-2011 Texas reported 216 cases. Given the CDC admission that the true number is likely 10 times greater than what is reported, we may assume that possibly more than 1,000 Texans are diagnosed yearly with this disease.

Lyme disease was only first identified in the U.S. in 1975, but it has likely been around in wooded areas of North America for centuries. Spirochete cells in the *Borrelia* genus were discovered in a 5,300 year old ice mummy in the Alps and even in fossilized ticks preserved in amber at least 15 million years ago in the Dominican Republic. If Lyme has been around for so long, why does it now seem more common? Has something changed in its habitat allowing it to spread at a rapid rate? I have a theory on this.

We know that American Indians used fire to keep the woods free of fleas, ticks and other pests. They were just like us except they lived in wild areas without our modern exterminating tools. There is little debate that they used the tools at their disposal to rid their villages and surrounding areas of pests. Fire may have been the most useful tool they had for managing the landscape, and the extreme heat of a wild or prescribed fire can kill a tick in any stage. In eastern Texas, the longleaf pine forests may have burned as frequently as every one to three years, and loblolly pine forests as often as five to 10 years. Grasslands of Texas are believed to have burned every five to fifteen years before European settlement. These frequent landscape fires would have served to keep tick populations down in general, and they would have kept local populations of ticks and small mammals isolated from each other. But landscape-scale fire doesn't fit well with our current lifestyle. For the past 200 years or more in the eastern part of the U.S. we have worked to remove fire from the landscape, preventing wildfires and suppressing those that are started. This lack of fire at a grand scale has created a feedback loop in eastern ecosystems termed "mesophication." As fire-prone, flammable vegetation has been replaced by vegetation that is neither dependent on fire nor adapted to it, ecosystems have become wetter and consequently less flammable, in a self-propelling cycle. With this mesophication has come many other changes as well; insect and wildlife species which were not favored by fire now thrive in its absence. My theory is that tick species are among those that have benefitted from lack of fire. I believe they have become more prevalent throughout their native ranges, possibly also expanded their ranges, and without fire periodically wiping out large portions of their populations they have been able to spread Lyme and other diseases uninhibited by this once-common barrier.

Protect Yourself From Ticks

Prevention and early treatment are the keys to dealing with all tick-borne pathogens. We've all heard about wearing long pants with long-sleeved shirts tucked into pants and applying DEET to clothing. We also need to shower and check for ticks

Borrelia burgdorferi in culture; green spirochetes are alive, red is dead.
Photo by Maria Esteve-Gassent using LIVE/DEAD® BacLight Bacterial Viability Kit by Life Technologies

immediately after coming in from outdoors because the chances of contracting Lyme or other tick-borne illnesses increase the longer a tick is attached. Be sure to scrub your skin with a loofah or pumice stone in the shower to remove nymphs that you may not see. Also, nymphal ticks will often be at your boot level: when working outside use duck tape to secure the bottom of your pants to your boots, wrapping the tape completely around the hem of the pant. This will prevent ticks from climbing up the inside of your pants where they won't be easily seen. There are also tick "gators" that can be worn around the bottom of your pant legs to do the same thing. If you don't plan on washing and machine drying your clothing upon coming inside, at least toss your clothes into the dryer on high heat for 15 minutes. Ticks are highly susceptible to desiccation, and this will kill any ticks that may be on your clothing. Treating your yard for ticks is an option, but perhaps the best option is to keep your lawn neat and avoid having areas that may attract small mammals and ticks. Lastly, make sure your dogs and cats are treated regularly with products that kill fleas and ticks.

What if You Get a Tick Bite?

According to the Lyme Disease Association if you find an embedded tick you need to remove it immediately by forcibly pulling it out, preferably with a pair of tweezers placed as close to your skin as possible. Any procedure that might cause the tick to let go on its own might also cause it to expel pathogens into your body in the attempt to let go.

Always request an antibiotic from your doctor right away. This may seem ill-advised in a social climate in which antibiotics are generally overused, but this is a very important preventative step. Lyme may be prevented with a two to four-week course of antibiotics started in the first few days to weeks after the tick bite. However, if you don't receive an antibiotic right away you face a lifetime of health issues that currently are best treated with multiple antibiotics and antimalarials for long periods of time – possibly a year or more. In a recent study of health-related quality of life chronic Lyme patients reported lower quality of life than patients with congestive heart failure, diabetes or arthritis. Your doctor may ask if you had a bulls-eye rash or flu-like symptoms, and may be reluctant to prescribe an antibiotic otherwise. However, various reports indicate only 50 to 70 percent of Lyme patients noticed a bulls-eye rash at the sight of the bite.

My advice is to be persistent with your health care provider, and insist on preventive care. Pay particular attention to "flu-like" symptoms of fever, headache and fatigue when no one around you is sick, especially during summer months.

As a teenager and young adult I suffered almost daily headaches beginning at age 14. They evolved to become so intense, involving my neck, jaw and teeth, that by the age of 28 I found myself in an oral surgeon's office begging him to remove all my teeth. It was an act of desperation, but I thought that at least my teeth couldn't hurt anymore. The surgeon refused, and I left his office disappointed, just as I had left countless doctors' offices in the previous years. It wasn't until many years later when I began reading about Lyme symptoms on my own that I began to suspect it as the cause of my headaches and many other health problems. Luckily I found a doctor who was well-versed in Lyme and able to properly test for and diagnose my problem using both my history of symptoms and CDC standards of ELISA and immunoblot testing. After years of chronic, unexplained headaches, muscle and joint pain, and a variety of other issues, I was treated for 12 months with three to four drugs at a time. Each month the drugs rotated, always including two to three antibiotics and an anti-malarial drug to combat Lyme in its various forms. It was a long and uncomfortable year, but my pain and other problems slowly began to fade.

The Future

We're learning more about Lyme disease and ticks in Texas every day. According to Dr. Feria-Arroyo, climate predictions indicate that favorable conditions will likely persist and even favor blacklegged tick habitat and distribution in Texas well into the future. Right now the most important thing we can do is to educate ourselves

Early Symptoms
Bulls-eye rash at site of bite
Feeling flu-like: fever, sore throat, swollen glands, headache, fatigue
Late Symptoms
Rash not at the bite site
Chills, night sweats, swollen glands, extreme fatigue
Chronic headaches, meningitis, Bell's palsy, pain in the back, neck and jaw
Joint and muscle pain or weakness in the limbs that may move from site to site
Sleep problems, depression, anxiety, OCD, white-matter lesions in brain
Twitching of eyelid or facial muscles, blurry vision, tinnitus, sensitivity to light or sound
Short-term memory problems, difficulty concentrating, disorientation, getting lost
Chest pain, heart skipping beats, heart block, murmur, valve prolapse
Switching words or letters when speaking, saying the wrong word, searching for words

Common symptoms of Lyme disease. For an exhaustive list see the Lyme Disease Association at www.lymediseaseassociation.org.

about how to reduce the chances of contracting tick-borne illnesses, and what to ask for from doctors when we are bitten by ticks. My doctor says I will never be Lyme-free, and I periodically have to repeat the long-term treatments. But, treatment does help. It may sound extreme to be on antibiotics for prolonged periods, but the quality of life that this course of action provides has made all the difference to me: most days I can get out of bed in the morning and do what I need to do at work and what I want to do with my family – it's a fair trade. I sometimes wonder, though, how different my life may have been had I gotten an antibiotic when I was first infected by *B. burgdorferi* so many years ago. My hope in writing this article is that I can prevent those who read it from ever wondering the same thing.

Don't Flush Your Tick!

Dr. Esteve-Gassent would like to have your tick even if it's not a blacklegged tick. Her lab can check the tick, not only for Lyme, but also for other tick borne illnesses such as *Ehrlichia, Anaplasma*, and relapsing fever *Borrelia* species. Using tweezers to hold the tick, place it in a zip lock bag with a cotton ball wet with rubbing alcohol. Wrap all that in a paper towel and ship it to her at the address below. Place each tick in a separate baggie with the date and location (county or zip code) it was found and what type of host it was on or on vegetation.

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