

Facts about Wildlife Diseases: South Tick Associated Rash Illness or “STARI”¹

Katherine Saylor, Carisa Boyce, and Samantha Wisely²

What is STARI?

Southern tick-associated rash illness, or “STARI,” is a human tick-borne disease that occurs following the bite of the lone star tick. STARI is also referred to as Masters’ disease, in memoriam of Dr. Edwin Masters, the Missouri physician who first recognized the disease in his patients. STARI is often described as a “Lyme-like illness” due to the red expanding rash called *erythema migrans* (EM) or the “bull’s eye rash” that occurs after a tick bite. Other symptoms of STARI that are similar to symptoms of Lyme disease include headache, fatigue, and muscle and joint pain (CDC 2015). The tick vector of STARI is known, and scientists know that some wildlife species play a role in maintaining the disease in nature, but very little else is understood about the natural history of this mysterious illness.

What causes STARI?

STARI is associated with the bite of *Amblyomma americanum*, the lone star tick. The lone star tick is the most common and aggressive human biting tick in the South and accounts for over 90% of human tick bites in the region (Stromdahl et al. 2015). Currently, the bacteria that causes STARI infection in people is unknown (Masters et al. 2008; Vaughn et al. 2010). This mystery is a subject of ongoing research and conversation among researchers, physicians, and the general public. Besides the fact that the disease is spread by the lone star tick, we know very little about

STARI. We do not know the pathogen or entity responsible for making people sick, and the natural history of STARI remains enigmatic (Vaughan et al. 2010).



Figure 1. EM-like lesions caused by STARI.
 Credits: CDC 2015. <http://www.cdc.gov/stari/symptoms/index.html>

1. This document is WEC376, one of a series of the Department of Wildlife Ecology and Conservation, UF/IFAS Extension. Original publication date August 2016. Visit the EDIS website at <http://edis.ifas.ufl.edu>.
2. Katherine Saylor, biological scientist III; Carisa Boyce, biological scientist I; and Samantha Wisely, associate professor, Department of Wildlife Ecology and Conservation; UF/IFAS Extension, Gainesville, FL 32611.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For more information on obtaining other UF/IFAS Extension publications, contact your county’s UF/IFAS Extension office.

U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A & M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Nick T. Place, dean for UF/IFAS Extension.



Figure 2. *Amblyomma americanum* or lone star tick adult female (upper left), adult male (upper right) and one of the immature stages (lower middle). The white dot on the back of the adult female gives it the name lone star tick.

Credits: Katherine Saylor

How is STARI different from Lyme disease?

In the United States, known tick **vectors** of Lyme disease are *Ixodes scapularis*, or the black-legged tick (aka the deer tick), in the east and *Ixodes pacificus*, or the western black legged tick, in the west. Lyme disease is caused by infection with *Borrelia burgdorferi*, and other closely related *Borrelia*, which are corkscrew-like bacteria called **spirochetes**. Symptoms of STARI are similar to Lyme disease, but STARI has a milder outcome than does Lyme disease. STARI patients generally respond more rapidly to antibiotic treatment than Lyme disease patients. Finally, the vectors of the two diseases differ: the lone star tick does not spread Lyme disease, and the black legged tick does not transmit STARI (Oliver et al. 2013).



Figure 3. Male *Ixodes scapularis* tick.

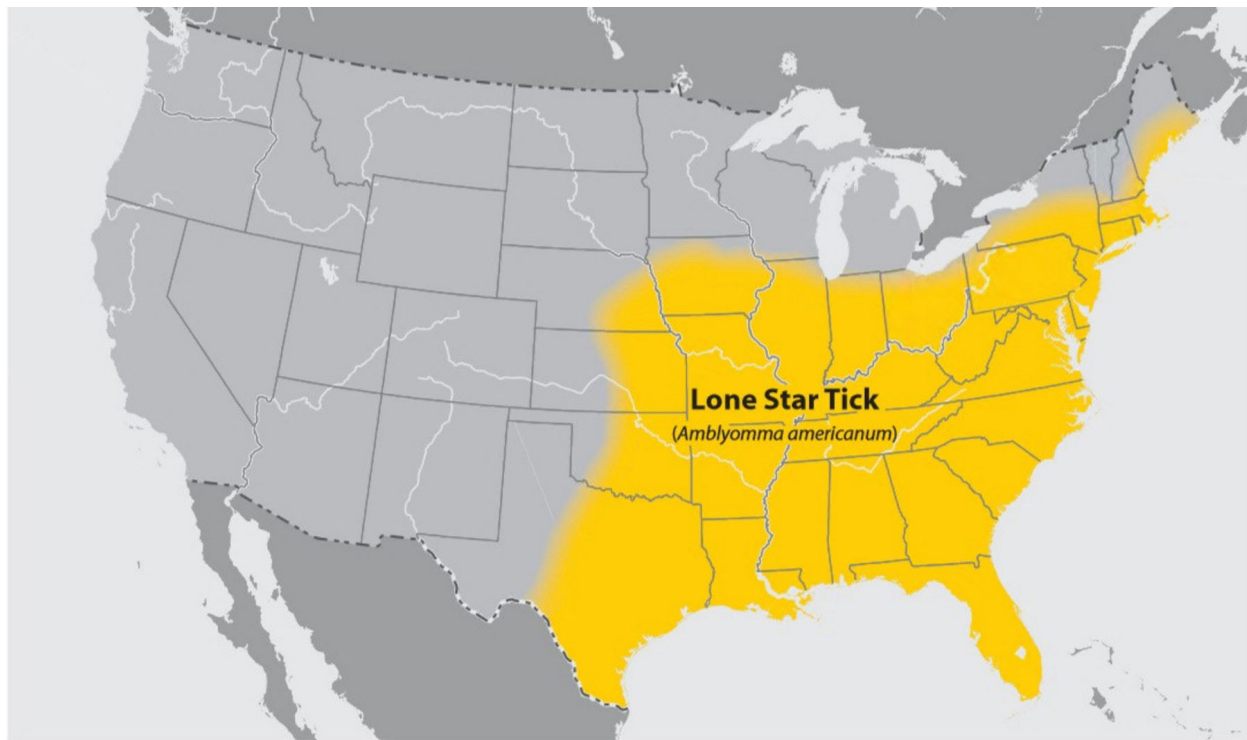
Credits: Katherine Saylor

The geographic distributions of these two diseases are also different: Lyme disease is primarily reported in the Northeast and mid-Atlantic, and in the north central United States, primarily Minnesota and Wisconsin, with some cases occurring along the West Coast. STARI occurs predominantly in the southeastern United States. However, the geographic distribution of lone star ticks is expanding both north and west, along with white-tailed deer, which are an important source of blood for adult and immature lone star ticks (Paddock and Yabsley 2007; Goddard and Varela-Stokes 2008). The expansion of the lone star tick has the potential to make diagnosis for Lyme or STARI more difficult in areas where both tick vectors overlap.

What should I do if I get bitten by a tick?

Remove the tick as soon as possible using fine-tipped tweezers by gently grasping the tick close to the skin's surface and steadily pulling outward with even pressure. Do not squeeze the body of the tick and never jerk or twist the attached tick, because jerking and twisting can cause the body of the tick to separate and leave the mouth-parts embedded in the skin. Pulling the tick out with your finger nails is difficult and might cause you to crush the tick, so the use of tweezers for tick removal is recommended. If you are unable to remove mouth-parts of the tick, leave it alone and allow the skin to heal. Never use "folklore" methods for removing an attached tick, such as applying nail polish or petroleum jelly to "suffocate" the tick, or burning the tick in an attempt to force it to detach (CDC 2015, Colville and Berryhill 2007).

Once the tick is removed, thoroughly clean the area of the bite with soap and water, rubbing alcohol, or iodine. Save the tick for identification by an expert by placing it in a sealed container in the freezer (a re-sealable baggie works well), or directly store the tick in a vial with rubbing alcohol. Monitor yourself for rash development around the site of the tick bite. Usually, a rash will appear within 7 days. If you start to feel any additional symptoms (fatigue, headache, fever, and muscle and joint pain), see your physician and tell them you were bitten by a tick. Currently, there are no diagnostic tests available specifically for STARI because the causative pathogen, or bacterium responsible for STARI, is unknown. Identification of the tick, along with recognition of signs and symptoms, may help your physician in determination of a diagnosis.



ABOUT THIS MAP: This map shows the extent of established *Amblyomma americanum* tick populations, commonly known as lone star ticks. However, tick abundance within this area varies locally. The map does not represent the risk of contracting any specific tickborne illness. Please consult your local health department or USDA Cooperative Extension office to learn about the risks of tickborne disease in your local area. Rev. 07/2011.

National Center for Emerging and Zoonotic Infectious Diseases
Division of Vector-Borne Diseases



Figure 4. Geographic distribution of lone star ticks.

Credits: CDC 2015. http://www.cdc.gov/ticks/geographic_distribution.html

What can I do to prevent a tick bite?

Avoid densely wooded, brushy areas, as well as high grass and leaf litter. Wear appropriate clothing for protection (i.e. long pants, long sleeves, socks with pant hems tucked inside, and light-colored clothing to easily spot ticks) when working or playing in these areas. Insect repellent-treated clothing is available for purchase and products that contain 0.5% permethrin are available for application directly onto clothing and outdoor gear (e.g. boots, tents). Be sure to follow the directions on the product label and allow these items to dry completely before use. Apply preventative products (acaricides) to your pets to protect you and your family from tick bites. There are many options for protecting pets against ticks including topical treatments, sprays, dusts, or collars. Dogs are particularly susceptible to tick bites, putting them at risk for a variety of tick-borne diseases, which can also be acquired by people (e.g., Lyme disease, rickettsiosis, and ehrlichiosis). Check yourself and your pets regularly for ticks, and remove ticks from your clothing or skin as soon as possible (CDC 2015, Colville and Berryhill 2007).

Glossary

Erythema migrans (EM) lesions are red, expanding rashes that occur following the bite of a tick. The term is from New Latin and means “migrating redness.”

Vectors are organisms (usually biting insects and ticks) that transmit pathogens from one animal to another.

Spirochetes are flexible, spiral-shaped or coiled bacteria. There are a variety of genera, including *Borrelia*, the causative pathogen of Lyme disease, and *Treponema*, the causative pathogen of syphilis.

References

Centers for Disease Control and Prevention. “Southern Tick-Associated Rash Illness.” Accessed July 1, 2016. <https://www.cdc.gov/stari/>.

Colville, J. L., and D. L. Berryhill. 2007. “How to Protect Yourself against Ticks & Tick Removal Procedures,” in *Handbook of Zoonoses: Identification and Prevention*. St. Louis, Missouri: Elsevier. 229–30.

Goddard, J., and A. S. Varela-Strokes. 2009. "Role of the Lone Star Tick, *Amblyomma Americanum* (L.), in Human and Animal Diseases." *Veterinary Parasitology* 160: 1–12. Accessed April 23rd, 2016, doi: 10.1016/j.vetpar.2008.10.089.

Masters, E. J., C. N. Grigery, and R. W. Masters. 2008. "STARI, or Masters Disease: Lone Star Tick-vectoring Lyme-like Illness." *Infectious Disease Clinics of North America* 22: 361–76. Accessed April 23rd, 2016, doi: 10.1016/j.idc.2007.12.010.

Oliver, J. H., Jr., T. Lin, L. Gao, K. L. Clark, C. W. Banks, L. A. Durden, A. M. James, and F. W. Chandler, Jr. 2003. "An Enzootic Transmission Cycle of Lyme *Borrelia* Spirochetes in the Southeastern United States." *Proceedings of the National Academy of Sciences USA* 100: 11642–1645. Accessed April 23rd, 2016, doi: 10.1073/pnas.1434553100.

Paddock, C. D., and M. J. Yabsley. 2007. "Ecological Havoc, the Rise of White-tailed Deer, and the Emergence of *Amblyomma Americanum*-associated Zoonoses in the United States." *Current Topics in Microbiology and Immunology* 315: 289–324. Accessed April 23rd, 2016, doi: 10.1007/978-3-540-70962-6_12.

Stromdahl, E. Y., R. M. Nadolny, J. A. Gibbons, L. D. Auckland, M. A. Vince, C. E. Elkins, M. P. Murphy, M. W. Eshoo, H. E. Carolan, C. D. Crowder, M. A. Pilgard, S. A. Hamer, and G. J. Hickling. 2015. "*Borrelia burgdorferi* Not Confirmed in Human Biting *Amblyomma Americanum* Ticks from the Southeastern United States." *Journal of Clinical Microbiology* 53: 1697–704. Accessed May 15, 2016. doi: 10.1128/JCM.03454-14.

Vaughn, M. F., P. D. Sloane, K. Knierim, D. Varkey, M. A. Pilgard, and B. J. Johnson. 2010. "Practice-based Research Network Partnership with CDC to Acquire Clinical Specimens to Study the Etiology of Southern Tick-associated Rash Illness (STARI)." *The Journal of the American Board of Family Medicine* 23: 720–27. Accessed May 2, 2016. doi: 10.3122/jabfm.2010.06.100098.