

Old Dominion University Tick Research Team

By: Sara Simmons, Alexis White, Laura Bitzer, and Holly Gaff, ODU

Old Dominion University has been known as a leader in tick research since Dr. Daniel Sonenshine arrived on campus in the early 1960's. The current ODU Tick Research Team has been conducting an active tick surveillance project since 2009 under the leadership of Drs. Holly Gaff and Wayne Hynes. We study everything about the ecology of ticks, including hosts, habitats and seasonal patterns. We also investigate the genetics of locally-collected ticks and the pathogens they may carry. From this, we can determine the origins of newly invading ticks and ask other questions about movement across the landscape. Our team includes students at all levels of study who gain hands-on research experience working with faculty members with expertise in mathematical ecology, mammalogy, avian ecology, micro- and molecular biology, and population genetics.

Our local field work is centered around the Hampton Roads Region of Virginia. Regular collection sites are typically located within an hour from Norfolk, VA, and include field sites from southeastern Virginia near the Great Dismal Swamp, across the bay to the Eastern

Fun Fact #1: Ticks are active year-round in Virginia. Blacklegged adult ticks are actively seeking hosts in winter. Most other species, and blacklegged nymphs are active in warmer weather from spring through fall.

The ODU Tick Team approach includes active environmental surveillance in addition to passive collection, such as tracking ticks sent to the lab after being found biting humans or animals. Active environmental surveillance can alert us to potential new concerns, such as the appearance of a new pathogen for which illnesses haven't yet been reported. Flagging is our primary method of collection. This is done by taking a large, white canvas flag on the end of a wooden dowel rod and passing it through vegetation with

Fun Fact #2: Ticks don't only feed on mammals. They will feed on almost any vertebrate, including birds, snakes, and lizards.



The ODU Tick Team at the 2018 Mid-Atlantic Tick Summit.

From left: Dr. Robyn Nadolny (alumna), Lexi White (PhD student), Sara Simmons (PhD student), Laura Bitzer (MS student), Alex Cumbie (PhD student) and Dr. Holly Gaff.

the flag out in front of the collector. Ticks cling to the flags, and we collect them in vials to bring them back to the lab. We also collect ticks from birds, small mammals, reptiles, deer processed at hunt check stations, and occasionally from roadkill.

One of the most common ticks that we encounter in Virginia is the lone star tick (*Amblyomma americanum*). Female lone star ticks are round, brown ticks with a single white spot located on the back, or dorsal surface. Males and nymphs are round and brown with few to no markings. Nymphs are much smaller than lone star adults. Larvae of this species are even smaller and generally found in clusters. This species is associated with several health-related conditions: ehrlichiosis, southern tick associated rash illness (STARI), and alpha-gal, an allergy to mammal meat. Ehrlichiosis is a rare but potentially life-threatening disease, especially for the elderly and immunocompromised. STARI is a skin rash that can develop near the bite and is sometimes mistaken for the classic bullseye rash that presents with Lyme disease. The alpha-gal allergy manifests as a delayed anaphylaxis after eating mammal meat products. Many people do not develop any type of hypersensitivity or immune reaction to tick bites. For those who do, symptoms can range from mild to severe and can be life-threatening.



Adult female lone star tick.
Photography credit:
graham.snodgrass@us.army.mil



Adult female blacklegged tick.
Photography credit:
graham.snodgrass@us.army.mil

Another tick of concern in Virginia is the blacklegged tick (*Ixodes scapularis*), also called the deer tick. These ticks can carry and transmit *Borrelia burgdorferi*, the causative agent of Lyme disease. Adult blacklegged ticks are active during the winter and feed on larger hosts, such as deer. They also bite humans! Female blacklegged ticks have a black upper back and legs, with a reddish-brown lower half. Blacklegged nymphs are much smaller, no larger than a poppy seed and look entirely black. Nymphs are a particular concern in our area because they are active in the summer when people are more likely to be outdoors, wearing less protective clothing. It is important to check for ticks after spending any time outdoors, and to be especially careful to look for nymphs, which can easily be mistaken for a freckle.

There are several other species that landowners are likely to encounter in Virginia such as the American dog tick (*Dermacentor variabilis*), the rabbit tick (*Haemaphysalis leporispalustris*), and *Ixodes affinis*, a tick that resembles its cousin the blacklegged tick, but does not bite humans. Some of these species may be locally present in high numbers. Also, you may notice that the number of ticks in your area changes dramatically from year to year. There are many reasons for this, not all of which are well understood. Changes in management practices, including the management of host species such as deer or rodents, may influence trends in tick populations. It is important to identify any tick species that is problematic in your area before you attempt any kind of tick control methods.

Fun Fact #3: No one has created a common name for *Ixodes affinis*. They do not bite humans and may be mistaken for a close relative, the deer tick.

Tick control is a tricky task. Removing tick habitats can help prevent ticks in your backyard. Just by maintaining a mowed landscape and removing leaf litter from the edge of residential property, you can create a habitat less favorable for ticks. All ticks are sensitive to desiccation, so mulch barriers can be useful between lawns and forests, or along paths.

Broadcast sprays have also shown to be effective at reducing tick populations but can be damaging to all other invertebrates including pollinators. Prescribed fire is often used as a management tool for conservation of some species and has been shown to have some effect on tick populations as well. Ticks are very host driven. Initially after fire, tick populations tend to decrease. However, fire improves habitat and food sources for some wildlife, and

Fun Fact #4: Ticks do not live in trees. Ticks stay low to the ground until they find a host, and they will climb up your body until they find a good place to take a bite. People often find ticks on their heads, behind their ears, and on other parts of their upper body, but this doesn't mean they fell from above.

therefore burning can indirectly contribute to increases in tick populations over time. This successional habitat can even be favorable to some species of ticks such as the Gulf Coast tick (*Amblyomma maculatum*), which is very habitat-specific to successional areas. Overall, fire may lead to reduction, but not eradication, of local populations of ticks.

Ticks can also be killed while they are on host. Rodents are common hosts for juvenile ticks of some species, like the American dog tick, so tick tubes were invented. Tick tubes are small tubes filled with chemically treated bedding. As rodents utilize the bedding, it will kill any ticks that come into contact with it. Tick tubes are useful for targeting some ticks. Lone star ticks and other species that do not often feed on rodents are less likely to be successfully managed with these methods.

Your greatest protection against ticks is awareness. Be aware when you are at risk of encountering ticks and be prepared. You should reduce any potential contact with ticks and

skin. If they can't reach you, they can't bite you. In the tick lab, we tuck our pant legs into our socks and will end duct tape our pants to our shoes during times of the year when larvae are questing. We also treat our clothes and boots with permethrin and use DEET as a repellent. When used properly, permethrin has been shown to be effective on several tick species that are in Virginia.

If a tick bites you, make sure to remove it as soon as possible! The best way to remove a tick is with pointy tweezers. Be sure to disinfect the tick-bite area with rubbing alcohol. Place your tweezers as close to the skin as possible. With pointy tweezers you should be able to grab the tick's "head" or directly above the "head." Once you've grabbed the tick firmly between your pointy tweezers, apply a slow, steady, upward pull to avoid breaking the tick. Disinfect the area with rubbing alcohol after removal. Then save the tick by storing it in the freezer with the date the tick was removed. If you any symptoms of a tick-borne illness, you can have the tick tested to see what pathogens you may have been exposed to. Here at the ODU Tick Lab we can test ticks for you or you can donate them to our research (For more information: <https://sites.wp.odu.edu/tick-team/tick-testing/>)

Fun Fact #5: Ticks do not have real heads. When we say "head" we are referring to the mouthparts or capitulum.

If you are interested in helping our project, please send us your ticks! We love to get ticks from anywhere you collect them, whether you find them on yourself, your pets, or other animals you encounter. Hunters, farmers and backyard poultry growers can be a huge help to us by sending us ticks from deer, bear, wild boar, turkeys, chickens, guinea fowl or any other animals that you raise or hunt! For more info, follow our adventures on Facebook: www.facebook.com/oduticklab.

Fun Fact #6: Birds like chickens can be both a host and a predator of ticks. No one really knows if they can control tick populations.

Sara Simmons is a PhD student, smcdo010@odu.edu; Alexis White is PhD Student, awhit130@odu.edu; Laura Bitzer is a MS Student, lbitz001@odu.edu; and Holly Gaff is an Associate Professor in the Department of Biological Sciences, hgaff@odu.edu, 757-683-6903.

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