UT Youth Environment and Health

February 11, 2022 E & PP Info #778 Volume 15 Issue 4

Pests and Pesticides in Child-serving Facilities: An IPM Newsletter

Ticks and their Presence on East Tennessee School Grounds

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We estimate that half of Tennessee school districts use integrated pest management that reduces and balances risks from pests and pesticides to school occupants and the environment. When COVID-19 prevention measures limited our access to the interior of demonstration schools in 2020 and 2021, we decided to focus on outdoor public health pests – one that may cause severe, acute health effects through venomous stings (fire ants) and another that may cause chronic, debilitating health effects through the transmission of a pathogen (ticks). While we have addressed fire ants in the past, we expanded our efforts to include tick surveillance due to the increased presence of *Ixodes scapularis*, the blacklegged tick (and primary vector of *Borrelia burgdorferi*, the causative agent of Lyme disease) in eastern Tennessee. Public school grounds of two eastern Tennessee counties were dragged for ticks once each season along fence lines, tree/shrub lines, and playground edges. Because the exotic, invasive Asian longhorned tick (ALT), *Haemaphysalis longicornis* was recently established in Tennessee, we chose Roane County with an established ALT population and Claiborne County where ALT had been detected to determine if this tick was also found on school grounds. A tick population is considered established if six or more adult ticks or two life stages are present.

The hard tick life cycle starts with an eggmass laid by an adult female off the host. The six-legged first instar hatches from the egg, finds and feeds on a host, drops off the host and molts into an eight-legged nymph. The nymph finds another host, usually a larger one, to feed on, then drops off the host and molts into the adult stage. The adults find a host, feed and mate on the host, and the female drops off to lay its egg mass often containing thousands of eggs. Depending on host availability, the time from egg to adult may take two to three years . The Asian longhorned tick is an exception. In the US, only female ALTs have been found. Adult females lay an eggmass without mating with a male and the entire lifecycle can be completed in 6 months. When the shorter lifecycle is taken into account, even if 1% of immatures survive to the adult stage, one Asian longhorned tick could produce 3.2 million offspring in 3 years compared to 1000 *Amblyomma americanum* or lone star ticks assuming 10% survival rates and 250 blacklegged ticks with 5% survival rates.

Special Points of Interest

Potential disease vectors were found on East Tennessee school grounds.

This issue

Potential disease vectors were found on East Tennessee school grounds. See Table 1 for a list of diseases and tick-related health problems caused by each tick species. Adult blacklegged ticks were detected in the late winter (March 4 - 6, 2021). Adult and nymphal lone star ticks and adult American dog ticks, *Dermacentor variabilis*, and adult blacklegged ticks were collected in late spring (May 21—June 2). The summer tick drags (July 26 - 30) yielded larval, nymph and female lone star ticks; male and female American dog ticks and male Gulf Coast ticks, *Amblyomma americanum*. The Fall drag was extended over a longer period (November 6 - December 4) due to the addition of Bradley and Monroe County Schools. Most of the schools in our study were dragged for ticks in the winter (January 8 - 23, 2022) but cold temperatures limited tick activity. Only adult blacklegged ticks were found in the fall and winter drags. Thus far, no Asian longhorned ticks have been found on Roane, Claiborne, Bradley, Monroe and several Hamilton county schools. We didn't start dragging Bradley, and Monroe county schools until November/December 2021 and Hamilton County until January 2022.

Common human-biting ticks in Tennessee	Characteristics	Habitat	Host by life stage	Diseases or other tick-related health problems
 **Blacklegged tick** (*Ixodes scapularis*)	**Female:** About 3.1 mm long. Eight legs. Long palps. Black legs. Reddish-orange body with a black scutum. **Male:** About 1.5 mm long. Eight legs. Long palps. Black legs. Black body. **Nymph:** About 1.6 mm long. Eight legs. Long palps. Black legs. Brown body with a black scutum. **Larvae:** About 0.8 mm long. Six legs. Long palps. Black legs. Brown body with a black scutum.	Forest-field edges, forested habitats	**Adults:** Humans, canines, deer, medium-sized animals **Nymphs:** Rodents, lizards, birds, medium-sized mammals **Larvae:** Rodents, lizards, birds, medium-sized mammals	Lyme disease, anaplasmosis, babesiosis, Powassan virus
 **Longhorned tick** (*Haemaphysalis longicornis*)	**Female:** About 2.7 mm long. Eight legs. Short palps. Red-brown with no markings. Fangs present on underside of palps. **Male:** has not been found in the United States. **Nymph:** About 1.7 mm long. Eight legs. Short palps. Red-brown with no markings. Fangs present on underside of palps. **Larvae:** About 0.5 mm long. Six legs. Short palps. Fangs present on underside of palps. Red-brown with no markings.	Forest-field edges, forests, field habitats	**Adults:** predatory birds, small-sized (e.g. rabbits), medium-sized (e.g. raccoons and canines), and large-sized mammals including humans **Nymphs:** livestock, medium-sized mammals **Larvae:** Medium- and large-sized mammals	anaplasmosis, ehrlichiosis, RMSF and SFR, babesiosis, theileriosis

Table 1. A description of the common human-biting ticks, their habitat, hosts by life stages, and potential diseases caused by pathogen/parasite transmission and other tick-related health problems. Excerpted from PB1895.

Common human-biting ticks in Tennessee	Characteristics	Habitat	Host by life stage	Diseases or other tick-related health problems
 **Lone star tick** (*Amblyomma americanum*)	**Female:** About 3.1 mm long. Eight legs. Prominent white circle on back. Long palps. **Male:** About 2 mm long. Eight legs. Red-brown with white/iridescence around perimeter of body and festoons. Long palps. **Nymph:** About 1.5 mm long. Eight legs. Red-brown. Long palps. **Larvae:** About 0.5 mm long. Six legs. Red-brown. Long palps.	Forest-field edges, forests, fields	All stages feed on humans **Adults:** Feed on variety of medium-sized (e.g. canines, felines) and large-sized (e.g. deer and livestock) mammals, and ground-feeding birds (e.g. turkey) **Nymphs:** Small-sized to large-sized mammals and ground-feeding birds **Larvae:** Small-sized (e.g. squirrels and rabbits) to large-sized mammals and ground-feeding birds	anaplasmosis, ehrlichiosis, RMSF and SFR, babesiosis, theileriosis, tularemia, alpha-gal syndrome
 **Gulf Coast tick** (*Amblyomma maculatum*)	**Female:** About 3 mm long. Eight legs. Long palps. Red-brown with white scutum. **Male:** About 2.5 mm long. Eight legs. Long palps. Red-brown with elaborate white/ iridescent markings/ lines on back. **Nymph:** About 1.3 mm long. Eight legs. Long palps. Red-brown with no markings. **Larvae:** About 0.5 mm long. Six legs. Long palps. Red-brown with no markings.	Grass prairies, upland habitats, Gulf coast prairie regions, meadows and grasslands	**Adults:** Humans, deer, companion animals, medium-sized wildlife, livestock and wild hogs **Nymphs:** Variety of songbirds and rodents **Larvae:** Variety of songbirds and rodents	ehrlichiosis, SFR, hepatozoonosis
 **American dog tick** (*Dermacentor variabilis*)	**Female:** About 5 mm long. Eight legs. Short palps. Dark brown with white scutum. **Male:** About 3.6 mm long. Eight legs. Short palps. Dark brown with elaborate white markings on back. **Nymph:** About 0.9 mm long. Eight legs. Short palps. Dark brown with white scutum. **Larvae:** About 0.6 mm long. Six legs. Short palps. Dark brown with white scutum.	Urban environments, fields, parks, forested habitats	**Adults:** Humans, deer, medium-sized (e.g. canine and raccoons) to large-sized mammals (e.g. livestock) **Nymphs:** Rodents and medium-sized mammals **Larvae:** Rodents and medium-sized mammals	RMSF and SFR, ehrlichiosis, Bourbon virus, Heartland viruses, tularemia

Table 1 continued. A description of the common human-biting ticks, their habitat, hosts by life stages, and potential diseases caused by pathogen/parasite transmission and other tick-related health problems. Excerpted from PB1895.

Ticks have been found on my school's property, what can I do to prevent disease transmission to our students and staff?

Due to the difficulty of controlling ticks in large spaces, environmental manipulation or application of pesticides is not always practical. The best management methods include actions that prevent tick bites and establishment at a site in order to prevent potential pathogen transmission.

Personal protection and removing ticks

There are a variety of methods that can be used to reduce the occurrence of tick bites or remove ticks before they can take a blood meal.

Before going into a potentially tick-infested area:

– Select and wear light-colored clothing including long-sleeve shirts and pants.
– Select and wear tall white socks.
– Spray selected clothing the day before with appropriately labeled permethrin to repel ticks. (Permethrin products applied to clothing the night before, and allowed to dry before use, may maintain potency up to two weeks after treatment regardless of washing.)
– Select and properly apply tick repellents to the skin following the label. Use the information in the text box to the right to select the best repellent for you.
– Duct tape pants around boots or duct tape top of socks to pants to prevent ticks from crawling on your skin.

At home, after being in a potentially tick-infested area:

– To avoid bringing ticks into your home, remove clothing and place it directly into a dryer rather than putting it in a dirty clothes hamper or basket. If you do not have a dryer, place clothing into a 2-gallon zip lock bag until one is accessible.
– Take a shower after being outdoors and check yourself for ticks.
– Get a partner or use a mirror to check for ticks in areas that you cannot see or reach well (behind legs, hair, back, etc.).
– Limit companion animals without tick prevention in areas where students play and sleep.

At school:

– Avoid areas of high vegetation and work with maintenance/facilities personnel to identify areas that need mowing.
– Report any ticks seen on school grounds to the pest logbook overseer and the pest management technician.
– Avoid using areas with high numbers of ticks.
– Encourage teachers and students to walk single-file in the center of trails.
– If outdoor environmental classrooms are on campus, ensure students are treated with repellents before using shaded areas or areas with tall vegetation and leaf litter. If possible, replace leaf litter with gravel or small rocks to dry out the area.
– Check for ticks after visiting outdoor areas and remind caregivers/guardians to check their children for ticks at home.
– Use an extra-sticky lint roller to remove ticks climbing on clothing or skin.
– Suggest families implement many of the suggestions listed above when not at school.

Personal Protection with Repellents

Repellents are a form of chemical control that can, and should, be used to help protect people from tick bites. They do not kill the tick, rather they keep ticks away from an area or site. The Environmental Protection Agency (EPA) has approved several active ingredients that can effectively prevent tick bites. These include DEET, IR3535, Picaridin, 2-undecanone, and some Oil of Lemon Eucalyptus (OLE) and PMD products. Product effectiveness and longevity will vary depending on the concentration used. Products containing OLE should not be used on people under the age of three.

For a complete list of repellents that prevent tick bites, you can visit the EPA website (epa.gov/insect-repellents/find-insect-repellent-right-you) and find the repellent that is best for students, faculty and staff.

Additional Considerations for Repellents:

– When choosing the best repellent, it is important to consider the length of time spent outdoors, location and risk of pathogens.
– Caregivers/guardians should apply a repellent to their child.
– Make sure to apply sunscreen before applying repellents.
– Do not use products that combine sunscreen and repellent because sunscreen needs to be reapplied more frequently. Additional repellents could be kept in the school nurse's office if reapplication is necessary.
– Most importantly, always follow the instructions on the label. This will prevent any negative effects due to exposure. If a rash or other irritation occurs, wash the repellent off with soap and water and contact a local poison control center.

School personnel:

Educate faculty, staff, students and guardians about wearing repellents (npic.orst.edu/ingred/ptype/repel.htm). Decide where repellents can be stored, who will apply them and what formulations (spray or lotions) are suggested.

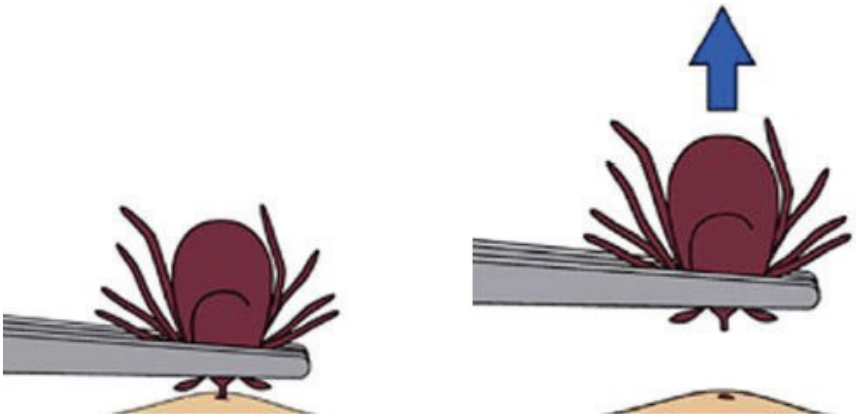
How to remove ticks:

– Remove ticks as soon as possible.

– If ticks are attached, use tweezers to remove them.

– Use tweezers to grasp ticks as close to an individual's skin as possible, but do not get so close that you rip skin.

– The closer you are to the skin the less likely the tick's head will be left in the skin during removal, as shown in the figure below. Ensuring that the head of the tick is removed with the tick's body decreases the chances of obtaining a harmful pathogen or causing infection. It's also difficult to identify a headless tick. Be careful to not scrape at the bite site as that could lead to a bacterial infection as well.



Steps to removing a tick (Credit: cdc.gov)

– After removal, wash around the wound with soap and water or similar substances recommended by medical professionals. Place ticks in a vial with a cotton ball soaked in 80 percent ethanol for transport. Save attached ticks in a sealable bag in the freezer if ethanol is not available and write the date and name of the person the tick attached to on the outside of that bag. Also watch the site for several days for signs of infection. It is normal for a red spot to appear in response to the bite, but if it becomes larger or a person begins to feel ill within a month of the bite, they should seek the advice of a doctor or other medical professional. The tick can be provided to the doctor's office to narrow the potential list of tick-borne diseases because certain species are better than others at transmitting pathogens.

Much of the above information is excerpted from *PB1895 Managing Ticks on School Grounds* available from UT Extension at https://extension.tennessee.edu/publications/Documents/PB1895.pdf. In future newsletter issues we will discuss the details of monitoring for ticks or tick dragging, how to modify the environment so it is less conducive to ticks and the use of pesticides to manage ticks on school property. Should you seek more information on diseases caused by these ticks or need information on tick dragging, environmental modification and pesticide use, please see PB1895 or contact me at kvail@utk.edu.

Solutions and Resources to Address COVID-19 in Schools: Establishing Lasting Improvements to Ventilation and IAQ

Join the U.S. Environmental Protection Agency (EPA) and featured speakers from the Center for Green Schools at the U.S. Green Building Council (USGBC), 21st Century School Fund, Michigan Chapter of ASHRAE, and Lawrence Berkeley National Laboratory for an upcoming webinar examining the state of our schools! Learn how to make the case to implement building upgrades to improve indoor air quality (IAQ), reduce the risk of COVID-19 transmission, and optimize school building energy performance.

Thursday, February 10, 2022 | 1:00 – 2:30 PM ET

https://register.gotowebinar.com/register/3588072998388220685?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=

Attend this webinar to learn how to—

- Make the case to implement building upgrades to improve IAQ, reduce the risk of COVID-19 transmission, and optimize school building energy performance;
- Assess your building system type and implement ventilation best practices and building design guidelines, such as mechanical ventilation, natural ventilation, filtration, and in-room air cleaners;
- Use federal, state, and local funding to make lasting improvements to school buildings and ventilation systems; and
- Replicate best practices to improve building health and energy efficiency used in school district case studies.

FEATURED SPEAKERS

Tracy Washington Enger
Facilitator
Indoor Environments Division
U.S. Environmental Protection Agency

Mary Filardo
Executive Director
21st Century School Fund

Sonya Pouncy
Principal, Building Vitals, LLC and Chair
Ad hoc Joint Michigan ASHRAE Chapters' COVID-19 Task Force

Anisa Heming
Director
Center for Green Schools at the U.S. Green Building Council (USGBC)

Dr. Wanyu Rengie Chan
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Partial support for this newsletter provided by the USDA NIFA CPPM EIP grant (# 2021-70006-35577) awarded to the University of Tennessee.

For more information about IPM in Tennessee schools and other facilities, or to view past issues of *Pests and Pesticides in Child-serving Facilities*, please visit http://schoolipm.tennessee.edu

NATIONAL IPM INFORMATION

eXtension's Pests in the Home
https://pestsinthehome.extension.org/

National School IPM
schoolipm.ifas.ufl.edu/

IPM in Schools Texas
http://schoolipm.tamu.edu/

IPM Institute of North America
www.ipminstitute.org/

School IPM PMSP—all schools IPM by 2020 https://ipminstitute.org/projects/school-ipm-2020/

EPA schools
http://www2.epa.gov/managing-pests-schools

For further information about the IPM program at your school or in your county, contact your county Extension Agent or the school IPM Coordinator. For county agent contact information, please visit https://utextension.tennessee.edu/office-locations-departments-centers/

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label and registered for use in your state.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

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