

## Busting Myths About Ticks CONTINUED FROM PAGE 343

repellant is to impregnate clothing with a compound called permethrin, which can be found at many sporting-goods stores. People shouldn't get permethrin on their skin and need to let their clothes dry before wearing.

In using both repellant and permethrin, it's important to follow the label directions, Dryden warns.

For yards, using a spray that contains a compound called cyfluthrin can be effective for tick control.

"You're generally going to spray under the

shrubs, bushes and around the edge of your property," Dryden says. "It's critical of any insecticide to always follow the label recommendations provided by the EPA (Environmental Protection Agency) and the manufacturer of that product. Spray the product, and let it dry before you let the pets and kids have access to that area."

An alternative to personally spraying the yard is to hire a professional exterminator, he says.

### More information

For more information about ticks in Kansas and tick-transmitted diseases, visit Dryden's website at [www.drmmichaeldryden.com](http://www.drmmichaeldryden.com), the Kansas Department of Health and Environment website at [www.kdheks.gov/epi](http://www.kdheks.gov/epi), or read more in this K-State Research and Extension publication: [www.ksre.ksu.edu/bookstore/pubs/mf2653.pdf](http://www.ksre.ksu.edu/bookstore/pubs/mf2653.pdf).



## Blacklegged ticks now established in Ohio

They were almost absent from Ohio until 2009. Since then, the number of blacklegged ticks found in Ohio has grown significantly. The bad news: Blacklegged ticks carry Lyme disease.

A new study conducted by Ohio State University (OSU) and the Ohio Department of Health has found that blacklegged ticks and Lyme disease are now an emerging public health concern in Ohio, as tick populations carrying the disease have become established, particularly in the eastern half of the state.

"Ohio had a low incidence of human Lyme disease, which is largely attributed to the absence of the transmitting vector, the blacklegged deer tick, in the state," says Glen Needham, professor emeritus of entomology in the university's College of Food, Agricultural, and Environmental Sciences (CFAES) and one of the study's authors. "However, evidence presented in this study suggests that the blacklegged deer tick is becoming established in certain areas of Ohio."

The open-access paper was published June 2014 in the journal *Frontiers in Cellular and Infection Microbiology*.

Ticks are small arachnids that hang out along woodland edges, in woods, tall grass, weeds and underbrush. Like mosquitoes, ticks feed on the blood of birds, reptiles and mammals, including humans and pets. In doing so, ticks can transmit a variety of diseases, such as Rocky Mountain spotted fever and Lyme disease.

Lyme disease causes flu-like symptoms such as fatigue, fever, headache, and muscle and joint aches. It often produces a distinctive large, circular red rash that looks like a bull's-eye. When caught early, the disease can be successfully treated with antibiotics. Though not known to be fatal, the disease can progress to chronic arthritis, neurological symptoms and cardiac problems if left untreated.

Lyme disease is caused by an agent known as *Borrelia burgdorferi*, which is found primarily in the white-footed mouse. Blacklegged ticks (*Ixodes scapularis*) pick up the disease-causing agent from the mice and serve as vectors, or carriers, of Lyme disease.

Most people who get Lyme disease, Needham says, will acquire it from the nymphal, or juvenile, stage of the tick, which is very small — the size of a poppy seed — and is active in spring and summer, particularly in wooded areas. Hunters and meat processors will especially be at risk from adult ticks this fall from September through December.

For the study, Needham and colleagues analyzed data from the state health department's tick surveillance program; Ohio's multi-agency surveillance of deer heads for chronic wasting disease; and the results of their 2010 studies of ticks and *B. burgdorferi* prevalence in rural Tiverton Township, Coshocton County, where established populations of blacklegged deer ticks carrying the Lyme disease agent have been identified.

The first blacklegged deer tick confirmed in Ohio was found

in 1989. The number of these ticks found annually remained low from 1989 until 2008 and accounted for less than 1% of all ticks collected by the state health department's tick surveillance program.

However, things began to change dramatically in 2009, when 15 blacklegged deer ticks were collected, followed by 40 in 2010, 184 in 2011 and 182 in 2012. By 2012, these ticks accounted for almost 25% of those received by the state health department. A higher number of ticks was also found on deer heads. For example, in 2011, 1,830 ticks were collected from 96 of 560 deer heads examined. The previous year yielded only 29 ticks from around 200 deer inspected.

Such an increase in the number of blacklegged deer ticks found throughout the state mirrored the confirmed and probable cases of Lyme disease reported to the health department: 43 cases in 2010, 50 in 2011, 67 in 2012 and 93 in 2013.

"Blacklegged deer ticks have now been found in 57 Ohio counties and are likely established in 26 of those counties, mostly east of I-71 where we have deciduous forest," says Needham, who is now studying tick-borne diseases for the U.S. Air Force at Wright-Patterson Air Force Base in Dayton.

In the United States, Lyme disease is endemic (meaning it has become highly prevalent) in two different regions: the Northeastern states and the Upper Midwestern states. Ohio lies between these two areas, which puts the state in the crosshairs of expansion of the disease.

"Given the proximity of Ohio counties with established blacklegged tick populations to highly endemic Pennsylvania, it is possible that the emergence of this tick vector simply reflects the continuing expansion of the Northeast Lyme disease-endemic region in the U.S.," Needham says.

"Migrating birds, deer and human activity are likely spreading the tick and the disease agent. Moving tick-infested harvested deer to non-infested areas of the state may play a role, too, so deer should be examined before moving them. If infested, then take care in processing the animal, and the hide needs to be buried or burned, or salted down if destined for tanning."

Because of these factors, Needham says he expects that the number of blacklegged ticks and the percentage of them infected with *B. burgdorferi* will continue to increase in Ohio.

"It is important that the public and health professionals become aware of the increased risk for contracting Lyme disease in Ohio, and that preventive measures are taken to limit exposure to ticks when going outdoors," he says.

Information about ticks and Lyme disease, including tips for prevention, is available at [www.cdc.gov/lyme/](http://www.cdc.gov/lyme/); [www.odh.ohio.gov/ticks](http://www.odh.ohio.gov/ticks); <http://wildlife.ohiodnr.gov/species-and-habitats/ticks-in-ohio>; and <http://tickencounter.org>.

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