Ticks and Tick-borne Diseases in Iowa
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Lyme Disease Surveillance Program
The Iowa Lyme Disease Surveillance Program (LDSP) was established in 1990 at Iowa State University, to respond to growing concern about this disease. Through this program, private citizens, health care providers, and government agencies are encouraged to submit ticks for identification and (in some cases) testing for bacteria transmitted by ticks.

The information collected from the LDSP tells us what ticks are in the state, at what time of year they are active, where in the state they are most common, and whether or not they are infected with the bacteria that cause Lyme disease (*Borrelia burgdorferi*). This information is important for Iowans to have so that they can avoid contact with infected ticks.

More than a dozen species of ticks occur in Iowa, but three species make up the majority of ticks submitted to the LDSP. These are: the blacklegged tick or deer tick, the American dog tick or wood tick, and the lone star tick. In general, these ticks are active from March through November (Fig. 1). This publication provides information and additional resources regarding these three species of ticks common in Iowa, information about the most important tick-borne illnesses of humans and animals, and methods for preventing tick bites and exposure to tick-borne diseases.

Tick Biology
The three tick species most often seen in Iowa are so-called “hard ticks”, because of a hard, shield-like structure found on their backs. The hard tick life cycle begins when a mated, blood-fed female deposits a thousand or more eggs in a mass on the ground in the late summer or fall. Larvae emerge from the eggs the following spring and develop into nymphs, which then become adults (Fig. 2). Larvae and nymphs must each take a blood meal to develop to the next stage. Larval ticks (also known as “seed ticks”) can be distinguished from nymphs and adults because of their small size and six legs. Nymphs and adults are larger and have eight legs. The ticks of importance in Iowa all feed on separate small hosts (typically rodents or birds) as larvae and nymphs, then on a larger host as adults.

Fig. 2. Active life stages of the blacklegged tick.

For size reference, ticks are placed next to a period (12 point, Times New Roman font) that is approximately 0.8 mm in diameter. Photo by Jeffery Alfred, USDA/APHIS/VS/NVSL.
The blacklegged tick or deer tick, *Ixodes scapularis*

The blacklegged tick is the tick of greatest importance to Iowans because it can transmit bacteria that cause Lyme disease. These ticks are most abundant in northeastern and eastern Iowa (Fig. 3). Nationwide, this tick's range extends from the eastern U.S. through the Midwest and into the Great Plains. This species often is associated with oak forests.

Adults and nymphs of blacklegged ticks generally have black or dark brown legs, mouthparts, and backs (Fig. 2). Both larvae (about 0.8 mm) and nymphs (about 1.6 mm) are small and difficult to detect. Adult female ticks are the stage most commonly found and when unfed are only slightly larger than a sesame seed (about 3.5 mm). Males are usually smaller (about 2.6 mm).

The seed ticks (larvae) climb short distances from the ground to wait on plants, so they can attach to a passing small animal (usually mice) to feed. After feeding, larval ticks drop from the host and develop into nymphs. Nymphs will bite most any mammal (including a human), bird, or reptile they encounter. Adults attach to a final host, usually larger mammals like deer, dogs, raccoons, foxes, or humans. After mating and feeding, adult females drop from the host, lay eggs, and die.

If a larva or nymph feeds on an animal infected with Lyme disease bacteria, it can be infected and can pass the bacteria to other animals as it feeds. Nymphs are the real villains for humans in the Lyme disease infection cycle. They are so small that people may not know that they have been bitten until the ticks have been attached for 36 hours – the minimal amount of time for transmission to occur in most cases.

The LDSP has documented infected blacklegged ticks in 17 counties in Iowa (Fig. 3). This species of tick also can transmit bacteria (*Anaplasma phagocytophilum*) that cause human granulocytic ehrlichiosis (HGE), equine ehrlichiosis, tick-borne fever, and pasture fever. It can transmit viruses, such as deer tick virus and the virus that causes Powassan encephalitis.
The American dog tick or wood tick  
*Derma*centor variabilis  
The American dog tick is the most common species of tick in Iowa. These ticks are common throughout the eastern, southern, and Midwestern U.S. In addition, some populations have become established along the western coast of the U.S. Locally, every county in Iowa has this tick, which is active from late March through August.

The female American dog tick is large, with a patterned, cream-colored shield covering the front portion of the body. The male is usually smaller, with a cream-colored shield that covers almost the entire upper body. Both otherwise are usually a chocolate brown color (Fig.5). Larvae and nymphs usually feed on small mammals, especially rodents. Adult ticks most commonly feed on dogs and other large mammals, including humans.

American dog ticks are carriers of the bacteria that cause Rocky Mountain spotted fever (*Rickettsia rickettsii*). This disease is rarely seen in Iowa -- only 51 cases have been reported since 1990. These ticks also can transmit the bacteria that cause rabbit fever (*Francisella tularensis*). In addition, they may cause tick paralysis, an uncommon but potentially fatal malady in which a female tick that has been attached for days paralyzes its host, though the paralysis disappears within a few hours of the tick’s removal.

The lone star tick  
*Amblyomma americanum*  
In the U.S., lone star ticks can be found from Texas to Florida, north into the Midwest as far as Iowa, and up the East Coast into Maine. These ticks are now found throughout Iowa, though they are most common in the southern counties (Fig. 6) but its range is expanding northward. They are most active from April through September.

Although slightly smaller than American dog ticks, adult females are still fairly large and possess a distinctive white or cream-colored “lone star” on the back, whereas males are smaller and lack this mark. These ticks are usually caramel brown in color (Fig. 7). All active stages will feed readily on humans, other mammals, and even birds.

Lone star ticks can transmit the bacteria that cause rabbit fever (*Francisella tularensis*), canine and human granulocytic ehrlichiosis (*Ehrlichia ewingii*), and human monocytic ehrlichiosis (*E. chaffeensis*). Although this tick is commonly found (in its range) and is an aggressive biter, only a low percentage of ticks usually is infected.
Lyme Disease

Lyme disease is named for Old Lyme, Connecticut, where some of the first cases in the U.S. were documented in children exhibiting signs of juvenile arthritis. Most cases occur in the Northeast, the Mid-Atlantic, and the upper Midwest, with fewer cases reported from the Pacific Coast. In Iowa, the numbers of Lyme disease cases have steadily increased since 1993, when 8 cases were reported, to 2005 when 90 cases of Lyme disease were reported (Fig.8). Although cases are reported from counties across the state, more cases of disease tend to be reported from those counties (particularly in northeast Iowa) from which the Lyme Disease Surveillance Program receives the most submissions of black-legged ticks.

Signs and symptoms of Lyme disease

Lyme disease usually appears 3 to 30 days after exposure to an infected tick. It causes a wide range of symptoms, but the unique sign of infection is the tell-tale bulls-eye-shaped rash, called erythema migrans, that is roughly circular, white in the center, and expands outward over time. About 70 percent of those who are infected develop this rash, which may be missed if it is out of sight or is not intensely colored.

Other signs and symptoms of Lyme disease include arthritis (especially in the knees), facial paralysis, neurological and cardiac problems, general malaise, and fatigue. Successful treatment for Lyme disease requires antibiotic therapy, and patients treated early in the disease process have a high chance of recovering.

Lyme disease in animals

Lyme disease has been reported in dogs, cats, horses, cattle, and sheep. The most common sign of disease is lameness. Approximately 10 to 20 percent of dogs may develop Lyme disease after being infected and will exhibit signs of fever, joint swelling, and lameness (from arthritis), fatigue, kidney damage, heart disorders, and neurological problems. Currently a vaccine is available to protect dogs from infection, but it will not cure an existing infection. Cats may develop Lyme disease, as well, with many of the same signs of infection as are seen in dogs.

Under everyday conditions, Lyme disease cannot be passed directly from an infected pet to a person. However, companion animals can bring infected ticks into your home, so frequent tick checks of pets, especially during spring and summer months, are highly recommended.

Livestock can fall ill with Lyme disease. Infected horses may show signs of lameness and stiff joints, refusal to feed, depression, laminitis, blindness, spontaneous abortion, encephalitis, and other neurological signs. Cattle also may show signs of lameness, including painful and swollen joints, and further, they may exhibit weight loss, fever, laminitis, and a rash on the udder. In contrast to domestic animals, wildlife, especially the deer and rodents that serve as tick hosts, seem to be largely unaffected by infection.

Prevention

Prevention is the best method of combating tick-borne disease. Knowing where in the state one might come in contact with infected ticks, and avoiding tick bites will help to prevent exposure to Lyme disease.

- Wear long-sleeved shirts and long pants, and tuck pants into socks.
- Wear light-colored clothing for easier visualization of ticks.
- Use a tick-specific, EPA-approved repellant (e.g., one containing DEET) making sure to follow the manufacturer's instructions. Permethrin-containing repellants also are effective but should be used only on clothing, as directed on the label.
- Perform regular tick checks at least once a day on yourself and others, including children, especially around the head and neck areas, and on companion animals that have been outside. Knowing the size of the tick is particularly critical, as detection of immature ticks requires extra vigilance.
Removing Attached Ticks

The folk remedies you may have used in the past to remove ticks can be dangerous and even increase your chances of contracting a tick-transmitted disease. The tick removal method described here is proven to be effective, and is the method recommended by the Centers for Disease Control and Prevention.

- Carefully remove the tick by using tweezers to grasp the tick’s mouthparts where they enter the skin. Pull steadily directly away from your skin. Because removing the tick is your main goal, do not be overly concerned if its mouthparts break off in the process. Clean the wound and disinfect the site of the bite.
- It usually takes at least 36 hours for an infected tick to transmit Lyme disease bacteria. If the tick is swollen and is a “gun-metal grey” color, it may have been attached for the minimal length of time needed for transmission.
- Tell your doctor if you experience any possible signs or symptoms of Lyme disease after a tick bite, such as fever, joint pain, a rash, or inflammation at the bite site. Symptoms typically develop 3 to 30 days after the bite.
- If you have been exposed to a tick in Iowa, and would like more information about that tick, please put it in a plastic bag with a blade of grass, and send it to:
  Lyme Disease Surveillance Program
  Iowa State University
  Science II Rm. 436
  Ames, IA 50011

Please include your name, address, place where you found the tick (city or county), information about the animal or person bitten, whether or not the tick was attached, the date the tick was found, and any other related information.

References and Resources


Tick Management Handbook. The Connecticut Agricultural Experiment Station, New Haven. This publication is available on-line at: http://www.caes.state.ct.us/SpecialFeatures/TickHandbook.pdf


Iowa Lyme Disease Surveillance Program. http://www.ent.iastate.edu/medent

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Acknowledgements

The Lyme Disease Surveillance Program was founded by ISU Professor Emeritus Wayne Rowley as a public health service to the people of Iowa. Partners in this project include the Iowa Department of Public Health, and the University of Iowa Hygienic Laboratory. Consultation on identification of some ticks has been provided by the Parasitology and Clinical Pathology Section of the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services, National Veterinary Services Laboratories.

Gratitude is expressed to James W. Mertins (USDA/APHIS/VS/NVSL), Glen Needham (Department of Entomology, Ohio State University, Columbus, Ohio) and Joseph Piesman (Centers for Disease Control and Prevention, Fort Collins, Colorado) for review of this text. Funding and support for this project are provided by the Iowa Department of Public Health and by the Agriculture and Home Economics Experiment Station (Ames, IA) project 5111, supported by the Hatch Act and State of Iowa funds.