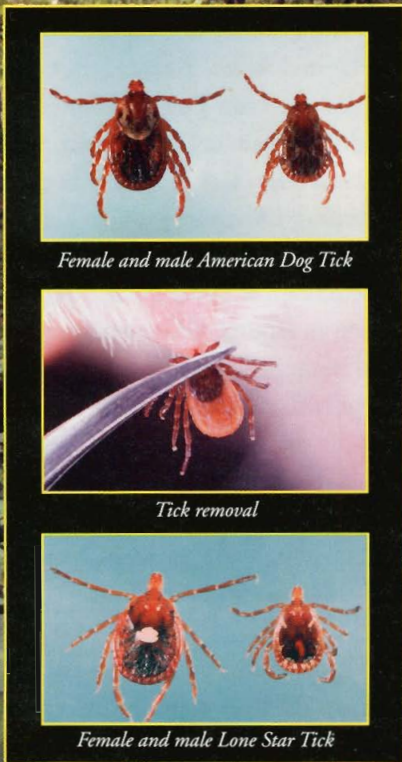


Ticks and Disease in Indiana



Female and male American Dog Tick

Tick removal

Female and male Lone Star Tick

What is a tick?

Ticks are small, insect-like animals that live in woodland or in mixed shrub and grassland environments. Ticks differ from insects in several ways, e.g., ticks have two body segments and eight legs, while insects have three body segments and six legs. The life cycle of ticks is also different and involves the following stages: egg, larva, nymph, and adult (Fig. 1).



Figure 1. The life cycle of a tick

The larval, nymphal, and adult life stages all actively seek vertebrate hosts in order to obtain blood meals. Different ticks prefer different hosts. In some species of ticks, the larva, nymph, and adult each feed on a different host; in other species, all stages feed on the same host. Through the process of attaching and feeding, ticks sometimes transmit disease-producing microorganisms to both animals and humans.

What kinds of ticks are found in Indiana?

About 15 different species of ticks can be found in Indiana. Of these 15, only 4 species are normally encountered by people and their pets. These are: the American dog tick, *Dermacentor variabilis*; the lone star tick, *Amblyomma americanum*; the blacklegged tick (also known as the deer tick or the Lyme disease tick), *Ixodes scapularis*; and the brown dog tick, *Rhipicephalus sanguineus*. The majority of ticks attached to



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people during the spring and summer in Indiana are American dog ticks; the second most common species is the lone star tick. The blacklegged tick, which was unknown in Indiana before 1987, has been found in increasing numbers, especially in northwestern Indiana. The brown dog tick is an occasional invader. The remaining 11 species of ticks are found almost exclusively on wild vertebrates and are rarely encountered by people.

Which ticks occur where I live?

Each of the common species of ticks has a different geographic distribution in Indiana. Some occur throughout the state, while others are found in specific regions.

The American Dog Tick

The slow moving American dog tick is the largest of the ticks discussed in this pamphlet. It has short mouth parts, and the female has a creamy, white shield on her back. The back of the male is mottled gray and dark brown (Fig. 2). The larvae and nymphs feed on small and medium-sized wild mammals, such as mice, in the woods and grasslands and are seldom seen. The adults feed on dogs, cats, and humans and are often seen in late April, May, June, and early July.



Figure 2. Female and male American dog tick, enlarged 6X

The American dog tick, the tick that most people see, occurs in all of Indiana's 92 counties, although the numbers vary greatly from one area to another. The tick population in any given area depends on environmental

conditions such as soil type, number of small mammals present, and amount of vegetation. Optimal conditions for the American dog tick can be found almost anywhere in Indiana.

The Lone Star Tick

The lone star tick is slightly smaller than the American dog tick but has much longer mouth parts (Fig. 3). The female has a single white spot near the center of her back. The males and nymphs are much smaller than the females. All three stages—larvae, nymphs, and adults—are quite active and move quickly. The lone star tick differs from the American dog tick in that all three active stages will attach to humans.

The immature stages of the lone star tick, sometimes referred to as seed ticks, "turkey ticks," or even "deer ticks," will even attach to ground-feeding birds and be carried to distant locations.

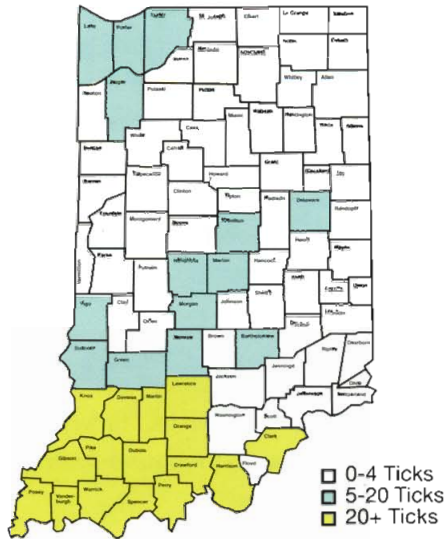


Figure 3. Female and male lone star tick, enlarged 7X

Lone star ticks have been collected in more than two thirds of Indiana's counties but are much more common in southern Indiana. High populations can be found in parts of Posey, Vanderburgh, Warrick, Spencer, Perry, Crawford, Harrison, Floyd, Gibson, Pike, Daviess, Martin, Orange, Lawrence, and Monroe Counties (Fig. 4). The distribution of the lone star tick seems to be expanding northward as a result of the strong growth of populations of the white-tailed deer in Indiana.

Adult lone star ticks appear in late March. Their numbers peak in May and June, and decline in July. Nymphs appear in April, peak in May and June, and can be found throughout the summer. Larvae appear in the spring and again in the fall but are not usually encountered in the middle of the summer.

Figure 4. Distribution of the lone star tick



The Blacklegged Tick (Lyme Disease Tick or Deer Tick)

The blacklegged tick (Lyme disease tick or deer tick), *Ixodes scapularis*, is the smallest of the four ticks described here. The female, the largest of the stages, is oval in shape, mahogany in color, and has long mouth parts. The male is smaller and has shorter mouth parts (Fig. 5). The nymph is not much larger than the size of a period on this page. Larvae of the blacklegged tick feed on mice and other small rodents, while adults prefer to feed on deer. Nymphs will feed on almost any host, including humans.

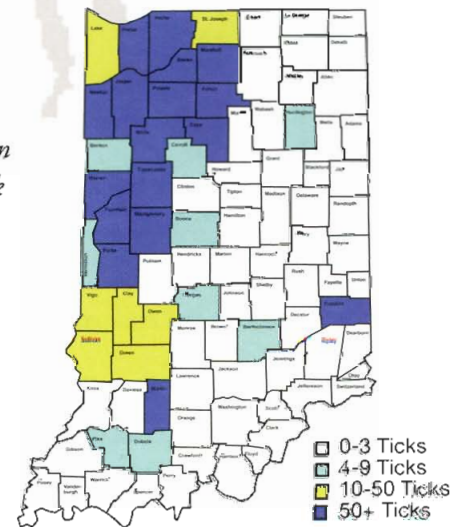
In Indiana, adults appear in September, seeking their preferred host, the white-tailed deer. They can be found in October and November and on warm days throughout the winter. Adults can even be collected in April and May but are usually not encountered during June to August. Nymphs are active during May to July, peaking in June, and larvae can be found from July to September, peaking in August.



Figure 5. Female and male blacklegged (Lyme disease) tick, enlarged 8X

The blacklegged tick arrived relatively recently in Indiana. The first specimens were collected from a deer killed in Porter County in 1987. Since then, its range has expanded considerably. By the end of 2000, specimens had been found in more than 60 of Indiana's 92 counties. Established populations are more likely to be found in the northwest quadrant of Indiana, including Lake, Porter, LaPorte, Newton, Jasper, Pulaski, and Starke Counties. The tick has also become established as far east as Steuben and Franklin Counties and throughout the western half of the state. Ticks infected with Lyme disease bacteria have been collected from five counties in the northwest corner of the state: Newton, Jasper, Pulaski, Porter, and St. Joseph. Counties with no record of blacklegged ticks are most likely to be on the eastern side of the state (Fig. 6).

Figure 6. Distribution of the blacklegged tick





The Brown Dog Tick

The brown dog tick is not native to Indiana but is occasionally brought into the state on pets. Thus, the brown dog tick is much less common than either the American dog tick or the lone star tick. Occasionally, this tick becomes a pest in kennels and in homes; it is the only tick that can become established inside the home. All stages readily feed on dogs and occasionally attach to humans. Like the American dog tick, the brown dog tick is uniformly brown in color. It is also smaller in size.

What diseases do ticks transmit?

In Indiana, ticks are responsible for transmitting several diseases. The four most common diseases are: Rocky Mountain spotted fever, Lyme disease, ehrlichiosis, and southern tick-associated rash illness. Ticks can also transmit tularemia, babesiosis, and several diseases of viral origin. In this pamphlet, we will limit our discussion to Rocky Mountain spotted fever, Lyme disease, ehrlichiosis, and southern tick-associated rash illness.

Rocky Mountain Spotted Fever

Rocky Mountain spotted fever (RMSF) is an acute infectious disease caused by the bacterium, *Rickettsia rickettsii*. Both the American dog tick and the lone star tick can harbor this bacterium, and bites from infected ticks of these species can transmit RMSF.

Since the peak activity of these ticks occurs in the spring, cases of RMSF usually occur in the spring or early summer. As many as 16 cases to as few as 0 cases have been reported annually in Indiana over the past 30 years. An average of 6 cases is reported annually in Indiana.

The major symptoms of RMSF begin 3 to 10 days after tick attachment. Symptoms include headache, chills and fever, and muscle aches. From 1 to 3 days after fever onset, a rash usually develops, appearing first on the wrists and ankles and then spreading to the rest of the body. When promptly diagnosed, RMSF can be successfully treated with antibiotics. The patient's recollection of a tick bite

is frequently the key factor in a successful diagnosis, treatment, and recovery. Conversely, when a prompt diagnosis is not forthcoming, deaths have occasionally occurred. Case fatality rates range from 13 to 25 percent in untreated cases.

Lyme Disease

Lyme disease is a chronic, tick-borne infection caused by the bacterial spirochete, *Borrelia burgdorferi*. The disease is named for the towns of Lyme and Old Lyme, Connecticut, where it was first discovered in 1975. Lyme disease is now the number-one reported vector-borne disease in the United States. Most of the cases are reported in New York and the New England States in the East, in Minnesota and Wisconsin in the Midwest, and in California in the West. However, cases have now been reported from 47 states, including Indiana.

The first reported case of Lyme disease in Indiana occurred in 1983. However, reports of Lyme disease cases in Indiana have increased in recent years; approximately 25 cases were reported annually during the 1990s. While an unknown percentage of the cases reported each year in Indiana are acquired out of state, the risk of acquiring Lyme disease through a tick bite received in Indiana is increasing, particularly in the state's northwestern-most counties where infected ticks have been collected.

Symptoms of Lyme disease vary from patient to patient. In approximately 70-80 percent of infected people, a rash will develop at the site of the tick bite within one month of the bite. This rash, the hallmark of early Lyme disease, begins as a small papule and expands, ranging from several inches to a foot or more in diameter. The rash usually appears reddish but may be pale in the center. It can be either flat or raised or even blistered or scabbed. Regardless of whether a rash appears, other symptoms can occur during this acute phase of infection, including: fatigue, fever, headache, swollen glands, and stiffness or pain in the muscles, joints, and neck. If these early symptoms are not treated with the appropriate course of antibiotics, the

disease may become disseminated. Medical complications from disseminated Lyme disease can involve the heart, nervous system, and joints. Diagnosis of Lyme disease is based on clinical findings and serologic (blood) tests.

Ehrlichiosis

Two types of human ehrlichiosis occur in the Midwest, human monocytic ehrlichiosis and human granulocytic ehrlichiosis (sometimes referred to as human anaplasmosis). Human monocytic ehrlichiosis (HME), first reported in Arkansas in 1986, is characterized by fever, headache, muscle aches, nausea, and vomiting. The disease can be serious but is usually not fatal. The first reported cases of HME in Indiana occurred in 1994. Most of the cases have been reported from Indiana's southern-most counties where the lone star tick is most abundant. Lone star ticks infected with *Ehrlichia chaffeensis*, the cause of human ehrlichiosis, have been collected from Warrick, Spencer, Crawford, Perry, Pike, and Orange Counties. Human granulocytic ehrlichiosis (HGE), which produces symptoms similar to those of HME, is transmitted by the blacklegged tick. The first case of HGE in Indiana was reported in 2003. Both types of human ehrlichiosis can be treated with antibiotics such as tetracycline.

STARI (Southern Tick-Associated Rash Illness)

Southern tick-associated rash illness (STARI) has been found in people in southeastern and south-central states and is associated with the bite of the lone star tick. Characterized by a rash similar to that of Lyme disease, the illness was identified by spirochetes from the rash of a patient who tested negative for Lyme disease. DNA analysis of test spirochetes indicated that they were *Borrelia lonestari*, the same bacterium that had previously been found in the lone star tick. Recent studies in Indiana have demonstrated the presence of *B. lonestari* in lone star ticks in several southern counties.

How can I avoid tick bites?

To avoid tick bites, stay out of tick-infested areas, especially during the height of the tick season—April, May, and June. When this is not possible, take the following precautions when entering a tick-infested area: (1) wear long pants and a long-sleeved shirt; (2) tuck the shirt into the pants, and the pants into the socks; (3) apply insect repellents to clothes to further reduce the incidence of tick bites (always follow directions for use on label); (4) conduct thorough “tick checks” immediately after leaving any tick-infested area. Inspect the entire body and promptly remove any ticks found. Prompt removal of attached ticks may reduce the risk of disease transmission.



Figure 7. Recommended procedure for tick removal

What is the best way to remove a tick?

Recent research indicates that some traditional methods of tick removal are ineffective and may even be dangerous. Medically acceptable procedures for tick removal are as follows: grasp the tick as close to the skin as possible with a pair of tweezers and apply an even, upward pulling force. If tweezers are unavailable and fingers must be used, they should be protected by disposable rubber gloves or, at least, facial tissue. Do not jerk or twist the tick; this action might tear the head and mouth parts from the tick's body and expose the feeding wound to the tick's body fluids.

Removed ticks should be saved in a vial or jar labeled with the date and location. This information will aid the physician in the diagnosis of RMSF or Lyme disease should an illness develop.

Questions and Answers

1. We often find American dog ticks on us and on our pets. Can these ticks transmit Lyme disease?

No. The American dog tick, *Dermacentor variabilis*, cannot transmit Lyme disease. *Ixodes scapularis*, the blacklegged tick, is the only species in Indiana that can transmit Lyme disease.

2. I am a deer hunter. Can I get Lyme disease if I come into contact with deer blood when I field dress my deer?

No. Research has found that deer seem to be immune to Lyme disease and that there are relatively few spirochetes, if any, in deer blood.

3. Can I get Lyme disease from eating wild game?

No. If the game is properly cooked (internal meat temperature of 145° F), any spirochetes will be killed.

4. I am a taxidermist and I sometimes handle deer from areas where Lyme disease ticks occur. Can I get Lyme disease from handling these deer?

Yes. Although it has not been shown that you can become infected directly through the handling of deer carcasses or blood, it is possible for Lyme disease ticks to remain on deer long enough to reach a taxidermy shop. If one of these ticks were infected and bit you, you could get Lyme disease. Some taxidermists in Indiana have found *I. scapularis* ticks on deer or on themselves. Taxidermists should examine themselves for ticks daily and remove any attached ticks following the medically acceptable procedures outlined in this pamphlet.

5. Which kinds of ticks carry Rocky Mountain Spotted Fever (RMSF)?

Both the American dog tick and the lone star tick can transmit RMSF. However, only a small percentage of these ticks are infected and capable of transmitting the infection to humans. Prompt removal of any ticks found will significantly reduce the chances that the tick will transmit disease. Remove attached ticks following the medically acceptable procedures described in this pamphlet.

6. During which seasons is the risk of acquiring a tick-borne disease the greatest?

Most cases of tick-borne diseases are acquired during the spring and early summer.

7. What kind of clothing provides the best protection against ticks?

Light colored, tightly woven clothing. The light color will make it easier to see the ticks, while the tight weave may make it harder for them to attach. Follow the guidance for appropriate clothing provided in this pamphlet.

8. Can dogs get tick-borne diseases described in this pamphlet?

Yes. Veterinarians can treat your dog for these diseases. There is also a Lyme disease vaccine available for dogs.

9. How can I control tick populations in my yard?

Keep your yard neat and keep your lawn closely trimmed. Mouse-proof your house and remove any outdoor materials that might make good homes for mice. If you are in an area frequented by deer, consider contacting a professional exterminator about spraying your yard for ticks.

10. Where can I go for more information?

Your local health department and the Indiana State Department of Health (ISDH) are excellent sources of information. The ISDH Lyme disease Web site is located at: www.in.gov/isdh/programs/lyme/index.htm. You can also ask your local librarian for information about these diseases or visit the Centers for Disease Control and Prevention Web site at: www.cdc.gov/. Click on the letter L in the A-Z index, then click on Lyme Disease. The Public Health Entomology Laboratory in the Department of Physiology and Health Science at Ball State University posts information on ticks and tick-borne diseases in Indiana at: www.bsu.edu/physiology-health/entomology_lab/. Purdue University has information and publications available at: www.entm.purdue.edu/Entomology/ext/targets/e-series/public.htm.

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Additional copies of *Ticks and Disease in Indiana* are available from the Indiana State Department of Health or from the Public Health Entomology Laboratory at Ball State University, Muncie, Indiana 47306-0510, (765) 285-1504