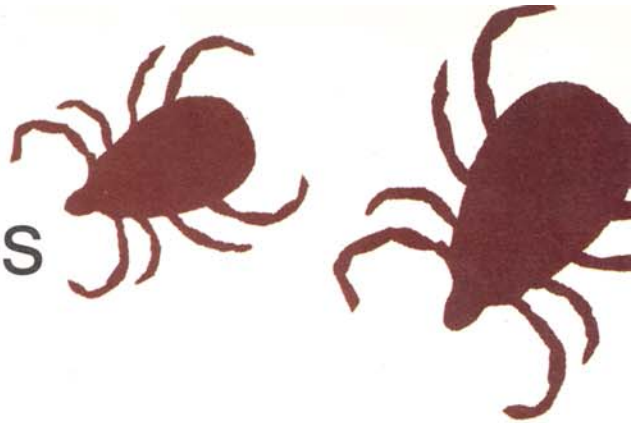


# Ticks and Tick-Borne Diseases in North Carolina



*Ticks have long been pests of humans and animals in North Carolina. From the larval to the adult stages, ticks attach to a living host and feed on the host's blood. In doing so, they may transmit germs that cause Rocky Mountain spotted fever or Lyme disease, both of which can have serious consequences for humans. This publication will help you identify the several species of ticks found in North Carolina and the diseases they transmit. It also describes ways you can protect yourself from ticks outdoors and control ticks in your home.*

## Biological Characteristics of Ticks

Ticks are related to mites and spiders. They have four stages of development — the egg, larval, nymph, and adult stages. After hatching from the egg, the tick must take a blood meal to complete each stage in its life cycle. Each stage of the tick usually takes a blood meal from a different host. For most ticks, each blood meal is taken from a different *type* of host.

Ticks are usually active in the spring, summer, and fall; however, the adults of some species are active in the winter. When seeking a blood meal, ticks move from leaf litter, from a crack or crevice along a building foundation, or from another secluded place to grass or shrubs where they attach themselves to an animal as it passes. If a host is not found by fall, most species of ticks move into sheltered sites where they become inactive until spring.

Once it is on a host, a tick crawls upward in search of a place on the

skin where it can attach to take a blood meal. The tick's mouth parts are barbed, making it difficult to remove the tick from the skin. In addition, the tick manufactures a glue to hold the mouthparts in place. The female mates while attached to a host and usually feeds for 8 to 12 days until it is full. By the time it finishes feeding, the female may increase in weight by 100 times (Figure 1). A male tick may attach, but it does not feed as long as the female.

The male tick may mate several times before dying. The female, after mating and feeding, drops to the ground where it lays a



**Figure 1.** From left: engorged female tick, unengorged female tick, and male tick. Note size in relation to pin head. (Photo courtesy of Pfizer Chemical Co.)

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mass of eggs in a secluded place such as in a crevice or under leaf litter. Shortly after laying an egg mass, which may contain thousands of eggs, the female dies. The eggs hatch in about two weeks, and the life cycle begins again. Depending upon the species of tick, the life cycle may take as little as a few months or as much as two years.

### The American Dog Tick

The adult *Dermacentor variabilis*, or American dog tick (Figure 2), is active in the spring, summer, and fall. It lives along woodland paths, in recreational parks, farm pastures, wastelands, and other shrubby habitats in rural and suburban areas of North Carolina. In each stage of its life cycle, this tick may feed on a different animal. For example, the larvae feed only on white-footed field mice and meadow voles or pine voles, whereas nymphs prefer medium-sized mammals such as opossum or raccoons. Adults prefer humans and dogs as hosts. In North Carolina and throughout the southeastern United States, the American dog tick is the vector of Rocky Mountain spotted fever. However, this species does not transmit Lyme disease. The American dog tick is found throughout North Carolina, but it is most common in the piedmont.



Figure 2. Male and female American dog tick.

### The Brown Dog Tick

*Rhipicephalus sanguineus*, the brown dog tick (Figure 3) occurs throughout North Carolina and may be active year round. In all stages, it feeds almost exclusively on dogs and rarely attacks people. Brown dog tick females may lay egg masses in cracks and crevices along building foundations, in pet kennels, and in homes. After a few weeks, you may find several thousand larvae climbing on walls, draperies, or furniture. When uncontrolled in kennels, populations of the brown dog tick may grow to extremely high levels.

### The Lone Star Tick

All stages of *Amblyomma americanum*, the lone star tick (Figure 4), readily feed on man and large wild or domestic animals such as deer and dogs. Adults and nymphs are abundant in the spring and summer months. The mite-like larvae of this species, commonly called *seed ticks*, are abundant in the fall. In this stage, the lone star tick readily attacks humans. This tick is found in habitats similar to those of the American dog tick. It occurs predominantly in the coastal plain, but it may be found in the North Carolina piedmont.



Figure 4. Male and female lone star tick.



Figure 3. Male and female brown dog tick.



Figure 5. Male and female black-legged tick.

## The Black-Legged Tick

Larvae and nymphs of *Ixodes scapularis*, the black-legged tick (Figure 5), feed on snakes and lizards. The adults attack large mammals such as dogs, deer, and humans. Adults are active in late fall, in early spring, and in winter when temperatures rise above freezing. The black-legged tick is found in the same habitats and regions of North Carolina as the lone star tick.

## Diseases Transmitted by Ticks

### Rocky Mountain Spotted Fever

Also known as tick typhus, Rocky Mountain spotted fever is caused by a bacteria-like microorganism, *Rickettsia rickettsii*. Rocky Mountain spotted fever rickettsiae are acquired by an American dog tick when it takes a blood meal from an infected animal. These bacteria are not harmful to most wild and domestic animals, but they are extremely pathogenic to humans and dogs. Rocky Mountain spotted fever is normally a disease of wild animals, but people can be infected while camping or hiking in tick-infested areas if they are bitten by an infected tick. In addition, pets may carry an infected tick into the family living area. The disease organisms can also be passed through the egg (Figure 6) of an infected tick and from stage to stage in



Figure 6. Female tick laying eggs.

the life cycle. Fortunately, only a small percentage of American dog ticks found in nature are infected.

Symptoms of Rocky Mountain spotted fever include headache, fever, chills, aches, pains, and sometimes nausea. These symptoms are usually accompanied by a rash that starts on the wrists and ankles. Because Rocky Mountain spotted fever is easily cured with antibiotics, a person exhibiting any of these symptoms 2 to 14 days after a tick bite should consult a physician at once. If left untreated, Rocky Mountain spotted fever can cause death.

### Lyme Disease

Lyme disease is caused by a spiral-shaped bacterium (called a spirochete), *Borrelia burgdorferi*. The bacterium is transmit-

ted through the bite of an infected tick. Lyme disease was recognized as a distinct disease in 1975 after several children, living close to each other in the town of Old Lyme, Connecticut, developed arthritis. In the northeastern United States where the disease is prevalent, the black-legged tick, *Ixodes scapularis* (formerly called the deer tick, *Ixodes dammini*) is the vector of the Lyme disease spirochete. The black-legged tick in the Southeast does not tend to bite humans and as a result many fewer cases of Lyme disease are found. The lone star tick does readily attack humans, but only a small number of spirochete-infected ticks have been collected in the Southeast. Like Rocky Mountain spotted fever, Lyme disease is indigenous to wild animals.

Lyme disease has been divided into three clinical stages. Stage I involves a rash and flu-like symptoms. Within 30 days of infection, a characteristic rash (erythema migrans) occurs at the site of the tick bite. Twenty to 50 percent of Lyme disease patients do not exhibit the rash, which often delays diagnosis of the disease. Erythema migrans may occur as an irregular-shaped red blotch or it may consist of a bright red ring around the bite that gradually expands over several days and clears in the center to form a bull's-eye pattern. The rash can vary in size from 1 to 18 inches. Later, secondary blotchlike skin lesions may occur away from the site of the bite when the spirochete spreads. The rash is usually accompanied by fatigue, a headache, a stiff neck, muscle aches and pains, and a general feeling of discomfort.

Stage II, which occurs during the next several weeks, includes cardiac and neurological symptoms. Neurological complications occur in about 15 percent of the patients and can involve encephalitis (inflammation of the brain), radiculitis (inflammation of the nerve roots), and Bell's palsy (transitory facial paralysis). In most instances, these symptoms completely disappear after lasting several months. Cardiac abnormalities occur in about 8 percent of patients. The symptoms include dizziness, shortness of breath, and heartbeat irregularities that may require installation of a pacemaker. Within several weeks these symptoms usually disappear.

Stage III is distinguished by arthritic problems that may appear as long as two years after the rash. Patients may experience pain, swelling, and elevated temperature in one or more joints. Some patients may also exhibit sleepwalking, loss of memory, mood changes, and inability to concentrate.

Lyme disease and its complications can be effectively treated with antibiotics. Physicians use different antibiotics against each stage of the disease. With early treatment, the course of Lyme disease is shortened and the occurrence of late complications, such as arthritis, is reduced. Therefore, it is important to diagnose Lyme disease and administer antibiotic therapy quickly.

### How to Protect Yourself from Ticks

- To avoid ticks that may be on grass and shrubs, stay on wide paths and roads when possible.
- When practical, layer your clothing. Tuck your pant legs into your socks and your shirttail into your pants. Wearing light-colored clothing makes ticks easier to see.

- Most commercial insect repellents are effective against ticks. Liberally apply one of these to exposed areas of your body and to your clothing.
- When camping, try to select an area that is not heavily infested with ticks. You can check for ticks by dragging a piece of white flannel cloth or clothing over the grass and shrubs and then examining it for ticks.
- When you have been in a tick-infested area, *examine your clothing and body at least twice each day*. Frequent self-inspection lessens the chance of a tick having enough time to attach. A tick must be attached at least six hours in order to transmit disease organisms causing Rocky Mountain spotted fever; therefore, the longer a tick is attached, the greater the chances are that germs will be transmitted. The minimum attachment time required for transmission of Lyme disease spirochetes is not yet known.

## Procedure for Removing Ticks

The risk of infection with tick-transmitted disease organisms can be greatly reduced by inspecting yourself frequently for ticks and promptly removing any that have attached. Applying petroleum jelly or cleaning fluid or holding a burning cigarette near an attached tick will not cause it to dislodge. Such "home remedies" irritate the skin and kill the tick, making it difficult to remove intact. Here is the best way to remove an attached tick:

1. Shield your fingers with a piece of folded tissue paper or use tweezers. Disease organisms carried by an engorged tick may penetrate even microscopic breaks in the skin. Grasp the body of the attached tick firmly and, without twisting or jerking, pull directly away from the point of attachment, increasing the force gradually until the tick is pulled free.
2. If the tick's mouth parts break off in the skin, use a sterilized needle to remove them as you would a splinter.
3. Wash the bite area with soap and water and apply an antiseptic such as alcohol.

4. Wash your hands thoroughly with soap and water after removing the tick.
5. Mark the date of the tick bite on a calendar. If symptoms of Rocky Mountain spotted fever or Lyme disease develop, you will be able to tell your physician when you were bitten.
6. Save the tick by preserving it in rubbing alcohol. If you cannot identify it using the pictures in this publication, take it to your county Cooperative Extension Center.

## Ticks and Pets

Pets may transport ticks into the family living area, so inspect them frequently for ticks. Remove attached ticks from pets using the same procedures described for people. Control ticks on pets using flea-tick collars and powder or liquid formulations of pesticides. In addition, several safe and effective pesticides can control ticks in pet quarters. Contact your county Cooperative Extension Service agent for advice on pesticides.

## Controlling Ticks on Home Grounds and in Public-Use Areas

Weeds and grass around homes and in public-use areas should be kept mowed to discourage rodent hosts of ticks from becoming established.

Reduce exposure to ticks by removing the leaf litter layer around picnic tables, in campsites, and along hiking trails.

Severe tick infestations can be controlled effectively with pesticides. Uniform application is critical to achieving adequate control. If a liquid formulation is used, the ground cover in tick-infested areas should be wetted thoroughly to the soil surface. Apply granular pesticides just before rainfall or water the granules thoroughly to assure that the pesticide is released. Until the treated areas have dried, keep children and pets away. Contact your county Cooperative Extension Service agent for advice on which pesticides to use against ticks.

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