

Update

NPMA LIBRARY UPDATE

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TICKS

Tick Facts at a Glance

- Ticks are arthropods of the class Arachnida (not an insect). Arachnids also include spiders and mites;
- The general life cycle of a hard tick:
- Egg - larva (has six legs); nymph (has eight legs); adult (also has eight legs);
- All three stages (nymph, larva and adult) require at least one blood meal per stage to grow and develop;
- The different stages (larva, nymph and adult) are progressively larger in size;
- Many features used to identify the stages and sexes are difficult to see without a microscope;
- Males take only small blood meals while females take large meals, each temporarily increasing in size;
- Nymphs are distinguishable from adults primarily by size (the size of the blood meal taken can vary considerably between the hard and the soft tick species);
- Questing is a term used to refer to a tick's behavior in which they climb to the tops of blades of grass and await an animal passing by; when they sense the animal's vibrations and/or heat, they grab a hold of the animal's fur.

Blacklegged Tick

The blacklegged tick (*Ixodes scapularis*), also called a deer tick or Lyme tick, is named for its dark legs; the body is pale in color. They live in grass and shrubs and adults feed primarily on the blood of white-tailed deer.

Blacklegged ticks live for two years and have three feeding stages: larva, nymph, and adult. Tick eggs are laid in the spring and hatch as larvae in the summer. Larvae can feed on mice and other small animals including birds into the summer and early fall. When a young tick feeds on an infected animal, the tick may also take in bacteria into its body with the blood meal, and it can then remain infected for the rest of its life. After this initial feeding, the larvae become inactive as they molt into nymphs. The following spring, nymphs seek blood meals in order to fuel their development into adults. When the tick feeds again, it can transmit any bacteria it contains to its new host. Usually the new host is another small rodent, but sometimes it may be a human. Although adult ticks often feed on deer, these animals do not become infected. Deer are nevertheless important in transporting ticks and maintaining tick populations in most areas.

Lone Star Tick

The lone star tick, (*Amblyoma americanum*) so called because of a white dot on the back of the adult female, is very abundant in the south central and southeastern United States. Over the past several years, this tick has also expanded its range into the Midwest. Although lone star ticks are most active in May and June, it is possible to find adults active on

Most Common Ticks found in the United States:

Blacklegged tick (below), Lone star tick, American dog tick, and Brown dog tick.



Photo: Scott Bauer, USDA Agricultural Research Service, Bugwood.org

warm days throughout the winter and early spring.

The lone star tick must have three blood meals to develop to the adult stage. This species has a wide host range. Adult ticks are commonly found on large mammals such as cattle, deer, horses, foxes, cats and dogs.



Lone star tick

The immature ticks (both larvae and nymphs) may feed on the same hosts, though they prefer to feed on birds and small mammals. All stages of lone star tick will feed on people. This tick is considered to be a human health threat because it is a major carrier of

Rocky Mountain spotted fever, especially in the Ozark and Carolina regions.

American Dog Tick

The American dog tick (*Dermacentor variabilis*) is a common tick found throughout the United States. Like all ticks, the American dog tick goes through an egg, larva, nymph, and adult stage during its development. While they may be found throughout the year, adults are most active during late April through May.



American dog tick (female)

The larva, nymph, and adult stages must each have a blood meal before they can develop to the next stage, (or in the case of the adult female, lay her eggs). The American dog tick has a fairly wide host range. Adults commonly infest both large and medium sized mammals such as dogs, cattle, deer, raccoons, and opossum. The immature stages may feed on these same hosts but prefer to infest smaller mammals such as meadow mice, squirrels, and chipmunks. All stages of the American dog tick will also feed on humans if given the opportunity. They are abundant and are the main carrier of Rocky Mountain Spotted Fever in many areas of the United States.

Brown Dog Tick

The brown dog tick (*Rhipicephalus sanguineus*) is unusual among ticks, in that it can complete its entire life cycle indoors! Because of this, it can establish populations in colder climates. Many tick species can be carried indoors on animals, but cannot complete their entire life cycle inside. Although the brown dog tick will feed on a wide variety of mammals, dogs are the preferred host in the United States and appear to be required to develop large infestations.

The tick is found worldwide, usually in warmer areas. It is found on dogs and occa-

sionally on wildlife. It is a small, red-brown tick lacking any ornamentation. If dogs are absent, the tick will feed on other domestic animals, rodents and rarely on humans.



Brown dog tick

Larvae and nymphs typically attach to a dog's back whereas, adults usually attach on the ears and between the dog's toes. An adult female will feed on the host for about a week, drop off the host and then typically climb upwards to find a secluded place for egg development. Cracks and crevices are ideal locations for egg laying. She continues to lay eggs for four days after she drops off. After she finishes laying her eggs, she dies.

A fully blood-fed female brown dog tick can lay up to 1,000-3,000 eggs; the number of eggs laid depends on the size of the tick and the amount of blood she has ingested. Temperature and humidity play a role in the length of time each stage feeds, and the time required for development and molting. Warmer temperatures promote faster growth.

Ticks are notoriously long-lived, and can live several months in each stage without feeding; adults can live 18 months without feeding.

Tick Associated Human Diseases

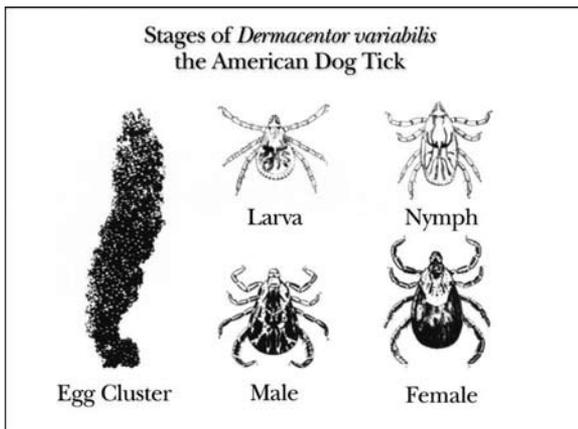
Tick-borne diseases are common and can be fatal if not treated. Early removal is important since disease organisms are usually not transferred until the tick has fed for several hours. Worldwide, there are many types of tick-borne disease; however, diseases in this Library Update will focus on several North American diseases.

Lyme Disease

Lyme Disease is a well publicized disease and has gained national attention due to the rapid spread of the disease. This disease has also been documented extensively within the pest management industry.

Lyme Disease (Lyme borreliosis) is the most common tick-borne disease in North America and northern Eurasia. The causative agent of this disease is the spirochete *Borrelia burgdorferi*; there are several Lyme-like diseases also on record.

The reservoir for Lyme Disease is small mammals, specifically rodents. Ticks, primarily *Ixodes scapularis* and *I. pacificus*, that feed on infected white-footed mice and transfer the



Generalized tick life cycle, showing egg mass, larva, nymph, and female and male adults. (Female is larger.) (source: <http://www.lib.uiowa.edu/hardin/MD/cdc/ticks.html>)

microbe to humans. The disease does not appear to affect the mice and is not documented affecting the other reservoirs. Research has shown that ticks must be attached for six to eight hours before the disease can be transmitted to humans; since many ticks are small, self examination is important to see if ticks are attached after humans frequent tick infested areas.

The symptoms of Lyme Disease may include a rash with a bulls-eye appearance, lethargy, later lesions, and finally chronic symptoms including lethargy as well as chronic arthritis, especially in the knee joints. There are about 20,000 cases of this disease reported in the United States annually.

Treatment is via a regimen of antibiotics when the disease is properly diagnosed by attending physicians. While deaths do occur due to Lyme Disease, treatment is generally successful short of chronic joint issues which may linger.

Ehrlichiosis

Ehrlichiosis is a disease caused by *Ehrlichia chaffeensis*, *E. ewingii*, and *E. phagocytophila* or similar bacterium. These varying sources can lead to several different types of Ehrlichiosis.

Three species of tick are known to be vectors of Human Monocytic Ehrlichiosis (HME). The lone star tick, *A. americanum* has been identified as a carrier of *E. chaffeensis*. This tick is common in the south-central and southeastern United States where the majority of cases have been contracted. The likely animal reservoirs of this organism are dogs and white tailed

deer. The blacklegged or deer tick, *Ixodes scapularis*, has been found to be infected with the HME bacterium in New York, Massachusetts and Wisconsin. The American dog tick, *D. variabilis*, is another vector of this *Ehrlichia* species. Dogs, white-tailed deer, deer mice and whitefooted mice are suspected of being animal reservoirs of the disease organism.

Ehrlichiae bacteria infect human white blood cells; therefore the body's immune system is disabled. Consequently, the body's ability to fight other infections is reduced. Each species prefers specific types of white blood cells. The clinical signs and symptoms of disease include high fever, headache, muscle aches or cramps, chills, sweating, nausea and vomiting. Occasionally, cough, joint pains, confusion and rash are reported. Treatment is possible with a regimen of antibiotics.

Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever (RMSF) is a disease whose causative agent is *Rickettsia rickettsii*. The main vector is the American dog tick *D. variabilis* in the east and central parts of the United States and the Rocky Mountain wood tick *Dermacentor andersoni* in the Rocky Mountain area. (However, the lone star tick can also serve as a vector.) The reservoirs typically do not have symptoms, but there are cases where symptoms of RMSF in animals have been observed.

Each year, reports of several dozen to hundreds of cases of RMSF are reported. Extreme cases can be fatal and can be as high as 5 percent even with treatment. Typically, it takes over four hours of feeding by a tick to transmit the agent causing RMSF. Treatment is possible with a regimen of antibiotics.

Temporary Tick Paralysis

The American dog tick, *D. variabilis*, is also known to cause paralysis in dogs and children where ticks attach at the base of the skull or along the spinal column. Paralysis is caused by a toxic secretion produced by the feeding tick. When the tick is removed, complete recovery is rapid, usually within eight hours. Sensitized animals may become paralyzed by tick attachment anywhere on the body.

Tick Pest Management

Pest management of ticks in outdoor areas is extremely difficult. While several pesticides are labeled for outdoor tick control, they are usually not effective in eliminating large num-

bers of ticks in brushy, heavily wooded areas. Habitat modification is considered to be the most permanent approach to tick management. Since ticks must be in areas of high humidity in order to survive, they are most commonly found in shaded grassy, brushy, or wooded areas. Keeping grass well-mown, removing brush regularly, and pruning trees to allow for more sunlight to penetrate to the soil surface will discourage ticks from becoming established in these areas. In addition, reducing vegetative cover will prevent a harborage for mice, the principal reservoir host of the spirochete for Lyme Disease. Use of a thin layer of mulch, one to two inches in depth, or bare soil around shrubbery also helps to reduce habitat.

Tick management may require both a coordinated veterinary pet treatment and a professional pesticide treatment of the infested area of home and/or yard. Homeowners should consult a veterinarian for proper pet tick prevention. Outdoors, infested areas should be treated by the pest professional by applying a broadcast treatment of pesticide to the landscape. Read the label thoroughly to be certain that the site and type of application (lawn, house, crawl space, kennels, etc.) is on the label. Special effort should be given in treating areas frequented by pets and children. Reapplications may be necessary to eliminate the ticks.

A tick drag may be conducted before initiating yard treatments to determine the extent of an infestation. A piece of light-colored flannel cloth may be dragged across vegetation where ticks may be waiting for a host. Ticks will attach themselves to the cloth and then can be killed by placing the cloth in sudsy soapy water. The number of ticks on drags then compared at different times can give you a rough idea of how well the I.P.M. strategy is working.

For ticks found within the home, pesticides should be applied carefully as spot, crack and crevice or surface treatments, especially around dog bedding areas and other pet resting areas. For heavy infestations indoors, or when egg masses of ticks hatch, space sprays can be applied to give a quick knockdown. Pets should be kept off of all treated surfaces until dry. Apply products according to label directions. Keep in mind that tick infestations in homes are often the result of wildlife or bird or rodent infestations in crawl or attic void areas. Be sure to exclude nuisance wildlife in all of these areas to help reduce ticks.

Personal Tick Prevention

When in an area where ticks are common, wear long-sleeved shirts and pants, preferably light colored so ticks will be easy to detect. Tuck pants into socks. Do not sit on the ground or on logs in bushy areas. Keep brush cleared or burned along frequently traveled areas. Repellents will protect exposed skin or clothing. However, ticks will sometimes crawl over treated skin to untreated parts of the body. When you return indoors, inspect all clothing and skin thoroughly for ticks, including your head. Wash clothes immediately.

Tick Removal

Ticks should be removed from pets and humans as soon as they are noticed. Ticks should be removed carefully and slowly. If the attached tick is broken, the mouthparts left in the skin may transmit disease or cause secondary infection. Ticks should be grasped with tweezers at the point where their mouthparts enter the skin and pulled straight out with firm pressure. A small amount of flesh should be seen attached to the mouthparts after the tick is removed. To be safe, any flu-like symptoms that occur within two weeks following the bite of any tick should be reported to the family physician as a precaution. 

Sources:

- NPMA Library Update: Human Ehrlichiosis
- Haymann, David L., Control of Communicable Diseases Manual, 18th Edition, APHA.
- Bonnefoy et al, Public Health Significance of Urban Pests. Bonn: WHO.
- Smith, E.H. and R.C. Whitman, 2007. NPMA Field Guide to Structural Pests, 2nd edition.
- <http://www.cdc.gov>
- <http://edis.ifas.ufl.edu/IG088>

Photo references:

blacklegged tick:

www.ent.iastate.edu/imagegal/ticks/defaulttn.html

lone star tick:

www.ent.iastate.edu/imagegal/ticks/defaulttn.html

American dog tick:

www.ent.iastate.edu/imagegal/ticks/defaulttn.html

Brown dog tick:

http://creatures.ifas.ufl.edu/urban/medical/brown_dog_tick.htm and www.entomology.cornell.edu/public/IthacaCampus/ExtOutreach/Medical/TickBioFS/pageBodySections/0/imageSet/0/image/rhipicephalusanguineus-www.jpg

General life stage of ticks:

www.lib.uiowa.edu/hardin/MD/cdc/ticks.html