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AMERICAN DOG TICK, *DERMACENTOR VARIABILIS*

The American dog tick, *Dermacentor variabilis*, is one of the most widely distributed and common ticks in Connecticut. This tick is found throughout the eastern United States. Known by some people as the wood tick, only adults of the American dog tick are usually found feeding on people and their pets. The American dog tick can transmit the organism that causes Rocky Mountain spotted fever, but this disease is not common in Connecticut. The tick does not transmit the Lyme disease bacterium, *Borrelia burgdorferi*.



Female American dog tick (CDC).



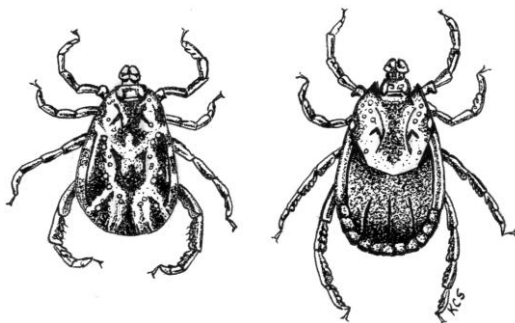
Distribution of *Dermacentor variabilis* in the United States (CDC).

DESCRIPTION

Adult American dog ticks are reddish brown in color with white markings on the back or upper body. They are about 1/4 of an inch long. Female ticks increase dramatically in size as they obtain their blood meal from a host animal. Fully engorged females may reach 1/2 inch in length and resemble a dark pinto bean. Male ticks do not change in size as they feed.

LIFE CYCLE

Ticks require blood from vertebrate animals to complete their life cycle. However, they can live for extended periods, if suitable hosts are not available. The maximum survival time for an unfed adult dog tick is about 1,000 days. The four stages in the tick life cycle are the egg, larva, nymph, and adult (male and female). Larvae and nymphs of the American dog tick feed on meadow voles (*Microtus pennsylvanicus*), white-footed mice (*Peromyscus leucopus*), and other rodents. Dogs are the preferred hosts of adult ticks, but they also feed readily on other medium to large mammals. These include opossums, raccoons, skunks, fox, coyote, bobcat, squirrel,



Left: Male *D. variabilis*. Right: Female *D. variabilis* (Kirby Stafford).

cattle, sheep, horses and people. Adults become active around mid-April to early May and remain a nuisance until August. Dog ticks climb up grass or other vegetation to grasp a passing host; they cannot fly or jump. A female tick will feed for 10-12 days. Once she is engorged with blood, she drops off the host, lays 4,000 to 6,500 eggs or more, and dies. Males ingest smaller amounts of blood from hosts. In Connecticut, the American dog tick probably requires 2 years to complete its life cycle.

TICK HABITAT

American dog ticks are most numerous along roadsides, paths, marshy areas and trails in brushy woodlands or meadows with tall grass or weeds. Meadow voles are found in fields, pastures, fresh and saltwater marshes, meadows, borders of streams and lakes, and open or wooded swamps. Consequently, large numbers of these ticks may be encountered in those areas. People or their pets may bring these ticks from outdoors into the home.

TICK BITE PREVENTION MEASURES

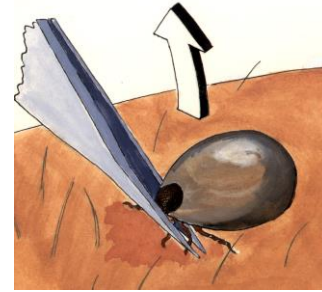
Avoid tick-infested areas during the peak season of adult dog tick activity – May through August. Wear light-colored clothing with the pants tucked into socks. On returning home, remove and wash the clothing. Carefully inspect the body and, by using tweezers, remove any attached ticks. Also, carefully inspect children and pets (Photo courtesy Pfizer Central Research).



Dog ticks seem to prefer certain areas of the host. Although these ticks may feed anywhere on a dog, examine carefully the area between the toes, under the legs, around the ears, and in deep folds of the skin. On children, all parts of the body should be examined, particularly the nape of the neck. The use of a tick repellent or companion animal products can provide relatively high levels of protection against ticks.

Tick removal – The mouthparts of an American dog tick are short and do not penetrate deeply into the skin. These ticks secrete a cement-like substance around the mouthparts and on the skin to help the tick hold tightly onto the host. Use thin-tipped tweezers or forceps to grasp the tick as close to the skin surface as possible. Pull the tick straight upward with steady even pressure. This usually removes the tick with the mouthparts attached. Disinfect the area with rubbing alcohol and apply a topical antibiotic. If kept for reference, store the tick in a small jar of alcohol. Contaminated tick tissues can

transmit spotted fever organisms. Therefore, do not crush the tick or remove it with unprotected fingers.



REPELLENTS FOR HUMAN USE

There are about 150 repellent products registered with the U.S. Environmental Protection Agency (EPA) for use on human skin. The primary active ingredient in most insect/tick repellents today is DEET (N,N-diethyl-3-methylbenzamide or N,N-diethyl-m-toluamide). DEET is the most effective, broad-spectrum repellent ever discovered. The U.S. Environmental Protection Agency (EPA) estimates that over one-third of the U.S. population will use a DEET-based product. Products range in concentration from 4% to 100% DEET and are available as an aerosol can, pump spray bottle, stick, lotion, cream, or towelette for application to skin or clothing. DEET is only effective for one to several hours and must be reapplied periodically. The effectiveness of DEET on the skin is influenced by the concentration of DEET, absorption through the skin, evaporation, sweating, air temperature, wind, and abrasion of the treated surface by rubbing or washing. Higher concentrations up can provide longer protection. However, a concentration greater than 30% doesn't provide extra protection. Several controlled-release, extended duration products with DEET have been developed which decrease skin absorption and increase protection time. All active ingredients and their concentrations are listed on the product label.

DEET and ticks: DEET will repel ticks and decrease the chances of tick bite, but depending upon the concentration, it may not provide total protection. Concentrations of DEET that might prevent tick attachment may not deter a tick from walking across the skin to unexposed and untreated areas. For ticks, DEET concentrations around 20 to 30% applied to clothes are about 86-92% effective in preventing tick bites. When applying a repellent against ticks, particular attention should be given to the shoe tops, socks, and lower portion of pants.

Safe Use of DEET: The Environmental Protection Agency (EPA) completed a review of DEET and concluded that normal use of DEET does not present a health concern to the general population when following label directions. The EPA established new labeling

requirements for directions, precautions, and claims. For example, child safe claims for low concentration DEET products are no longer allowed. The EPA is requiring or proposing changes to the label to ensure the safe use of DEET, particularly on children. For example, a new repellent awareness graphic would provide easily viewed information on what is repelled by the product and for how long it should be effective. The EPA has a repellent selection search tool available at <http://cfpub.epa.gov/oppref/insect/>



DEET has been used by millions of Americans for over 40 years and the incidence of adverse reactions is low. However, some allergic, toxic, and neurological reactions to DEET have been reported in medical literature. Repeated applications have occasionally produced tingling, mild irritation or contact dermatitis. Some individuals may be particularly sensitive to chemicals. Toxic encephalopathic reactions are rare, but have occurred with applications to the skin, particularly with children. Reported cases involved ingestion of DEET, applications of high concentrations of DEET and over application of product contrary to label directions. Therefore, it is prudent to minimize the use of high concentrations on the skin and follow the directions and precautions given on the repellent label. The American Academy of Pediatrics recommends not more than 30% DEET be used on children and none on infants younger than 2 months of age. People with certain skin conditions should be cautious about the use of DEET. Apply DEET sparingly to exposed skin, and spray on clothing when possible. However, DEET will harm some synthetic fabrics (rayon and spandex), plastics (watch crystals and eyeglass frames), and car and furniture finishes. If you suspect a reaction to DEET (or any other repellent), stop using the product, wash the treated skin, and call the poison control center (CT 1-800-343-2722).

CLOTHING REPELLENTS

Permethrin is the active ingredient in products for use only with clothing or other fabrics such as mosquito netting or tents. Products for consumer application to clothing contain 0.5% permethrin formulated as an aerosol spray (e.g., *Duranon® Tick Repellent*, *Repel® Permethrin Clothing & Gear*, *Permethrin Tick Repellent*, *Sawyer® Clothing Repellent*). A synthetic pyrethroid insecticide rather than a true repellent, permethrin works primarily by killing ticks on contact with the treated clothes and can provide high levels of protection against ticks (and mosquitoes). It may be purchased at lawn and garden centers or sports stores. Permethrin has low mammalian toxicity, is poorly absorbed through the skin and is rapidly neutralized by the body. Skin reactions are uncommon.

Several vendors also provide various permethrin treated or impregnated clothing for protection against ticks and mosquitoes in styles and sizes for men, women and children. The fabric is protective for up to 70 washings, essentially the life of the clothing. Major brands include *Insect Shield®*, *Orvis Bugsaway®*, *Insect Blocker™*, and *ElimiTick™* (for sportsmen).

Medical and safety information about the active ingredients in an insect repellent is available from the **National Pesticide Information Center** at <http://npic.orst.edu>

COMPANION ANIMAL PRODUCTS

There are over 450 products or brands available to help protect your pets, mainly dogs, from ticks and/or fleas. The majority are topically applied products that provide protection for about a month. Major products include:

Name	Ingredient(s)	Company
Preventic®	amitraz	Virbac
NexGard™	afoxolar	Merial
Frontline®	fipronil	Merial
Certifect®	fipronil, amitraz	Merial
K9 Advantix®	permethrin, imidocloprid	Bayer
Vectra3D®	permethrin, dinotefuran	Summit
Revolution®	selamectin	Zoetis
Scalibor	deltamethrin	Intervet

NexGard™ is a relatively new oral chewable that lasts about a month. Preventic® is an amitraz-based collar that lasts about 90 days. Scalibor® is a deltamethrin collar that lasts about 6 months. Revolution® is labeled only for American dog ticks (and fleas). Certifect® and the Plus versions of Frontline and other fipronil-based parasiticides also contain (S)-methoprene, an insect growth regulator. Only Frontline®, Frontline®Plus, and similar products containing fipronil such as Parastar™, Fiproguard® and PetAmor® are labeled for use for cats. Other active ingredients in some products include the organophosphate insecticides tetrachlorvinphos or propoxur, and the pyrethroid cyphenothrin. Consult your veterinarian for what may work best for your pet.

TICK CONTROL

Altering the landscape to increase sunlight, lower humidity and reduce overgrown vegetation can reduce tick populations. Rodent hosts of these ticks will also be discouraged. Close-cut sunny lawns do appear to have fewer ticks. Tick populations can be reduced by:

- Regularly mowing the lawn and other grassy areas (especially near the home and pathways).

- Pruning trees.
- Removing accumulated leaf litter.
- Clearing underbrush in woodlots.
- Cutting down weeds.
- Clearing brush along edges of the lawn, stone walls, and driveways.
- Treating or protecting domestic dogs (see above).
- Applying an approved acaricide (a pesticide or insecticide that kill ticks) to the vegetation.

Acaricides (pesticides) may be applied to kill adult ticks on lawns, paths, and at grassy or woodland edges. Lawn care professionals or arborists licensed for ground applications can be hired to control ticks in the yard. Many pesticides are restricted to use by commercial or licensed pesticide applicators, but some products are available to homeowners. Check the pesticide label to see if a particular product is registered for use against ticks.

Pesticide labels provide information on the active chemical ingredients, formulation, pests and sites for which they can be legally used. They also provide directions for use, precautions, hazards to humans, wildlife and the environment, and first aid instructions. **Always read and follow pesticide label directions and precautions.** Additional toxicological and environmental information is available from the **National Pesticide Information Center** at <http://npic.orst.edu>.

The time to begin a spray application to control adult American dog ticks would be late April. Wooded or grassy areas adjacent to the home should be treated for maximum effectiveness. These chemicals are highly toxic to fish and other aquatic organisms and application to or near water should be avoided. Most are also toxic to bees and other beneficial insects. Most pyrethroid insecticides bind tightly to soil with little potential for contamination of well or ground water.

Acaricides registered for the control of dog ticks in Connecticut are listed below. Some chemicals or products are restricted to use by certified applicators. Mention of a trade name does not constitute an endorsement by The Connecticut Agricultural Experiment Station.

Available as General Use Formulations

- **Carbaryl** (Sevin, other brands). Chemical class: carbamate. Available as a spray or granule for ticks on turf and recreational areas.
- **Pyrethrins**. (Pyrenone, Kicker, other brands) Pyrethrins are natural insecticides derived from the chrysanthemum flower. They are often combined with the synergist piperonyl butoxide (PBO). Natural pyrethrin is toxic to aquatic life and bees. There is little residual activity with pyrethrin and pyrethrins alone are not very effective against ticks.

Available as Commercial, Restricted Use, and General Use Formulations

- **Bifenthrin** (Talstar, Ortho). Chemical class: pyrethroid.
- **Cyfluthrin** (Tempo, other brands). Chemical class: pyrethroid.
- **Esfenvalerate** (Ortho, various brands). Chemical class: pyrethroid.
- **Deltramethrin** (Suspend®, DeltaGard®). Chemical class: pyrethroid. Restricted use, low concentrations are used in some non-restricted products.
- **lambda-cyhalothrin** (Scimitar® CS, Demand®). Chemical class: pyrethroid. Restricted use, low concentrations are used in some non-restricted products.
- **Permethrin** (Permethrin, Astro®, other brands). Chemical class: pyrethroid.
- **Fluvalinate** (Mavrik®Perimeter). Chemical class: pyrethroid. Restricted use.

TICK-ASSOCIATED DISEASES

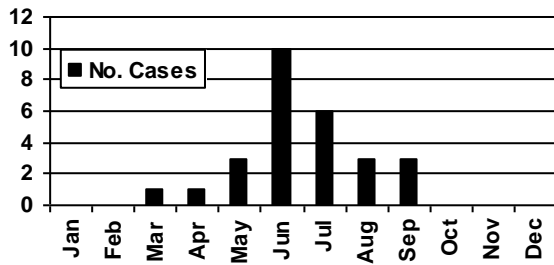
The American dog tick carries and can transmit several disease pathogens, including Rocky Mountain spotted fever and tularemia. This tick can also cause paralysis in people and dogs.

Rocky Mountain Spotted Fever - Rocky Mountain spotted fever (RMSF), caused by *Rickettsia rickettsii*, is rare in Connecticut. This disease occurs throughout the United States, but most cases of RMSF occur in the South Atlantic and West Central states. Nationally, the number of cases of RMSF has increased dramatically in the last decade with > 2,000 cases annually. The majority of RMSF cases are associated with the bite of the American dog tick. In the western U.S., the Rocky Mountain wood tick, *D. andersoni* is the vector. State scientists found that less than 1% of 3,000 American dog ticks examined in Connecticut had the spotted fever-group organisms. Not all spotted fever group rickettsiae are infectious to humans. Between 1980 and 2013, 65 human cases were reported to the Connecticut Department of Public Health. Seventy percent of these cases were in Fairfield and New Haven counties. No cases have been reported in Connecticut since 2002.

Symptoms usually appear within 2 to 9 days after a tick bite. Symptoms include sudden fever (90% of 1989 cases), headache (89% of cases), muscle pain (83% of cases), and rash (78% of cases).



Rash from Rocky Mountain spotted fever (CDC).



Reported RMSF cases by the month of onset in Connecticut, 1983-1993. Data used with permission by Connecticut Epidemiologist.

The rash is noticed 2-4 days after illness begins and may include the palms (50% of cases) and soles of the feet. Prompt antibiotic treatment with tetracycline, doxycycline, or chloramphenicol for suspected cases of RMSF is important because it can be fatal in 15-20% of untreated cases. Delays in diagnosis because of the absence of the rash or no knowledge of a tick bite could be serious. However, in recent years despite an increase in the incidence of disease, only about 0.5% of cases in the U.S. have been fatal. A clinical diagnosis may be confirmed by antibody (blood) tests.

Tularemia (rabbit fever) - The bacterium, *Francisella tularensis*, that causes tularemia is transmitted mainly by the bite of several species of ticks and contact with infected animals. The disease may be contracted while handling dead infected animals (i.e. skinning infected rabbits, hence the name rabbit fever), eating under cooked, infected meat, bites of infected animals, drinking contaminated water, inhalation of contaminated dust, contact with other contaminated materials, or the bite of some deer flies and horse flies. This disease has been reported throughout the United States, except Hawaii. Most cases have been reported from the central states of Missouri, Arkansas, Oklahoma, and Kansas. The number of cases has declined over the past several decades. Between 2003 and 2012, there were 1,352 cases reported nationally and only one in Connecticut. Except for cases mainly associated with Martha's Vineyard, MA, reports of this disease are relatively rare in New England.



Characteristic type of ulcer or lesion from tick transmitted tularemia (CDC).

Ticks associated with tularemia are the American dog tick, *D. variabilis*; lone star tick, *A. americanum*; and Rocky Mountain wood tick, *D. andersoni*. Most cases occur during the summer (May-September) and are associated with tick bites.

The clinical symptoms of tularemia depend upon the means of infection. With infection by tick bite, an ulcer often occurs at the site of the bite with possible swelling of the regional lymph nodes. Fever is the most commonly reported symptom. Diagnosis can be confirmed by an antibody test. Streptomycin, gentamicin, doxycycline, and ciprofloxacin are used for the treatment of tularemia.

Tick Paralysis - The feeding by certain *Dermacentor* ticks can cause a progressive paralysis, which is reversed upon removal of the tick. Recovery is usually complete. The paralysis is not caused by a disease pathogen, but by a toxin produced by the tick. Paralysis begins in the extremities with a loss of coordination. It progresses to the face with corresponding slurred speech, and finally shallow, irregular breathing. Failure to remove the tick can result in death by respiratory failure. Most cases of tick paralysis are caused by the Rocky Mountain wood tick (*Dermacentor andersoni*) in western and northwestern states, but the American dog tick has also been known to cause tick paralysis.

REFERENCES

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2. Connecticut Dept. of Public Health. 1994. Rocky Mountain spotted fever Connecticut, 1983-1993. Conn. Epidemiol. 14: 11-12.
3. Magnarelli, LA, JF Anderson. 1978. Collecting ticks and searching for tick-borne disease in Connecticut. Frontiers of Plant Sci. 30:4-5.
4. Smith, CN. 1946. Biology and control of the American dog tick. USDA Tech. Bull. 905.

Additional information is available from the Centers for Disease Control and Prevention (CDC) at:

- <http://www.cdc.gov/ticks/index.html>
- <http://www.cdc.gov/tularemia/>
- <http://www.cdc.gov/rmsf/index.html>