



PESTS

That Affect Human Health



Ticks in Kansas

Controlling ticks is important not only because they are nuisance parasites of humans and animals, but also because they are vectors of a variety of microbial pathogens. Control and prevention of tick infestations should begin with an understanding of tick life history. It is important to keep in mind that control of ticks and diseases they transmit is often difficult for a number of reasons: 1) multiple tick species, 2) prolonged life cycles, 3) high reproductive capacity, 4) numerous wildlife hosts, and 5) immature tick life stages in the environment.

Ticks are slow-crawling, wingless parasites that feed exclusively on human and animal blood. Ticks are divided into two primary families: Argasidae (soft ticks) and Ixodidae (hard ticks). The ticks of most importance to humans and pets (dogs and cats) in Kansas are the hard ticks. Hard ticks are characterized by a hardened dorsal shield (scutum). In addition, the head (capitulum) of the hard tick extends in front of the body.

Ticks develop in four stages: egg, larva, nymph and adult. The hard ticks of medical importance in Kansas are considered three-host ticks, with each successive stage feeding on separate hosts after molting (Figure 1).

Adult male and female ticks usually mate on the host. Then the female feeds until engorged, and drops off and deposits eggs in the habitat. Female hard ticks die after depositing an egg mass typically numbering in the thousands. The six-legged larva stage hatches from the egg and remains on the ground or on low vegetation waiting for a host – usually small rodents or birds. After feeding for a few days, the engorged larva drops off the host and molts on the ground to the eight-legged nymph stage. The nymph then feeds on another host such as an opossum, rabbit, raccoon, or skunk. Once the nymph has completed feeding (after several days to a week), it falls and molts to the eight-legged adult stage, which then feeds on a separate host.

While ticks can crawl several feet in response to host stimuli such as carbon dioxide and heat, they most commonly find a host using an ambush technique. Ticks crawl onto blades of grass, weeds, or low bushes and wait for a host to brush against the vegetation. When the host brushes against the plant, the tick immediately releases from the vegetation and crawls onto the host. It then crawls around on the host seeking a site to attach and feed. Ticks do not jump or drop from trees. They are usually found just a few inches or feet off the ground on vegetation. The tick species most commonly

encountered infesting people and dogs in Kansas are *Amblyomma americanum* (lone star tick), *Dermacentor variabilis* (American dog tick), and *Ixodes scapularis* (blacklegged tick or deer tick). *Rhipicephalus sanguineus* (brown dog tick) usually only infests dogs. While not infested as commonly as dogs, cats can be infested with *A. americanum*, *D. variabilis*, and *I. scapularis*.

American dog tick (*Dermacentor variabilis*)

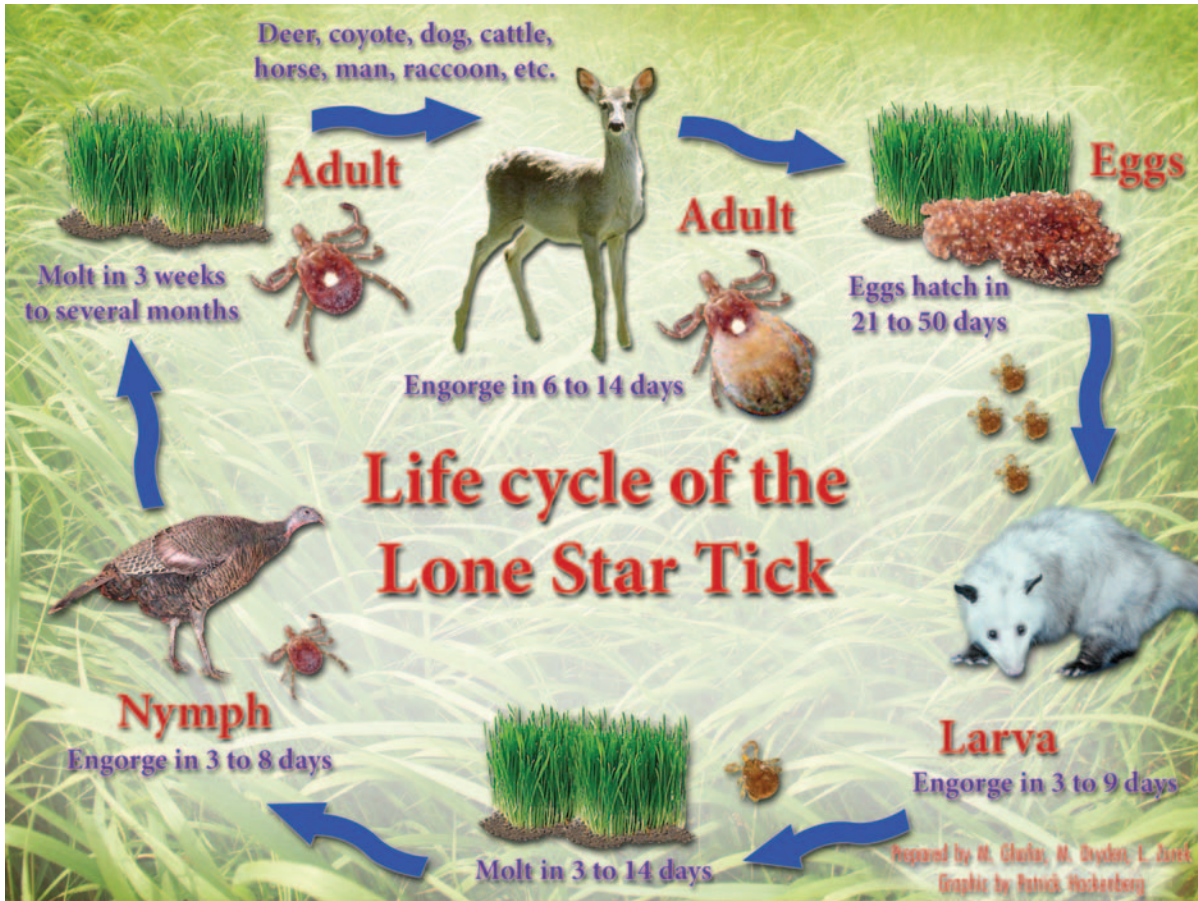
American dog ticks are common throughout Kansas (Figure 2). In the typical developmental cycle of the American dog tick, larvae usually feed on small mammals such as rats and mice. Nymphs can be found on cats, dogs, opossums, rabbits, raccoons, and other medium to small sized mammals. The unengorged adult tick is about 1/8-inch long, brown to tan, with obvious white mottled markings on the back. It can feed on cats, dogs, cattle, horses, and other large mammals, including man. The male tick feeds sparingly and does not engorge. Females engorge on blood and increase markedly in size, often up to 3/4-inch. The entire life cycle can be completed in as little as three months, but more typically it takes two years. In Kansas, ticks can be encountered from March through September in grasslands and along forest edges. American dog ticks are of importance because they can transmit Rocky Mountain Spotted Fever (*Rickettsia rickettsii*) to dogs, cats and humans, and Cytauxzoonosis (*Cytauxzoon felis*) – an often fatal blood parasite to cats. The American dog tick can also cause tick paralysis.

Lone star tick (*Amblyomma americanum*)

This tick is named for the easily recognizable single white spot on the dorsal shield of the female. Males do not have the white spot, but have a few short white to yellow lines on the edge of their dorsal shield (Figure 3). The lone star tick has become common in the eastern half of the state and has been found as far west as Mitchell County.

Several factors have contributed to the increased range and occurrence of the lone star tick. It occurs most commonly in woodland habitats with dense underbrush. Reforestation in urban and rural environments has provided increased habitat. The white-tailed deer is considered a prominent host for the lone star tick, because larvae, nymphs, and adults will all feed successfully on this host. The wild turkey is another host that lives in similar habitats and is an excellent host for larval, and particularly nymphal, lone star ticks. In

Figure 1. Life cycle of a lone star tick



Common Kansas Ticks

Figure 2. American dog tick



female



male

Figure 4. Brown dog tick



female



male

Figure 3. Lone star tick



female



male

Figure 5. Black-legged tick



male



female

fact, many other animals can serve as host for this aggressive tick. Immature stages can be found on a variety of birds such as quail and wrens, as well as red foxes, rabbits, squirrels, dogs, cats, coyotes, and humans. Adult ticks can also feed on a variety of hosts including cattle, horses, sheep, dogs, cats, and humans. Adults are often encountered in Kansas from late February through early June; nymphs from April through July; larvae are frequently found in the late summer and fall. Larvae can be found in large numbers (hundreds or even thousands of individuals from one egg mass) all accumulating on a single plant leaf. Similar to other three-host ticks in Kansas, the life cycle often takes two years to complete. While the lone star tick is considered a major nuisance parasite, it is also a vector of *Ehrlichia chaffensis* (human monocytic ehrlichiosis) and *Borrelia lonestari*, which causes a Lyme disease-like infection called Southern tick-associated rash illness. This tick has also been implicated in the transmission of *Francisella tularensis* (Tularemia). Although not as common, the Gulf Coast tick, *Amblyomma maculatum*, rarely infests dogs in Kansas and carries *Hepatozoon americanum*, the etiologic agent of American canine hepatozoonosis. The transmission of this disease is unique in that dogs need to ingest the engorged adult female tick to become infected.

Brown dog tick (*Rhipicephalus sanguineus*)

The brown dog tick is reddish brown in color, lacking the dorsal markings seen on the American dog tick and lone star tick (Figure 4). It is also a three-host tick but larvae, nymphs, and adults can all successfully feed on dogs. Larvae will also feed on rats and nymphs on rabbits, but both stages prefer to feed on dogs. It is the only species of tick that infests human dwellings and kennels in North America. Infestations can occur in heated buildings any time of the year. These ticks often crawl up into the ceilings and into cracks and crevices along floors to molt or lay eggs. Infestations of homes or kennels are distressing to pet owners and are extremely difficult to eradicate. Infestations in kennels may be associated with outbreaks of *Ehrlichia canis* (canine ehrlichiosis) and *Babesia canis*.

Black-legged tick (*Ixodes scapularis*)

The black-legged tick is also referred to as the deer tick or Lyme disease tick and is found from Florida into central Texas and from Maine to Minnesota (Figure 5). The distribution of the black-legged tick is linked to the distribution and abundance of its primary host, the white-tailed deer. Importance of this tick is increasing across eastern Kansas. The adult male is dark brown, almost black, because the dark dorsal shield covers the entire dorsal surface. Females are two-toned: a dark to black dorsal shield covering the anterior third of the body, leaving the orange-brown posterior area of the body exposed. This species is a small, three-host tick with larvae the size of a pinhead and unengorged adults about $\frac{1}{16}$ inch (2-3 mm). Larvae are the size of a poppy seed, flat, six-legged, and nearly translucent, making them

extremely difficult to see. They feed primarily on white-footed mice but also on a variety of other small mammals, such as other species of mice, squirrels, voles, shrews, and birds. Nymphs are $\frac{1}{32}$ -inch-long (1-2 mm), the size of a long pinhead or sesame seed and can feed on mice, squirrels, chipmunks, raccoons, opossums, shrews, cats, and humans. In Kansas, juveniles occur from May through July. Adults occur most commonly from September through December but also can be encountered in the spring. Adults feed primarily on white-tail deer and occasionally on coyotes, dogs, raccoons, and other wildlife. The black-legged tick is the vector of *Borrelia burgdorferi* (Lyme disease) in the central and eastern United States, and also the vector of *Anaplasma phagocytophilum* (human granulocytic ehrlichiosis).

Soft ticks

The soft tick of medical and veterinary importance in Kansas is the spinose ear tick, *Otobius megnini*. Soft ticks have no dorsal shield, and the head of the adult is situated beneath the body. This tick is unique because only the larva and nymph are parasitic. Larvae, which look like small shriveled grapes, infest the ears of livestock and occasionally dogs and people. Larvae feed and molt to the nymph stage on the host. The nymph stage has a spiny cuticle from which the tick derives its name. Engorged nymphs drop from the host and crawl into cracks and crevices, under stones, or under the bark of trees where they develop to adults. They are encountered in southern and western Kansas.

Tick removal

Ticks can be removed manually by grasping as close to the skin as possible with fine forceps or tweezers. The tick is then pulled slowly straight away from the skin, using slow, steady pressure. The tick should not be twisted or jerked out of the skin because this might cause the head to become detached and left in the skin. Use of a lighted match or covering the tick in vaseline or nail polish are not recommended. Ticks removed from people should be saved in a vial with alcohol and labeled with the date. If flu-like symptoms – including, headache, skin rash, and fever – occur 10 to 14 days after tick removal, see a physician immediately and take the tick with you or send it to the local K-State Research and Extension office.

Personal protection

It is a good idea to avoid going into tall grass, weeds, and brushy areas and to restrict pets from such areas. Light-colored clothing helps to see ticks before they can reach the skin. Repellents based on DEET (N,N diethyl-meta-toluamide) and permethrin work well keeping ticks (and mosquitoes) away. Permethrin-based repellents must not be applied directly to skin. After coming home from potentially tick-infested areas, inspect skin and remove ticks immediately. Ticks removed within several hours after attachment are very unlikely to transmit pathogens.

Prevention and control

Grassy and weedy areas around the house should be clipped short to expose ticks to the sunlight and consequent desiccation. Spring burning of grasslands reduces tick populations and rodent (tick host) habitat temporarily.

Chemical pesticides targeting ticks (and mites) are called acaricides. These should be used only in areas with chronic tick problems. Only acaricides labeled for outdoor application can be used. Houses infested with brown dog ticks usually have to be treated with acaricides. Treatments should be applied along baseboards, window and door frames, and similar sites where ticks hide.

Ticks on dogs and cats

If several ticks are found on your pet, or your pet goes outdoors regularly in tick-infested areas, a regular application of acaricides is often necessary to protect the pet from ticks and diseases they transmit. Topically administered acaricides based on Amitraz (impregnated collar), Fipronil (spray and spot-on formulations) and Permethrin (spray and spot-on formulations) appear to have the greatest activity against ticks. All three compounds are approved for use on dogs, but only fipronil can be applied safely to cats. Note that amitraz collars and many permethrin products can be highly toxic or even lethal to cats. Fipronil and amitraz prevent tick attachment and cause tick death usually within 24 to 48 hours. Permethrin also produces rapid tick kill and may provide some repellent-like activity.

Rapid tick kill or prevention of attachment and feeding is important in the prevention of tick-transmitted diseases. Ticks transmit diseases by consuming blood and injecting salivary proteins with infectious agents. Once a tick finds a host it must attach, then initiate feeding. Feeding activates the pathogen that is then released from the tick to the bloodstream

of the host. This typically takes 24 to 48 hours. If ticks can be repelled, prevented from attaching or killed outright during this period, then disease transmission is likely prevented. Proper product selection and timing of application can reduce disease transmission. Your pet's veterinarian can provide the best recommendation of product selection.

Occasionally, a label recommendation of topical acaricides does not solve the tick problem and other measures are needed. If possible, start by destroying/modifying tick habitat. Cutting or removal of grass, weeds, and brush piles, between fences, property lines, and along buildings will allow for tick desiccation. In addition, such areas also serve as refuge for wild animals that can also serve as hosts for ticks. Controlled burning of forest canopy or grasslands may temporarily reduce tick populations, but must be done with caution.

If brown dog ticks are encountered in buildings, acaricides such as cyfluthrin and permethrin should be sprayed into cracks and crevices, behind and under cages, and along the boards in the ceiling. Foggers also can be used to spread acaricides into areas difficult to reach with directed aerosols. Applications of acaricides outdoors can have a significant impact on tick populations. Effective compounds for outdoor tick control include carbaryl, cyfluthrin, permethrin, and s-fenvalerate. Broadcast applications of acaricides are rarely necessary in the yard. Spot treatment along fences, kennels, or shaded areas is preferred. Acaricides should be applied indoors or outdoors only by a licensed pest management specialist (exterminator). Always follow state laws and label recommendations when applying insecticides/acaricides to human dwellings. After application, make sure the acaricide is dry before allowing animals or humans to return to the premises to minimize toxicity problems.

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