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Research and Extension

Ticks in Kansas

Ticks are important ectoparasites affecting both human and animal health. Ticks are effective vectors for a wide array of pathogens; therefore, prevention of bites and overall tick control is important. Ticks are divided into two primary families: Argasidae (soft ticks) and Ixodidae (hard ticks), with the most important ticks in Kansas belonging to the hard tick family. Hard ticks are characterized by a hardened dorsal shield called the scutum, with the capitulum (mouthparts) of the hard tick extending in front of the body.

Ticks can crawl several feet in response to stimuli such as carbon dioxide and host odors, and most commonly ticks find a host using a process known as questing. When questing, ticks crawl onto blades of grass, weeds, or low bushes and wait for a host to brush against the vegetation (Figure 1). Ticks do not jump or drop from trees but can be pulled a short distance by static electricity.

The tick species that most commonly infest people and domestic animals in Kansas are *Amblyomma americanum* (lone star tick), *Dermacentor variabilis* (American dog tick), *Dermacentor albipictus* (winter tick), *Ixodes scapularis* (blacklegged tick or deer tick) and *Rhipicephalus sanguineus* (brown dog tick).

Figure 1. Adult tick showing questing behavior. Photo: Emily Sur.

American dog tick (*Dermacentor variabilis*)

American dog ticks are common throughout Kansas. Typical development of the American dog tick occurs with larvae feeding 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. Preferred hosts at the adult stage include dogs, cats, cattle, horses, and other large mammals, including humans (Figure 2).

The unfed adult female tick is about ⅛-inch long, brown to tan, with obvious white mottled markings on the back. Engorged female ticks are roughly ¾-inch long and gray in color.

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 can transmit Rocky Mountain spotted fever (*Rickettsia rickettsii*) to dogs, cats, and humans. They can also transmit cytauxzoonosis (*Cytauxzoon felis*) — an often-fatal blood parasite to cats. The American dog tick can also induce tick paralysis, which is caused by components in tick saliva. Tick paralysis occurs more frequently in children and smaller animals and can often be reversed by removing the tick in a timely manner.

Figure 2. Adult American dog tick *(Dermacentor variabilis)* male (L) and female (R).

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, instead they have a few short white to yellow lines on the edge of their dorsal shield (Figure 3). Immature stages (larva and nymph) can be very small (Figure 4). The lone star tick has become common in the eastern half of Kansas 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 and encroachment of woody shrubs like eastern redcedar in prairie has expanded suitable environments for this tick species.

This tick is an aggressive feeder, and many other animals can serve as host for this tick including humans, livestock, and pets. The white-tailed deer is considered a common host for the lone star tick, because larvae, nymphs, and adults will all feed successfully on this host. Wild turkeys are an excellent host for larval, and particularly nymphal, lone star ticks.

Adults and nymphs are often encountered in Kansas from early spring through the fall, larvae are frequently found in the late summer and fall.

While the lone star tick is considered a major nuisance parasite, it is also a vector of *Ehrlichia chaffeensis* (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), Heartland virus, and Bourbon virus. Bourbon virus was discovered in Bourbon County, Kansas in 2014. This tick is also commonly associated with alpha-gal syndrome, known as the red meat allergy.

Figure 3. Adult lone star tick *(Amblyomma americanum)* male (L) and female (R).

Figure 4. Larval lone star tick *(Amblyomma americanum)* on adult fingernail.

Figure 5. Adult Gulf Coast tick (*Amblyomma maculatum)* male (L) and female (R).

Although not as common, the closely related Gulf Coast tick, *Amblyomma maculatum* (Figure 5) can be found feeding on the ears of cattle causing an inward turning and scarring called gotch ear. It is also a vector for *Hepatozoon americanum*, the etiologic agent of American canine hepatozoonosis. The transmission of this pathogen is unclear, but it is thought dogs need to ingest the tick to become infected.

Brown dog tick (*Rhipicephalus sanguineus*)

The brown dog tick (Figure 6) is a three-host tick, reddish brown in color, and lacking the dorsal markings seen on the American dog tick and lone star tick (Figure 3).

Larvae, nymphs, and adults can all successfully feed on dogs which are the preferred hosts. Larvae will also feed on rats, and nymphs will feed on rabbits, although both stages prefer to feed on dogs.

It is the only species of tick that infests human dwellings and kennels in North America and the entire life cycle can be completed indoors. Infestations can occur in heated buildings any time of the year. These ticks often crawl 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*.

Figure 6. Adult brown dog tick (*Rhipicephalus sanguineus)* male (L) and female (R).

Figure 7. Adult Black-legged tick *(Ixodes scapularis)* male (L) and female (R).

Black-legged tick (*Ixodes scapularis*)

The black-legged tick (Figure 7) 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. Its importance is increasing across eastern Kansas. The distribution of the black-legged tick is linked to the distribution and abundance of its primary host, the white-tailed deer.

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 unfed adults are about 1⁄16-inch (2 to 3 mm) long.

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 1⁄32-inch long (1 to 2 mm), the size of a long pinhead 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-tailed 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 the vector of *Anaplasma phagocytophilum* (human granulocytic ehrlichiosis).

Winter tick (*Dermacentor albipictus*)

Unlike most ticks that are most active over the warmer spring and summer months, the winter tick is active over fall and winter. *Dermacentor albipictus* is a one-host tick, parasitizing a single host though all stages of feeding. Ticks prefer large mammals like elk, deer, and moose but can also parasitize domestic animals like cattle, horses, and dogs. Large tick numbers can cause hair loss in moose resulting in difficulty maintaining heat and even exsanguination in large numbers.

Soft ticks

Soft ticks differ significantly from hard ticks, most notably by the absence of a hard scutum replaced with a leathery exoskeleton. While each life stage of a hard tick takes one large blood meal, soft ticks will take multiple smaller blood meals.

The spinose ear tick (*Otobius megnini*) is the primary soft tick of medical and veterinary importance in Kansas. 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 and cause significant pain and irritation in livestock.

Tick control

Tick control can be difficult to achieve due to a number of factors including potentially long life cycles with multiple hosts, high reproductive potential and long periods of time spent off animal hosts between feedings. All the tick species of concern will feed on wild animals, leaving a host reservoir that is difficult to control and treat. Tick control is achieved through a combination of preventing exposure, removal of ticks, and acaricidal control.

Reducing exposure and personal protection

Most ticks are encountered during outdoor activities. Avoid going into tall grass, weeds, and brushy areas and restrict pets from such areas. Light-colored clothing helps to make ticks visible before they can reach the skin.

Repellents based on DEET (N,N diethyl-meta-toluamide), picaridin, and permethrin work well at 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 less likely to transmit pathogens.

Tick removal

If the infestation is low, ticks can be removed manually by grasping as close to the skin as possible with the thumb and index finger, fine forceps, or tweezers. Pull the tick 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 mouthparts to become detached and left in the skin. Do not use a lighted match or cover the tick in petroleum jelly/nail polish.

Ticks removed from people should be saved in a vial with alcohol and labeled with the date. If preserving in alcohol isn't feasible, freeze in a container or plastic bag. 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 for identification.

Ticks transmit pathogens by acquiring them in the blood meal. The pathogen is then transmitted in the next feeding period through the injection of saliva with infectious agents. Rapid tick removal or prevention of attachment and feeding is important in the prevention of tick-transmitted pathogens.

Once a tick finds a host, it must penetrate the skin, secure the mouthparts, and then initiate feeding. This can take 24 to 48 hours; after this, active feeding and pathogen transmission occurs. If ticks can be repelled, prevented from attaching, or killed outright during this period, then pathogen transmission is unlikely.

Environmental prevention and control

Grassy and weedy areas around a house should be clipped short to expose ticks to the sunlight. Sunlight increases temperature and decreases humidity resulting in tick desiccation and death. Cutting or removal of grass, weeds, and brush piles, between fences, property lines, and along buildings removes habitats where ticks can survive. In addition, such areas serve as refuge for wild animals that can also serve as hosts for ticks.

Burning of grasslands directly reduces tick populations, with burning in early spring before ticks emerge from overwintering being the most effective.

Chemical pesticides targeting ticks (and mites) are called acaricides. These should be used only in areas where chronic tick problems exist. Houses infested with brown dog ticks usually must be treated with acaricides.

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. Spot treatment along fences, kennels, or shaded areas is preferred.

Acaricides should be applied 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 acaracide is dry before allowing animals or humans to return to the premises to minimize exposure and toxicity. 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, an application of acaricides is often necessary to protect the pet from ticks and pathogens the ticks can transmit. Topically administered acaricides based on amitraz (impregnated collar), fipronil (spray and spot-on formulations), and permethrin (spray, spot-on formulations, and collars) appear to have the greatest activity against ticks.

Newer systemic products containing fluralaner are available for both cats and dogs. Fipronil can be applied safely to cats. Note that amitraz collars and many permethrin products can be highly toxic or even lethal to cats. All products should cause tick death within 24 to 48 hours.

Essential oil-based products have also been shown to be toxic and have tick repelling properties. Although garlic has been anecdotally reported to control ticks, garlic's effect has not been demonstrated in research settings. It is not safe for use in horses or dogs. Consult with your pet's veterinarian for the best recommendation for product selection.

Ticks on livestock

Ticks, and the pathogens they transmit, are a significant constraint to livestock production. In addition to blood loss, tick bites damage animal hides and can lead to secondary infections. Tick-transmitted *Anaplasma marginale*, the causative agent of bovine anaplasmosis, is endemic in Kansas and a significant economic burden for livestock producers.

Tick control in livestock can be achieved with chemical acaricides. To reduce the spread of acaricide resistance, annual rotation of chemical classes is crucial. Annual burning of pastures significantly reduces tick populations, but special attention must be paid to brush areas to avoid creating areas of refuge for ticks.

Hard Tick Life Cycle

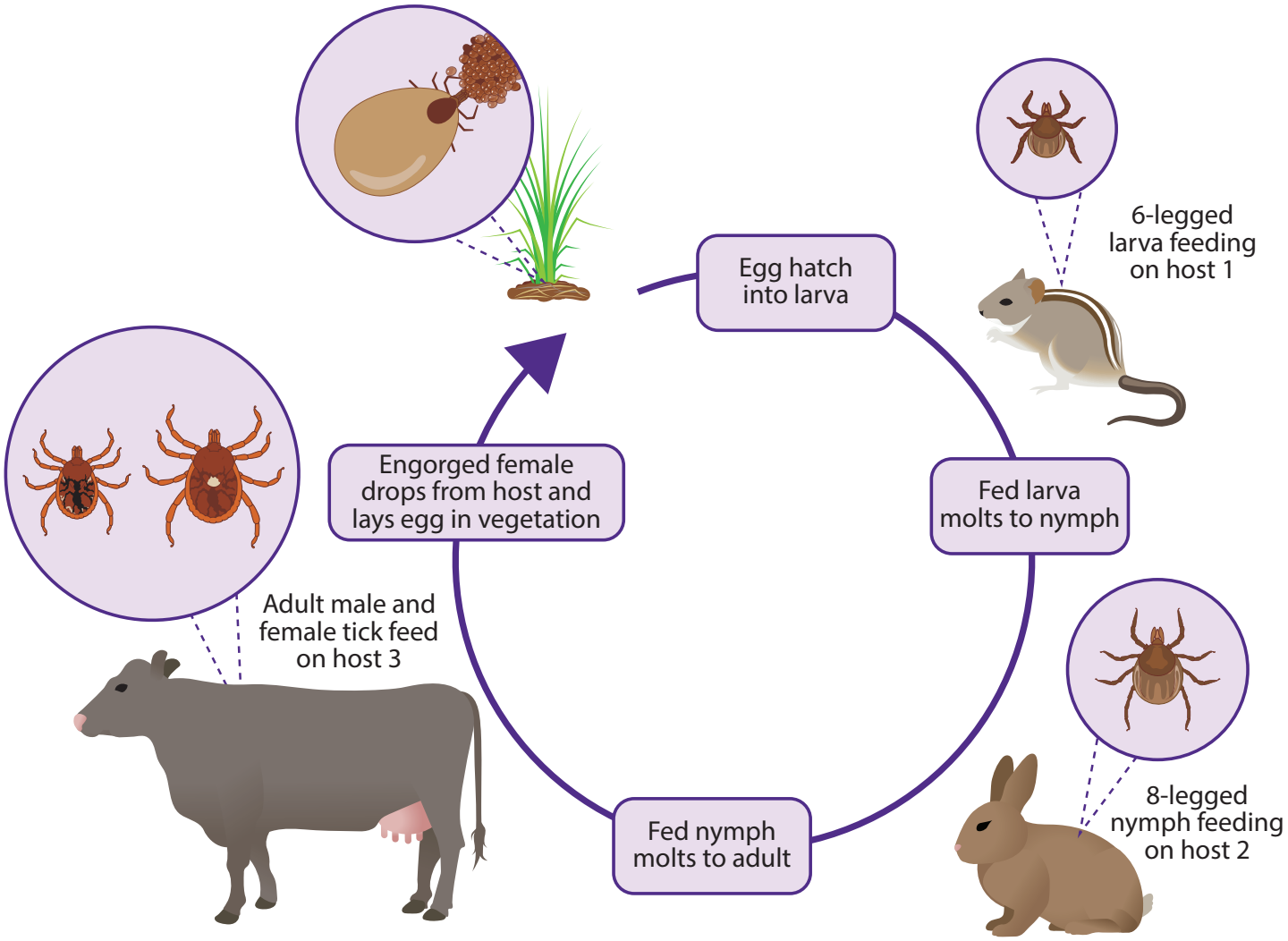

Figure 8. Life cycle of a typical three-host hard tick species showing each life stage feeding on a different host.

After hatching from eggs, hard ticks have three developmental stages (larva, nymph, and adult) all of which need to consume a blood meal from a vertebrate host (Figure 8).

Adult male and female ticks usually mate on the host, mated females will engorge fully with blood and drop from the host. Female ticks deposit their eggs in the environment, often in leaf litter or protected by vegetation. A female hard tick will lay a single large batch of eggs and then die, while a soft tick will lay multiple, smaller batches and can live much longer. Male ticks may take multiple smaller blood meals and will attempt to mate with multiple female ticks. Hard ticks may have one-, two-, or three-host life cycles determined by the number of vertebrate hosts needed to complete a single generation. Larva of one-host ticks attaches to a single host where it remains through the nymph stage until it becomes an engorged adult. For a two-host tick, larva and nymph may feed on one host before finding another host as an adult. For a three-host tick species, each life stage feeds on a different host, in this case the life cycle might take multiple years to complete.

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