What's Eating You? *Amblyomma* Ticks (*Amblyomma americanum*)

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Amblyomma ticks are characterized by long anterior mouthparts, an ornate scutum, widely spaced eyes, and posterior festoons (Figure 1). Ventral adanal plates are absent in the male. *Amblyomma americanum*, the lone star tick, demonstrates inverted horseshoe markings on the male's posterior scutum and a single white spot on the female's scutum, which often covers only a portion of the body to allow room for engorgement (Figure 2). Larval, or "seed," ticks have 6 legs and feed on small animals; while adult ticks and nymphs, which are sexually immature, have 8 legs and feed on large animals. Most ticks have a "3-host life cycle," which means that they attach for one long blood meal during each of their 3 phases of life. Because they search for a new host for each blood meal, they are efficient disease vectors.

A americanum and *Dermacentor variabilis* have been implicated as vectors of *Ehrlichia chaffeensis*, the agent of human monocytic ehrlichiosis,[1] but *A ameri-*

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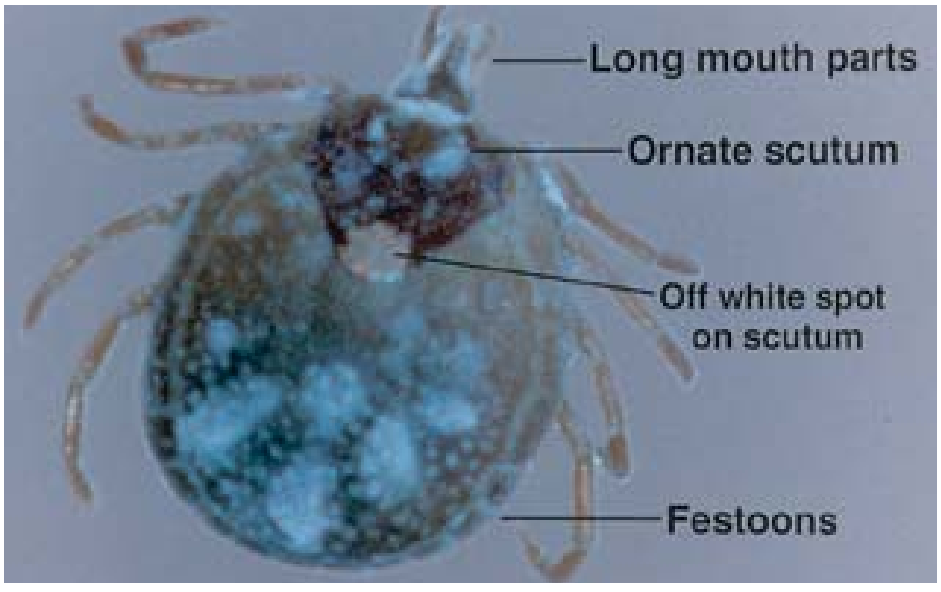

FIGURE 1. Female *Amblyomma americanum.*

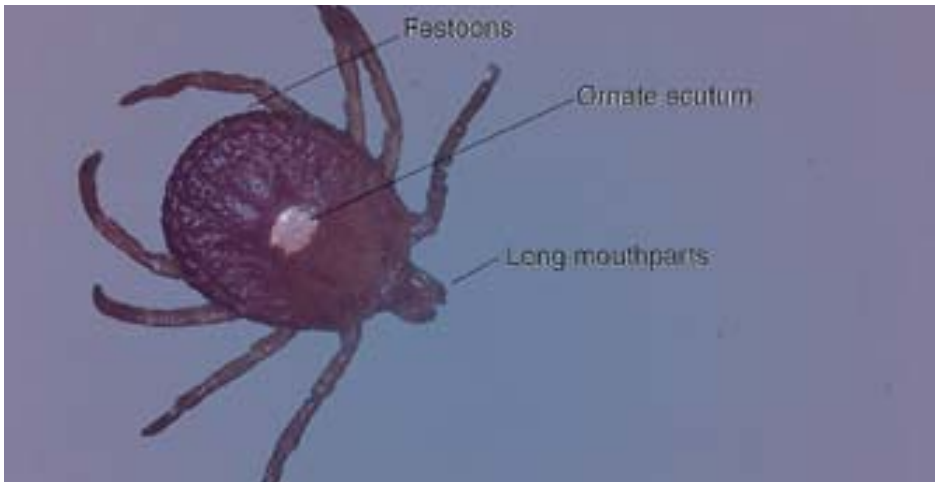

FIGURE 2. *Amblyomma americanum.*

canum appears to be the major carrier organism.[3,4] This disease, which has been documented in more than 30 states, presents with fever and headache and has been compared to a mild form of Rocky Mountain spotted fever. Wild white-tailed deer serve as reservoir hosts for the disease,[5] and communities located close to wildlife reserves may have a higher rate of infection.[6]

Immune fluorescent antibody testing can be used to establish a diagnosis of monocytic ehrlichiosis and, with prompt tetracycline treatment, the prognosis is usually good.[2] Future disease-control efforts should include the study of agents such as avermectins, that can be placed in deer corn to kill ticks that feed on deer. Similar strategies have been proposed for control of Lyme disease, and injectable ivermectin has already been shown to reduce tick infestation of livestock.[7]

Amblyomma ticks also transmit tularemia and may transmit Rocky Mountain spotted fever. In Missouri, strains of *Borrelia burgdorferi* have been isolated from *A americanum* ticks that feed on cottontail rabbits[8] and may be implicated in the spread of Lyme disease in that state. Isolation of this organism supports the notion that true Lyme disease occurs in Missouri. Lyme disease-like illnesses not related to *B burgdorferi* also occur in southern states, but more work needs to be done to establish their causes and vectors.[9]

Bullis fever, which appears to be caused by *Rickettsia* infection, was first described at Camp Bullis, near San Antonio, Texas, and affected huge numbers of military personnel. During one outbreak, *A americanum* was so numerous that more than 4000 adult ticks were collected under a single juniper tree and more than 1000 ticks were removed from one soldier who sat in a thicket for 2 hours. At Little Rock Air Force Base in Arkansas, *A americanum* has been a source of *Ehrlichia* infection. During one outbreak, deer in the area were found to have as many as 2550 ticks per ear.[10]

Although these figures demonstrate the magnitude of tick infestation in some areas, it is important to note that ticks are ubiquitous: *A americanum* has a wide distribution and can be found from Texas to Iowa to New Jersey. Infestation can occur in affluent suburbs as well as in rough thickets, and tick attachments are often seen on people who work outdoors, especially when new commercial or residential developments disrupt the environment and the tick's usual host leaves the area.

Patients usually become aware of tick bites while the tick is still attached, which provides physicians with an opportunity to identify the species. Figure 3 shows the approximate size of the ticks. On examination, physicians should also check for symptoms of tick-borne disease and discuss tick-control measures. Once the tick has been removed, delayed-type hypersensitivity to tick antigens continues at the attachment site. Erythema and pruritus

FIGURE 3. Approximate size of *Amblyomma* ticks.

can be dramatic, and nodules with a pseudolymphomatous histology can occur. Although mild reactions respond to an application of topical corticosteroids, intense reactions may require an intralesional corticosteroid injection or surgical excision.

A critical part of tick-control efforts is the removal of leaf debris. Absorption of water from the atmosphere keeps ticks hydrated: they absorb water from surrounding moist air through their intensely hygroscopic saliva and then reingest it. Ticks produce little urine; instead, excess water is eliminated through the spiracles and by salivation back into the host. In hot climates, ticks are prone to dehydration unless they can find a source of moist air, such as a layer of leaf debris.[11] Tick eggs also require sufficient humidity to hatch. Clearing away debris discourages the growth and spread of ticks: insecticides sprayed on top of leaf debris do little to harm the ticks underneath, and ticks and humans make contact when debris is stirred by humans walking through the area. Clearing of the leaf debris improves the effectiveness of insecticide applications.

An excellent natural means of tick control is imported fire ants, voracious eaters that gather and consume tick's eggs. Although fire ants are a nuisance, they are not disease vectors. The number of ticks in places like Camp Bullis, Texas, has declined dramatically since the introduction of imported fire ants. People who do not demonstrate severe allergies to fire ants may prefer them to ticks and leave untreated fire ant mounds in their yards to help control infestation.

Tick-control efforts are complicated when *Amblyomma* ticks attach to birds and other animal hosts with long-range migration patterns,[12] which may contribute to the spread of disease from one geographic region to another.

Methods for tick removal and control of ticks on household pets, as well as tick repellants, will be covered in future articles in this series.

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