Editorial

Another Look at the Potential Role of *Amblyomma americanum* in the Transmission of Tick-borne Disease

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Until the mid-1970s, tick-borne diseases affecting humans in the Northeast and mid-Atlantic states remained more of a medical curiosity than a public health threat. Prior to that time, the only tick-borne disease of any significance in this region was Rocky Mountain spotted fever. The principal vectors of the etiological agent, *Rickettsia rickettsii*, are the American dog tick, *Dermacentor variabilis* Say; and the lone star tick, *Amblyomma americanum* L.[1] In most of the Northeast, *A. americanum* is considered as a secondary vector, primarily because of its limited geographical distribution. *A. americanum* is known mainly for its economic importance as a serious pest of humans, livestock, and wildlife.[2-5]

The relative insignificance of tick-borne diseases to the entire spectrum of public health changed dramatically with the description of Lyme disease in Connecticut in 1975.[6] Based on epidemiological evidence, the blacklegged or deer tick, *Ixodes scapularis* Say (formerly *I. dammini* Spielman, Clifford, Piesman, and Corwin)[7] was implicated as the vector of the as yet unidentified etiological agent.[8] Early investigations centered on *I. scapularis*, and in 1982, the spirochete *Borrelia burgdorferi* was found in this tick species collected from eastern Long Island, NY.[9] *B. burgdorferi* subsequently was isolated from *I. scapularis* from the northern Midwest and *I. pacificus* Cooley & Kohls in the West.[10] In less than a decade, a complete understanding of the epidemiology of Lyme disease seemed at hand.

Early studies of Lyme disease foci in New Jersey showed that *A. americanum* temporally and spatially coexisted with *I. scapularis*.[11,12] New Jersey and parts of southeastern New York, however, mark the northern extent of significant populations of *A. americanum*, so this tick was not considered a potential vector of Lyme disease elsewhere in the Northeast. The vector potential of the lone star tick first became evident in 1982, when an *A. americanum* female was removed from the site where erythema migrans (EM) later developed in an 87-year-old male from Medford, NJ. This case predated the discovery of *B. burgdorferi*. In 1983, a second case of Lyme disease associated with *A. americanum* was reported when a tick was removed from the site at which EM developed in a 37-year-old female from Barnegat, NJ.[13] Spirochetes subsequently were identified in *A. americanum* adults and nymphs collected from the place of residence of the second case and elsewhere in New Jersey.[14] Although garnering some early interest in the scientific community, the potential importance of *A. americanum* in Lyme disease transmission was dismissed when early efforts to culture spirochetes from this species were unsuccessful.[15]

In the late 1980s, physicians from Georgia and Missouri began reporting an illness clinically indistinguishable from Lyme disease,[16-18] but subsequent investigations failed to implicate *B. burgdorferi*. Although both *I. scapularis* and *B. burgdorferi* were present in this region, the most commonly reported tick exposure for patients was to *A. americanum*.[18] Renewed interest in *A. americanum* spurred new investigations into the potential importance of this tick in Lyme disease transmission. Other than the earlier reports from New Jersey,[14] spirochetes were found in *A. americanum* collected from Alabama,[19] Indiana,[20] Iowa,[21] Missouri,[22] North Carolina,[23] Oklahoma,[24] and Texas.[25] Unsuccessful attempts to cultivate these spirochetes and the inability of *A. americanum* to transmit *B. burgdorferi* in the laboratory seemed irreconcilable.[14,26-28] Recently, through the use of DNA sequencing, it has been postulated that this noncultivable spirochete retrieved from *A. americanum* is a new *Borrelia* sp., *B. lonestari*, which may be responsible for a new Lyme disease-like illness.[29] This issue is far from resolved.

As the role of *A. americanum* in the transmission of Lyme disease or a new Lyme disease-like illness is being revisited, researchers will need to address the emergence of two new rickettsial diseases simultaneously, human mono-

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cytic ehrlichiosis (HME) and human granulocytic ehrlichiosis (HGE), as serious potential threats to human health. *Ehrlichia chaffeensis*, the etiological agent of HME,[30,31] is known to be transmitted by *A. americanum*.[32] More than 400 cases of HME have been reported in the United States,[33] including nine cases from New Jersey in 1995 (T.L.S., unpublished data). Approximately 170 cases of HGE, caused by an as yet unnamed *Ehrlichia* sp., have been reported since 1994, primarily from upper midwestern and northeastern states.[33] Although *I. scapularis* is purported to be the vector of this new *Ehrlichia* sp., cases to date have been reported from outside the geographical range of *A. americanum*, so that the vector potential of this tick regarding HGE remains unclear. Interestingly, the first known outbreak of human ehrlichiosis in New Jersey occurred more than a decade ago in 1985,[34] in July, when both *I. scapularis* and *A. americanum* are active.

Although the emergence of the ehrlichioses is strikingly similar to that of Lyme disease nearly 2 decades earlier, a number of important differences exist. Owing to the sheer number of cases, Lyme disease has achieved a certain notoriety. As a result, public interest in other tick-borne diseases is considerable. In contrast to the emergence of Lyme disease, the recent recognition of *A. americanum* as another vector of Lyme disease or a new spirochetal illness and its role in the transmission of HME is likely to stimulate an already sensitized public to demand timely information from health agencies.

An important difference in the ability to provide information rapidly and develop strategies to deal with these emerging tick-borne disease issues is the current state of scientific knowledge. When Lyme disease was first described, little was known about the distribution, ecology, and control of *I. scapularis*. Well over a decade of research has been devoted to developing our understanding of this previously unimportant tick species. In contrast, because of its longstanding economic importance, the distribution, ecology, and control of *A. americanum* have been investigated more thoroughly, particularly in the southern United States. Much less is known about this tick along the northern extent of its geographical range. Compared to its economic importance, the role of *A. americanum* as a vector of human disease has received superficial attention. The distribution of *Borrelia* spp. and *Ehrlichia* spp. in *A. americanum* throughout its geographic range is poorly understood and should receive a high research priority.

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