Dutchess County Department of Behavioral & Community Health

Tick-Borne Disease Prevention FAQ Series

TICK BITE AVOIDANCE

Personal Prevention Measure: Avoidance of high risk habitats during peak tick activity periods.

The first line of defense against contracting a tick-borne disease is to avoid being bitten by the ticks that carry disease. Knowing when and where tick bites are most likely to occur is key.

Geographic range of ticks

Maps of the geographic ranges of ticks that bite people in the United States, and what diseases they are capable of carrying, can be found at:

http://www.cdc.gov/ticks/geographic_distribution.html

Ticks that may transmit disease to people in Dutchess County include:

- The American dog tick (*Dermacentor variabilis)*: Rocky Mountain spotted fever, tularemia (CDC, 2010).
- The Blacklegged tick *(Ixodes scapularis)*: Lyme disease, anaplasmosis, babesiosis, Powassan virus, *Borrelia miyamotoi* (CDC, 2010; Krause et al., 2014).
- The Lone Star tick *(Amblyomma americanum):* Ehrlichiosis, STARI (CDC, 2010).

Tick-borne diseases found in Dutchess County

The **blacklegged tick,** also commonly known as the deer tick, is the vector for the three tick-borne diseases that occur most commonly in Dutchess County: Lyme disease, anaplasmosis, and babesiosis. Below, tick-borne diseases are listed from most to least frequently diagnosed in Dutchess County.

> **Lyme disease:** Lyme disease is the most common vector-borne illness in the United States, and New York is one of 14 states that account for 95% of cases in the United States. Lyme disease is by far the most common tick-borne disease in Dutchess County and throughout the Hudson Valley. About 95% of all the Lyme disease cases in New York State come from the Hudson Valley, with higher rates of disease in the counties east of the Hudson River (Prusinski et al., 2014). The New York State Department of Health (NYSDOH) recorded 435 cases of Lyme disease in Dutchess County in 2012 (NYSDOH, 2013).
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> **Anaplasmosis:** Anaplasmosis occurs less frequently than Lyme disease, but the distribution of cases follow the same geographic pattern. New York is one of six states that account for 90% of anaplasmosis cases nationwide (CDC, 2013a). The NYSDOH recorded 66 cases of anaplasmosis in 2012, and four cases classified as either anaplasmosis or ehrlichiosis (NYSDOH, 2013).

Babesiosis: Babesiosis began to be recognized in the Lower Hudson Valley in 2001, and since then the number of cases per year has been trending upward (Joseph et al., 2011). New York (with most cases coming from the Hudson Valley) is one of seven states that account for 96% of babesiosis cases nationwide (CDC, 2014). The NYSDOH recorded 21 cases of babesiosis in Dutchess County in 2012 (NYSDOH, 2013).

Ehrlichiosis: The Lone Star tick is the primary vector for the organisms that cause ehrlichiosis, and rates of disease correspond to the geographic distribution of this tick. Ehrilichiosis is reported more frequently in the southeastern and south-central United States than in the northeast (CDC, 2013c). The NYSDOH recorded 1 case of ehrlichiosis in Dutchess County in 2012, and four cases that may have either been ehrlichiosis or anaplasmosis (NYSDOH, 2013).

Powassan Virus Encephalitis: Deer tick virus, a genetic variant of Powassan virus, may be carried by blacklegged ticks (Dupuis et al., 2013). There were ten cases of Powassan virus encephalitis in the Lower Hudson Valley between 2004 and 2012 (El Khoury et al., 2013). There was one confirmed case of Powassan Virus encephalitis in Dutchess County in 2009 (DCDOH, 2013).

Rocky Mountain spotted fever may be carried by American dog ticks**.** It is not diagnosed commonly in New York State (CDC, 2013d). There was one case of Rocky Mountain spotted fever in Dutchess County in 2012 (NYSDOH, 2013).

Tularemia may be carried by American dog ticks. It has not been diagnosed in New York State since 2009. Between 2006-2009 there was only one case each year in New York State (CDC, 2013e).

Borrelia miyamotoi: In recent years, the spirochete bacteria *Borrelia miyamotoi* has been recognized in *I. scapularis* ticks. Prevalence of disease caused by this organism is unknown at this time, but one study in southern New England has measured seroprevalence of *B. miyamotoi* in asymptomatic individuals at 3.9% (as compared to 9.4% for Lyme disease) (Krause et al., 2014).

STARI (Southern Tick-Associated Rash Illness) can be carried by Lone Star ticks, but has not been diagnosed in the Hudson Valley. It has only been diagnosed once in New Jersey and once on Long Island, though it is possible that some cases of erythema migrans rashes diagnosed as Lyme disease are actually cases of STARI (Feder et al., 2011).

Further information on tick-borne disease in Dutchess County may be found in our most recent Community Health Assessment.

Time of Year and Risk of Tick-Borne Disease

Annual rates of occurrence of tick-borne disease correspond to the lifecycles of the ticks transmitting the disease. Lyme disease and other tick-borne diseases occur most frequently during the late spring and summer when nymphal ticks are most abundant and active (Falco et al., 1999; Moore, Eisen, Monaghan, & Mead, 2014). Case numbers peak in June and July. Few cases occur from December through March (CDC, 2013b). Two-thirds of cases of Lyme disease from 1992 to 2006 had a reported onset date in June, July, or August. Year to year weather patterns affect the timing and degree of nymphal activity. Nymphs may develop earlier and be more active in years with higher temperature and humidity (Moore et al., 2014). It should be noted that adult *I. scapularis* (black-legged) ticks do over-winter (Brunner, Killilea, & Ostfeld, 2012; Daniels, Fish, & Falco, 1989), and so while less likely, it is possible to be exposed to tick-borne disease in the winter (Falco & Fish, 1988). One study in Maryland was able to capture adult *I. scapularis* ticks during periods of 70% snow cover and in temperatures as low as 28 degrees Fahrenheit (Carroll & Kramer, 2003). Adult *I. scapularis,* while commonly infected with Lyme disease, are less commonly responsible for disease transmission as compared to nymphs because they are likely to be noticed and removed prior to transmission due to their larger size (Falco et al., 1999) . Adult *I. scapularis* activity and tick acquisition has a peak in the spring and in the fall (Daniels et al., 1989; Falco & Fish, 1988). Bar graphs showing cases per month for the various tick-borne diseases can be accessed through the CDC website at http://www.cdc.gov/ticks/geographic_distribution.html. The risk of acquiring a tick-borne disease may be diminished by avoiding tick habitats during months of peak activities (Piesman & Eisen, 2008), and when this is not possible or desirable, enlisting other methods of protection.

Habitat and Risk of Tick-Borne Disease

A review of the research on *I. scapularis* (black-legged tick) density in the habitats of the Northeastern and Midwestern United States provides the following insights: Wooded areas or forests support higher densities of *I. scapularis* ticks than lawns or more open habitats. Tick densities tend to be higher in deciduous forests with shrub understories than in coniferous forests or wetlands. Fragmented forests have higher tick densities than large continuous forests (Killilea, Swei, Lane, Briggs, & Ostfeld, 2008; Schulze & Jordan, 2005). Within forests, tick densities have been found to be higher in areas with ground cover. Ticks are found at the highest densities in areas with 3 or more inches of ground cover, and in the lowest densities where bare ground is visible (Schutzer, Brown, & Holland, 1997). In wooded areas and their borders immature ticks are most commonly found in the leaf litter or on low growing vegetation near ground level. Adult ticks may be found in the leaf litter or in brush or woody shrubs less than a meter in height (Maupin, Fish, Zultowsky, Campos, & Piesman, 1991).

The outdoor areas surrounding residential homes have been found to be a common site for tick acquisition in the Northeast United States (Falco & Fish, 1988; G. Smith, Wileyto, Hopkins, Cherry, & Maher, 2001). Residential properties in the Hudson Valley may include several different micro-

habitats that present varied degrees of risk for tick acquisition. One study of tick abundance on residential properties in Westchester County, NY found *I. scapularis* nymphs were most dense in wooded areas, followed by unmaintained edges of wooded areas, ornamental gardens, and lawns. Adult ticks were found in equal abundance in woods and unmaintained edges, and were extremely rare on lawns. The lawns most likely to contain ticks were those adjacent to woodlots (Maupin et al., 1991). Absence of tick habitats in residential areas has been found to be protective. A Connecticut study found decreased risk for Lyme disease in residents of densely populated villages as compared to those living outside of villages (Cromley, Cartter, Mrozinski, & Ertel, 1998).

Activities and Risk of Tick-Borne Disease

Results of surveys looking at which outdoor activities may pose increased risk for getting a tick-borne disease have been inconsistent. A 1986 survey of seroprevalence for Lyme disease in outdoor workers in the New York counties of Westchester, Putnam, and Suffolk failed to find an association between seroprevalence and time spent in any of the following outdoor environments: meadows, mowed lawns, paved areas, sand beaches, shrub growth, and woodlands (P. F. Smith, Benach, White, Stroup, & Morse, 1988). A 1988 study in New Jersey found hunting as a leisure activity to be a risk factor for seroprevalence for Lyme disease (Schwartz & Goldstein, 1990). A 1993 study of Hunterdon County, New Jersey residents found participation in the clearing of brush on property to be a risk factor for Lyme disease, but the following activities were not found to be risk factors: gardening, mowing the lawn, picnicking, walking or jogging in grassy or woody areas, or playing in mowed fields (Orloski et al., 1998). A 1998 study in Chester County, PA found gardening for more than four hours per week, attending children's outdoor sporting activities, and picnicking outside of designated areas in parks to be risk factors. Other outdoor activities were not (G. Smith et al., 2001).

One study attempted to identify what activities in nymph infested woodlands resulted in the most risk of acquiring *I. scapularis* (black-legged) and *A. americanum* (lone star) nymphs. The activities studied were: walking, crawling on hands and knees (meant to stand in for any activity which requires putting one's hands or knees down on the ground), and sitting on logs. Significantly more nymphs were picked up after 30 seconds of crawling than 30 seconds of walking. *I. scapularis,* but not *A. americanum,* nymphs were found commonly on logs that might be suitable resting spots during hiking. The authors concluded that putting hands and/or knees down in leaf litter and sitting on logs pose a greater risk for nymph acquisition than simply walking in the woods (Carroll & Kramer, 2001).

Efficacy of Tick Avoidance to Prevent Tick-Borne Disease

Unfortunately, for people who live in regions with a high prevalence of ticks, it's not entirely possible or desirable to avoid tick habitats for the following reasons:

- Residential properties include high risk habitats. (Piesman & Eisen, 2008)
- Occupational exposure is involuntary. (Schwartz & Goldstein, 1990)
- Recreational exposure avoidance is undesirable.

In some parts of Europe and North America residents can be counseled to avoid tick infested recreational areas during months of peak tick activity. However, in many areas of the northeastern United States this recommendation may be ineffectual because ticks infest residential properties to a high degree (Hayes & Piesman, 2003). Additionally, while it seems logical that exposure to infested habitats at peak tick activity periods would lead to greater risk for disease, studies attempting to document the risk associated with occupational or recreational exposure have yielded inconsistent results (Vazquez et al., 2008). In fact, more research implicates the residential property setting as the most frequent location for disease transmission (G. Smith et al., 2001).

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