

# **Dutchess County Department of Behavioral & Community Health**

## **Tick-Borne Disease Prevention FAQ Series**

### **PERSONAL PROTECTION MEASURES: OVERVIEW**

#### **Introduction**

Residents of Hudson Valley counties in New York State run a higher risk of contracting Lyme disease and other tick-borne diseases compared to residents of much of the rest of the state (NYSDOH, 2013). Numerous personal protection measures have been suggested to residents to decrease this risk. The CDC recommends the following: hypervigilance for ticks during the late spring and summer (season of greatest nymph activity), use of insect repellent on skin and clothing, the avoidance of tick habitats, walking in the center of trails when hiking, showering promptly after returning inside, frequent and thorough body checks for ticks, thorough examination of gear and pets for ticks before returning indoors, and putting clothes in the dryer on high heat for an hour to kill remaining ticks (CDC, 2011). However, studies to assess the efficacy of such measures have produced conflicting results (Hayes & Piesman, 2003), and educational efforts promoting them have had only limited success in altering behavior and preventing Lyme disease (Piesman & Beard, 2012). An important limiting factor in the effectiveness of personal protection measures to lower the rates of Lyme disease and other tick-borne diseases is lack of widespread adoption of preventative measures in spite of awareness (Hallman, Weinstein, Kadakia, & Chess, 1995).

The purpose of this document is to inform residents of the scientific evidence supporting and refuting the use of the various personal protection methods. This section summarizes data from epidemiological surveys of risk factors and protection measures. Sections following will look at specific evidence for each protection method individually in greater detail.

#### **Summary of Epidemiological Surveys**

- Most surveys suggest that personal protection measures reduce the risk of tick borne disease, however, there is great variation between studies as to which measures are beneficial and to what degree.
- Evidence exists supporting the use of insect repellents, protective clothing, and frequent tick checks.
- Studies show that risk of tick borne disease increases with time spent outdoors in endemic areas, however there is inconsistency between studies in terms of what types of outdoor activities contribute to risk. It is likely degree of risk has more to do with the level of exposure to tick habitats than to activity category.
- There is evidence that the timing and method of delivery of education about personal protection measures has an impact on the degree and proficiency with which targeted populations will adopt such measures, and in the resultant rates of Lyme disease and other tick-borne diseases.

## **Study Findings**

A 1986 survey of seroprevalence for Lyme disease in outdoor workers in the New York Counties of Westchester, Putnam, and Suffolk found a stronger association between seroprevalence and time spent outdoors for leisure than seroprevalence and time spent outdoors for work. There was no association between seroprevalence and use of tick avoidance precautions including: wearing long pants, tucking pant legs into socks, wearing long-sleeved shirts, use of insect repellent on skin or clothes, or tick checks (P. F. Smith, Benach, White, Stroup, & Morse, 1988).

Risk factors for seroprevalence of Lyme disease, based on 1988 study of occupational risk in New Jersey included: occupational tick exposure, hunting as a leisure activity, and removal of ticks with gasoline. Protective effects were seen with antibiotic use and insect repellent use (Schwartz & Goldstein, 1990). Further analysis of the same data, when comparisons were made between residents of different counties, found that residents reported more frequent use of personal protection measures in counties with low rates of seroprevalence and high rates of tick exposure than in counties with higher rates of seroprevalence despite lower reported rates of tick exposure. The data suggests that personal protection measures may reduce risk of exposure to Lyme disease (Goldstein et al., 1990).

A 1993 study of Hunterdon County, New Jersey residents documented risk factors for and personal protection measures used to prevent Lyme disease. Risk factors were found to be: living in a rural versus urban or suburban setting, the clearing of brush on property, the presence of wood or rock walls on property, the presence of a bird feeder on property, and the presence of deer on property. The following were not found to be risk factors: cat ownership, presence of a garden on property, and reports of frequent damage to property by deer. Likewise, no greater risk was associated with the following activities: gardening, mowing the lawn, picnicking, walking or jogging in grassy or wooded areas, or playing in mowed fields. Overall, few participants reported regular use of personal protection measures. The most frequently reported method in use was frequent tick checks. Tick checks were utilized by a higher percentage of study participants who did not contract Lyme disease than the group who did contract Lyme disease, but the difference was not statistically significant (Orloski et al., 1998).

A survey of Nantucket residents between 1993 and 1995 aimed to identify risk factors for Lyme disease in a high incidence area. The lifetime prevalence of disease in island residents was estimated at 15%. Residents practiced protective behaviors at the following rates: tick checks 80%, wearing long pants and long sleeves 53%, avoiding tick habitats 34%, and using insect repellent 11%. No association was found between any of the protective behaviors and prior history of Lyme disease (Phillips et al., 2001).

A 1998 case-control study of residents of Chester County, Pennsylvania examined factors associated with increased or decreased risk of Lyme disease infection. Residential settings

offering greater opportunities for tick exposure were a risk factor for Lyme disease. Gardening for more than four hours per week, attending children's outdoor sporting activities, and picnicking in parks outside of designated areas were risk factors. Tick checks during outdoor activity and use of insect repellents were associated with decreased risk for Lyme disease. No benefit was seen from the use of protective clothing or tick checks performed after returning indoors from outdoor activity (G. Smith, Wileyto, Hopkins, Cherry, & Maher, 2001).

A survey of Connecticut residents conducted from 2000-2003 looked at Lyme disease incidence and personal protective behaviors in order to assess effectiveness. CDC case definitions were used to classify Lyme disease cases. The study found use of protective clothing (long pants, long sleeves, light colored clothing) to be 40% effective in the prevention of Lyme disease and use of insect repellent on skin or clothing while outdoors to be 20% effective. Other protective measures such as tick checks and the spraying of lawns with acaricides were not found to have a protective effect, but the authors cautioned that this result may reflect the inherent limitations of the study. Recreational outdoor activities, living near a wooded area, and owning a pet were not found to be risk factors for Lyme disease. The study concluded that while there is benefit from established protective measures, they only prevent a portion of cases of Lyme disease, and the development of additional strategies (vaccination, tick reduction measures) should be pursued (Vazquez et al., 2008).

A case-control study was conducted in 24 Lyme endemic Connecticut communities between April 2005 and November 2007 to evaluate the effects of peridomestic prevention measures on risk of Lyme disease. Checking for ticks within 36 hours of spending time in the yard at home, and bathing within two hours of coming in from the yard were found to be protective against Lyme disease. There was a difference between cases and controls with respect to the use of insect repellent, but the difference was not great enough to reach statistical significance. No differences were found between cases and controls with respect to the following behaviors: wearing long pants, or wearing light colored clothing (Connally et al., 2009).

A study simultaneously assessing the association between Lyme disease and both individual and environmental risks on Block Island, RI, between 2005 and 2011 found an association between positive serology for Lyme Disease, the numbers of hours spent outdoors per day, and the density of vegetation at property edges. Negative Lyme disease serology was associated with the use of protective clothing (Finch et al., 2014).

A 1999 study in Lyme endemic Baltimore County, Maryland assessed the effectiveness of an education program targeted at preventing Lyme disease. Study participants received tick related (experimental group) or general health related (control group) educational materials bimonthly through the mail during tick season. Tick exposure was measured using antibodies to a recombinant tick saliva protein (ARTCA) as biomarkers. ARTCA is a biomarker for the tick bites of longer duration that are most likely to lead to transmission of Lyme disease. Knowledge and

use of preventative measures, especially tick checks and use of repellents, increased in the experimental group as compared to the control group. However, no difference was seen in tick exposure between the two groups. The authors note that tick exposure, as measure by ARTCA, was lower than expected in both experimental and control groups, and this may have impacted the ability to detect a potential benefit of the educational intervention (Malouin et al., 2003).

There is evidence that the timing and method of delivery of education about personal protection measures has an impact on the degree and proficiency with which targeted populations will adopt such measures, and in the resultant rates of Lyme disease and other tick-borne diseases. Daltroy, et al conducted a randomized trial of a primary prevention targeting passengers on ferry boats to Nantucket Island, MA (endemic for Lyme disease and other tick-borne diseases). Experimental groups received education on the prevention of tick borne disease and control groups received education on prevention of bicycle and roller-blading accidents. Recommendations to the experimental group included: avoiding tick infested areas, wearing protective clothing, use of repellents, doing tick checks, safe removal of ticks, and prompt recognition of symptoms to expedite early treatment. The educational presentation was designed using a combination of methodologies that have a proven track record in successful behavior change programs in health education. Follow up surveys found that members of the experimental group were more likely than control participants to take precautions against tick-borne disease and do daily tick checks, and had a 60% reduction in risk of tick-borne infection (for participants staying greater than two weeks, based on self-reported symptoms) (Daltroy et al., 2007).

In conclusion, personal protection methods are inexpensive and unlikely to cause harm, but to date they have not proven powerful enough to decrease annual reports of Lyme disease and other tick-borne diseases either in the United States or in Europe. However, it is speculated that public health initiatives to promote personal protection measures have blunted the increase in cases (Hayes & Piesman, 2003). Evidence supporting the use of the various protective measures suggested by the CDC and other public health officials is not consistent from study to study, hence the recommendation that multiple protective measures be employed.

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