Maine Medical Center
RESEARCH INSTITUTE
VECTOR-BORNE DISEASE LABORATORY

Environment Committee Co-Chairs April 22, 2008
Legislative Office Building, Room 3200
Capitol Avenue, Hartford, CT

Subject: House Bill 5852: An Act to Control Lyme Disease

Gentlemen/Ladies:

I have been asked by Georgina Scholl, Vice Chair of the Connecticut Coalition to End Lyme Disease, to provide you with the results of our research in Maine relating deer density to the abundance of *Ixodes scapularis,* the deer tick vector of Lyme disease.
The work is primarily represented in two published studies:

Rand, P.W., Lubelczyk, C., Holman, M. S., Lacombe, E. H., and Smith, R. P., Jr. 2004. Abundance of *Ixodes scapularis* (Acari: Ixodidae) after the complete removal of deer from an isolated offshore island, endemic for Lyme disease. J. Med. Entomol. 41: 779-784.

Rand, P. W., C. Lubelczyk, G. R. Lavagne, S. Elias, M. S. Holman, E. H. Lacombe, and R. P. Smith, Jr.: Deer Density and the Abundance of *Ixodes scapularis* (Acari: Ixodidae). J. Med. Entomol. 40 (2): 179-184, 2003.

In the first, we measured tick abundance seven years before, and now eight years following, the complete removal of deer from Monhegan Island, Maine, an isolated island lying 10 miles off Maine's midcoast. White-tailed deer, first introduced in 1955, reached a population density of ~100/mi^2 by 1996. The island became heavily browsed, and from 1989-1996 ten of the island's ~75 permanent residents contracted Lyme disease. We initiated annual fall tick collections 1990 by sweeping adult ticks from vegetation with flannel "flags", and by 1996 were collecting 17 ticks per flagging hour island-wide, with some areas producing 40/hr. Following votes by the islanders to reduce, and then to eliminate, the deer, all deer were removed, primarily by sharpshooter, between November 1996 and March 1999.

Because adult ticks feed on deer, as the deer were removed the number of ticks that could be flagged from vegetation temporarily increased until the life cycle of the ticks that were there before the deer were removed ended in 2001. From 2002 through 2007, tick collections have averaged 1.5/h. For comparison, in 2007 we flagged 110/hr in Wells, Maine, and 54/hr in Cape Elizabeth.

On Monhegan, the reservoir for the Lyme disease bacteria is Norway rats, which are highly infectious to the deer tick larvae and nymphs that feed on them. A portion of subadult ticks feed on deer, however, and deer do not transmit the Lyme bacteria. Hence, with the removal of deer, there were fewer non-infected adults in the fall, and the infection rate of those we collected rose temporarily. Thereafter, infection rates fell, averaging 27% over the last 6 years. Over that period, adult deer ticks in Wells and Cape Elizabeth have been approximately 60% infected.

Further evidence that the removal of deer has broken the life cycle of deer ticks on Monhegan is our failure to find larval or nymphal ticks on Norway rats since 2001. Our current research will look for the source of the few ticks that we are able to flag on the island, and of the Lyme bacteria that infects roughly one third of them. Evidence points to migrant, ground-associating neotropical songbirds.

Monhegan Island was heavily browsed prior to deer removal. High fences surrounded private gardens, trails were clear, and maintaining ornamental plantings was extremely difficult. Vegetation now flourishes all over the island. Only one case of Lyme disease has been reported from Monhegan Island since 1997. Year-round residents and multitudes of summer visitors to Monhegan now enjoy one of the safer places in Maine with respect to Lyme disease risk.

More pertinent to the mainland situation where deer roam freely is our second study in which we compared the abundance of fall-flagged adult deer ticks with the presence of deer along multiple 1000 ft transects within 8 study sites throughout southern Maine. Sampling included 74 transects, each examined from 1 to 3 years, for a total of 155 records (a total of 29 transect miles). Deer density, here in terms of ticks per square mile, was estimated from pellet group counts using a published conversion factor. As seen in the accompanying plot, deer density was highly positively correlated with tick abundance (Fig 1).

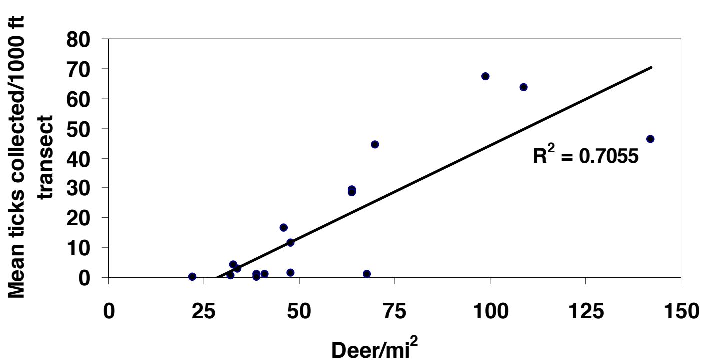

Figure 1. Relationship of tick density to deer abundance (Rand et al. 2003).

In this study we found few ticks where deer densities dropped below 15/mi².

In a recently reported study, Jordan, et al. (Journal of Medical Entomology 44:752-7, 2007) found no change in tick numbers after reduction of deer densities in New Jersey. When the reduction in deer density they reported (from ~117 to ~62/mi²) is superimposed on the above plot, it becomes apparent that little change in tick abundance might be expected at these high deer densities.

To summarize, a unique study revealing >90% reduction in questing ticks following the complete and permanent extirpation of deer from an offshore island has demonstrated the quintessential role of this host in the maintenance of deer tick populations. In addition, mainland transect surveys have demonstrated a strong, positive relationship between deer presence and tick abundance, with few ticks found below deer densities of approximately 15 deer/mi².

Because the abundance of ticks is directly related to the abundance of deer, herd reduction represents an extremely important and effective method to reduce the risk of Lyme disease, particularly in populated areas where deer ticks are established and local ordinances and posted properties allow deer herds to burgeon.

Respectfully submitted,

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