THE HUMANE SOCIETY
OF THE UNITED STATES

Why Hunting Won't Reduce Human Risk of Lyme Disease

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Misleading information given at last week's public hearing

Contrary to what was said at the Environment Committee hearing on March 22nd, the Centers for Disease Control (CDC) do not recommend hunting to control Lyme disease. If one scours the CDC web pages on Lyme disease, many recommendations are given about how to prevent Lyme disease, but there is no mention of hunting in the CDC web page text, nor any recommendation for hunting[1]. See http://www.cdc.gov/lyme/

Leading experts underscore why hunting won't work:

- An interview with Dr. Tamara Awerbuch of the **Harvard School of Public Health**, entitled *Killing Deer Not the Answer to Reducing Lyme Disease, Says HSPH Scientist*, explains in detail why hunting won't reduce Lyme Disease. http://www.hsph.harvard.edu/news/features/features/kiling-deer-not-answer-reducing-lyme-disease.html

- As recently reported in the Proceedings of the **National Academy of Sciences**, *"increases in Lyme disease in the northeastern and midwestern United States over the past three decades are frequently uncorrelated with deer abundance and instead coincide with a range-wide decline of a key small-mammal predator, the red fox...* " (Levi et al, 2012)

- A scientific study – and entire book on Lyme disease -- by leading Lyme disease expert Richard Ostfeld confirms that *human risk of exposure to Lyme disease is correlated with the abundance of immature (rodent) hosts and their food resources, not deer numbers* (Ostfeld et al, 2006, 2011).

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[1] There is a paragraph in a web link to a CT Ag Station document which discusses how attempting to interrupt the transmission of Lyme Disease by trying to drastically lower a deer herd to 8 deer per square mile "may render this strategy unrealistic,' excepting some island or peninsula populations. The advantages of alternative strategies – landscaping, fencing, 4-posters, etc are fully discussed (See Tick Management Handbook by Kirby Stafford, 2004. Published by CT Ag. Station).

How Lyme disease works:

The culprit in the spread of Lyme disease is *Ixodes scapularis*, the Black-legged tick which carries a disease-causing bacterium (*Borrelia burgdorferi*) in its bloodstream. The tick transforms from a larvae into a nymph and then an adult over a 2 year span. At each stage, the tick takes a blood meal from a host and then drops off and molts into the next life stage. While taking a blood meal, infected ticks are able to inject the disease-causing bacterium into a new host.

Lyme disease has proven difficult to control largely because the tick (*Ixodes scapularis*) is carried by many hosts including many bird species, lizards and all mammals. Deer seem to the preferred host for the *adult* stage of the tick. For unknown reasons, the tick seems to prefer a progressively larger host. Certain small rodent species, namely the white-footed mouse, serve as the primary host for *immature* ticks. In addition, birds can transport the disease to new areas (Anderson, 1988, Battaly and Fish, 1993, Keirans et al, 1996).

At one time, the Black-legged tick was called a "deer tick." This common name was a misnomer due to tick's multiple hosts.

Deer Hunting and Lyme Disease

The reason that hunting is not efficacious in controlling Lyme disease is because hunting does not significantly reduce the *tick* population. For example, in one study where as many as 70% if the deer were removed from an island, there was "no marked reduction in the abundance of the tick." (Wilson et al, 1984, p.697)

Another study conducted at Crane's Beach in Ipswitch, MA found that after gradually reducing the deer population from 350 to 60 deer over a 7 year period, immature tick numbers did decline – but soon increased again to pre-hunt levels, despite the vastly reduced deer density. Interesting, *adult* tick numbers *increased* the entire time. (Wilson and Deblinger, 1993, Ostfeld, 2011).

When the deer population was reduced as much as 83%, the authors concluded that "the reduction in tick numbers was insufficient to reduce the number of female ticks that reproduced." (Deblinger et al, 1993, p.148)

Most hunting seasons are also poorly timed to affect tick reproduction. By the time regular hunting season occurs in November, a good portion of adult ticks have already mated and *dropped off* the deer to lay eggs. This issue was discussed by researchers who stated, "deer reduction practices carried out when adults are relatively inactive at the end of fall will have minimal impact on the tick population." (Falco and Daniels in McShea, 1997)

In addition, the ticks seem to confound deer reduction efforts by taking advantage of other hosts (Duffy et al, 1994) or congregating at higher densities on the remaining deer (Deblinger et al, 1993).

It appears that a deer population level would need to be extremely low, close to zero, to impact the transmission dynamics of Lyme disease. Note that the few cases where Lyme disease was reportedly reduced by hunting were small island or isolated populations where deer could be eradicated or nearly eradicated --- *and there were hardly any deer (or none!) in the surrounding community to take their place*. In non-island areas, like most of Connecticut, any reduction in deer numbers is quickly offset by an increase in the remaining deer's reproductive rate – and influx of deer from the surrounding area.

Safety issues:

One key study (Perkins et al, 2006) suggests that a local absence of deer may actually *increase* tick feeding on rodents, which can lead to the potential for disease "hot spots."

In addition, researchers warn that hunting may actually *increase* the public safety risk in the short-term because any remaining ticks who are still "questing" for a large host are more likely to end up on large hosts like humans after deer numbers have been reduced (Ginsberg and Zhioua, 1999).

Deer reduction is not synonymous with disease reduction

The issue of infectivity comes into play when understanding why fewer deer does not mean less human disease.

Research indicates that approximately 50% of ticks are infectious for Lyme disease. If a person is bitten by 12 ticks a year, and half of those ticks are infected, then the probability of that person being bitten by at least one infected tick is 99.98%. An intervention which cuts the number of tick bites by 90% will not lower the probability of transmission by the same factor (90%). This is because even if the person is bitten by only one tick, *half are infected, so that person will still have a 56.5% probability of becoming infected with Lyme disease*. So it is not just the *number* of ticks, but their infectivity rate and probability of being bitten, that comes into play when looking at disease transmission risks (Mather et al, 1996).

Tools for tick control

Some of the best ways to control human Lyme disease involve doing a combination of the following: checking oneself and family members for tick after being outdoors, taking precautions like wearing light-colored clothing, tucking in sleeves and socks, using tick-repelling products on your skin and insecticidal sprays on properties, doing habitat alteration to reduce tick and tick-host habitat, and consulting a doctor immediately when signs of Lyme disease or the characteristic rash occur.

There are three devices on the market that target ticks exclusively and have shown promising results in terms of significantly reducing the tick population.

One is called the ***Maxforce*** system which is a bait box that attracts mice and applies fipronil (the active ingredient in *Frontline*) to their bodies when they enter. In a study done by Connecticut Agricultural Station, there was an 80% and 96% reduction in nymphs by the first and second years of the study, respectively, and infectivity was lowered 67% by the second year. They also found a 77% reduction in questing adults on the treated properties and lowered infectivity rates (Dolan et al, 2004). This device is best suited to a property-level approach yet has limited availability right now, so it may not be an option for many communities.

A similar baiting device exists for deer, called the "***4-Poster***." The 4-Poster is a device that *uses the deer* to kill ticks (Pound, 2000). This device has been tested by the USDA in a 5 state, 7 year research program and has proven extremely effective in reducing tick numbers (McGraw and McBride, 1991). It contains a corn bait, which attracts deer, and when they eat the corn, a chemical (10% permethrin) is applied to their necks and shoulders which kills 95%-98% of the adult ticks. A study done at the Goddard Flight Center found that by using the 4-Poster system, adult ticks were completely eliminated by the 2nd year of the study; all stages were reduced 91-100% by year 3 (Solberg et al, 2003). Results of more field trials in various states were written up in the journal *Vector Borne and Zoonotic Diseases* (vol 9).

One more product is ***Damminix Tick Tubes***, which consists of cardboard tubes filled with permethrin-treated cotton balls which mice use for nesting material Deer ticks that feed on mice in the Spring and the Fall are exposed to permethrin and killed. This product is commercially available and well suited to a property-level approach.

Summary:
The human risk of Lyme disease won't be lessened by reducing deer numbers, based on many scientific studies. There are far better strategies for reducing human risk, improving human safety, and controlling the spread of this multi-host disease.

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