

ISLESBORO HEALTH CENTER

LYME DISEASE ON ISLESBORO

INTRODUCTION

The incidence of Lyme disease on Islesboro has increased dramatically in recent years. In 2003 one case was diagnosed; in 2008, there were 18 new cases.

The staff of the Islesboro Health Center believes that the increase in the number of Lyme disease cases constitutes a **serious health problem** for Islesboro and that an inquiry into the causes of the disease and ways that the disease can be prevented should be conducted immediately. As a first step, the staff has enlisted the assistance of the Health Center Advisory Board to gather information that will be the basis of the Health Center's course of action.

This report, prepared by an ad-hoc sub-committee of the Islesboro Health Center Advisory Board, includes the following sections:

- General information about Lyme disease
- General information about the deer tick
- General information about Lyme disease prevention
- Lyme disease and prevention on neighboring islands
- Lyme disease and prevention on Islesboro
- Deer hunting on Islesboro
- Sources of expertise
- Conclusions

The report also includes a listing of useful sources of information.

GENERAL INFORMATION ABOUT LYME DISEASE

Lyme disease, or borreliosis, is the most common tick-borne disease in the Northern Hemisphere. It is transmitted to humans by a bite from a deer tick that has been infected by the microscopic bacteria *Borrelia burgdorferi*. Lyme disease can affect virtually any system in the body, producing a range of symptoms. Early manifestations of infection may include fever, headache, stiff neck, fatigue, depression and a skin rash. They can usually be treated with antibiotic therapy. Late, delayed or inadequate treatment can lead to symptoms such as severe fatigue, problems with vision or hearing, migraines, sleep disturbance and cognitive difficulties and can have disabling effects upon the joints, heart and nervous system. In some cases, Lyme disease patients can become paralyzed and/or comatose.

The incubation period from infection to the onset of symptoms is usually 3-30 days. Lyme disease can be difficult to diagnose, for not all patients with Lyme disease will have all

symptoms, and many of the symptoms are not specific to Lyme disease but can occur in other diseases as well.

Children as well as adults can be infected with Lyme disease. People who have had the disease are not immune and may be re-infected.

While the cost of antibiotic therapy at the early stage of Lyme disease is modest, diagnosis and treatment at later stages can involve many thousands of dollars.

GENERAL INFORMATION ABOUT THE DEER TICK

In order to understand how Lyme disease spreads, it is important to know the life cycle of the deer tick.

The Life Cycle of the Deer Tick

The life cycle of the deer tick (*Ixodes scapularis*, also known as the “black-legged tick”) extends over two years.

Year One

- Spring. Deer tick eggs hatch. Tiny, six-legged larvae, which survive by feeding on the blood of mammals, reptiles and birds, climb stalks of grass or brush and wait passage of a host animal; any animal which brushes against the larva’s perch becomes a host. About 10% of larvae succeed in finding a host. Although mice are the most common hosts, other small animals – chipmunks, squirrels, rabbits, birds and cats – can serve that purpose as well.
- Summer/fall. Larva molt, resulting in an 8-legged nymph. Like the larvae, the nymphs find a host by climbing grass and brush. Again, they find a host, which can be larger than the first host and can include dogs and deer. After a few months feed and drop off the host to molt.
- Winter. Nymphs overwinter.

Year Two

- Spring. Adult tick emerges, and for a third time, quests for a host. Now they are able to climb higher and usually find their way to a deer or bear. Adult tick stays on the host for several months, sometimes overwintering.
- Summer/fall. Ticks mate.
- Fall/winter/spring. Female drops off host, lays up to 3,000 eggs and dies, thus completing the life cycle.

Ticks have the capacity to bite and infect humans during both year one and year two of the life cycle. If a tick has 6 legs it is a larva and is unlikely to cause Lyme disease. If a tick has 8 legs, then it is a nymph or adult and has the potential to transmit Lyme disease.

Facts about the Deer Tick

- A deer tick acquires the Lyme disease bacteria when it feeds on the blood of a small animal which has Lyme disease. Once infected, the deer tick retains the Lyme disease bacteria through subsequent molts.
- Not all deer ticks are infected with Lyme disease, though in some areas 80% of ticks are infected.
- Most tick bites in warm months are from larvae, since only a small percentage of deer tick larvae find a host and advance to the adult stage.
- **Ninety percent of adult deer ticks find deer as hosts; they mate on the deer. 10% find other kinds of animals.**
- When the deer population is below about 10-15 per square mile, the adult deer tick's probability of finding a host drops below that needed for them to survive with a stable population, so their numbers decline. In one case, when deer were totally eliminated from an area, the deer tick population was about 4% of the original level after 3 years and not measurable after 4 years.
- If uncontrolled, deer population generally increases 40% a year.
- In the state of Maine, the deer tick is most prevalent along the coast from Kittery to Bar Harbor and inland in Knox, Waldo and Lincoln counties (Attachment A). The largest number of cases have been diagnosed in York and Cumberland counties. In 2003, 175 cases were identified state-wide; in 2007, 529 cases were identified.
- Lyme disease, or borreliosis, is the best known and most common bacterial disease spread by ticks, but it is not the only one. There are presently 12 diseases known to be vectored by the deer tick. Among them are ehrlichiosis, bartonella and babesiosis. It is possible, and becoming more common, for a single bite to cause a combination infection involving more than one disease.

GENERAL INFORMATION ABOUT LYME DISEASE PREVENTION

Lyme disease is prevented by reducing the number of animals that serve as hosts to the deer tick. There are a number of options.

- Reducing the population of small host mammals. Applying the insecticide permethrin to the nesting material of small rodents will reduce their population. However larvae and nymphs will then resort to other small animals (mice, chipmunks, squirrels) or birds as hosts.
- Applying a pesticide to deer. If corn treated with the pesticide ivermectin is fed to deer, the ticks will die. This was tried on Monhegan with initial success. However, the pesticide also killed intestinal parasite which plagued the deer, making them healthier. With improved health, deer reproduced faster, resulting in an increased deer population.
- A four-poster device. This device is baited with corn that is treated with an acaricide. When deer come to feed, the acaricide brushes onto them and subsequently kills the ticks. Although this method has had some success, it is labor-intensive and costly to maintain. In Connecticut the 4-poster experiment failed: the tick population was reduced to 35% of the original, sufficient ticks remained to reproduce and cause disease.
- Contraception. Contraceptive drugs can be administered orally (with corn that has been treated), or with under- the-skin implants or injections. Best used for single herds of deer that are manageable.
- Deer reduction. **Research shows that the only workable solution to preventing Lyme disease so far in the northeastern US has been reduction of the deer population density.** When the density of deer is reduced, the probability of an adult tick finding a host and surviving to lay eggs is reduced. Pete Rand of the Vector-borne Disease Laboratory at the Maine Medical Center writes: *Where it can be accomplished, the best way to reduce the abundance of deer ticks is to reduce the abundance of deer which female ticks feed on to obtain the nourishment to produce eggs – up to 3000 per tick. How far deer have to be reduced is not really known, but our work suggests that it’s below, at most, 15/square mile. Some say <10/sq mi. And when that level is reached, it must be maintained, because sub-adult ticks will always be coming in on birds. Of course, the more the deer, the more the ticks, so any reduction should help.*

LYME DISEASE AND PREVENTION ON NEIGHBORING ISLANDS

	Population	Size	Lyme cases	Deer taken
Monhegan	75	.9 sq. miles	N/A	N/A
North Haven	381	12 sq. miles	2007 – 6 2008 – 4	Guns allowed. 2007 - 111

Vinalhaven	1,200	108 sq. miles	2007 – 6	Guns allowed. 2007 - 103
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Monhegan. The white-tailed deer was introduced to Monhegan in 1955; by 1996 there were approximately 100 deer per square mile. Lyme disease was first noticed in the 1980's and by 1996, 13% of year-round residents had contracted the disease. Norway rats were the primary hosts for the deer tick. Led by Monhegan Associates, the conservation organization on the island, residents resolved to address the deer problem, enlisting the assistance of the Vector-borne Disease Laboratory and the Department of Inland Fisheries and Wildlife. Initially deer were treated with chemical compounds. When this had little effect, the community decided to eliminate deer from the island. From November 1996 to March 1999 - through relaxed hunting regulations, professional sharpshooting, poaching and natural deaths, - all deer were removed from the island. Funding for the Vector-borne Disease Laboratory's work was provided by the Center for Disease Control in Fort Collins, CO. According to the Laboratory, the deer reduction work was paid for by Lincoln County. With the absence of deer in the fall of 1999, both the density of host-seeking ticks and infection prevalence rose. By the summer of 2003, no sub-adult ticks were found on rats. There have been no new signs of deer.

North Haven. In a recent conversation, a member of the Town Office staff said that Lyme disease did not appear to be a problem.

Vinalhaven. In a recent conversation, a resident was of the opinion that ticks found on Vinalhaven were not infected by Lyme disease. He said that many more deer were taken than reported. The number taken in 2007 is closer to 150 than the 103 indicated on the chart above.

Please see Attachment B.

LYME DISEASE AND PREVENTION ON ISLESBORO

Islesboro, which is 14 square miles in size, has a year-round population of 650 and an additional 2,000 summer residents.

New Cases of Lyme Disease

2003 – 1
2004 – 0
2005 – 3
2006 – 4
2007 – 7
2008 - 18

Of the new cases in 2008, 9 involved year-round residents, 6 involved seasonal residents, and one involved a frequent visitor to the island.

Prevention

In order to institute a Lyme disease prevention program on Islesboro, the following questions must be addressed:

- What is the deer population on Islesboro?
- What is the tick density on Islesboro?
- How infected are the host mice and other small animals?

The only available statistics relating the numbers of deer on the island are the numbers of deer tagged.

2003 – 128
2004 – 148
2005 – 151
2006 – 126
2007 - 175

Please see Attachments C, D and E

DEER HUNTING ON ISLESBORO

Since the mid-1930's, firearms (rifles and shotguns) have been outlawed on Islesboro. Hunters may use only bows and arrows to take deer. Licenses hunters may take unlimited does.

The annual deer hunting season extends from mid-October to mid-December.

Hunters must register their taken deer at tagging stations located either on Islesboro or on the mainland. Statistics are maintained by the Maine Department of Inland Fisheries and Wildlife.

AVAILABLE EXPERTISE

During the preparation of this report, the Ad Hoc Committee has established contact with knowledgeable professionals who are experienced in tick management. They are:

- Peter W. Rand, MD, Vector-borne Disease Laboratory, Maine Medical Center Research Institute. Dr. Rand, who spoke at Islesboro's "Tick Talk" in 2007, has excellent information about making the public aware of the risk of tick bites, how to avoid them, and how to control ticks on their properties. Furthermore, his laboratory has the capacity to analyze the situation on Islesboro and to recommend what steps, if any, should be taken. Dr. Rand and his staff were instrumental in designing and implementing the program on Monhegan Island.
- Chuck Lubelczyk, Biologist, Vector-borne Disease Laboratory. Works with Dr. Rand.

- Lee Kantar, Deer biologist, Maine Department of Inland Fisheries and Wildlife.

Please see below for contact information.

THE AD HOC COMMITTEE'S CONCLUSIONS

Based on the information gathered for this report, the Ad Hoc Committee has come to the following conclusions:

- The health threat posed to residents of Islesboro by the presence of the deer tick appears to be serious and should become a top priority for the Health Center, the Health Center Advisory Board and the Town of Islesboro.
- To determine the course of action to address this potential problem, the Health Center Advisory Board should initiate a medical and scientific inquiry into the incidence of Lyme disease on Islesboro, its causes and what steps, if any, should be taken to address the problem.
- Staff of the Vector-borne Disease Laboratory and the Department of Inland Fisheries and Wildlife, recognized authorities on issues related to Lyme disease, should be enlisted at the outset in order to assist in the design and implementation of the Health Center's inquiry.
- The Health Center should inform the Board of Selectmen of this initiative and should keep the Selectmen briefed on an ongoing basis.
- While the inquiry is being carried out, the Health Center should make every effort to inform islanders of the risk of tick bites, how to avoid the and how to control ticks on their properties.

SOURCES OF INFORMATION

Agencies

Vector-borne Disease Laboratory
Maine Medical Center Research Institute
75 John Roberts Road, Ste. 9B
South Portland, ME 04107
207-662-7141
207-662-7147 Fax
<http://www.mmcri.org/lyme/index.html>

Pete Rand, MD, Senior Investigator
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Chuck Lubelczyk, Biologist

Maine Department of Inland Fisheries and Wildlife
284 State Street
Augusta, ME 04333
207-941-4477
Lee Kantar, Deer Biologist

Publications

Tick Management Handbook, prepared by Kirby C. Stafford III, Chief Scientist, Connecticut Agricultural Experiment Station, Entomology Department, 123 Huntington Street, PO Box 1106, New Haven, CT 06504, 2004, <http://www.mmcricri.org/lyme/download/TickHandbook.pdf> or call 203-974-8500.

John Moran, Newtown, CT, “*Dealing with Ticks*,” 2002, modified annually up to the present, <http://webpages.charter.net/balplanman/Interests/DeerTick.html>

Island Institute website, Bob Moore, “Lyme Disease Continues to Spread in Maine,” posted July 1, 2008, www.workingwaterfront.com/Lyme

Peter W. Rand, Charles Lubelczyk, Mary S. Holman, Eleanor H. Lacombe and Robert P. Smith, “*Abundance of Ixodes scapularis after the Complete Removal of Deer from an Isolated Offshore Island, Endemic for Lyme Disease*,” *Journal of Medical Entomology*, Vol. 41, No. 4, July 2004

DVD

Lyme Disease Awareness and Prevention, Maine Center for Disease Control and Prevention, Division of Infectious Disease, 286 Water Street, 8th Floor, 11 State House Station, Augusta, ME 04333-0011; call Ann Redmond Sites, MPH CHES, Program Manager, Infectious Disease Epidemiology, 207-287-7273 or 287-4326

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