

Prevention of Lyme and Tick-Borne Diseases, Nova Scotia; Resources, References and Links

Ticks are here to stay and the ticks are winning. [1] Fresh crops of infected ticks arrive here on the backs of songbirds every spring and are dispersed to far-flung places. [2] The ticks aren't everywhere but they can be any place songbirds can fly in Canada. The number of confirmed cases in Nova Scotia nearly doubled in 2017 to **586** [3] and this figure likely represents only 10% of the actual number of cases, [4] yet public health officials and infectious disease doctors continue to downplay the risks and tell us Lyme is rare. With revised figures of 5,860 cases per year or a rate of 631 per 100,000 Lyme and TBD's would become our most common reportable infectious diseases and would be almost twice as common as Chlamydia which would then become number 2 on the list.

Education is the answer and it will likely require the use of a whole suite of approaches to help slow or control this pandemic. [5] Nova Scotia has a Tick-Borne Diseases Response [April 2018] Plan on their website [6] that is revised yearly but has never been implemented. It is a very weak response and almost completely passive. The N.S. **risk map** [7] <https://novascotia.ca/dhw/CDPC/lyme.asp> can be printed as a poster as can the pamphlets and an additional poster in the column to the right.

Every season is tick season in Nova Scotia. Ticks are cold adapted and are active at 4 degrees Celsius and above. Ticks may seem to disappear from Late July to mid September but this is misleading as they are still present near the ground where the humidity can be higher and this is the time when larvae and the tiny nymphs appear that are responsible for most of the problems because they are so hard to see.

By far, the best way to avoid Lyme and tick-borne diseases (TBD's) is to be aware of the risk of tick bites and act accordingly. Blacklegged ticks don't like to get dried out so stay on the path and avoid contact with the wet tall grasses, weeds and undergrowth at the edges of properties and beside trails. Ticks seldom move above knee or hip height. Sandals and open toed shoes are out -even rubber boots can help. The good news is that blacklegged ticks [*Ixodes scapularis*] usually do not transmit Lyme bacteria [*Borrelia burgdorferi*] right away. [8,9]

33% - 35% of blacklegged ticks [also known as deer ticks or BLT's] carry the *Borrelia* bacteria that can cause Lyme disease. [10] Ticks are like dirty needles and they carry other harmful co-infections like *Babesia*, *Bartonella*, *Ehrlichia*, *Anaplasmosis* and *Rickettsia* that can be just as serious as Lyme. No tick is a good tick. Dog ticks [*Dermacentor*] can carry *Rickettsia*, *Bartonella* and *Powassan* virus. [11] Tick bites are usually painless, don't itch and few people are aware that they have been bitten.

Borrelia transmission was shown to occur as early as 12 hours of tick attachment. It is therefore important to remove nymphs or adult ticks as soon as possible

after bite to prevent any transmission. [12,13] Diagnosed early Lyme is usually easily and effectively treated with oral antibiotics. If Lyme is unrecognized and untreated it may progress to a multi-staged, multi-system disease that causes arthritis, neurological problems and can mimic many other serious disorders like MS, ALS, Parkinson's and Alzheimer's, but treatment is often still possible even at these later stages. [14,15]

Precautions to Avoid Tick Bites

- **Clothing**

Wear light-coloured clothing so ticks may be seen more easily. Tuck your pant legs into your socks and your shirt into your pants when walking in woods, brush, or tall grass. Blacklegged ticks attach to clothing and then walk upward. Unlike mosquitos they can't bite through most clothing [the exception is socks with open mesh]. Some people use gaiters or wrap duct tape around their pant cuffs and socks as an extra precaution. The way to avoid the problem of tick larvae crawling through the mesh of socks is to wear socks that have been treated with permethrin. Ticks can't get through nylons. Repellents can be sprayed on clothing as well as skin but it is the permethrin that is most effective. Don't forget to spray hats and footwear. One study showed that those wearing treated footwear had 74% fewer tick bites compared to those with untreated shoes. [16,17,18,19]

Hunters and workers handling dead animals should wear gloves.

Use fine tipped tweezers, duct tape or a sticky lint roller to remove ticks from clothing and check the inside of clothing as well. Dispose of ticks in alcohol or down the toilet

- **Repellents**

Use repellents that are recognized as being effective against ticks such as those containing 30% DEET, 20% icaridin also known as Picaridin that can be used on children from 6mos. of age onwards and Natrapel lemon/eucalyptus [p-menthane-3,8 diol] may work to repel ticks but it isn't labelled as such. For more information on repellents and children see ages 3 and under:

https://www.caringforkids.cps.ca/handouts/insect_repellents

Most repellent testing has been carried out on flies and repellents don't seem to be nearly as effective when used for ticks so thorough tick checks as soon as possible or at least within a couple of hours of visting an area that might have ticks and showering are highly recommended. Most alternative natural repellents that people mention don't appear to work or at least not very well. [20]

- **Pets**

To protect pets, consult your veterinarian about tick repellents, medications, drops, collars and Lyme vaccines for dogs. Cats are carriers and are seldom affected by TBD's but they can carry ticks into the house. Keep dogs on a short leash in tick territory and inspect yourself, the kids and the dog's skin soon after a walk and remove ticks promptly. Try not to transport ticks on the dog to other

locations. Dogs can get sick but with treatment they can recover and unlike us they can build up resistance to TBD's over time. Check your pets for ticks including between the pads on the dog's feet. Try using duct tape to remove unattached ticks from fur otherwise fine-tipped tweezers may have to be used. https://www.cdc.gov/lyme/prev/on_pets.html

- **Tick Checks**

Do tick checks whenever you've been outdoors! Individuals should check their clothes and bodies for ticks as soon as possible. This should include a visual inspection as well as a manual inspection feeling around the body [through the hair, for example] for ticks. In tick season this should be done once daily. Areas to check in particular include under the arms in and around the ears, inside the belly button, behind the knees, between the legs, around the waist using mirrors if necessary or a partner. [21] Use a fine tipped pair of tweezers or special tick removing tools and not your fingers when handling ticks. Dispose of the ticks in alcohol or down the toilet.

Clothing should be placed in a gas **dryer** on high for 15 minutes or an electric dryer on high for 20 minutes or more before they are washed. Washing won't kill ticks even after an hour.

Bathing and showering as soon as possible after coming indoors is an ideal way to wash off any unattached ticks. Research suggests that the sooner the removal of ticks the less likely will be the transmission of *B. burgdorferi*.

- **Property Changes that will Mitigate Risk**

Reducing deer and animal attractants like bird feeders in yards by placing them outside of the yard or higher where the deer can't reach are effective steps that should be taken. In some cases, high fences can be installed. Use plants that don't attract deer like daffodils, lavender, poppies, foxglove, iris's, fragrant herbs and native evergreens. Prune trees to reduce the shade and let in more sunlight. Establish a gravel or wood chip border of one meter at the edge of the lawn so you are not exposed to the tall grasses, weeds and brush. Remove any Japanese barberry as this plant provides a favourable habitat for all stages of tick development. [22]

Reduce the use of foundation planting with low spreading plants like ferns and junipers. Prune plants to increase the space between the ground and branches. Clean up holes in foundations and fill chinks in stonewalls to discourage rodent activity. Move woodpiles away from the house; widen trails, Move swing sets and sand boxes away from the property edges. [23]

If the infestation is severe because of location and damp conditions consider hardscaping and xeriscaping using gravel and deer resistant plants.

Dress properly with long sleeved shirts and pants with everything tucked in while mowing and using trimmers. Ticks can't jump or fly but they can be thrown by the lawnmower and many ticks have landed on the driver.

- **Permethrin**

“An ounce of permethrin is worth a pound of antibiotics” [5]—Dr. E. Maloney

People who must be in areas where ticks are prevalent may pre-treat their clothing with permethrin containing products that both repel and kill ticks. We have had centuries of experience working with pyrethrum and pyrethrin derived from chrysanthemum. It doesn't persist in the environment and when used appropriately it is safe. Permethrin treated clothing really does work [24,25] but Health Canada and the Pest Management Regulatory Agency have banned its use in Canada for ticks even though it has worldwide acceptance as being safe and efficacious. They have encouraged manufacturers to submit products for safety testing for Canadians but refuse to set time or financial limits. In the meantime as long as the permethrin containing products labelled for similar uses such as wasp sprays, head lice bed bugs, ant sprays, barn flies, bugs and for agricultural uses they are permitted we should make use of them for the prevention of Lyme and TBD's. Canada's armed forces use permethrin on their clothing and gear and Health Canada encourages Canadians travelling abroad to purchase the pre-treated clothing and the over the counter permethrin sprays for ticks. [26] So permethrin is permitted around food handling facilities for our military, for head lice on children, and Canadians travelling abroad, just not for Canadians for protection against tick bites in Canada. Mark's No Fly Zone clothing will work on ticks but it is expensive, there are no socks or children's sizes available and the company is not allowed to advertise in Canada that it works on ticks. The manufacturer says that such advertising is allowed in the U.S. and elsewhere.

There are a limited number of clothing items advertised on Amazon.com that have been treated by Insect Shield for secondary clothing manufacturers who are not supposed to be supplying Canadians but are doing so anyway despite their agreement with Insect Shield international.

We would suggest Canadians might try a temporary or makeshift DIY solution until this problem is resolved by using ant sprays with 0.25% permethrin on their outdoor clothing and footwear. An alternative to this is to buy 10% permethrin online from www.amazon.com and dilute it to the preferred 0.5% concentration. Durvet 2253432 will cost about \$50 and when diluted will make 19 litres. The ant sprays like Ortho Home Defense Max and Wilson's AntOut are available across Canada in various garden centres such as Canadian Tire, Walmart, Home Hardware, Home Depot, Shur-Gain and work fine from personal experience.

Canadians can purchase 500ml bottles of 1.25% Protector House and Garden spray concentrate from The Kore Garden [home office Vancouver, shipped from Toronto] which can be diluted with 750ml of water to produce 1.25l of 0.5% solution for about \$48 with shipping and taxes. This is also available in lots of 4

bottles for a discount. Another Canadian source available from various suppliers of horse and veterinary products of 5% permethrin spray is Absorbine Ultra Shield Ex. A 950 ml spray bottle with shipping and taxes would cost about \$47. There is a 4l size available that might be more reasonably priced especially if you can pick it up. [27,28]

Three ounces or 85 grams is all that is required of the 0.5% spray and the same amount for the 0.25% ant spray for each clothing item. A pair of socks is considered to be one item. To assist with this measurement a kitchen scale is recommended. It only takes a few molecules in order for this to work on clothing and footwear so the material need not be fully saturated. Clothing and gear can be soaked but this will require longer drying time and you may be just be wasting product. Of course more molecules means it will work better and contact with the insect or tick is required for this to work. Permethrin spray should be applied in the shade [sunlight will cause it to break down] on a calm day out doors and allowed to dry for a couple of hours. A mask shouldn't be necessary. The permethrin spray won't harm us but it also won't work on our skin, as natural skin oils will neutralize it in about 20 minutes. Don't use the wet spray near pollinators, fish or the cat [dried sprays won't hurt the cat]. [29,30]

Those spraying their own clothing should first roll up the bottoms of pant and shorts and spray the inside of the bottom few inches first as contact with ticks is necessary to be effective.

The spray should last on clothing for up to 42 days or 5- 6 washes. Keep a log of the spray dates on your calendar. Factory treated clothing can last for 70 washes or the expected lifetime of the garment. Don't store treated garments in direct sunlight. The permethrin will last from 4-6 years in containers if not subjected to freezing or high temperatures.

- **Tick Tubes**

Tick tubes are another use for the permethrin spray. Dryer lint or balls of cotton wool can be sprayed with the permethrin and packed into toilet paper tubes. These are placed around the property, under the building, in woodpiles etc. where the rodents will collect the treated lint for their nests and this will kill the ticks at their source. The mice and other rodents won't be harmed. This can be up to 90% effective but it works best if the neighbours participate and use tick tubes on their properties as well. Not all rodents use lint the same way when nest building. Instructions for making tick tubes can be found on YouTube online like "Practical Skill of the Month –tick tubes" [31]

- **Other Management Directions**

-Rodent Bait boxes & Genetic Modification of white-footed mice.

Rodent bait boxes are currently being tested to attract rodents with bait and an arachnicide to kill the ticks. This technique is considered safe and better than indiscriminate yard spraying. More research is required to see how long this

takes to become effective and how many boxes are required. This technique will depend on the neighbours' participation to be effective.

Genetically engineering mice so that they are resistant to tick-borne diseases is another proposed solution. Immunizing mice so that they can't carry the disease causing microbes will bring us closer to eliminating these diseases. This would have to be an inheritable trait.

Guinea fowl will feed on ticks and some people are keeping them for that purpose while also keeping the grass mowed and their yards neat.

Deer bait stations are not recommended because after a five year Cape Cod study it was found that there was only a modest 8.4% reduction in the tick population. [32]

- **Tick Removal**

The sooner the tick is removed the less likely is disease transmission. Avoid grasping the tick with your fingers and inoculating yourself. To remove them from clothing or before they become attached try using duct tape. To remove ticks grasp them firmly as close to the skin as possible with fine point tweezers or tick removal tool and pull straight up. The ticks glue their mouthparts to the skin so they can be quite difficult to remove. Don't use Vaseline, a match or irritants to assist with this. After removal wash the area with soap and water and apply antiseptic ointment available at pharmacies. [33]

If the tick that bit you is a Lyme-carrying species, don't wait to develop symptoms. Go to your doctor and request antibiotics as a precaution. The Canadian Lyme Disease Foundation disapproves of the use of one or two pill prophylactic doses of antibiotics. Antibiotics are meant to be used appropriately and Canadian physicians now have the option of using the ILADS guidelines [34] that call for an initial 21-day dose according to the Public Health Agency of Canada (PHAC). [35,36]

If you do have to consult a health care professional for a tick bite it is a good idea to have an organized history with location where you were exposed to ticks and a list of events and symptoms [if any]. It is also a good idea to study the list of possible symptoms since this disease can become multi-staged and multi-systemic. Those diagnosed early and adequately treated usually fair very well. [37]

- **Other Requirements**

Nova Scotia for the most part lacks visible warning signs in key locations like visitor information centres, hospitals public health offices, clinics, schools, municipal & town offices, parks campgrounds, and trails. There are few public service announcements in the media that you could be seriously injured or killed by an infection acquired from a tick bite. There are no education programs in our schools and doctors continue to be taught erroneously that Lyme and TBD's are

nothing more than minor nuisance diseases. Politicians express interest before they are elected but once in office the infectious disease doctors and public health officials express concern for the suffering of patients but suggest the politicians do nothing until all the science is completed. In the meantime what little money there is is directed to the status-quo researchers thus ensuring the situation is unlikely to change.

PHAC officials have made it clear that they do not intend to lead and have reminded us that health is a provincial matter. Since our elected provincial officials won't take action it is up to us advocate for change starting at the local level.

The opinions expressed are those of the author.

Rob Murray (DDS ret'd)
Lunenburg, NS
BoJ 2Co

Tel. 902-634-8542
Email: murrayr@eastlink.ca

Board member Canadian Lyme Disease Foundation (www.CanLyme.com)

o **Other Resources**

Canadian Pediatric Society Update:
<https://www.cps.ca/en/documents/position/preventing-mosquito-and-tick-bites>

Canadian Centre for Occupational Health & Safety (CCOHS):
<http://www.ccohs-.ca/oshanswers/diseases/lyme.html>

Government of Canada: <http://healthy Canadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/lyme/index-eng.php>

Tick Management Handbook, Connecticut, pdf.
<http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1010.pdf>

Tick Encounter Resource Center, University of Rhode Island/ prevention
<http://www.tickencounter.org/prevention>
-Tick smart tips: <https://tickencounter.org/ticksmart/tips>
-*Top Ten Things Everybody Should Know About Ticks These Days – and stay disease free* -by Dr. Thomas Mather:
https://tickencounter.org/prevention/top_ten_things_list

Maine Department of Transportation YouTube video on *Staying Safe During Tick Season*:

<https://www.youtube.com/watch?v=dchPJcErbB4&t=1s>

Tick Habitat Warning Signs: Amazon.ca and

<https://www.campgroundsigns.com/tick-warning-signs>

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<https://www.frontiersin.org/articles/10.3389/fmicb.2018.01722/full>
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17. Poster: How to dress in tick country: <https://www.lymedisease.org/wp-content/uploads/2014/08/Image47-Protect-Poster.pdf>
18. See Prof. David Patriquin's picture and additional notes on the efficacy of permethrin: <http://versicolor.ca/noticks/>
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<https://canlyme.com/lyme-prevention/>
20. *Preventing tick bites* CDC 2018-08-14:
https://www.cdc.gov/ticks/avoid/on_people.html
21. How to do a tick check: https://www.trails.com/how_1198_check-for-ticks.html
22. Nova Scotia Landscape management handbooks to deter ticks:
<https://novascotia.ca/dhw/CDPC/documents/Landscape-Management-Handbook.pdf>
23. Plants that deter deer: <https://www.almanac.com/content/deer-resistant-plants>
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<http://canadianrockiestrailguide.com/permethrin-treated-clothing-arrives-in-canada/>
29. How to apply permethrin to clothing, YouTube:
<https://www.youtube.com/watch?v=4rytOraKLjo>
30. Material Data Safety Sheet Martin's 10% permethrin: https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Martins_Permethrin1_10_MSDS.pdf
31. **Tick Tubes**, Practical Primitive skill of the month:
<http://www.practicalprimitive.com/skillofthemoth/ticktubes>
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