

# Tick Borne Diseases Response Plan

August 2021

# TICK BORNE DISEASES RESPONSE PLAN

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# 1.0 Introduction

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The Nova Scotia Tick Borne Diseases Response Plan is updated annually by the Nova Scotia Zoonotic Diseases Technical Working Group (NS ZWG). The NS ZWG consists of experts in ticks, human health and animal health who work together from a One Health approach to ensure consistency and coordination in the protection of Nova Scotians from vector borne diseases; including those transmitted by ticks. This group of experts is responsible for developing and implementing this Tick Borne Diseases Response Plan and for the ongoing assessment of risk to Nova Scotians. Members represented on the working group have different roles and responsibilities. Representatives from the Department of Health and Wellness Public Health (DHW PH), coordinate and co-chair the NS ZWG. The group meets to monitor all activities related to the response plan.

The key components of the plan include:

- Surveillance for tick borne illnesses in humans
- Environmental surveillance to determine the distribution of vectors for tick borne diseases and the prevalence of disease-causing pathogens
- Prevention and control of human infection with tick borne diseases
- Communication to public, media and health care professionals

The development of the plan was initiated in response to Lyme disease (Ld), when it was an emerging illness in the province, and its vector, the blacklegged tick, *Ixodes scapularis*. Blacklegged ticks have established populations in a growing number of areas throughout the province. Based on available evidence and climate factors, it is anticipated that over time, blacklegged tick populations will likely be established throughout the entire province.

In addition to Ld, the plan incorporates other pathogens that are transmitted to humans by blacklegged ticks, such as *Anaplasma phagocytophilum*, the cause of Human Granulocytic Anaplasmosis (HGA), *Babesia microti*, the cause of Human Babesiosis, *Borrelia miyamotoi*, the cause of tick borne relapsing fever, and Powassan virus.

## 1.1 Background

Blacklegged ticks, *Ixodes scapularis*, are the primary vectors of pathogens that cause human disease in NS. They can transmit the pathogens that cause Ld, HGA, Babesiosis and Powassan virus infection. Populations of blacklegged ticks were first identified in NS in 2003. The agent of Lyme disease, *Borrelia burgdorferi*, is the most common pathogen found in blacklegged ticks in NS. Other pathogens, such as, *Anaplasma phagocytophilum*, *Babesia microti*, and *Borrelia miyamotoi* have been detected in a small number of blacklegged ticks or small mammals in the province. Powassan virus has only recently been detected.

Migratory and non-migratory birds transport larval and nymphal blacklegged ticks into and across NS on an annual basis. Incursion of these “bird-borne” ticks does not routinely result in established tick populations because localities where ticks drop from birds do not always have the appropriate habitat and climate required for tick survival and establishment. A locality must also have sufficient populations of deer and small mammals (such as mice and squirrels) in order to support tick populations because these animals are the hosts that the adult and immature (larvae and nymphs) blacklegged ticks prefer to feed upon, respectively.

Range expansion of blacklegged ticks has been influenced by a warming climate and there are many areas in Nova Scotia where ticks have become established. Although there are areas of NS where the risk of encountering blacklegged ticks is higher, there is a possibility of encountering blacklegged ticks anywhere in the province. Ticks are usually encountered in leaf litter on the forest floor or low-lying vegetation like grasses, shrubs and other types of herbage.

People are most likely to be exposed to blacklegged ticks in environments such as wooded or forested habitats where tick populations are established and may be infected with tick borne pathogens after a bite, of sufficient duration, from an infected nymphal or adult female blacklegged tick.

Although widespread in NS and a common biter of people, American dog ticks cannot transmit any of the pathogens associated with blacklegged ticks.

The first reported human case of Ld in Nova Scotia was confirmed in 2002 and the first reported human case of HGA was confirmed in 2017.

## **1.2 GOALS AND OBJECTIVES**

Goal:

To monitor the risks from exposure to blacklegged ticks and their associated pathogens and reduce the risk of human infection related to tick borne diseases in Nova Scotia.

Objectives:

- To estimate the range of blacklegged ticks and the geographic scope of risks of exposure to tick borne diseases in NS based on the passive tick surveillance data collected from [etick.ca](http://etick.ca).
- To determine the annual incidence of human infection with tick borne diseases in NS.
- To increase the awareness of the public and health care professionals (HCPs) about the risk of infection with tick borne diseases.
- To increase public and HCPs awareness about typical symptoms and signs of tick borne diseases.
- To provide information to the public and HCPs about effective ways to prevent exposure to and infection with tick borne diseases.
- To identify and implement evidence-based strategies to control the spread of vectors of tick borne diseases, as appropriate.

## 2.0 Roles and Responsibilities of Organizations and Agencies Related to Tick Borne Diseases

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### 2.1 Nova Scotia Department of Health and Wellness Public Health (DHW PH)

- Conducts surveillance for human infection with Ld and for any rare, unusual or emerging tick borne diseases.
- Summarizes, interprets and produces reports from human case surveillance information; including, the Vectorborne and other Zoonoses section of the Annual Notifiable Disease Surveillance Report and other ad hoc reports ([novascotia.ca/dhw/populationhealth/](https://novascotia.ca/dhw/populationhealth/)).
- Develops guidance documents for public health surveillance and case management of humans with tick borne diseases in consultation with other NS government departments, the NS ZWG, the Infectious Diseases Expert Group (IDEG), and the Public Health Agency of Canada (PHAC).
- Provides communication support for provincial prevention initiatives, media coverage, news releases, and other materials as required.
- Coordinates and chairs the NS ZWG.
- Collaborates and coordinates with partners to review and analyze blacklegged tick surveillance data, human case surveillance data and prioritizes surveillance initiatives.
- Identifies levels of risk and communicates information on changes in an area's level of risk to the Medical Officer of Health of the area, and the NS ZWG.
- Coordinates revisions of the Tick Borne Diseases Response Plan and other key public health guidelines.

### 2.2 Nova Scotia Department of Lands and Forestry (DLF)

- Conducts active tick surveillance in collaboration with DHW Public Health and PHAC as required.
- Forwards blacklegged ticks and/or samples from small mammals to National Microbiology Laboratory (NML) in Winnipeg for testing as required.
- Contributes to the review and analysis of blacklegged tick surveillance data to prioritize surveillance initiatives.

### 2.3 Public Health Agency of Canada/National Microbiology Laboratory (PHAC/NML)

- Conducts active tick surveillance in collaboration with DHW PH and DLF as required.
- Tests blacklegged ticks and small mammals for *B.burgdorferi*, *B.miyamotoi*, *Babesia microti*, *Anaplasma phagocytophilum*, Powassan virus and other emerging pathogens as required.
- Contributes to the review and analysis of blacklegged tick surveillance data in order to prioritize surveillance initiatives.

- Provides human Ld immunoblot testing of samples submitted by the Queen Elizabeth Health Sciences Centre (QEII) anchor laboratory of the Provincial Public Health Laboratory Network as required.
- Provides (as requested) molecular diagnostic testing on samples collected from humans for evidence of infection with a suite of tick associated pathogens (as listed above for ticks and small mammals).
- Report the outcomes of diagnostic testing on humans to the QEII anchor laboratory of the Provincial Public Health Laboratory Network.
- Provides direction on standards for laboratory testing of suspect Lyme disease and other tick borne diseases.

## **2.4 Nova Scotia Health (Public Health)**

- Investigates all reported probable and confirmed cases of Lyme disease (as per case definition) and unusual tick borne disease occurrences and submits reports to DHW PH.
- Determines location where acquisition most likely occurred.
- Provides education to the public about tick borne diseases and measures to prevent disease.
- Provides advice to the public and health care professionals regarding tick borne diseases.
- Establishes links with local communities and works to promote awareness to decrease the risk of tick borne diseases.
- Communicates to the public about Ld and other tick borne diseases including prevention initiatives, media, news releases, issue management, print materials and others as required.

## **2.5 Nova Scotia Department of Agriculture (NSDA)**

- Provides expertise in animal-related infectious diseases.

## **2.6 First Nations and Inuit Health Branch (FNIHB)**

- Provides linkage from Province to First Nations communities.
- Provides educational materials to First Nations communities.
- Provides guidance on zoonotic diseases including tick borne diseases such as Lyme disease to First Nations communities.

## **2.7 Provincial Public Health Laboratory Network (PPHLN)**

- Provides expertise in the diagnosis of human infectious diseases and links to the Division of Microbiology in the Department of Pathology and Laboratory Medicine and to the Division of Infectious Disease in the Department of Medicine.
- Provides timely and appropriate human diagnostic laboratory services for Ld and other tick borne diseases.
- Works in collaboration with the NML for human diagnostic testing and reports results from the NML to Public Health via the Panorama laboratory reporting system.
- Reports all confirmed positive tests to Nova Scotia Health (Public Health).

- Responds to questions from physicians, other health care providers and public health staff on laboratory issues.

## 2.8 Nova Scotia Department of Environment and Climate Change

- Provides recommendations and advice on the use of pesticides in relation to tick control.
- Assesses environmental health issues related to tick control methods.

# 3.0 Diagnostic Testing and Case Management

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## 3.1 Lyme Disease

### Diagnostic Testing for Human Illness

As of April 1, 2021, serological testing for Lyme disease at the QEII HSC Microbiology Laboratory will transition to the modified two-tier testing (MTTT) algorithm using 2 enzyme immunoassays (EIAs). Previously, serological testing for Lyme disease used the standard two tier testing (STTT) algorithm, where specimens that are reactive or indeterminate on the first step EIA are forwarded to the National Microbiology Laboratory in Winnipeg for further testing using immunoblotting. With the MTTT algorithm, specimens will first be tested using the Zeus C10/VIsE EIA (ZEUS ELISA Borrelia VIsE1/pepC10 IgG/IgM), with reactive specimens tested in our Microbiology Laboratory by a second EIA, the Zeus whole cell EIA (ZEUS ELISA Borrelia burgdorferi IgG/IgM), rather than an immunoblot. Specimens with positive results on both EIAs are considered to be positive. This approach has been validated by the QEII laboratory and is approved by the FDA and endorsed by the CDC in Atlanta and the Canadian Public Health Laboratory Network.

The MTTT approach offers advantages over the STTT approach:

- It is more sensitive for detecting early infection (formal evaluation showed that the MTTT approach detected 28% more cases of early infection).
- It has a similar specificity compared to the STTT (99.6% with our validation).
- Both EIAs can be performed at the QEII HSC Microbiology Laboratory, which will significantly improve turn-around-time for results.
- It simplifies the interpretation of Lyme disease serology results, which will now be reported as “positive” or “negative”.

While the MTTT approach has improved sensitivity for detecting early infection, it is important for clinicians to remember that patients presenting with early localized Lyme diseases should be treated on the basis of a clinical diagnosis, without relying on serology. The improved sensitivity and turn-around-time may be an advantage for investigating patients where early disseminated Lyme disease is a consideration. Use of other non-validated tests to support clinical evidence of Ld infection are not recommended. Specimens submitted for other tick borne disease diagnostic testing are sent directly to the NML. For further information on testing please refer to the Provincial Public Health Lab Network User’s manual. <http://www.cdha.nshealth.ca/pathology-laboratory-medicine/clinical-services/microbiology-services-diagnostic>.

## Case Management

Human cases of specific tick borne diseases are reportable by health care providers to Public Health under the Regulations of the *Nova Scotia Health Protection Act*. The NSH manages cases and provides health professionals with information on clinical assessment for Ld (and other tick borne diseases as needed).

Guidelines for Public Health case management of Lyme disease, including clinical information, can be found here: <http://novascotia.ca/dhw/cdpc/cdc/>.

The IDEG (an independent advisory committee that provides expert advice to DHW PH on the prevention and control of infectious/communicable diseases) has developed a 'Guidance for Primary Care and Emergency Medicine Providers in the Management of Lyme Disease in Nova Scotia' [novascotia.ca/dhw/CDPC/documents/statement\\_for\\_managing\\_LD.pdf](http://novascotia.ca/dhw/CDPC/documents/statement_for_managing_LD.pdf). Please refer to this document for further information regarding diagnostic testing and clinical management of Ld.

Effective August 1, 2021, Pharmacists may prescribe chemoprophylaxis for Lyme disease for asymptomatic adults and children in accordance standards developed by the Nova Scotia College of Pharmacists, which aligns with the guidance by IDEG as described above. This enhances timely access to prophylactic treatment for Lyme disease and provides additional support for the public in identifying early symptoms of Lyme disease.

### 3.2 Other Tick Borne Diseases

Clinical information related to HGA, Babesiosis, *Borrelia miyamotoi*, and Powassan can be found here: <https://www.cdc.gov/DiseasesConditions/az/b.html>

## 4.0 Epidemiology and Surveillance

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### 4.1 Epidemiology

Human cases of Ld are reportable, under the *Regulations of the Nova Scotia Health Protection Act*, to DHW PH. Other tick borne diseases such as HGA, Babesiosis and Powassan virus are reportable in NS as "any unusual disease occurrence" under the *Health Protection Act (It's the Law: Reporting Notifiable Diseases and Conditions)*. Two human cases of Anaplasmosis have been reported in NS; one in 2017 and one in 2018. The first confirmed case of Anaplasmosis in a horse occurred in 2009. No human cases of Babesiosis or Powassan virus have been reported in NS; however, one tick was positive for the Powassan virus in 2016.

From 2002 to 2019, there was a total of 2890 cases of Ld reported in Nova Scotia. The trend of Ld cases has been increasing annually is likely due to a number of factors including:

- an increase in the number of blacklegged tick populations established in NS,
- increases in the sizes of the established populations of blacklegged ticks, especially of nymphal cohorts,
- increases in the rate of infection with *B.burgdorferi* within the blacklegged tick populations,



- an increase in awareness among individuals and health care providers leading to increased diagnosis and reporting of Ld.

There were 830 cases of confirmed and probable Lyme disease reported in 2019, which is an increase from 2018 (n=454). This increase in Lyme Disease cases is likely due to multiple factors including a true increase in the number of cases as well as changes to administrative processes within local public health to allow for more timely data entry of cases into Panorama.

The Annual Notifiable Disease Surveillance Report contains more information, such as disease trends and highlights, and can be found here: <https://novascotia.ca/dhw/populationhealth/>.

## 4.2 Surveillance

National case definitions are used for surveillance of human Ld in NS. The Public Health surveillance case definitions are found in the Surveillance Guidelines for Notifiable Diseases and Conditions [novascotia.ca/dhw/populationhealth/surveillanceguidelines/](https://novascotia.ca/dhw/populationhealth/surveillanceguidelines/). Health care providers are required to notify Public Health of all human cases of Ld. Public Health will determine if the case meets the case definition and if so, will then initiate investigation of the case. Health care workers and laboratories are also required to report any rare or unusual diseases to Public Health, such as HGA, Babesiosis or Powassan virus.

DHW PH reviews the geographic distribution of human cases, current and past tick surveillance results to determine if any further active tick surveillance is required.

In 2017, the entire province of NS was declared an at-risk area. Based on historical human and tick data, each county is defined as being lower, moderate or higher risk and these categories are reviewed annually.

## 5.0 Risk and Prevention

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### 5.1 Risk assessment

Blacklegged ticks infected with *B. burgdorferi* have been found in many areas of NS. The province is therefore considered an “at risk area”, with the risk for human infection greatest in areas where infected blacklegged ticks have become established and exposure to the ticks is more likely.

DHW PH shares information about the distribution and presence of blacklegged ticks, Ld and other tick borne diseases with the public, media and health care professionals on a regular basis. The information is used to provide guidance about the risk of infection from Ld and other tick borne diseases in NS. The [Lyme disease estimated risk areas map](#) for Nova Scotia uses historical Ld case data and active and passive tick surveillance data to capture the gradient of Ld case data and tick surveillance data (generated by eTick) will continue to be used to update the map.

## 5.2 Risk reduction

To reduce the risk of tick borne diseases in NS, several approaches are used:

- Ongoing surveillance for vectors, pathogens and human illness.
- Ongoing evaluation of the surveillance systems, in order to estimate and communicate risk to the public and health care professionals.
- Providing information on landscaping techniques to reduce blacklegged tick habitat around homes.
- Educating health care professionals and veterinarians to recognize symptoms of tick borne diseases.
- Educating the public on personal protective measures and other methods to reduce exposure to blacklegged ticks.

## 5.3 Public Awareness and Education

Actions taken by the general public play an important role in preventing human cases of Ld, HGA and other tick borne diseases. Information for the public on the prevention of tick borne diseases is provided; as well as, information on the risks and symptoms of Ld. The DHW PH website is updated to include new evidence-based information on Ld as it becomes available. The public can receive further information from Public Health in the NSH.

Press releases, media interviews and social media posts keep the public informed and updated during the spring, summer and fall months (when temperatures are above 4°C) as needed.

Key messages include:

### **Reduce the risk of a tick bite:**

- Walk on well-traveled paths, avoiding high grass and vegetation.
- Use an insect repellent (DEET or Icaridin) following label directions carefully.
- Cover skin when walking, working, or playing in areas where ticks may be found.
- Wear light coloured, long sleeve shirts and pants, closed-toe shoes.
- Tuck shirt in pants and pant legs in socks.
- Check companion animals to ensure that ticks are not brought into the home environment.
- Permethrin treated clothing repels and kills ticks when they come in contact with it and is now registered for use in Canada for those 16 years of age and older.

### **Remove ticks as soon as possible:**

- The risk of infection depends on how long the tick has been attached. For most tick pathogens, if a tick is removed within 24 hours, the risk of infection is very low.
- Performing tick checks on yourself, children and pets after spending time in natural habitats in forested areas will allow you to identify and remove ticks. Check clothing and inspect skin. Although blacklegged ticks can attach anywhere on the skin, special attention should be provided to in warm, moist areas of the body; including, in and around ears, arm pits, inside belly button, groin, around the waist, and in the hair and scalp area.

- When possible, take a bath or shower within two hours of coming indoors. This increases the chance of promptly finding (and removing) attached ticks and possibly washes away unattached ticks.
- If the tick is attached, carefully grasp the head of the tick as close to the skin as possible with clean tweezers and slowly pull the tick straight out. Try not to twist or crush the tick. Clean your hands and the bite area with soap and water or alcohol-based sanitizer where the tick was attached to the skin.

#### **Eliminate ticks from clothing:**

- Put clean outdoor clothes in a dryer on high heat for 10 minutes to kill any remaining ticks. If your clothes are damp, additional drying time is needed. If you need to wash your clothes first, hot water is recommended. If the clothes cannot be washed in hot water, tumble on low heat for 90 minutes or high heat for 60 minutes.

#### **Know the signs and symptoms of infection:**

- See a health care professional if symptoms of Lyme disease or other tick borne disease develops after exposure to a blacklegged tick or to an area where blacklegged ticks are known to be established.

#### **Reduce ticks around your home:**

- Use simple landscaping techniques to reduce the number of blacklegged ticks around homes and parks: <https://novascotia.ca/dhw/CDPC/documents/Landscape-Management-Handbook.pdf>

## **5.4 Control Measures**

- There are multiple measures that can be effective for tick control; such as, landscaping techniques and treatment of vegetation with chemical or biological pesticides. The key to these techniques is an understanding of tick habitat. Reductions in abundance of ticks through treatment of vegetation with pesticides will have varying results depending on the products used, frequency of application and coverage. At the present time, relatively few products are available for vegetative treatments to control ticks in Canada. Although pesticide use has been shown to be effective in reducing blacklegged tick populations, it has not been demonstrated to significantly reduce the risk of Ld in the limited number of studies to date. Many factors need to be considered prior to the potential use of pesticides for tick control; such as, seasonal timing, weather and area of application. Reductions in tick populations are likely to be temporary and repeat applications will often be required to maintain tick populations at low levels. In Nova Scotia, any pesticide use must comply with any pertinent federal and provincial pesticide legislation.
- Although pets can't spread Lyme disease directly to humans, they can carry infected ticks into your home or yard. Regular tick checks and prompt tick removal are just as important for pets as for people. Seek veterinary advice on the proper control of ticks on domestic animals.

- Although white-tailed deer are a preferred host for adult blacklegged ticks, management of deer populations in urban areas has significant logistical challenges and removal of deer is not seen as a standalone intervention to reduce the risk of Ld. In some circumstances, exclusion of deer may reduce tick populations, but the geographic scale of the exclusion is usually small (to several hectares) and not at a community level. In addition, ticks can take a blood meal from a wide variety of mammals and birds, therefore solely addressing the deer population will not be an effective control measure.

## 6.0 Communication Strategy

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To raise awareness of tick borne diseases, such as Ld, within Nova Scotia, the DHW PH will partner with the NSHA and other government and community partners to:

**• Provide Nova Scotians with consistent, current and reliable information about tick borne diseases, including Ld:**

DHW PH will continue to educate Nova Scotians about tick safety and the risk of tick borne diseases through an annual public awareness campaign. Information is available online through the DHW Communicable Disease Prevention and Control website: <https://novascotia.ca/dhw/CDPC/lyme.asp>. DHW PH will work with its partners to identify and leverage optimal methods for sharing information with the public.

**• Emphasize the importance of personal responsibility in preventing the transmission of tick borne diseases:**

DHW PH will work with the NSHA and other government and community partners with a focus on creating greater awareness for Nova Scotians to self-manage the prevention of tick borne diseases. This work includes engaging community organizations and providing information online and through healthcare professionals, so that Nova Scotians have the right information and tools they need to prevent the spread of tick borne diseases. Encourage the use of tick identification services, such as [eTick](#). A tick safety website provided by the government of Nova Scotia can be found here: <https://novascotia.ca/ticksafety/>

**• Ensure healthcare providers, health system and the public have access to information about tick borne diseases, including Ld:**

Nova Scotians expect their healthcare providers to be knowledgeable when it comes to the identification, management and treatment of tick borne diseases. DHW PH will continue to engage healthcare professionals to ensure they have the most current information to address patient questions and concerns and provide an appropriate level of care. the IDEG Guidance for Primary Care and Emergency Medicine Providers in the Management of Lyme Disease in Nova Scotia: [https://novascotia.ca/dhw/cdpc/documents/statement\\_for\\_managing\\_LD.pdf](https://novascotia.ca/dhw/cdpc/documents/statement_for_managing_LD.pdf)

• **Dispel misinformation about Ld and other tick borne diseases.**

Supported by its partners, the department will address misinformation related to Lyme disease and other tick borne diseases, as it is identified, to ensure Nova Scotians have access to evidence based and consistent information.

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