
September 4, 2020.

This critique is a collaborative effort of several groups/organizations* that represent Canadians living Lyme disease in response to PHAC's call for feedback.

The final decisions on the content which will be incorporated currently lie with unknown decision-makers. For there to be real collaboration with all members the Lyme Disease Multi-disciplinary Roundtable, the final draft should be shared for final review prior to publication.

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LymeNB
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Ontario Lyme Alliance

PUBLIC HEALTH AGENCY OF CANADA

LYME DISEASE WEB OPTIMIZATION 2020

To assist with your review of the content, here are the links to the previous version of the **Lyme disease: Symptoms and treatment** page:

- <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/symptoms-lyme-disease.html>
- <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/treatment-lyme-disease.html>
- <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/provincial-territorial-resources.html>

Lyme disease: Symptoms and treatment

On this page

- Symptoms of Lyme disease
- If you become ill
- Diagnosing Lyme disease
- Treating Lyme disease
- Provincial resources for Lyme disease

Symptoms of Lyme disease

Signs and symptoms of Lyme disease can vary from person to person. Early symptoms of Lyme disease usually start 3 to 30 days after you have been bitten by an infected blacklegged tick.

~~Most people experience mild flu-like symptoms after being bitten, while some may have more symptoms weeks after the bite.~~

COMMENT: This sentence fails to be a helpful explanation. Describing the symptoms as "mild" is not supported by any scientific studies nor is it reflective of the reality of the patient experience. Not only do symptoms vary from patient to patient, but patients find the symptoms can vary from day-to-day as does the severity of the symptoms. Often, patients report that it was the fact that their symptoms were longer lasting and more severe than any flu previously experienced that prompted them to seek medical advice. A revision is offered below.

~~Early signs and symptoms of Lyme disease may include:~~

- ~~• a rash that is sometimes shaped like a bull's eye~~
- ~~• fever~~
- ~~• chills~~
- ~~• headache~~
- ~~• fatigue~~
- ~~• muscle and joint aches~~
- ~~• swollen lymph nodes~~

REVISION

The signs and symptoms of Lyme disease often appear about 3 to 30 days after an infected tick bite. Both the symptoms and their severity vary from person to person. Early signs and symptoms of Lyme disease may include:

- An expanding Erythema Migrans (EM) rash may appear. It is not usually itchy or warm to the touch. There also may be no rash at all, or a rash that may be hidden and hard to see. The rash has numerous variations. Although it is most publicized, the least common EM rash is what is called

the "bull's-eye" rash. The EM rash may be more difficult to detect on darker skin.

COMMENT: A link here to rash photos would help people understand what they should be looking for and lead to more people seeking early medical attention when needed. People unfamiliar with EM rash presentations often overlook one believing it to be inconsequential especially if they are not experiencing any symptoms or do not remember a tick bite. The simple addition of rash photos could improve patient outcomes. The Maryland Department Health uses [this](#) in poster format.

(Early signs and symptoms of Lyme disease cont'd)

- Fatigue, malaise
- Flu-like symptoms, including fever, chills, headache, muscle and joint pain
- Stiff neck
- Swollen lymph glands

~~If left untreated, the infection could spread to other body parts, which could lead to:~~

- ~~• severe headaches~~
- ~~• facial paralysis (Bell's palsy)~~
- ~~• muscle, joint, tendon and bone aches that occur irregularly~~
- ~~• arthritis with joint pain and swelling, particularly the knees and less commonly in other joints, such as the ankle, elbow and wrists~~
- ~~• heart disorders (heart palpitations, abnormal heartbeat), known as Lyme carditis~~
- ~~• neurological disorders that can include:~~
 - ~~○ dizziness~~
 - ~~○ nerve pain~~
 - ~~○ memory loss~~
 - ~~○ inflammation of the brain and spinal cord~~
 - ~~○ numbness or tingling in the hands or feet~~
 - ~~○ mental confusion or inability to think clearly~~

~~In rare cases, death could occur due to the complications involving infection of the heart.~~

REVISION

If untreated, the infection will spread to various parts of the body. Symptoms are numerous but may include:

- Fatigue
- Multiple red rashes (EM's)
- Severe headaches and neck stiffness
- Joint swelling and/or pain
- Palpitations or chest pain, shortness of breath – a possible cause can be Lyme carditis, a serious, life-threatening condition that needs immediate medical attention

- Facial nerve dysfunction leading to weakness or paralysis of facial muscles (often mislabeled as Bell's palsy) can occur in early Lyme as well
- Neuropathic symptoms - nerve pain, numbness, hot/cold sensations, tingling
- Cognitive dysfunction
- Memory impairment
- Unprovoked pain which may interfere with sleep
- Light-headedness, fainting
- Gastrointestinal symptoms
- Psychiatric symptoms- including depression, anxiety, and mood changes

If you become ill

Lyme disease is a serious illness but early diagnosis and treatment can prevent complications. If you develop symptoms of Lyme disease, consult your health care provider right away.

Since ticks are tiny, you may not feel the tick attach to the skin or remember being bitten by a tick. It is still important to contact your health care provider [if your symptoms might be those of Lyme disease](#).

If you saved the tick that bit you, take it to your medical appointment.

Tell your health care provider:

- where on your body the tick was attached
- how long you think the tick attached to you
- [the method used to remove the tick, i.e., with fine-tipped tweezers or an alternate method](#)
- where you were at the time you were bitten by the tick [or may have been exposed to ticks](#)
- describe your symptoms and how long you have experienced them

Diagnosing and Treating Lyme disease

Diagnosing Lyme disease can be challenging as symptoms and their severity vary from person to person. ~~They can also mimic other illnesses, such as the common cold, flu and arthritis.~~

~~A diagnosis of Lyme disease is based on the presence of Lyme disease symptoms and a history of possible exposure to infected blacklegged ticks.~~

Laboratory testing is not reliable in early Lyme disease. [A negative test result does not mean you do not have Lyme disease. There are strains of the bacteria which cause Lyme disease that are not responsive to the standard antibody tests. Antibiotic usage can also produce false negative results.](#) Therefore, physicians need to make a clinical diagnosis based on the signs and symptoms of Lyme disease and possible exposure to ticks. (See: [Health Canada Adverse Reaction Newsletter, October 2012](#)).

and should only be used to supplement clinical findings, not as a basis for diagnosis of early Lyme disease.

Treating Lyme disease

Lyme disease is treated with antibiotics. The earlier you receive treatment for Lyme disease, the greater the chance of a successful recovery.

Some people who are treated for Lyme disease may continue to have symptoms following treatment. This condition is known as post-treatment Lyme disease syndrome (PTLDS).

COMMENT: PTLDS is a highly contentious label not supported by people living with persistent symptoms of Lyme disease or their treating physicians. These sentences serve no real purpose here when the focus of this webpage supposedly is on the diagnosis and treatment of acute Lyme disease. The reference to PTLDS here seems to be used as an opportunity to anchor bias re PTLDS. It should be removed.

Provincial resources for Lyme disease

For local information on Lyme disease, consult your provincial or territorial health ...

Related links found here.

Lyme disease: Prevention and risk

On this page

- How Lyme disease spreads
- Preventing Lyme disease
- Risks of getting Lyme disease
- Lyme disease and pregnancy

How Lyme disease spreads

Lyme disease is caused by bacteria that [are](#) spread through the bite of an infected tick [and can be transmitted from a mother to her baby in pregnancy.](#)

More than 40 different types of ticks live in Canada but there are 2 main types that can spread the bacteria that can cause Lyme disease:

1. blacklegged tick or deer tick, common to southeastern and south-central regions of Canada
2. western blacklegged tick, common to British Columbia

Ticks need blood to survive, so they attach onto animals and humans to feed. Ticks can become infected with the Lyme disease bacteria by feeding on infected wild animals, such as birds and rodents.

Once infected, ticks can spread the bacteria to humans and [other animals.](#) ~~pets,~~ ~~particularly dogs.~~ Dogs are very vulnerable to tick bites and tick-borne diseases.

Animal to person

Humans **cannot** be infected directly by their pets/[animals](#). However, pets can carry ~~unattached and potentially infected~~ ticks into your home and your yard, which could increase your chances of being bitten by a tick.

Person to person

At this time, there is no conclusive evidence that Lyme disease can spread from person to person, such as through:

- sex
- kissing
- touching

COMMENT: The spread of Lyme disease from a mother to her baby in pregnancy would be considered person to person. Clearly a baby is a person.

Blood transfusions

COMMENT: The CDC's statement should be used instead of the incomplete statement below. "Although no cases of Lyme disease have been linked to blood transfusion, scientists have found that the Lyme disease bacteria can live in blood from a person with an active infection that is stored for donation."

~~At this time, there are no known cases of Lyme disease linked to blood transfusion. Ask your local blood donor clinic about possible restrictions to donating blood if you have had a tick borne disease, including Lyme disease. For more information, consult Canada Blood Services.~~

Preventing Lyme disease

Currently, there is no vaccine available for humans. However, we are actively monitoring the ongoing clinical trials in Europe and the U.S.

Ticks are often found in and near areas with trees, shrubs, tall grass or piles of leaves. They are active when temperatures are above freezing. In below freezing temperatures, ticks are not active and hide under fallen leaves or snow.

The best way to protect yourself against Lyme disease and other diseases that ticks can carry is to prevent tick bites.

Before you go outdoors:

- wear light coloured long-sleeved shirts and pants to spot ticks more easily
- tuck your shirt into your pants and pull your socks over your pant legs
- wear closed-toe shoes

- use approved bug ~~spray~~ ~~safely~~ repellents containing DEET or Icaridin on your skin and clothing (always follow label directions)
- you can also wear permethrin-treated clothing, now available in Canada (always follow label directions) (will link to permethrin-treated clothing factsheet)

COMMENT: It would be helpful to explain that there are natural repellents, as well. The CDC makes reference to them on their website. People also appreciate knowing the correct order of application of insect repellent with sunscreen.

While you are outdoors:

- walk on cleared paths or walkways – keep pets/children from wandering off paths, too
- avoid using trails created by animals (such as deer/moose) - ticks are often waiting there on tall grasses/weeds
- avoid wooded and brushy areas

COMMENT: Should be expanded upon. Readers need to know that blacklegged ticks like humid areas that are protected from direct sunlight. They can be found in damp leaf litter, on fallen trees, in crevices of stone fences/rock faces, marshy areas and weedy shorelines of creeks/rivers/lakes.

Before you go indoors: (new heading)

- do a tick check on your outdoor gear and your pets before going inside

After you come indoors:

COMMENT: The order of the list is re-organized to put tick checks before showering.

- do ~~regular~~ ~~at least one~~ full-body tick checks on yourself and your children after outdoor activities. Ticks will latch on to the skin anywhere, but be sure to pay careful attention to ~~around~~ the toes, behind the knees, the groin area, naval, armpits, both behind and inside ears, and check the hair and scalp.
- having a shower or a bath as soon as possible after being outdoors helps to remove loose ticks

COMMENT: ticks are known to hide in the hair and around the neck/ears so a full-body shower is likely to be more effective than a bath.

- if you find an attached tick, remove it immediately using approved methods

COMMENT: put a link here to a webpage on how to remove a tick

- ~~do a tick check on your outdoor gear and your pets as they could carry ticks inside your home~~ **COMMENT: this point was moved to a new section up above called "Before you go indoors".**
- ~~put outdoor clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing~~
 - put outdoor clothes/gear in the dryer on high heat for at least 10 minutes to kill any hidden ticks. Damp clothing may need to be dried for longer.
- ~~if clothes are damp, more time may be needed to dry the clothes~~
 - if clothes require washing, hot water is recommended. (~~cold and medium water temperatures will not kill ticks~~). Ticks can survive a cold/warm wash cycle.

Reducing tick habitats near your home

Blacklegged ticks thrive in damp, shady environments. They cannot survive long in dry, sunny areas. The following advice ~~can will~~ help create an environment near your home that ~~limit exposure to ticks will avoid~~.

- Mow the lawn regularly to keep the grass short, ~~as ticks have difficulty surviving in sunny areas~~ **COMMENT: removed as this is now said above.**
- ~~Taking care to use tick bite preventative measures,~~ remove leaf litter, brush, ~~long grass~~ and weeds at the edge of the lawn and around stonewalls and woodpiles to reduce places where ticks can live.
- Create a 1-metre or wider wood chip, mulch, or gravel border between your lawn and shrubs, woods or stone edges. This helps reduce ticks on your lawn.
- Prune shrubs and trees to allow sunlight to filter through and reduce heavily shaded areas
- Prevent animals from bringing ticks into the yard by:
 - putting barriers around your home to stop deer ~~from visiting~~
 - sealing up any ~~access to the house/outbuildings or stonewalls to reduce rodent habitats~~
- Place Patios, decks and children's playground sets ~~should be placed~~ away from the yard edges and ~~shady areas under~~ trees where ticks are more likely to live. ~~Instead,~~ place these in sunny areas of the yard. Play sets are ideally placed on a mulch base or shock absorbing playground surface which deters ticks.
 - ~~If possible, place them on a woodchip or mulch foundation and in sunny areas where ticks have difficulty surviving.~~
- Treat pets that are exposed to ticks with oral or topical acaricides (poison for mites or ticks), as recommended by your veterinarian.
 - This will prevent pets from carrying ticks into the home, as acaricides kill ticks through direct contact with the animal's blood, fur or skin.

Risks of getting Lyme disease

If you work outdoors (in sectors such as but not limited to the agricultural, mining, geological, forestry, parks, landscaping or utilities sectors) or participate in outdoor activities (such as but not limited to hiking, fishing, golfing, hunting, camping, gardening), you may be at a greater risk for tick bites. You should always take precautions against tick bites.

•hiking• fishing•golfing• hunting•camping•gardening

COMMENT: Revisions were made here because this section previously said "if you work outdoors" but it placed an emphasis on outdoor recreational activities. Examples of both occupational and recreational activities were needed.

Lyme disease and pregnancy

Pregnant women should always take steps to prevent tick bites.

It is important to remember that contracting any infectious disease during pregnancy can be a concern for the baby as well as the mother. If you are pregnant and don't feel well or are concerned about your health, consult your health care provider.

If a pregnant woman gets Lyme disease, she can be safely and effectively treated with antibiotics. If infection of the placenta does occur, this could cause pregnancy complications, so early treatment of pregnant women with Lyme disease is prudent.

~~If it occurs, the spread of Lyme disease from mother to fetus is rare.~~

COMMENT: A simple, factual and more appropriately worded statement would be:

"The spread of Lyme disease from a mother to her baby is possible."

Another more appropriate statement is used by Alberta Health which says:

"A pregnant woman may be able to pass Lyme disease to her unborn child, but proven cases are rare."

Found at:

<https://myhealth.alberta.ca/Health/Pages/conditions.aspx?hwid=hw77226#aa10177>

Another option is the statement used by Occupational Health and Safety Canada from 1999-2008 which said,

“It can also cross from mother to an unborn child.”

Found at:

<https://web.archive.org/web/20080602101953/http://www.ccohs.ca:80/oshanswers/diseases/lyme.html>

The term “spread from mother to fetus” in your proposed revisions de-personalizes and minimizes the potential health risk to mother and baby. The terminology used on PHAC’s web pages for other congenital infections is not what is being suggested here for Lyme disease. Where congenital transmission is acknowledged elsewhere, it is said to occur from ‘mothers to unborn babies’, or ‘mother to child’, or ‘mother to her baby’. This begs the question of why the terminology would be different for mother-to-baby transmission of Lyme disease.

Two examples of what is found on other PHAC web pages are:

Syphilis: “*Congenital syphilis occurs through mother-to-child transmission*”

Found at: <https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2018-44/issue-2-february-1-2018/article-2-syphilis-2010-2015.html>

HIV: “*to an unborn child during pregnancy or delivery*”

Found at: <https://www.canada.ca/en/public-health/services/diseases/hiv-aids/health-professionals.html>

~~No adverse outcomes have been seen in children born to women who acquired infection during pregnancy and received appropriate treatment.~~

COMMENT: This statement cannot be substantiated. The sentence needs to be removed. The last two papers published on Lyme and pregnancy acknowledge that treatment results in good outcomes but they do not state that there are ‘no adverse outcomes.’ In fact, in the Lakos¹ paper, even with IV antibiotic treatment, there was still a 12.1% rate of adverse outcomes. In the Maraspin/Strle² paper, most women were treated with IV ceftriaxone and the adverse outcome rate was 13.8%. In both papers, direct detection study of infants/placentas/fetal tissue in cases of fetal death affected by adverse outcomes was not done and the authors recognize this as a limitation.

Lakos paper (2010):

"Adverse outcomes were seen in 8/66 (12.1%) parentally treated women, 6/19 (31.6%) orally treated women, and 6/10 (60%) untreated women. In comparison to patients treated with antibiotics, untreated women had a significantly higher risk of adverse pregnancy outcome (odds ratio (OR) 7.61, p = 0.004). While mothers treated orally had an increased chance (OR 3.35) of having an adverse outcome compared to those treated."

¹Lakos, A., & Solymosi, N. (2010). *Maternal Lyme borreliosis and pregnancy outcome. International Journal of Infectious Diseases, 14(6), e494–e498. doi:10.1016/j.ijid.2009.07.019*

Maraspin paper (2020) – just published:

"The outcome of pregnancy was unfavorable in 42/304 (13.8%) patients: preterm birth in 22/42 (52.4%), fetal/perinatal death in 10/42 (23.8%), and/or anomalies in 15/42 (35.7%). Several patients had potential explanation(s) for the unfavorable outcome."

²Maraspin, V.; Lusa, L.; Blejec, T.; Ružić-Sabljić, E.; Pohar Perme, M.; Strle, F. *Course and Outcome of Erythema Migrans in Pregnant Women. J. Clin. Med. 2020, 9, 2364 <https://doi.org/10.3390/jcm9082364>*

If you suspect that you may have Lyme disease, consult your health care provider as soon as possible.

Breastfeeding while being treated for Lyme disease:

If you are breastfeeding and concerned about Lyme disease, consult your healthcare provider.

COMMENT: While there have been no reported cases of transmission of *Bb* through breastmilk, it has been detected by nested PCR in breast milk.¹ The relevant study's authors found:

"Human breast milk was tested from two lactating women with EM and from three healthy controls."

"Two of the 68 untreated EM patients were lactating. We tested the breast milk of both these women as well as their urine, and found it to be reactive."

"To our knowledge, this is the first report on the occurrence of *B. burgdorferi* DNA in the breast milk of women with EM."

¹Schmidt B, Aberer E, Stockenhuber C, Breier K, Luger A. *Detection of Borrelia burgdorferi DNA by Polymerase Chain reaction in the Urine and Breast Milk of Patients with Lyme borreliosis*. *Diagn Microbiol Infect Dis* 1995;21:121-128.

A 2011 review on Borreliosis during pregnancy reviewed the risks to the unborn child.² The author states:

"Since there have been no reported cases of transmission of Borrelia via breast milk, the risk of this cannot be assessed. While it is noteworthy that it was possible to obtain Borrelia DNA via PCR from two lactating mothers (Schmidt et al. 1995), it is unclear whether this indicated that intact bacteria or fragments of the bacterial genome were present. Due to the lack of data on this topic, a contraindication to lactation has been established.

A recommendation for this may be especially prudent, as Treponema transmission through such a pathway is entirely possible. However, it must be noted that the transmission of Treponema through mucous membranes such as occurs in genital and oral sex has not been seen in Borrelia infection in humans or in animal experiments (Woodrum and Oliver 1999). An additional problem is the use of antibiotic therapy during lactation, as these drugs can pass into the breast milk and lead to diarrhea or candidiasis in children."

²Mylonas, I. *Borreliosis during Pregnancy. A Risk for the Unborn Child?* *Vector-borne and Zoonotic Diseases*. Vol 11 (7), 2011. DOI: 10.1089/vbz.2010.0102

COMMENT: Overall, even though the risk of transmission through breast milk is minimal, it cannot be excluded. Lactating mothers should be made aware of the possible risk.

Lyme disease: Removing and identifying ticks

Learn how to identify and remove a tick from your body.

On this page

- Removing ticks
- Saving ticks
- Testing ticks
- Identifying ticks

Removing ticks

Different types of ticks live in Canada. Some can transmit diseases while others are only a nuisance. Infected blacklegged ticks can transmit bacteria that causes Lyme disease.

COMMENT: Written as is, this appears to be an ill-conceived attempt to persuade the reader that there is only one tick species and one infection of concern. Perpetuation of this misinformation is irresponsible. As is already the case in several states bordering Canada, the likelihood of a number of tick species carrying/transmitting other human pathogens is imminent in Canada.

Removing ticks as soon as possible after a tick bite can prevent infection. You can remove a tick that has latched onto you by doing the following.

1. Use clean, *fine-tipped* tweezers to grasp the head as close to the skin as possible and slowly pull straight out. Try not to twist or squeeze the tick. *A tick is able to "cement" itself into the skin so slow but firm traction is often needed.*
 - Do not try to remove the tick by using nail polish or petroleum jelly, or heat to burn the tick.
2. If the mouthparts break off and remain in the skin, remove them with the tweezers. If you are unable to remove them easily, leave them alone and let the skin heal. If you have any concerns, consult your health care provider.
3. Wash the bite area and your hands with soap and water or disinfect with alcohol-based hand sanitizer.
4. Try to save the tick that bit you (see "Saving ticks" below).

Visit your health care provider as soon as possible if:

- you are not comfortable with removing a tick
- you cannot remove the tick because it has buried itself deep into your skin

If you develop symptoms of Lyme disease, contact your health care provider right away. Tell them:

- where on your body the tick was attached and how it was removed
- how long you think the tick was attached to you
- where you were when you were bitten by the tick

Saving ticks

It may be helpful to save [any](#) attached ticks to show your health care provider during your medical appointment. To save the tick(s) for your medical appointment:

1. Put the tick(s) in a plastic bag that you can seal or container such as a pill bottle. Record the location and date of the bite.
2. Store the container for up to 10 days in the:
 - refrigerator, for live ticks
 - freezer, for dead ticks

Killing ticks (**COMMENT: this was moved to fall below Saving ticks**)

Ticks can be killed by drowning them in rubbing alcohol or by freezing them for several [days](#) hours. Avoid squashing ticks with exposed fingers. You can dispose of them in household garbage once they are dead.

Identifying and testing ticks

~~Submitting a tick for identification and testing will **not** lead to a diagnosis or treatment. However, this information helps to understand:~~

- ~~• how blacklegged ticks have spread in Canada~~
- ~~• the risk of human exposure to infected blacklegged ticks~~

~~Tick identification may be~~ [is now done by very few local public health units in](#) ~~in~~ some provinces Canada. [Contact your local public health unit for information.](#)

Ticks can be identified virtually by submitting a picture to various websites such as eTick.ca and Manitoba Tick Checker.

~~Contact your local public health authority for details on:~~

- ~~• the tick identification program available in your area~~
- ~~• how to submit a tick~~ **[COMMENT: This has been revised and inserted above.](#)**

For more information, check out provincial resources for Lyme disease.

If you live in a province that does not accept ticks for surveillance or testing, it may be possible to send ticks directly to the National Microbiology Laboratory (NML); however, please contact the laboratory via email or phone before submitting the specimens.

NML:

By phone at 204-789-2000

By e-mail at ticks@canada.ca

To assist with your review of the content, here are the links to the previous version of the **Lyme disease: For health professionals** page:

- <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/health-professionals-lyme-disease.html>

Lyme disease: For health professionals

On this page

- What health professionals need to know
- Clinical manifestations
- Clinical diagnosis
- Laboratory testing
- Treatment

What health professionals need to know

Lyme disease is a vector-borne zoonotic disease caused by the bacteria ***Borrelia burgdorferi*** or ***Borrelia mayonii*** in North America. These bacteria are spirochetes and are most often transmitted by infected nymphal and adult female Ixodes ticks. The ticks mainly responsible for Lyme disease are the:

- blacklegged tick (***Ixodes scapularis***), sometimes called deer ticks
- western blacklegged tick (***Ixodes pacificus***)

~~The ticks feed on animal reservoirs, in particular, wild rodents, deer and birds in which the bacterium circulates. These ticks could also transmit other pathogens, which can cause disease in humans, including:~~

REVISION:

~~Blacklegged ticks feed on rodents, mammals, and birds, some of which are reservoirs for Lyme disease and other pathogens such as, but not limited to, the following:~~

- Anaplasmosis
- Babesiosis
- Powassan Virus disease

Most infections occur during the warmer months, but cases can occur throughout the year whenever the temperature is above freezing if the snow covering is light or non-existent.

With an increase in the number of Lyme disease cases in Canada, it is necessary that health professionals be knowledgeable about this emerging disease. Most cases of Lyme disease can be managed successfully with a timely diagnosis and appropriate treatment.

COMMENT: Fifteen tickborne diseases of concern are listed in Table 1: Tick-borne pathogens that are present in or may spread to Canada which was published in CCDR Volume 45-4, April 4, 2019: Climate change and infectious diseases: The challenges. It would be ideal to include this table here for physicians to read and better understand the need to consider tick-borne pathogens in their differential diagnoses.

Physicians need to be provided with more than just the names of these illnesses, they need to know how to diagnose and treat these illnesses. The severe and varying symptoms of Anaplasmosis and Babesiosis were addressed in the Manitoba CMOH's 2018 letter to physicians along with testing and treatment recommendations. (Found at: <https://www.gov.mb.ca/health/publichealth/cdc/docs/hcp/2018/041818.pdf>).

To reinforce this, the CDC identifies Lyme, Anaplasmosis, Babesiosis and Powassan Virus as just 4 of the 16 tick-borne human pathogens now found in the USA. It can be expected that more will be discovered. Canadians are world travellers, so the physicians we come home to from our travels need to know to consider other tick-borne illnesses.

Bartonella, an arthropod-borne pathogen, has been reported in Atlantic Canada according to a yet unpublished study done at Dalhousie University. Bartonella has also been found in a Quebec family. (Breitschwerdt, 2019. <https://pubmed.ncbi.nlm.nih.gov/30589638/>)

Tularemia which was found in the muskrat population at Long Point Provincial Park this spring can be transmitted by fleas and some species of ticks if they have fed off infected animals. Tularemia has also been a concern in Nova Scotia. Tularemia should be added. We need to be ahead of the game instead of lagging behind in physician awareness/education about tick-borne illnesses.

Lone Star Ticks are being found in Eastern Canada and yet there is not one public health authority in Eastern Canada advising the public of the presence of this dangerous species. Considering that this species can cause anaphylaxis due to Alpha-Gal Allergy and also transmit life-threatening illnesses, there needs to be some reference to this species and its health risks in the web pages.

Our physicians need to be informed that ticks can transmit multiple pathogens, known as co-infections, in a single blood meal. The severity of symptoms following an infected tick bite can be due to co-infections accompanying Lyme disease and treatment protocols do vary.

As per the National Institute for Allergy and Infectious Diseases:

"Ticks can become infected with more than one disease-causing microbe (called co-infection). Co-infection may be a potential problem for humans, because the Ixodes ticks that transmit Borrelia burgdorferi, the bacterium which causes Lyme disease, often carry and transmit other pathogens, as well. In the United States, a single tick could make a person sick with any one—or more—of several diseases at the same time. Possible co-infections include Lyme borreliosis, anaplasmosis, babesiosis, Powassan virus, and B. miyamotoi infection."

Found at: <https://www.niaid.nih.gov/diseases-conditions/lyme-disease-co-infection>

"In New York state, 22% of surveyed I. scapularis carried more than one human pathogen." (Stewart/Bloom. 2020)

Found at: <https://doi.org/10.3389/fcimb.2020.00142>

Clinical manifestations

The incubation period is 3 to 30 days.

It is important to note that some people with Lyme disease may have no or minimal symptoms. Others may experience more severe symptoms.

Individuals who do not develop symptoms until weeks after the tick bite may not remember being bitten or associate the illness with the bite. Furthermore, because nymphal blacklegged ticks are very small and tick bites are usually painless, most people may not even know that they were bitten.

Clinical manifestations are not necessarily specific to the stage of infection. They can overlap and form a continuum in some untreated patients.

Early localized Lyme disease (less than 30 days)

Early localized Lyme disease usually presents as an acute illness characterized by:

- flu-like symptoms, such as:
 - fever
 - malaise
 - myalgias
 - headache
 - migratory arthralgias
- lymphadenopathy
- erythema migrans

Erythema migrans

Erythema migrans is an annular homogenous erythematous expanding skin rash greater than 5 cm in diameter at the site of the tick bite, sometimes with central clearing. It is usually painless and non-pruritic. [Contrary to popular belief, in the majority of cases, an EM rash will not present with a "bull's-eye" appearance. As well, there can be an absence of a rash in about 20% of cases.](#)

Most patients will present with erythema migrans within 7 days of the initial tick bite. In dark-skinned people, the rash may [be more difficult to determine.](#) ~~appear more as a bruise.~~

A patient presenting with an erythema migrans ~~should~~ [may](#) be clinically diagnosed with Lyme disease [and immediately treated.](#) If a patient has a history of tick exposure and presents with other non-specific symptoms, such as headache, fever, and muscle and joint pain, but does not present with an erythema migrans, the patient may still have Lyme disease. [Details are provided within the Early Lyme Disease Management in Primary Care toolkit found at the Centre for Effective Practice website.](#)

~~, if they have a history of exposure. That is, if they live in an endemic area or have recently travelled to an area where infected ticks are prevalent. In this instance, treatment is recommended, without laboratory testing.~~

~~In this scenario, laboratory testing is recommended, and a convalescent sample (2 to 4 weeks after the initial sample) may be required to obtain laboratory support for a diagnosis of Lyme disease. However, some individuals who receive treatment during the acute phase may not seroconvert (i.e., IgG antibodies may not be detected in their serological tests).~~

Images of erythema migrans

Early disseminated Lyme disease (less than 3 months)

If untreated, the [bacteria](#) causing Lyme disease can:

- disseminate via the bloodstream and lymphatic system to other body sites
- provoke damage to body tissues at those sites, most commonly nervous and musculoskeletal systems

Signs and symptoms can include:

- fatigue and general weakness
- multiple erythema migrans lesions
- cardiac manifestations, such as:
 - atrioventricular block
 - myocardial dysfunction

- chronic arthritis
 - if untreated, arthritis may recur in the same or different joints
 - myopericarditis
 - tachyarrhythmias
- neurological manifestations
 - aseptic meningitis
 - cranial neuropathy, especially facial nerve palsy (i.e., Bell's palsy)
 - encephalitis, encephalomyelitis, subtle encephalopathy or pseudotumor cerebri (all rare)
 - motor and sensory radiculoneuropathy and mononeuritis multiplex
 - subtle cognitive difficulties
- rare manifestations, such as:
 - conjunctivitis
 - keratitis
 - mild hepatitis
 - splenomegaly
 - uveitis

Late disseminated Lyme disease (more than 3 months)

If Lyme disease remains untreated or diagnosed later, it can persist for months or even years.

Possible musculoskeletal manifestations include:

- Baker's cyst
- intermittent episodes of swelling and pain in one or multiple large joints (especially the knees) leading to chronic arthritis
 - if untreated, arthritis may recur in the same or different joints

Possible neurological manifestations include:

- subacute mild encephalopathy, affecting:
 - memory
 - concentration
- chronic mild axonal polyneuropathy, manifested as:
 - distal paresthesia
 - radicular pain (less common)
- encephalomyelitis (rare)
- leukoencephalopathy (rare)

Lyme disease and pregnancy

If a pregnant woman gets Lyme disease, she can be safely and effectively treated with antibiotics. If infection of the placenta does occur, this could cause pregnancy complications, so early treatment of pregnant women with Lyme disease is prudent.

~~If it occurs, the spread of Lyme disease from mother to fetus is rare.~~

~~No adverse outcomes have been seen in children born to women who acquired infection during pregnancy and received appropriate treatment.~~

COMMENT: See Page 9 re why these statements are inappropriate and need to be revised.

For more information, consult the [Society of Obstetricians and Gynaecologists of Canada](#).

Clinical diagnosis

The diagnosis of acute Lyme disease is primarily clinical, supported by a history of possible tick exposure.

Patients with symptoms of early localized Lyme disease and [possible](#) exposure history should be diagnosed and [immediately](#) treated without laboratory confirmation, as serologic tests are insensitive at this stage.

COMMENT: Physicians should be directed [here](#) to the [Early Lyme Disease Management in Primary Care Tool](#) published by the Centre for Effective Practice.

~~Since some people may have minor symptoms and not remember a tick bite, absence of an erythema migrans rash does not rule out possible infection. diagnosis should not be based solely on the presence or absence of an erythema migrans. As such, it is important to ask patients if they have travelled to or live in an area where blacklegged ticks are established or emerging~~ [have had possible exposure to ticks. Consider whether they are pet/animal owners or someone who works with animals. Inquire whether they spend time outdoors.](#)

[If a patient has experienced a tick bite, consider whether they may have been bitten by more than one tick. As well, rashes can present where a patient may not have observed it such as on the scalp. A thorough physical examination is advised.](#)

Ticks can be found outside currently identified risk areas, so while a known history of exposure to blacklegged ticks helps with the diagnosis, absence of a history of exposure does not rule out Lyme disease. **(COMMENT: underline for emphasis)**

Consider other signs and symptoms as part of your differential diagnosis of the disease, including:

- ~~fatigue~~
- ~~headache~~
- ~~arthralgia~~
- ~~low grade fever~~

[o fever \(often low-grade\)](#)

- o malaise
- o myalgias (neck stiffness is a common initial complaint)
- o headache
- o migratory arthralgias
- o lymphadenopathy
- o fatigue

Also consider the overall waxing and waning of symptoms.

Laboratory testing

Laboratory testing should only be used to supplement clinical findings and should not be the primary basis for making diagnostic or treatment decisions. Serology cannot rule out Lyme disease due to sensitivity and specificity limitations which are identified in the Canadian Adverse Reaction Newsletter, Volume 22 - Issue 4 - October 2012. (Found at: <https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/health-product-infowatch/canadian-adverse-reaction-newsletter-volume-22-issue-4-october-2012.html>)

Currently, the main laboratory tests consist of two-tiered antibody testing. These tests:

- may yield false ~~positive~~ negative results due to slow antibody response to *Borrelia burgdorferi* in early localized disease
 - o this is a reflection of the pathogen's slow replication
- may be negative for patients treated early with antibiotics
- cannot determine treatment efficacy

COMMENT: Any signs of immunodeficiency or immune dysfunction in a patient warrants immunoblot testing regardless of EIA results. These more complex cases lack a "standard" immune response with EIA testing. Immunoblot results can provide physicians with banding imagery and data that could more accurately aid in determining or eliminating a Lyme diagnosis in these patients.

Two-tiered serological testing

The two-tiered serological testing approach is recommended when testing for antibodies to *Borrelia burgdorferi*. This approach is validated for use in Canada and includes:

- an enzyme immunoassay (EIA)
- a confirmatory immunoblots (e.g., western blots or line blots) which are performed on samples that are positive or equivocal on the EIA

Interpretative criteria for the EIA and immunoblot (IB) have been standardized and summaries of the diagnostic approaches for Lyme disease are available.

If testing is required, indicate the presumed exposure area (for example, North America or Europe) on the requisition. The location will determine which specific test kits will be used, as different IB are used when exposure occurs in Europe versus North America. In suspected Lyme meningitis, testing for intrathecal IgG or IgM antibodies may be helpful.

Serological tests cannot be used to measure treatment response, as antibody persistence precludes the distinction between active and past infection from being made on positive results.

Enzyme immunoassays

Most EIA have a high sensitivity if done at least 2 weeks after the possible exposure. They have lower specificity as they may cross-react with antibodies to commensal or pathogenic spirochetes (e.g., varicella, Epstein-Barr virus, syphilis) or to certain autoimmune diseases (e.g., lupus).

EIA cannot differentiate between a past and current infection, and may yield false-positive results when used as a stand-alone test.

Immunoblots

Immunoblots are performed only if the EIA is positive or equivocal. It is highly specific and can be used to rule out other infections or conditions. False negatives may occur if the test is performed before IgG antibodies develop, which typically occurs after 4 weeks post infection.

As IgM antibodies can persist for months to years (despite effective antibiotic treatment), a positive IgM IB is not sufficient to diagnose current disease in patients with symptoms of longer duration. A positive IgG IB is required.

When testing patients with illness duration greater than 1 month, [some doctors feel that](#) only IgG IB should be performed (not IgM).

Two-Tier Chart is here.

Treatment

A patient with erythema migrans ~~who lives in and/or travelled to an endemic area~~ should be treated for Lyme disease promptly without the need for serological testing. **[COMMENT: The case definition is once again being inappropriately applied here. An erythema rash alone is definitive of Lyme disease and requires immediate, appropriate treatment. \(Again, see the Centre for Effective Practices - Early Lyme Disease Management in Primary Care Tool.\)](#)**

Most cases of Lyme disease can be treated successfully with appropriate treatment. **[COMMENT: "Most" cannot be substantiated. It is only an assumption. This](#)**

statement also raises the question that if treatment is not successful, what is the next step? As advised in the NICE Guidelines and the CEP Primary Care Tool, it would be highly appropriate to try a second course of treatment if symptoms have not been alleviated.

Doxycycline and amoxicillin are the most commonly recommended oral antibiotics, whereas ceftriaxone is the drug of choice for intravenous use. Doxycycline is not recommended for pregnant women.

~~For more information, consult the Association of Medical Microbiology and Infectious Disease Canada (AMMI).~~

COMMENT: There are two sets of treatment guidelines used in North America. If AMMI is being linked here then there must be a link to the ILADS website for their treatment guidelines. It is the intellectual right of both physicians and patients to be fully informed about the treatment guidelines that are available. Giving a singular link to AMMI where the IDSA Guidelines are endorsed without linking to ILADS for their treatment guidelines clearly demonstrates bias on the part of PHAC and is suggestive of regulatory capture.

~~Post-treatment Lyme disease syndrome (PTLDS)~~

~~Some patients who were treated for Lyme disease may continue to have persistent symptoms following treatment. This condition is known as PTLDS. To date, there is no definitive evidence that persistent symptoms represent ongoing infection.~~

COMMENT: PTLDS is a highly contentious nomenclature with derogatory implications. It used to compartmentalize and then dismiss all those who are living with late-stage Lyme disease into the category of "medically unknown symptoms" or MUS. It offers patients no hope and provides physicians with no advice.

The term itself demonstrates denial of the fact that a large portion of patients treated with the IDSA treatment recommendations fail to see their symptoms fully eradicated and go on to develop multi-systemic complications of late-stage Lyme disease. There is no certainty about the actual percentage of patients who fail to improve after the standard 2- to 4-week antibiotic regime, but the CDC has estimated it in the past to be 10-20%. The authors of IDSA Lyme Treatment Guidelines invented the term to excuse the treatment failure rate that follows their restrictive antibiotic protocols for Lyme disease. Animal studies have shown persistent symptoms are attributable to persistent infection (i.e., Crossland et al., 2017) after standard IDSA treatment protocols. The fact that the IDSA refuses to accept evidence-based findings begs for hard questions to be asked about motives.

PTLDS is used to anchor the bias which causes enormous harm to late-stage Lyme patients, this needs to be removed.

~~Serological tests cannot be used to measure treatment response, as antibody persistence precludes the distinction between active and past infection from being made on positive results. **This is already above.**~~

~~Research continues into the causes and treatment of PTLDS. **Comments have been made above.**~~

~~For more information, consult the Association of Medical Microbiology and Infectious Disease Canada (AMMI). **Comments have been made above.**~~

To assist with your review of the content, here are the links to the previous version of the **Lyme disease: Surveillance** page:

- <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/surveillance-lyme-disease.html>

Lyme disease surveillance

On this page

- Monitoring for Lyme disease in Canada
- How we classify cases
- Human cases of Lyme disease in Canada
- Provincial resources

Monitoring for Lyme disease in Canada

Canada monitors Lyme disease with surveillance activities that:

- keep track of the number of people infected with Lyme disease
- identify the areas where people are most at risk for getting Lyme disease

To get as much information as possible, we work with:

- local health authorities
- provincial and territorial public health organizations
- other experts, such as researchers and academia

The types of national Lyme disease surveillance include:

1. **human surveillance**, using reported cases of Lyme disease (voluntarily reporting by provincial and territorial public health organizations)
2. **tick surveillance**, using ticks that are collected:
 - in their environment, during field studies (active tick surveillance)
 - from people and pets through voluntary submission by doctors and veterinarians (passive tick surveillance)

How we classify cases

We use the national case definition for Lyme disease to classify cases reported to the Public Health Agency of Canada.

We developed the first national case definition in 2009, when Lyme disease became nationally notifiable. Nationally notifiable diseases are infectious diseases that have been identified by the federal government, provinces and territories as priorities for monitoring and control efforts. We last updated it in 2016.

(COMMENT: In truth, the revised case definition was not issued until early 2017 although it was labelled as the 2016 Case Definition.)

Human cases of Lyme disease in Canada

Between 2009 and 2018, health professionals have reported 7,516 human cases of Lyme disease across Canada.

Year	Number of cases
2009	144
2010	143
2011	266
2012	338
2013	682
2014	522
2015	917
2016	992
2017*	2,025
2018*	1,487

* Reported Lyme disease cases include cases caught in Canada and internationally (travel-related).

All 10 provinces provided data over the 10 year period. This does not include territories. Territories have not reported Lyme disease cases to the Public Health Agency of Canada since the disease became notifiable in 2009.

Reported cases for 2016, 2017 and 2018 use the updated Lyme disease case definition.

COMMENT: Presumably, the 2019 case numbers will be included.

We strongly recommend that a caveat be added here similar to the one used by the CDC which acknowledges that the annual case numbers in the United States are under-reported. The CDC uses a multiplier of ten to account for this discrepancy. For PHAC to publish

its annual case numbers without disclosing the fact that it is known that under-reporting/under-detection are similarly happening in Canada is misleading. The following paper by Canadian researchers (Lloyd/Hawkins, 2018) speaks to the severity of under-detection and under-reporting of Lyme disease in Canada:

“Our calculations indicate that only approximately 1 of every 6 infected patients for whom laboratory testing is ordered receives a formal diagnosis of Lyme disease. Similarly, reporting of acute Lyme is estimated at 1 of every 6 patients seen; the number of these patients that are appropriately treated is unknown. This implies that for approximately 4 of 6 patients with Lyme infections, the diagnosis is not considered or not substantiated (Figure 4). The combined estimated under-detection ranges from 12.1 to 58.2-fold (1.7% to 8.3%) under-detection. Research is urgently required to identify, quantify, and address the relative contribution of factors leading to under-detection. While this estimate is anchored with data from the province of NB for 2014, there is no reason to assume that the issues leading to under-detection are regionally specific or would have resolved in the intervening period. If so, the 992 Lyme disease cases in Canada reported by surveillance criteria for 2016 [91], would actually range from 8432 to 56,147.”

Found at: <https://doi.org/10.3390/healthcare6040125>