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NH DIVISION OF Public Health Services
Improving health, preventing disease, reducing costs *for all*
Department of Health and Human Services

New Hampshire Tickborne Diseases (TBDs) Update, 2021

Key Points and Recommendations:

1. Tickborne diseases (TBDs) are increasing nationally with Lyme disease accounting for 82% of all TBDs in the U.S. (MMWR. 2018 May;67(17):496-501). A new estimate of commercial insurance claims data estimates more than 475,000 people in the United States are diagnosed with Lyme disease annually; an increase from their previous estimate (Emerg Infect Dis. 2021 Feb;27(2):616-9).
2. People in New Hampshire are at risk for five different TBDs, including: Lyme disease, anaplasmosis, babesiosis, *Borrelia miyamotoi* infection, and Powassan virus infection; all are transmitted by the bite of the blacklegged tick.
3. New and updated resources are available for healthcare providers and organizations to assist with diagnosis and management of Lyme and other TBDs:
    - 2020 Guidelines for the Prevention, Diagnosis and Treatment of Lyme Disease developed by the Infectious Disease Society of America (IDSA), American Academy of Neurology (AAN), and American College of Rheumatology (ACR)
    - 2020 Guideline on Diagnosis and Management of Babesiosis developed by IDSA
    - Suggested Reporting Language, Interpretation and Guidance Regarding Lyme Disease Serologic Test Results developed by the Association of Public Health Laboratories (APHL)
    - Lyme Disease Updates and New Educational Tools for Clinicians (CDC webinar that was presented and recorded May 20, 2021)
    - Guidance for Clinicians: Recommendations for Patients after a Tick Bite (including post-exposure prophylaxis guidance for Lyme disease)
    - Tickborne Diseases of the United States: A Reference Manual for Healthcare Providers (Fifth Edition, 2018)
    - CDC is developing online Lyme disease training modules that offer continuing education (CE) credits; check the CDC TRAIN website (pending release)
4. Consider testing for TBDs in patients presenting with compatible signs and symptoms, especially if there are risk factors for tick bites; co-infection with multiple TBDs can occur.
    - Lyme disease diagnostics rely on serological (antibody) testing. Because antibodies take several weeks to develop to detectable levels after initial infection, testing within the first few weeks of infection may be falsely negative
    - Lyme disease serology is not useful to monitor response to treatment and both IgM and IgG antibodies can remain positive for years/decades after an initial infection. Re-infection, however, can occur so clinical judgement may be needed when evaluating a patient for repeat exposure or infection

5. Report all TBDs, confirmed or suspected, to the Bureau of Infectious Disease Control at 603-271-4496 (after hours 603-271-5300).
6. Advise patients on tick-bite prevention methods, which should focus on personal protective measures (see information below). Additional educational resources can be found here on the NH DPHS Lyme and Other Tickborne Diseases website.

Background Epidemiology:

New Hampshire has identified local transmission of five tickborne diseases (TBDs): Lyme disease (*Borrelia burgdorferi*), anaplasmosis (*Anaplasma phagocytophilum*), babesiosis (*Babesia spp.*), *Borrelia miyamotoi*, and Powassan virus, all of which are transmitted by the bite of the blacklegged tick (*Ixodes scapularis*). Lyme disease is the most common and has been identified in all 10 NH counties. Although both adult and nymph stages of the tick can transmit pathogens, people are most likely to be infected between April and August when the nymphs are questing for a host. Nymphs are very small (< 2mm) and difficult to see unless they become engorged with blood. Even when engorged, nymphs may evade timely detection and removal.

Symptoms:

Many TBDs present initially with nonspecific symptoms that may include fever, chills, malaise, headache, muscle and joint pains, and lymphadenopathy. Some may also present with other systemic symptoms (neurological, cardiovascular, gastrointestinal symptoms). Powassan virus infection, in particular, can progress to meningoencephalitis and ~10% of Powassan encephalitis cases are fatal. About half of those that survive clinical disease have permanent neurological sequelae.

For more information about specific clinical syndromes associated with the different TBDs, please review the following:

- Lyme disease: https://www.cdc.gov/lyme/signs_symptoms/index.html
- Anaplasmosis: https://www.cdc.gov/anaplasmosis/symptoms/index.html
- Babesiosis: https://www.cdc.gov/parasites/babesiosis/disease.html
- *Borrelia miyamotoi*: https://www.cdc.gov/ticks/miyamotoi.html
  https://www.ncbi.nlm.nih.gov/pubmed/26053877
- Powassan: https://www.cdc.gov/powassan/symptoms.html

The CDC has published a reference for healthcare providers on the diagnosis and treatment of TBDs found in the US: https://www.cdc.gov/ticks/tickbornediseases/index.html.

Diagnostic Testing:

Providers should consider testing for TBDs in patients presenting with non-specific flu-like symptoms (i.e., fever, chills, headache, malaise, fatigue, myalgia, arthralgia), especially if there are risk factors for tick bites. Testing varies by organism:

- Lyme disease: diagnosed by detection of IgM or IgG antibodies in serum on a two-stage testing algorithm, including a confirmatory Western Blot. If symptom onset was more than a month prior, diagnosis relies on IgG positivity because an isolated positive IgM at this point is often a false-positive. In 2019 the FDA approved the use of two sequential ELISA assays in a modified two tier diagnostic algorithm. The CDC has approved this alternative algorithm for use.
  - When an erythema migrans rash (i.e., an expanding ring of erythema at the site of a tick bite that is usually 5 cm in diameter or larger) is present, no testing is

necessary because it is classic for Lyme disease and serology is often negative at this early stage of disease; these patients should be treated for Lyme disease based on the presence of the erythema migrans rash alone.

- When a rash is present that is suggestive of, but atypical for erythema migrans and the patient is not being treated empirically, serological testing on acute-phase serum specimen or in paired-specimen with collection dates 2-3 weeks apart may provide aid in the diagnostic process.

- Anaplasmosis: diagnosed by PCR (most sensitive during the first week of illness), or a 4-fold increase in IgG antibody titers (first titer obtained the first week of illness followed by a second titer 2-4 weeks later); IgM tests alone should not be used for diagnosis.
- Babesiosis: diagnosed by peripheral blood smear (thick and thin blood smear) and/or PCR. An IgG antibody titer can be supportive evidence, but positive antibody tests do not differentiate between recent and past infection.
- *Borrelia miyamotoi*: diagnosed by PCR and antibody based tests (see attachment for more information). Positive C6 peptide ELISA tests (for Lyme disease) may indicate infection by *Borrelia miyamotoi*.
- Powassan: diagnosed by finding virus-specific IgM antibodies in serum or cerebrospinal fluid (CSF); testing is coordinated through our State Public Health Laboratories.

Additional testing information:

- In patients presenting with short duration of symptoms, antibody-based tests may be negative and repeat testing may be necessary several weeks after onset of illness.
- Because antibody tests can remain positive for months or years after an infection (sometimes decades with Lyme disease), single antibody titers do not differentiate between recent and past infection, so clinical judgement is needed when ordering and interpreting tests.
- More detailed information on the modified two tier algorithm for Lyme disease testing is found here: https://www.cdc.gov/mmwr/volumes/68/wr/pdfs/mm6832a4-H.pdf
- Information about the performance of the C6 peptide ELISA may be reviewed here: https://academic.oup.com/cid/article/66/9/1407/4631884

For Lyme disease, anaplasmosis, and babesiosis, providers should use their established clinical testing networks. Powassan virus testing should be coordinated through New Hampshire's Public Health Laboratories by calling the Bureau of Infectious Disease Control. To initiate testing, completely fill out our requisition form (see links below), including onset date. For testing information on *Borrelia miyamotoi*, please see attachment 1.

If you suspect another tickborne disease for which testing may be limited or not accessible, please contact the Bureau of Infectious Disease Control at 603-271-4496 (after hours 603-271-5300).

Treatment:

Review and be familiar with the following resources and guidance for treatment of TBDs:

- Lyme disease: 2020 Guidelines for the Prevention, Diagnosis and Treatment of Lyme Disease
- Babesiosis: 2020 Guideline on Diagnosis and Management of Babesiosis
- Anaplasmosis (and other rickettsial diseases): Diagnosis and Management of Tickborne Rickettsial Diseases: Rocky Mountain Spotted Fever and other Spotted Fever Group Rickettsioses, Ehrlichioses, and Anaplasmosis – United States: A Practical Guide for Health Care and Public Health Professionals

- *Borrelia miyamotoi*: Data on treatment is limited and case reports suggest treatment is likely similar to that of Lyme disease. In patients diagnosed with *Borrelia miyamotoi*, we suggest consultation with an Infectious Disease specialist
- Powassan: There is no specific treatment and care is supportive

Reporting Tickborne Diseases:

Clinicians should report suspected and confirmed cases of all tick-borne diseases to the Bureau of Infectious Disease Control by submission of a case report form or by calling 603-271-4496 (after hours 603-271-5300). Please be sure to record the date of symptom onset and exposure history. Completed forms can be mailed or faxed to the Bureau of Infectious Disease Control at 29 Hazen Drive, Concord, NH, 03301 (Fax: 603-271-0545). Please utilize the following case report forms:

- Lyme disease: http://www.dhhs.nh.gov/dphs/cdcs/documents/lymediseasereport.pdf
- Babesia: https://www.cdc.gov/parasites/babesiosis/resources/50.153.pdf
- Tickborne Rickettsial Diseases: https://www.cdc.gov/ticks/forms/2010_tbrd_crf.pdf
- Other tickborne diseases: https://www.dhhs.nh.gov/dphs/cdcs/documents/diseasereport.pdf

Prevention Messages for Patients:

- Avoid tick-infested areas when possible and stay on the path when hiking to avoid brush.
- Wear light-colored clothing that covers arms and legs so ticks can be more easily seen.
- Tuck pants into socks before going into wooded or grassy areas.
- Apply insect repellent (20-30% DEET) to exposed skin. Other repellent options may be found here: https://www.epa.gov/insect-repellents/find-insect-repellent-right-you#searchtool
- Permethrin is highly effective at repelling ticks on clothing; it is not meant for use on skin.
- Outdoor workers in NH are at particular risk of tickborne diseases and they should be reminded about methods of prevention.
- Perform daily tick checks to look for ticks on the body, especially warm places like behind the knees, ears, groin, belly button, and the back and neck.
- Pets returning inside may also bring ticks with them. Performing tick checks and using tick preventatives on pets will minimize this occurrence.
- Encourage landscape or environmental management to reduce tick habitat and encounters.
- Shower soon after returning indoors to wash off any unattached ticks and check clothes for any ticks that might have been carried inside. Placing dry clothes in the dryer on high heat for ten minutes (one hour for wet or damp clothes) effectively kills ticks.
- Remove ticks promptly using tweezers. Tick removal within 36 hours of attachment can prevent Lyme disease, but transmission of other tick-borne diseases can occur with shorter periods of attachment time.
- Monitor for signs and symptoms of tickborne diseases for 30 days after a tick bite. Patients should contact their healthcare provider if symptoms develop.

There are additional resources available to educate your patients about how to reduce their risk of tick encounters and tick bites:

- State of New Hampshire Tickborne Disease Webpage: https://www.dhhs.nh.gov/dphs/cdcs/lyme/

- State of New Hampshire Tickborne Disease Prevention Plan: https://www.dhhs.nh.gov/dphs/cdcs/lyme/documents/tbdpreventionplan.pdf
- University of New Hampshire Cooperative Extension's Biology and Management of Ticks in New Hampshire: https://extension.unh.edu/resources/files/Resource000528_Rep1451.pdf
- Connecticut Agricultural Experiment Station's Tick Management Handbook: https://portal.ct.gov/CAES/Tick-Office/Tick-Office/Tick-Related-Information
- CDC Tick Bite Prevention: https://www.cdc.gov/ticks/avoid/index.html

For any questions regarding this notification, please call the NH DHHS, DPHS, Bureau of Infectious Disease Control at (603) 271-4496 during business hours (8:00 a.m. – 4:30 p.m.)

If you are calling after hours or on the weekend, please call the New Hampshire Hospital switchboard at (603) 271-5300 and request the Public Health Professional on-call

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Originating Agency:	NH Department of Health and Human Services, Division of Public Health Services

Attachments: *Borrelia miyamotoi* lab testing table

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ATTACHMENT 1

Borrelia miyamotoi lab testing

Confirmation of a diagnosis relies on 1) the use of polymerase chain reaction (PCR) tests that detect DNA from the organism (preferred) or 2) antibody-based tests. Both types of tests are under development and not widely commercially available but can be ordered from a limited number of CLIA-approved laboratories.

Less sensitive and specific methods for detecting *B. miyamotoi* and agents of tickborne relapsing fever include identification of spirochetes in peripheral blood films and spinal fluid preparations and serologic testing.

Lab	Test	Specimen	Volume	Storage	Shipping	Turnaround time	Comments
Imugen	*Borrelia* PCR	CSF, Synovial Fluid or EDTA Whole Blood	2.0 ml (0.5 ml minimum)	Refrigerate	Ambient	24-48 hours from receipt	Doesn't differentiate between *B. burgdorferi* and *B. miyamotoi*
Imugen	*B. miyamotoi* serology (IgM and IgG)	Serum or CSF	2.0 ml (0.5 ml minimum)	Refrigerate	Ambient	24-48 hours from receipt	**Most patients acutely symptomatic with *Borrelia miyamotoi* infection are seronegative.** If the clinical history strongly suggests infection, collect/submit a convalescent specimen 3-4 weeks later.
Mayo	*B. miyamotoi* PCR	EDTA whole blood	1.0 ml (0.3 ml minimum volume)	Refrigerate	Ambient	Unknown	
Quest	*B. miyamotoi* PCR	CSF, synovial fluid, whole blood (EDTA)	1.0 ml (0.3 ml minimum volume)	Refrigerate	Ambient	Unknown	