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May 19, 2014, 1400 EDT (2:00 PM EDT)
NH-HAN 20140519

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

Lyme Disease and Other Tickborne Diseases in New Hampshire

NH Division of Public Health Services (NH DPHS) recommends:

1. Recognition that NH continues to have one of the highest rates of Lyme disease in the nation and ~60% of deer ticks sampled in NH are infected with *Borrelia burgdorferi*, the bacteria that causes Lyme disease.
2. Prevention of disease through use of DEET insect repellent, wearing long pants and sleeves outdoors, and daily tick checks followed by prompt removal of any ticks.
3. Diagnosis of early Lyme disease when erythema migrans is present based solely on clinical suspicion because diagnostic serologies (including IgM) may not yet be positive.
4. Awareness that recent reports of sudden cardiac death attributed to Lyme disease carditis highlight the importance of prompt diagnosis and treatment of Lyme disease.
5. Report all tickborne diseases, confirmed or suspected, to the NH DPHS Bureau of Infectious Disease Control at 603-271-4496 (after hours 1-800-852-3345, x5300).

Background:

Lyme disease (*Borrelia burgdorferi*), babesiosis (*Babesia microti* and other species), anaplasmosis (*Anaplasma phagocytophilum*), and Powassan virus are transmitted by the bite of the deer tick (*Ixodes scapularis*), also known as the black-legged tick. Although these ticks have a 2-year life cycle, the greatest risk for human acquisition of tickborne diseases is between May and August when the aggressive nymph stage of the deer tick is active. Nymphs are very small (< 2mm) and easy to miss unless they become engorged with blood.

Epidemiology:

Over the last decade, reported Lyme disease cases have increased significantly in NH. In 2013, 1,689 cases (confirmed and probable) were reported. The highest disease rates occurred in Rockingham, Strafford and Hillsborough counties, respectively. Compared to national data from 2012 (the most recent available), the Centers for Disease Control and Prevention (CDC) reports that NH has the highest incidence rate of Lyme disease in the United States (75.9 confirmed cases per 100,000 population). NH Lyme disease data and maps by county and town from 2006-2013 are available at http://www.dhhs.nh.gov/dphs/cdcs/lyme/publications.htm. In 2013, 88 cases of anaplasmosis, 23 cases of babesiosis, and the first case of locally-acquired Powassan virus infection were also reported.

The risk of Lyme disease for any individual depends on their outdoor activities and the abundance of infected ticks. Tick surveillance performed during 2007-2010 in NH counties showed that >50% of ticks tested in most counties were infected with the bacteria causing Lyme disease with the exception of slightly lower rates (40%) in Belknap and Carroll, and very low numbers of ticks collected in Coos County, precluding prevalence assessment. *Babesia* and *Anaplasma* have been detected in ticks in NH, though reliable prevalence data for these pathogens in ticks is not available.

Lyme Disease

Clinical Presentation: Lyme disease is caused by the bacteria *Borrelia burgdorferi* and the incubation period is 3-30 days after tick exposure. In approximately 60-80% of patients, illness first manifests with a red rash that expands slowly, often with central clearing (erythema migrans [EM] or bulls eye rash). Early systemic manifestations may include malaise, fever, headache, stiff neck, muscle and joint pains, and lymphadenopathy. At this stage, serologic testing is often negative and treatment should be based on clinical diagnosis. Early treatment generally leads to complete and rapid recovery, and may prevent seroconversion (so that later testing is negative). Patients who are not treated at this stage of infection may develop a variety of syndromes including aseptic meningitis, cranial neuritis, and cardiac abnormalities such as heart block or myopericarditis. Without treatment, a patient may develop chronic or intermittent episodes of arthritis or neurological symptoms weeks to years after onset.

In 2013, CDC released a report of three Lyme disease carditis cases in the northeastern United States that resulted in sudden cardiac death. While rare, these cases highlight the importance of prompt diagnosis and treatment for Lyme disease. Healthcare providers should ask patients with suspected Lyme disease about cardiac symptoms and obtain an EKG if indicated. Healthcare providers should also ask patients with unexplained heart block about possible exposure to infected ticks. The full report on this rare clinical presentation is available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6249a1.htm

Testing: Laboratory testing should be used to support clinical suspicion of disease, based on clinical features and possible exposure to infected ticks. Within 4 weeks of infection, specific antibodies can be detected using FDA-approved two-stage serologic testing. ELISA is the screening test, confirmed by Western Blot if positive or equivocal. A patient is considered to have positive Lyme serology if 2 of 3 IgM bands are reactive (24, 39, 41 kDa) OR if 5 of 10 IgG bands are reactive (18, 21, 28, 30, 39, 41, 45, 58, 66, 93 kDa). An isolated positive IgM (without positive IgG) in a patient with tick exposure more than 8 weeks prior is suspicious for a false positive test. Only laboratories with validated and FDA-approved testing methods for Lyme ELISA and confirmatory Western blot should be used for diagnosis of disease.

Treatment: The Infectious Disease Society of America (IDSA) updated guidelines for tickborne diseases in 2006. The IDSA guidelines were confirmed by an independent panel (recommendations published in 2010) and are the best available synthesis of the medical literature on the diagnosis and treatment of Lyme disease. A summary of treatment recommendations based on these guidelines is attached and the full guidelines are available at: http://cid.oxfordjournals.org/content/43/9/1089.full.pdf+html

Antibiotic Prophylaxis: Based on the high prevalence of Lyme disease in NH, providers can consider prescribing single dose doxycycline prophylaxis for patients who meet all four criteria outlined in the attached Lyme disease prophylaxis guidelines. Note that single-dose doxycycline is not 100% effective for prevention of Lyme disease; consequently, patients who receive this therapy should monitor themselves for the development of Lyme disease as well as other tickborne diseases, including anaplasmosis and babesiosis. It is also a reasonable course of action to ask the patient to monitor the bite site and call back for further medical evaluation if a rash or any systemic symptoms develop. Testing the tick for tickborne infectious agents is available in certain labs but is not recommended for guiding individual prophylaxis or treatment decisions.

Anaplasmosis

Clinical Presentation: Anaplasmosis (human granulocytic anaplasmosis [HGA], previously known as human granulocytic ehrlichiosis) is an infection of neutrophils caused by the rickettsial bacteria *Anaplasma phagocytophilum*. Transmitted by the deer tick, symptoms typically occur 5-21 days following the bite of an infected tick, and may include fever, chills, headache, and myalgia. Some people, particularly elderly persons or those with weakened immune systems, may have a more severe illness.

Testing: Identification of the characteristic intragranulocytic inclusions on blood smear is the most rapid diagnostic method, but requires lab expertise. Acute and convalescent antibody assays are the most sensitive diagnostic method.

Treatment: Doxycycline is the first line therapy for anaplasmosis (see attached treatment guideline table). If co-infected with Lyme disease, doxycycline will treat both infections. Antibiotic therapy should not be delayed in a patient with a suggestive clinical presentation pending the results of diagnostic testing.

Babesiosis

Clinical Presentation: Babesiosis is caused by the intraerythrocytic protozoan *Babesia microti* (or other *Babesia* species) and is transmitted by the deer tick. Although most people infected with *Babesia* are asymptomatic, some people experience fever, chills, sweats, myalgia, arthralgias, anorexia, nausea, vomiting, and/or fatigue within 1-4 weeks after infection. Severe and fatal cases most often occur in patients who are older or have a weakened immune system, particularly those without a spleen. Rare cases of relapsing disease have been reported.

Testing: Diagnosis is based on identification of *Babesia* parasites in a blood smear or by PCR amplification of babesial DNA.

Treatment: Babesiosis can be successfully treated with antimicrobial therapy (see attached treatment guideline table).

Powassan Virus Infection

Clinical Presentation: Powassan (POW) virus is an RNA virus of the genus *Flavivirus* with an incubation period of 7-30 days following bite of an infected tick. Although most infections are subclinical, symptoms may include fever, headache, vomiting, and generalized weakness that can progress to meningoencephalitis.

Testing: Cerebrospinal fluid (CSF) findings include normal or mildly elevated protein, normal glucose concentration, and lymphocytic pleocytosis <500 white blood cells/mm3 with granulocytic predominance. Brain magnetic resonance imaging (MRI) is superior to CT imaging, and reveals changes consistent with microvascular ischemia or demyelinating disease in the parietal or temporal lobes. Electroencephalography (EEG) shows generalized slow wave activity.

Diagnosis can be made by the detection of POW virus-specific IgM antibody in serum or CSF, combined with a consistent clinical presentation. Currently, POW virus testing is not commercially available but can be arranged through the NH Public Health Laboratories.

Treatment: Treatment is supportive.

Reporting Tickborne Diseases:

Clinicians should report suspect and confirmed cases of Lyme disease, anaplasmosis, babesiosis, and Powassan virus infection to the NH DPHS Bureau of Infectious Disease Control at 603-271-4496 (after hours 1-800-852-3345, x5300). When filling out the Lyme disease case report form, it is important to record the date of symptom onset because this information is used to determine whether a case meets the CDC case definition for surveillance. A copy of the most recent Lyme disease case report form is attached. The case report form is also available at: http://www.dhhs.nh.gov/dphs/cdcs/documents/lymediseasereport.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 tick repellent (20-30% DEET) to exposed skin. Other repellent options may be found here: http://www.epa.gov/pesticides/insect/choose.htm
- Outdoor workers in NH are at particular risk of tickborne diseases and they should be reminded about methods of prevention.
- Do daily tick checks to look for ticks on the body, especially warm places like behind the knees, the groin, and the back and neck.
- Remove ticks promptly using tweezers. Tick removal within 24-36 hours of attachment can prevent disease.
- Monitor for signs and symptoms of tickborne diseases for 30 days after a tick bite. Patients should contact their healthcare provider if symptoms develop.

For any questions regarding the contents of this message, please contact NH DHHS, DPHS, Bureau of Infectious Disease Control at 603-271-4496 (after hours 1-800-852-3345 ext.5300).

To change your contact information in the NH Health Alert Network, contact Denise Krol at 603-271-4596 or email Denise.Krol@dhhs.state.nh.us

Status:	Actual
Message Type:	Alert
Severity:	Moderate
Sensitivity:	Not Sensitive
Message Identifier:	NH-HAN 20140519 Lyme Disease and Other Tickborne Diseases
Delivery Time:	12 hours
Acknowledgement:	No
Distribution Method:	Email, Fax
Distributed to:	Physicians, Physician Assistants, Practice Managers, Infection Control Practitioners, Infectious Disease Specialists, Community Health Centers, Hospital CEOs, Hospital Emergency Departments, Nurses, NHHA, Pharmacists, Laboratory Response Network, Manchester Health Department, Nashua Health Department, Public Health Networks, DHHS Outbreak Team, DPHS Investigation Team, DPHS Management Team, Northeast State Epidemiologists, Zoonotic Alert Team, Health Officers, Deputy Health Officers, MRC, NH Schools, EWIDS
From:	Elizabeth A. Talbot, MD – Deputy State Epidemiologist
Originating Agency:	NH Department of Health and Human Services, Division of Public Health Services

Attachments: 1. Tickborne diseases treatment table, 2. Lyme disease prophylaxis guidelines, 3. Lyme disease case report form

ATTACHMENT 1

Tick bites and single–dose doxycycline as prophylactic treatment for Lyme disease in NH (Based on the 2006 Infectious Disease Society of America guidelines)

A **single** dose of doxycycline (200 mg) may be offered to adult patients and to children ≥8 years of age (4 mg/kg up to a maximum dose of 200 mg) when ALL of the following conditions exist:

1. The attached tick is a black-legged tick (deer tick, *Ixodes scapularis*). Tick identification is most accurately performed by an individual trained in this discipline. However, black-legged ticks are very common in southeastern and central New Hampshire and there are many images available online to help identification. AND

2. The tick has been attached for at least 36 hours. This determination is most reliably made by an entomologist, but simply asking the patient about outdoor activity in the time before the tick bite was noticed can often lead to an accurate estimate of attachment time. Unengorged (unfed) black-legged ticks are typically flat. Any deviation from this "flatness," which is often accompanied by a change in color from brick red to a gray or brown, is an indication that the tick has been feeding. AND

3. Prophylaxis can be started within 72 hours of the time that the tick was removed. This time limit is suggested because of an absence of data on the efficacy of prophylaxis for tick bites following longer time intervals after tick removal. AND

4. Doxycycline prophylaxis is not contraindicated. Doxycycline is contraindicated in pregnant women and children less than 8 years old. The other common antibiotic treatment for Lyme disease, amoxicillin, should NOT be used for prophylaxis because of an absence of data on an effective short-course regimen for prophylaxis and the likely need for a multi-day regimen and its associated adverse effects.

Note that single-dose doxycycline is not 100% effective for prevention of Lyme disease; consequently, patients who receive this therapy should monitor themselves for the development of Lyme disease as well as other tickborne diseases including anaplasmosis and babesiosis.

Adapted from: Wormser GP, et al. The Clinical Assessment, Treatment, and Prevention of Lyme Disease, Human Granulocytic Anaplasmosis, and Babesiosis: Clinical Practice Guidelines by the Infectious Diseases Society of America. Clinical Infectious Diseases;2006;43:1089 –1134. Available online at: http://cid.oxfordjournals.org/content/43/9/1089.full

ATTACHMENT 2

NH DPHS Treatment Recommendations for Tickborne Diseases
Summary of 2006 Infectious Disease Society of America Guidelines

Disease	Treatment Regimens for Adults	Treatment Regimens for Children
Lyme disease	Oral Options	
	Doxycycline 100 mg PO bid*	Doxycycline 2 mg/kg PO bid (max 100 mg/dose) **only if 8 years and older**
	Alternative: Amoxicillin 500 mg PO tid	Alternative: Amoxicillin 50 mg/kg/d in 3 divided doses (max 500 mg/dose)
	Alternative: Cefuroxime axetil 500 mg PO bid	Alternative: Cefuroxime axetil 30 mg/kg/d in 2 divided doses (max 500 mg/dose)
	Parenteral options	
	Ceftriaxone 2g IV qd	Ceftriaxone 50-75 mg/kgIV qd (max 2g) – preferred
	Alternative: Cefotaxime 2g IV q8h	Alternative: Cefotaxime 150-200 mg/kg/d IV in 3-4 divided doses (max 6g/d)
	Alternative: Penicillin G 3-4 MU IV q4h	Alternative: Penicillin G 200-400K U/kg/d divided every 4h (max 18-24MU/d)
	Note: Choice of regimen, route and length of treatment for Lyme disease depends on symptoms and stage of disease.	
Anaplasmosis	Doxycycline 100 mg PO bid for 10 days* Alternatives: <u>Severe OR co-infected with Lyme:</u> Amoxicllin / cefuroxime axetil (dose as above for Lyme disease) <u>No coinfection and mild disease:</u> Rifampin 300 mg PO bid for 7-10 days	**8 years and older:** Doxycycline 2 mg/kg PO bid for 10 days (max dose 100mg) **Under 8 years old:** <u>Severe disease:</u> Doxycycline (dose as above) for 4-5 days then complete a 14 days course with Amoxicillin OR Cefuroxime axetil (doses as above) <u>Mild disease:</u> Rifampin 10 mg/kg PO bid (max 300 mg/dose) for 7-10 days
Babesiosis	Atovaquone 750 mg PO bid + Azithromycin 500-1000 mg on day 1 then 250 mg PO qd <u>Severe disease:</u> Clindamycin 300-600 mg IV q6h (or 600 mg PO q8h) + Quinine 650 mg PO q 6-8h. Consider exchange transfusion.	Atovaquone 20 mg/kg PO bid (max 750 mg/ dose) + azithromycin 10 mg/kg/d on day 1 (max 500 mg/d) then 5 mg/kg/d (max 250 mg/d) <u>Severe disease:</u> Clindamycin 7-10 mg/kg q6-8h PO or IV (max 600 mg/dose) +quinine 8 mg/kg PO q8h (max 650 mg/dose). Consider exchange transfusion.

***NOTE: For pregnant women, doxycycline should not be used.**

Adapted from: Wormser GP, et al. The Clinical Assessment, Treatment, and Prevention of Lyme Disease, Human Granulocytic Anaplasmosis, and Babesiosis: Clinical Practice Guidelines by the Infectious Diseases Society of America. Clinical Infectious Diseases;2006;43:1089 –1134. Available online at: http://cid.oxfordjournals.org/content/43/9/1089.full

NEW HAMPSHIRE LYME DISEASE CASE REPORT FORM
HEALTH CARE PROVIDER

Patient's Name_____Report Date _____
(Last Name) (First Name)

Date of Birth_____ Age_____ ☐ Male ☐ Female ☐ Unknown

Address_____

City / Town_____County_____ State_____ Zip_____

Home Phone_____Work Phone_____

Occupation:_____

Race
- ☐ White
- ☐ African American
- ☐ Asian
- ☐ Hawaiian or Pacific Islander
- ☐ Native Am./Alaskan Native
- ☐ Other
- ☐ Unknown

Ethnicity
- ☐ Hispanic
- ☐ Not Hispanic
- ☐ Unknown

SYMPTOMS AND SIGNS OF CURRENT EPISODE (Please answer each question)

Is this person being diagnosed with Lyme Disease?…… …… ☐ Yes ☐ No

Date of symptom **onset**_____ Onset date unknown ☐ Date of Lyme Disease diagnosis_____

DERMATOLOGIC:

Erythema migrans (physician diagnosed EM at least 5 cm in diameter)?…… ☐ Yes ☐ No ☐ Unknown

RHEUMATOLOGIC:

Arthritis characterized by recurrent brief attacks of joint swelling? …… ☐Yes ☐No ☐ Unknown

NEUROLOGIC:

Bell's palsy or other cranial neuritis? …… ☐ Yes ☐ No ☐ Unknown

Radiculoneuropathy? …… ☐ Yes ☐ No ☐ Unknown

Lymphocytic meningitis? …… ☐ Yes ☐ No ☐ Unknown

Encephalitis/Encephalomyelitis? …… ☐ Yes ☐ No ☐ Unknown

CSF tested for antibodies to *B. burgdorferi*? …… ☐ Yes ☐ No ☐ Unknown

Antibody to *B. burgdorferi* higher in CSF than serum …… ☐ Yes ☐ No ☐ Unknown

CARDIOLOGIC:

Acute onset 2nd or 3rd degree atrioventricular block? …… ☐ Yes ☐No ☐ Unknown

Pregnant: ☐ Yes ☐ No ☐ Unknown

Hospitalized: ☐ Yes ☐ No ☐ Unknown If yes, where_____

Treatment: ☐ Doxycycline ☐ Amoxicillin ☐ Other: _____

Duration of treatment in days: _____

Has this patient been diagnosed with Lyme Disease prior to this diagnosis? ☐ Yes, date (mm/yyyy)_____ ☐ No ☐ Unknown

EXPOSURE HISTORY

Tick Bite reported within 30 days of onset: ☐ Yes ☐ No ☐ Unknown

In the 30 days prior to symptom onset, did this individual travel outside of NH: ☐ Yes, out of state ☐ Yes, out of country ☐ No ☐ Unknown

County and **state** most likely exposed?_____

LABORATORY RESULTS (Check all that apply)

EIA/IFA: ☐ Positive ☐ Equivocal ☐ Negative ☐ Not done/Unknown Date if positive:_____

Western Blot: ☐ IgM Positive ☐ IgM Negative ☐ Not done/Unknown Date if positive:_____
☐ IgG Positive ☐ IgG Negative ☐ Not done/Unknown Date if positive:_____

Culture Results/Other:_____

HEALTH CARE PROVIDER REPORTING INFORMATION:

Reported by _____

Ordering Provider _____Phone _____

Provider Facility_____

City/Town _____State _____ Zip_____

For NH DHHS Staff Only

Imported
- ☐ Acquired in NH
- ☐ Acquired Outside US
- ☐ Acquired in Another State
- ☐ Unknown

Case Status
- ☐ Confirmed (meets CDC definitions)
- ☐ Probable (meets CDC definitions)
- ☐ Suspected (meets CDC definitions)
- ☐ Not A Case
- ☐ Out of state

Notes:

Mail or Fax to: NH Department of Health and Human Services,
Bureau of Infectious Disease Control
29 Hazen Drive, Concord, NH 03301. Fax: (603) 271-0545,
Phone: Hotline 1 (888) 836-4971. **vMar14**