Date: June 2, 2017
To: All North Carolina Clinicians
From: Zack Moore, MD, MPH, State Epidemiologist
Subject: Annual Update on Surveillance for Lyme disease in North Carolina (2 pages)

Introduction
Lyme disease (LD) is caused by infection with the bacterium *Borrelia burgdorferi* sensu stricto transmitted by the bite of an infected *Ixodes scapularis* tick, commonly known as the deer tick or black legged tick. The North Carolina Division of Public Health (DPH) encourages clinicians to consider the possibility of LD when assessing patients with clinically compatible signs or symptoms. The diagnosis of LD should be based on a combination of symptoms, laboratory findings, and patient exposure history.

Surveillance for Lyme disease
In North Carolina, health care providers are required to report cases of confirmed or suspected LD to their local health department within 7 days. Laboratories are also required to report positive tests for LD to DPH [1]. Surveillance for LD is based on a national case definition, which establishes uniform criteria for disease reporting in order to monitor trends and take action to reduce disease and improve public health [2]. In 2016, a total of 266 cases of LD were reported in NC (30 confirmed, 236 probable; provisional data). Since 2008, when the probable case classification was introduced, the number of reported confirmed cases of LD has remained relatively constant with an average of 28 cases per year. In contrast, the number of reported probable cases increased more than seven-fold from 2008 to 2016, from 31 to 236 (Fig. 1 & 2).

High-incidence vs. low-incidence states
Effective January 2017, the CDC amended the previous definition of exposure criteria from “endemic counties” to “high and low-incidence states”. High-incidence states are defined as those that have had an average of ≥10 confirmed cases of Lyme disease per 100,000 residents over the previous three reporting years [3]. Low-incidence states are defined as states with a disease incidence of <10 confirmed cases per 100,000 residents. Cases of erythema migrans with exposure to tick habitat in a high-incidence state are classified as confirmed. All late manifestations of LD (musculoskeletal, cardiac, and nervous system) and early LD with exposure in a low-incidence state must also be accompanied by appropriate laboratory testing to fulfill the surveillance case definition requirements. Based on the criteria listed above, North Carolina is currently designated as a low-incidence state for surveillance purposes.

Serologic testing for Lyme disease
If LD is suspected, two-tiered serological testing is recommended [4,5]. Patients should first be tested by enzyme immunoassay (EIA) or immunofluorescent assay (IFA), and positive and equivocal results should
be confirmed by further testing with the more specific Western blot test. Patients may test negative early in the course of infection, so if LD is highly suspected a convalescent sample should also be tested. For patients who have been ill for more than 4 weeks, IgG will usually be positive by Western blot; an isolated positive IgM in this timeframe is likely a false positive (Fig. 3).

**Erythema migrans (EM) rash in NC**

There are multiple potential causes of EM, including STARI (southern tick-associated rash illness), ringworm, and cellulitis [6]. STARI can occur after the bite of the lone star tick, *Amblyomma americanum*, the most common tick in North Carolina. Lone star ticks are not known vectors for *B. burgdorferi* [7]. The etiologic agent for STARI is unknown and there is no diagnostic test. STARI presents with an EM-like skin lesion which is clinically indistinguishable from the EM rash associated with LD. For surveillance purposes, an EM rash must be accompanied by laboratory evidence of infection to be considered a confirmed case of Lyme disease. Treatment of EM rash should be initiated using the best judgment of the attending clinician.

**Education of patients, prevention of disease:**

We encourage all clinicians to educate their patients about personal protective measures to minimize their risk of acquiring tickborne illness. Lyme disease prevention materials are available from the CDC [8]. Please visit our website ([http://epi.publichealth.nc.gov/cd/diseases/ticks.html](http://epi.publichealth.nc.gov/cd/diseases/ticks.html)) or contact the epidemiologist on call at 919-733-3419 with any questions regarding surveillance of Lyme disease.

**Figures 1 & 2: Reported Cases of Lyme Disease in North Carolina, 2011–2016**

![Confimred and Probable Lyme disease cases by Month of Illness Onset, NC, 2011-2016; n=1053](image1.png)

![Confirmed and Probable Lyme disease cases by Month of Illness Onset, NC, 2011-2016; n=1053](image2.png)

**References:**

2. 2. [https://www.cdc.gov/nndss/](https://www.cdc.gov/nndss/)
8. 8. [https://www.cdc.gov/lyme/](https://www.cdc.gov/lyme/)
Date: June 2, 2017  
To: All North Carolina Clinicians  
From: Zack Moore, MD, MPH, State Epidemiologist  
Subject: Annual Update on Diagnosis and Surveillance for Tickborne Rickettsial Disease (2 pages)

Introduction
Tickborne rickettsial diseases share clinical similarities and include Rocky Mountain spotted fever as well as diseases caused by other *Rickettsia, Ehrlichia* and *Anaplasma* species. Rocky Mountain spotted fever and other spotted fever illnesses cannot be distinguished by routine testing and, for surveillance purposes, are reported as Spotted Fever Group Rickettsiosis (SFGR, *Rickettsia spp*). SFGR comprised 86% of all TBD reported in North Carolina during 2016. Cases of human monocytic ehrlichiosis (11%) and anaplasmosis (3%) comprised the remainder of tickborne rickettsial disease reports.

Diagnosis and Surveillance
Paired serologic testing of specimens by immunofluorescent assay of IgG antibody is the gold standard for diagnosing tickborne rickettsial diseases[1]. IgG is not detectable during the first week of illness of most tickborne rickettsial diseases; convalescent samples should be collected 2–4 weeks after acute samples for comparison. Because ELISA (EIA) tests are not quantitative and IgM tests lack specificity, relying on these tests alone for diagnosis is not recommended.

Testing for spotted fever rickettsia is available at no charge from the State Laboratory of Public Health (http://slph.state.nc.us/virology-serology/special-serology.asp). It is important to keep in mind that currently available serological tests are not species specific and will cross react with other species in the genus *Rickettsia*.

Several commercial laboratories also offer PCR testing for *Rickettsia rickettsii, Ehrlichia chaffensis* and *Anaplasma phagocytophilum*. DNA detection confirms the diagnosis and can be very helpful when assessing patients acutely ill with anaplasmosis or human monocytic ehrlichiosis. PCR is less sensitive for RMSF because the organism may not be present in the blood in large enough numbers to be detectable.

In North Carolina, the number of reported cases of SFGR (including RMSF) has increased steadily since 2009 (Fig. 1–4). However, only about 5% of cases in any year are confirmed via paired acute and convalescent serology. The vast majority of cases are classified as probable, based on a single serologic result. While this is consistent with national reporting patterns, we request your support to improve diagnostic specificity and surveillance by ordering both acute and convalescent serum samples or considering PCR testing.

Treatment
Regardless of the ultimate cause of infection, if tickborne rickettsial disease is suspected, patients of all ages, including children, should be treated promptly and appropriately with doxycycline [1,2,4]. Tickborne rickettsial diseases are potentially fatal, and since laboratory confirmation of infection may take weeks, therapy should not be delayed pending diagnosis. In a recent survey of healthcare providers, 80% identified doxycycline as the appropriate treatment for Rocky Mountain spotted fever in patients greater than 8 years old, but only 35% correctly chose doxycycline in patients aged
less than 8 years. These findings raise concerns about the higher case-fatality rate of Rocky Mountain spotted fever among children that has been observed nationally [3].

**Recommendations of the CDC and American Academy of Pediatrics [1,4,5]**

The use of doxycycline to treat suspected ehrlichiosis/RMSF in children is standard practice recommended by both CDC and the AAP Committee on Infectious Diseases. Unlike older generations of tetracyclines, the recommended dose and duration of medication needed to treat ehrlichiosis/RMSF has not been shown to cause staining of permanent teeth, even when five courses are given before the age of eight. Healthcare providers should use doxycycline as the first-line treatment for suspected ehrlichiosis/RMSF in patients of all ages.

If you have any questions about surveillance of tick borne rickettsial diseases please visit our website (http://epi.publichealth.nc.gov/cd/diseases/ticks.html) or contact Dr. Alexis M. Barbarin or Dr. Carl Williams at 919-733-3419.

**References**
5. Todd, et. al. No Visible Dental Staining in Children Treated with Doxycycline for Suspected Rocky Mountain Spotted Fever. *J Pediatr.* 2015 May; 166(5): 1246-1251. DOI: [http://dx.doi.org/10.1016/j.jpeds.2015.02.015](http://dx.doi.org/10.1016/j.jpeds.2015.02.015)

**Figures 1–4: Reported Cases of Tickborne Rickettsioses in North Carolina, 2011–2016**

*Note: 2016 data are preliminary and subject to change.*
Reporting Communicable Diseases – Mecklenburg County

To request N.C. Communicable Disease Reporting form, telephone 980-314-9201 or 980-314-9220

Mark all correspondence “CONFIDENTIAL”

**Tuberculosis:**
TB Clinic 980.314.9470
Mecklenburg County Health Department FAX 704.432.2493
2845 Beatties Ford Road
Charlotte, NC 28216

**Sexually Transmitted Diseases, HIV, & AIDS:**
Syphilis and HIV/AIDS Reporting 980.314.9226 or 704.614.2993
Other STD Reporting 980.314.9220
Mecklenburg County Health Department FAX 704.336.6200
700 N. Tryon Street, Suite 214
Charlotte, NC 28202

**All Other Reportable Communicable Diseases**
Report to any of the following nurses:
Lori Bowers, RN 980.314.9212
Shawn Wilson, RN (Child Care Nurse) 980.314.9208
Tiffiney McKoy, RN 980.314.9207
Julie Secrest, RN 980.314.9209
Tammy Moss, RN 980-314-9205
Deborah Lentz, RN 980-314-9204
Susannah Stone-Gill, RN 980-314-9203
Brian Lackey, RN 980-314-9206
Communicable Disease Control FAX 704.353.1202
Mecklenburg County Health Department Urgent after-hours 24/7 704-432-0871
700 N. Tryon Street, Suite 214
Charlotte, NC 28202

**Animal Bite Consultation / Zoonoses / Rabies Prevention:**
Jose Pena 980.314.9210
Communicable Disease Control FAX 704.353-1202
Mecklenburg County Health Department 700 N. Tryon Street, Suite 214
Charlotte, NC 28202
State Veterinarian 919.733.3419
State after hours 919.733.3419

**Suspected Food borne Outbreaks / Restaurant, Lodging, Pool and Institutional Sanitation:**
Food & Facilities Sanitation (Mon-Fri 8-5) 980-314-1620
Mecklenburg County Health Department (evenings; Sat/Sun) 980.314.1660
700 N. Tryon Street, Suite 208 (pager evenings; Sat/Sun) 704.580.0666
Charlotte, NC 28202 FAX 704.336.5306

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