Lyme Disease in 2013: Lessons Learned in Surveillance

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The State of Maryland

Proclamation

From the Governor of the State of Maryland

TICK-BORNE DISEASE AWARENESS MONTH
MAY 2013

WHEREAS, Lyme Disease, which is transmitted by the bite of an infected tick, is the most commonly reported tick-borne disease in Maryland with more than 1,300 cases reported in 2011; and

WHEREAS, Ticks transmit not only Lyme Disease, but also other serious diseases including Rocky Mountain spotted fever, babesiosis, ehrlichiosis, anaplasmosis, and tularemia; and

WHEREAS, Lyme Disease, and other diseases transmitted by ticks, are best prevented by wearing protective clothing, applying appropriate repellents, checking thoroughly for ticks and showering after being in tick habitats, avoiding tick-infested areas, keeping ticks off of pets, and managing the environment to minimize tick abundance; and

WHEREAS, The Maryland Department of Health and Mental Hygiene joins with local health departments, health care providers, veterinarians, community organizations and advocacy groups to raise awareness about these dangers; and

NOW, THEREFORE, I, MARTIN M. O'MALLEY, Governor of the State of Maryland, do hereby proclaim May 2013 as Tick-Borne Disease Awareness Month in the State of Maryland, urging all Marylanders to take steps to avoid tickborne diseases and to work together to raise awareness about these dangers.

In testimony whereof, I have hereunto set my hand and caused the seal of the State to be affixed at Annapolis, Maryland, this 23rd day of April, 2013.
Lyme Disease

- Most common reported vector-borne disease in U.S. and Maryland
  - Caused by *Borrelia burgdorferi*
  - Transmitted by *Ixodes scapularis*
- Incubation period: 3-30 days
- Systemic disease with protean manifestations
- Three stages
  - Early localized
  - Early disseminated
  - Late disseminated

From CDC PHIL – MD woman with EM on right posterior upper arm
<table>
<thead>
<tr>
<th>Disease</th>
<th>Rate Per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chlamydia</td>
<td>466.9</td>
</tr>
<tr>
<td>2. Gonorrhea</td>
<td>110.8</td>
</tr>
<tr>
<td><strong>3. Lyme disease</strong></td>
<td><strong>23.2</strong></td>
</tr>
<tr>
<td>4. HIV/AIDS</td>
<td>20.1</td>
</tr>
<tr>
<td>5. Salmonellosis</td>
<td>17.3</td>
</tr>
<tr>
<td>6. Campylobacteriosis</td>
<td>10.6</td>
</tr>
<tr>
<td>7. <em>Strep</em> Group B, invasive</td>
<td>10.4</td>
</tr>
<tr>
<td>8. <em>Strep pneumoniae</em>, invasive</td>
<td>10.1</td>
</tr>
<tr>
<td>9. Meningitis, aseptic</td>
<td>9.0</td>
</tr>
<tr>
<td>10. Syphilis, Primary &amp; Secondary</td>
<td>7.8</td>
</tr>
</tbody>
</table>
Public Health and Lyme Disease

- **Education**
  - Prevention
  - Early detection → early treatment and better outcome

- **Surveillance**
  - Understand burden of disease
  - Know who is at risk
  - Determine geographic foci
  - Monitor trends
Education
Ecology and Transmission

- *B. burgdorferi* transmitted in tick saliva
- Larval ticks born uninfected
  - Become infected after bloodmeal on reservoir
- Nymphs tiny (1 mm)
  - Need to be attached >24 hours for transmission
- Deer critical as hosts for the tick
Ixodes Nymphs are Very Difficult to Spot
To Remove a Tick

- Use fine-tipped tweezers and protect your hands with a tissue or gloves.
- Grab the tick close to the skin. Don’t twist or jerk the tick.
- Gently pull straight up until all parts of the tick are removed.
- Clean the tick bite with soap and water or an antiseptic.
- Wash your hands with soap and water or an alcohol-based rub.
- Do not use petroleum jelly, a hot match, nail polish or other products to remove ticks.

For more information, visit our web site at www.MarylandTickOff.org

Maryland Department of Health and Mental Hygiene
Community Health Administration
Office of Epidemiology and Disease Control Programs
Center for Veterinary Public Health
201 West Preston Street,
Baltimore, Maryland 21201
1-877-4MD-DHMH (1-877-463-3464)

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April 2008
Looking for a bull’s-eye rash? Look again – erythema migrans can take many forms.

Central Clearing/Target Lesions
The classic bull’s-eye target lesion of Lyme disease occurs in the minority of patients. The majority of Lyme disease skin lesions lack the hallmark rings and central clearing. Only about 20% of Lyme disease lesions have a bull’s-eye appearance.

Uniformly Red Lesions
Most Lyme disease skin lesions are uniformly red without the rings or target appearance. They are distinguished from other skin rashes by their round or oval shape and sharply demarcated borders. Skin lesions often hide in difficult to see places such as behind the knee or in the groin or armpit.

Blistering Lesions - It’s not a spider bite.
1% of Lyme disease skin lesions have a central blistering or pustular appearance that is commonly mistaken for a spider bite. Why does this occur? It is likely a more severe inflammatory reaction to Borrelia burgdorferi that results in skin blistering.

Blue-Red Lesions
Some Lyme disease skin lesions have a blue-purple color and can be mistaken for a bruise. What distinguishes this from a bruise? The perfectly uniform circle and sharply demarcated border. They may be minimally pruritic or sensitive to touch but do not resemble painless lumps or extremely painful like stingers or cellullitis.

Disseminated Lesions
These are not multiple tick bites. The original skin infection of Lyme disease can spread through the bloodstream to other areas of the body, including the joints, nervous system and other areas of the skin. This results in multiple skin lesions that often have variable shapes and appear throughout different areas of the skin.

How to differentiate Lyme disease from other causes of fever and rash.
While viral illnesses and other bacterial infections can cause symptoms of fever, fatigue, and pain that mimic Lyme disease, they do not have large distinct round or oval rashes like Lyme disease. In addition, most viral illnesses have typical cold symptoms of runny nose or prominent cough which are not common in Lyme disease.
Surveillance Begins in Maryland’s 24 Local Health Departments (LHDs)
Lyme Disease Surveillance in Maryland

Healthcare Provider

Orders Lyme disease test

Clinical Laboratory

Results reported

Data provided

Investigation initiated: clinical and other data requested

Positive test results reported

Local Health Department

Classifies case according to case definition

Enters data into NEDSS

Maryland Department of Health and Mental Hygiene

Reviews and finalizes case classification

CDC
Lyme disease (*Borrelia burgdorferi*)

2011 Case Definition

CSTE Position Statement(s)
10-ID-06

Background
This surveillance case definition was developed for national reporting of Lyme disease; it is not intended to be used in clinical diagnosis.

Clinical Description
A systemic, tick-borne disease with protean manifestations, including dermatologic, rheumatologic, neurologic, and cardiac abnormalities. The most common clinical marker for the disease is erythema migrans (EM), the initial skin lesion that occurs in 60%-80% of patients.

For purposes of surveillance, EM is defined as a skin lesion that typically begins as a red macule or papule and expands over a period of days to weeks to form a large round lesion, often with partial central clearing. A single primary lesion must reach greater than or equal to 5 cm in size across its largest diameter. Secondary lesions also may occur. Annular erythematous lesions occurring within several hours of a tick bite represent hypersensitivity reactions and do not qualify as EM. For most patients, the expanding EM lesion is accompanied by other acute symptoms, particularly fatigue, fever, headache, mildly stiff neck, arthralgia, or myalgia. These symptoms are typically intermittent. The diagnosis of EM must be made by a physician. Laboratory confirmation is recommended for persons with no known exposure.
Two-Tiered Testing for Lyme Disease

First Test:
- Enzyme Immunoassay (EIA) OR Immunofluorescence Assay (IFA)

Second Test:
- Signs or symptoms ≤ 30 days
  - IgM and IgG Western Blot
- Signs or symptoms > 30 days
  - IgG Western Blot ONLY

Consider alternative diagnosis OR
If patient with signs/symptoms consistent with Lyme disease for ≤ 30 days, consider obtaining a convalescent serum

National Center for Emerging and Zoonotic Infectious Diseases
Division of Vector Borne Diseases | Bacterial Diseases Branch

CDC
known tick vector are infected with *B. burgdorferi*.

**Case Classification**

**Suspected**

- A case of EM where there is no known exposure (as defined above) and no laboratory evidence of infection (as defined above), OR
- A case with laboratory evidence of infection but no clinical information available (e.g., a laboratory report).

**Probable**

Any other case of physician-diagnosed Lyme disease that has laboratory evidence of infection (as defined above).

**Confirmed**

- A case of EM with a known exposure (as defined above), OR
- A case of EM with laboratory evidence of infection (as defined above) and without a known exposure OR
- A case with at least one late manifestation that has laboratory evidence of infection.

**Comment(s)**

Lyme disease reports will not be considered cases if the medical provider specifically states this is not a case of Lyme disease, or the only symptom listed is "tick bite" or "insect bite."
Public Health and Lyme Disease

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- **Surveillance**
  - Understand burden of disease
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Confirmed and Probable Lyme Disease Cases, Maryland, 1990-2011

Case definition changed
Total Confirmed and Probable Lyme Disease Cases, by Sex and Age Group - Maryland, 2007-2011

Count

Age groups (yrs)

Male
Female
Public Health and Lyme Disease

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Average Annual Incidence of Lyme Disease by Zip Code, Maryland, 1993-1998

Interpreting Surveillance Data

- The public and the media see absolute case counts

- Challenging to explain in simple terms
  - Complexity of surveillance process
  - Data are presented by residence location (not location of exposure)
Key Public Health Messages

- Lyme disease is endemic throughout Maryland

- People should
  - Take precautions to prevent tick bites
  - Learn to recognize signs of tickborne disease
Surveillance Data Help Guide
Public Health Practice

The Lyme and Other Tickborne Diseases Prevention Study (LTDPS)
Hypothesis

A single well-timed acaricide application to residential properties in Lyme disease-endemic areas will reduce the incidence of tick bites and tickborne disease.
LTDPS

- CDC multi-state collaboration
- Randomized, blinded, placebo-controlled trial
  - Acaricide vs. water placebo
- Outcome measures
  - Physician-diagnosed tickborne illness
  - Tick-human encounters
- ~2500 households enrolled
- Implemented in 2011 and 2012
- Data analysis ongoing
LTDPS Study Locations

Maryland
Baltimore, Howard and Harford Counties (Carroll in year 2)

Connecticut
Fairfield County

New York
Dutchess County

Maryland
Baltimore, Howard and Harford Counties (Carroll in year 2)
Lyme Disease Surveillance Presents Challenges

- Resource intensive
  - Burden on healthcare and public health communities
  - Other diseases that require action once identified may garner greater priority for investigation

- Undoubtedly underreported
  - Clinically diagnosed LD not represented in database
  - Investigations lost to follow-up
  - Incomplete laboratory results reported

- Yet, value in conducting surveillance for LD
  - Are there alternative approaches?
TickNET

- Established by CDC in 2007
  - State and local health departments
  - CDC Division of Vector-borne Diseases
  - CDC Division of Parasitic Diseases and Malaria
- Collaborative public health effort
  - Surveillance
  - Research
  - Education
  - Prevention of tickborne diseases
TickNET: Emerging Infections Program Model Adapted for Tickborne Diseases
TickNET: Lyme Disease (LD) Underreporting in Maryland

- Survey of LHDs to systematically characterize LD surveillance practices
- Billing code assessment to explore alternative approaches for Lyme disease surveillance
- Medical record review to determine multiplier
  - “Suspected” cases that would be “Confirmed” with additional information
Local Health Department LD Surveillance Practices

- Wide variability across LHDs for LD investigations
- Trying to streamline LD surveillance by prioritizing investigations most likely to be confirmed
- In 2010, 7 of 24 LHDs lost a total of 3.4 FTEs involved in LD surveillance
- LHDs contact healthcare providers a median of 2 (range 1-4) times for LD investigations
- Median estimated time per LD report is 2.6 (range 0.5-52) hours
Exploring Alternative Approaches to Lyme Disease Surveillance

- Are there billing (ICD9) codes that can predict confirmed LD cases?

- Methods
  - Select 10% random sample of reported LD cases by case classification from 2009
  - Request ICD9 codes from providers
  - Determine sensitivity and specificity of codes or combination of codes
Characteristics of ICD9 Lyme Disease Code (088.81) for Confirmed Lyme Disease

<table>
<thead>
<tr>
<th>NEDSS Classification</th>
<th>Confirmed</th>
<th>Not A Case</th>
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<tbody>
<tr>
<td>088.81</td>
<td>58</td>
<td>47</td>
</tr>
<tr>
<td>088.81 not included</td>
<td>79</td>
<td>148</td>
</tr>
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</table>

- **Sensitivity** = 0.42
- **Specificity** = 0.76
- **Predictive Values**
  - Positive = 0.55
  - Negative = 0.65
Can We Improve by Combining Codes?

Confirmed Cases

Sensitivity

Specificity

Lyme only  Lyme +1  Lyme+2  Lyme+3  Lyme+4
In Summary

- Considerable amount of Lyme disease in Maryland, regardless of exact numbers
- Public health plays key role in education
  - Prevention
  - Early recognition
- Efforts underway to reduce burden of Lyme disease surveillance, at the same time understanding the true burden of Lyme disease
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- Emerging Infections Program (TickNET)
  - Maryland
  - Centers for Disease Control and Prevention
Resources and References

- CDC Lyme disease information: http://www.cdc.gov/lyme/
Prevention of Tickborne Diseases

- Tick bite prevention
  - Repellent
  - Protective clothing
    - Long pants and sleeves
    - Light colored clothing
  - Avoiding tick habitat
  - Daily tick checks
  - Bathe immediately after coming in from outdoors
  - Wash and dry clothes in dryer

- Pet tick preventives
- Environmental management