Tickborne Disease Case Investigations

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Global Health

Tick and Mosquito Infections Spreading Rapidly,
Tens of thousands likely to get tick-borne disease in Mass. this year

Introduction: Vectorborne diseases are common vectorborne pathogens. Rocky Mountain spotted fever is a disease that is often transmitted by ticks. The occurrence of nationally reported cases of Rocky Mountain spotted fever during 2004–2016 were analyzed.

Methods: Data reported to the Centers for Disease Control and Prevention (CDC) during 2004–2016 were analyzed.

Results: A total of 642,602 cases of vectorborne diseases were reported during 2004–2016. The number of cases of Rocky Mountain spotted fever more than doubled during this period, from 1,236 cases in 2004 to 2,403 cases in 2016. Rocky Mountain spotted fever is caused by the bacterium Rickettsia rickettsii, which is transmitted to humans by the bite of an infected tick. The disease is characterized by fever, headache, muscle pain, and rash. Rocky Mountain spotted fever is most commonly diagnosed in the southern United States, but cases have been reported in other regions of the United States.

Conclusions and Implication: Vectorborne diseases are a growing health problem in the United States, and they are often rooted in biologic differences that require major national improvements. including vaccines.

By Donald G. McNeil Jr.

May 1, 2018
Factors Associated with Increasing Risk of Tickborne Diseases

- Fragmented forest environment leading to expansion of habitat
  - Increased deer population
  - Increased white-footed mouse population
  - Increased black-legged tick population
- Amplification of the pathogens
- More people exposed to tick habitat
Where do Ticks Live?

- SHADED
- DAMP
- FORESTED
- BRUSHY
- LEAF LITTER
How Do Ticks Get on You?

- Ticks do not jump, fly, or drop from above

- Ticks grab onto a host when they brush directly against them
How a tick feeds

- Anticoagulants
- Vasodilators
- Pain Inhibitors
- Cementing Material
When Are Ticks Active?

- In general, at temperatures just above freezing

Nymphs most active

Adults most active

Number of Confirmed and Probable Lyme Disease Cases Reported in Massachusetts by Month of Onset, 2014

- Probable Cases
- Confirmed Cases

Month of Onset

Number of Cases

JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
Tickborne Diseases Transmitted by *Ixodes scapularis* (the black-legged tick, or deer tick)

- **Lyme Disease (*Borrelia burgdorferi*)**
  - Early and late manifestations, persistent symptoms in some

- **Babesiosis (*Babesia microti*)**
  - Red blood cell parasite: fever, chills, anemia

- **Anaplasmosis (*Anaplasma phagocytophilum*)**
  - Bacteria that invades white blood cells: fever, headache, muscle aches, chills, sweating, nausea, and vomiting

- **Borrelia miyamotoi**
  - Newly recognized bacteria as a human pathogen, relapsing fever

- **Powassan/Deer Tick Virus**
  - Flavivivirus related to WNV
Reported Cases of Lyme Disease (divided by 10), Babesiosis and Anaplasmosis, by Month, MA
Tick-borne Diseases

*2013: showing laboratory only reporting for Lyme disease

Babesiosis  Anaplasmosis  Lyme
Incidence Rates for Lyme Disease in MA 2010-2014

Incidence Rates (per 100,000 population) for Confirmed and Probable Lyme Disease in Massachusetts 2010-2014*

Statwide Totals

Incidence Rate: 68.30
Population: 6,547,629
Unknown City/Town: 2,588

Incidence Rate

- <= 100
- 101 - 250
- 251 - 500
- > 500
- Suppressed ~
- No Reported Cases

* Data as of 6/3/2015 and subject to change. Case counts less than 5 in populations or less than 50,000 are suppressed to maintain patient confidentiality.
* Population based on 2010 Census data.
Incidence Rates for Babesiosis and Anaplasmosis in MA 2012-2016

Incidence Rates (per 100,000 population*) for Confirmed and Probable Babesiosis in Massachusetts 2012-2016*

Statewide Totals

Incidence Rate

No Reported Cases

Suppressed ~

< 25

25 - 49

50 - 149

>= 150

* Data as of 9/30/2019 and subject to change.

Case counts less than 5 in populations* less than 30,000 are suppressed to maintain patient confidentiality.

* Population based on 2010 Census data.

Incidence Rates (per 100,000 population*) for Confirmed and Probable Anaplasmosis in Massachusetts 2012-2016*

Statewide Totals

Incidence Rate

No Reported Cases

Suppressed ~

< 25

25 - 49

50 - 149

>= 150

* Data as of 9/30/2019 and subject to change.

Case counts less than 5 in populations* less than 30,000 are suppressed to maintain patient confidentiality.

* Population based on 2010 Census data.
Powassan/Deer Tick Virus

- **Pathogen:**
  - North American flavivirus

- **Vector:**
  - Powassan transmitted by *Ixodes cookei* (Lineage I)
  - Deer Tick virus (Lineage II) isolated from *I. scapularis* by Telford, *et al*.

- **Reservoir species:**
  - white-footed mice or ticks?

- **Susceptible population:**
  - Rare disease in humans – but severe illness associated with marked neurological sequelae and 10-15% case-fatality rate
  - Increased recognition with increased evaluation of encephalitis because of WNV
Data Table: In the United States, the number of Powassan virus neuroinvasive disease cases reported each year varies. From 2006 through 2015, an average of 7 cases were reported annually (range 1–12).
Confirmed Powassan Virus Infection Reported in MA

- Made reportable in 2013
  - 2013 – 1 case
  - 2014 – 4 cases
  - 2015 – 3 cases
  - 2016 – 5 cases
  - 2017 – 3 cases

- All encephalitis/meningoencephalitis
  - At least 3 fatalities

- Male 15/female 1
- Ages 21-82 years (mean 64)
- Month of onset
  - Early summer and fall

MA SPHL screening of clinical samples submitted for WNV/EEE testing. Case identification raised provider awareness and increased requests for testing.
Borrelia miyamotoi

- Vector: *Ixodes scapularis*
- Reservoir species: Small rodents/white-footed mice
- Susceptible population:
  - First identified as human pathogen in 2011
  - First US case identified in 2013
Borrelia miyamotoi
Massachusetts, 2013-2017

- Newly reportable, limited data
- 78 cases (48 confirmed, 30 probable)
- 52% male
- Age range: 12-86, median 54 y/o
- Month of onset
  - June, July, August, September
- At least one hospitalization
  - No fatalities
Cases by County, 2013-2017

B. miyamotoi

Boundaries as of January 1, 1980
Cases LBOHs will see in MAVEN

Most common in MA

- Lyme disease*
- Anaplasmosis
- Babesiosis
- Borrelia miyamotoi
- Ehrlichiosis

Most rare in MA

- Rocky Mountain Spotted Fever

* - LBOHs are not asked to conduct case-based follow-up for Lyme disease
Case follow-up in MAVEN

• Goals of TBD surveillance:
  – Track emerging diseases
  – Monitor geographic spread
  – Inform targeted prevention efforts

• EPI staff review serology results that do not meet follow-up thresholds

• Always contact the provider’s office to confirm the diagnosis and obtain clinical data before contacting the patient.
Clinical information (all cases)

• Symptom information
  – Fever
  – Chills
  – Sweats
  – Headache
  – Myalgia (muscle pain)
  – Arthralgia (joint pain)
  – Anemia (low hemoglobin)
  – Leukopenia (low white blood cell count)
  – Thrombocytopenia (low blood platelet count)
  – Elevated liver function tests
  – Rash

• Hospitalization history

Critical for case classification and, subsequently, accurate case counts
Risk history information

• For all cases
  – History of known tick bite
  – Travel history

• For babesiosis, ask about:
  – History of receiving blood transfusion, tissue products, or organ transplant
  – History of donating blood, tissue products, or organs
Simple risk reduction tools

- Awareness
- Repellents
- Showers/Clothes in Dryer
- Tick Checks
- Removal
- Identification
- Healthcare Provider
- Habitat Modification
- And don’t forget your pets
Educational materials available

https://massclearinghouse.ehs.state.ma.us/

Preventing Disease Spread by Ticks

Tick Identification Card

MA Department of Public Health
617.983.6800
www.mass.gov/dph

Mosquitoes:
They’re out in MASS

Mosquitoes can spread diseases that make you very sick. Take steps to protect against mosquito bites.

Ticks:
They’re out in MASS

Ticks are everywhere. They can carry diseases that can make you, your family, or your pets very sick. Take steps to protect against tick bites.
Public Resources

DPH
• www.mass.gov/dph/tick

UMass
• http://www.tickdiseases.org/

Tick Encounter – URI
• http://www.tickencounter.org/

CT Agricultural Station

Repellent Selector Tools
• https://www.epa.gov/insect-repellents/find-insect-repellent-right-you
• http://pi.ace.orst.edu/repellents/
Questions?

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