Vectorborne Diseases in Maine

Presented by:
Maine Center for Disease Control and Prevention

Emer Smith, MPH
Field Epidemiologist
Presentation Agenda

- Tick biology
- Lyme disease
- Other tick-borne diseases in Maine
- Prevention
- Mosquito ecology
- Mosquito-borne illnesses

Maine Center for Disease Control and Prevention
Ticks in Maine

• There are 15 different species of ticks endemic to Maine

• Deer Ticks, Dog Ticks, Woodchuck tick, squirrel tick, *Ixodes muris*, *Ixodes angustus*, Moose tick, Rabbit tick, Lone Star Tick, Brown Dog Tick (Kennel Tick), Bird Tick, *Ixodes brunneus*, *Ixodes dentatus*, *Ixodes uriae*, and *Ixodes banksi*.

Maine Center for Disease Control and Prevention
Ixodes Scapularis (Deer Tick)

- **Blacklegged (or deer) ticks** (*Ixodes scapularis* can transmit several tick-borne diseases including anaplasmosis, babesiosis, and Lyme disease)
- **Nymphal ticks (~1/16”):** most commonly bite humans and are usually found in the spring and fall
- *Generally,* deer ticks prefer wooded areas.

Larger than actual size.

Maine Center for Disease Control and Prevention
Dog ticks (*Dermacentor variabilis*) have either a white scutum (dot or shield behind the head) or white ‘racing stripes’ down the back.

- In the summer, large adult dog ticks (1/8”-3/16”) can be found.
- Typically they are commonly found in open habitats.
Deer Ticks vs. Dog Ticks

Maine Center for Disease Control and Prevention
Risk of human infection greatest in late spring and summer
Bite is Worse Than the Bark

- Hypostome barbed
- Ticks secrete an anesthesia and anticoagulant when biting
- To transmit the Lyme bacterium (*Borrelia burgdorferi*), ticks must feed for at least 24 hours!

A: Scanning Electron Microscope (SEM) image of a deer tick. Courtesy of MicroAngela

B: *Borrelia burgdorferi* spirochete. Courtesy of US CDC
Tick Distribution

1994

Maine Medical Center Research Institute
Vector-borne Disease Laboratory
Deer Tick Submissions 1989-1994

# ticks submitted

0 - 4
5 - 19
20 - 49
50 - 199
200 - 800

2013

Submissions of *Ixodes scapularis* to MMCRI, 1989-2013

Legend

1989-2013

0
1-5
6-20
21-50
51-200
>200
Weekly Deer Tick Submissions: 1989-2010
Ticks & Habitat

• **Favorable Habitat**
  – Deciduous (broadleaf) forest such as oaks
  – Shrubby areas

Photos: MMCRI
Unfavorable Habitat

- Open, dry habitats
Lyme Disease
# Symptoms of Lyme Disease

**Early Manifestations of Lyme Disease**

- Erythema migrans (bull’s eye rash)
- Muscle and joint pain
- Fatigue
- Chills, fever, and headache
- Swollen lymph nodes

**Disseminated Manifestations of Lyme Disease**

- Arthritis with recurrent, brief attacks of joint swelling
- Lymphocytic meningitis
- Cranial neuritis (such as Bell’s palsy)
- Encephalitis
- 2nd or 3rd degree atrioventricular block

EM image: CDC

Maine Center for Disease Control and Prevention
Lyme Disease Cases
Maine, 2007-2016

Lyme Disease Cases - Maine, 2006-2016

Number of Cases

Cases: 530 909 976 752 1012 1113 1384 1410 1215 1485
Lyme Disease in Maine

2004

2008

2012

2016

Rate

- <6
- 6.1 - 25
- 25.1 - 50
- 50.1 - 100
- >100

Maine Center for Disease Control and Prevention
Seasonality of Cases in Maine

*data as of 1/18/2017

Maine Center for Disease Control and Prevention
Lyme Disease Rates by Age Group
Maine, 2011-2016

Lyme disease rates by age group:
Maine 2011-16

Rate per 100,000 persons

Maine Center for Disease Control and Prevention
Treatment

• Identify symptoms early, as treatment is more effective the earlier it is started

• If bitten by a deer tick: monitor for signs and symptoms of Lyme disease for 3-30 days following bite

• If you have symptoms consistent with Lyme Disease, consult a healthcare provider for treatment

• Current treatment guidelines can be found on the Infectious Diseases Society of America website:

  http://www.idsociety.org/Lyme/
  https://academic.oup.com/cid/article-lookup/doi/10.1086/508667
Other Tick-borne diseases
Anaplasmosis

- Carried by *Ixodes scapularis* tick

- Symptoms range from mild: (fever, headaches, body aches) to severe: (encephalitis, death).

- Testing can be done by PCR (preferred), morulae visualization, or serology
Anaplasmosis

- **Cases**
  - 2016: 372
  - 2015: 185
  - 2014: 191
  - 2013: 94
  - 2012: 52
  - 2011: 26
  - 2010: 17
  - 2009: 15
  - 2008: 17
  - 2007: 9
Babesiosis

- Carried by *Ixodes scapularis* tick
- Symptoms include: fatigue, sweating, dark urine, chills and possible anemia.
- Testing can be done by PCR (preferred), parasite visualization, or serology
Babesiosis

• Cases
  – 2016: 82
  – 2015: 55
  – 2014: 42
  – 2013: 36
  – 2012: 10
  – 2011: 9
  – 2010: 5
  – 2009: 3
  – 2008: 11
  – 2007: 11
Powassan

- Maine had confirmed cases in 2013, 2015, 2016, and 2017
- Rare
- Two strains of the virus, one carries by *Ixodes scapularis* (DTV) and one carried by *Ixodes cookei*. Clinically there is no difference between the strains
- Only tickborne arboviral disease in the U.S. and Canada
This is the link to the PubMed abstract for the article that is most commonly cited for the 15 minute transmission time for Powassan…

Other Tick-Borne diseases

- **Rocky Mountain Spotted Fever (RMSF)**
  - Potentially carried by the dog tick (*Dermacentor variabilis*)
  - Ticks in Maine not known to be infected
  - Symptoms include fever, headache, rash
  - Testing is by serology

- **Ehrlichiosis**
  - Carried by the Lonestar tick (*Amblyomma americanum*) which is uncommon in Maine
  - Symptoms include fever, headache, nausea and body aches
  - Testing by PCR (preferred) or serology
Borrelia miyamotoi

- Newly described tick-borne illness
- Closely related to bacteria that cause tick-borne relapsing fever
- First identified in ticks in 1995
- First cases identified in Maine residents in 2016
- Commercial tests available from multiple reference laboratories (Imugen, Mayo, Quest)
Personal Protection

- Dress appropriately when outdoors
- Use repellants containing DEET, oil of lemon eucalyptus, IR3535, picaridin, or permethrin
- Thoroughly wash and dry clothes
Personal Protection

• Do a daily “Tick Check” by sight and by touch-inspect your body after being outdoors, and again a few hours later

• Pay attention to your head, hairline, nape of the neck, armpits, waist, between your legs, thighs, and behind the knees

• Do a “Tick Check” on your pets as well
Don’t Forget to Check for Ticks!!

They look a little something like this:

But their actual size is more like this:

Places on your body where ticks commonly hide:

WHAT TO DO IF YOU FIND ONE ON YOUR BODY:

- Grasp the tick with tweezers as close to the skin as possible.
- Pull gently but firmly until the tick lets go.
- Do not handle the tick with bare hands or squeeze the tick.
- Apply antiseptic to the bite.
Make your yard safer

• Remove brush, leaf litter and tall grass

• Create a dry border between woods and lawn

• Remove plants that attract deer and construct physical barriers that may discourage deer from entering your yard

Maine Center for Disease Control and Prevention
Tick Removal: Prompt Removal is Important!

With a Tick Spoon

• Place the wide part of the notch on the skin near the tick (hold skin taut if necessary)
• Applying slight pressure downward on the skin, slide the spoon forward so the small part of the notch is framing the tick
• Continuous sliding motion of the remover detaches the tick

With Tweezers

• Grasp the tick close to the skin with tweezers
• Pull gently until the tick lets go
Killing / Preserving Ticks

• To kill a tick found in your home or removed from a person or pet, it is easiest to put it in a container of rubbing alcohol
• Tick will soon die and be preserved in the event it is submitted to a laboratory
• Washing your clothes will not kill the tick, however drying the clothes on high heat before washing will kill the ticks.
Submitting Ticks

• Tick identification is available at the University of Maine Orono Cooperative Extension

• Tick submission form should accompany each tick. Forms and instructions can be downloaded at http://umaine.edu/ipm/tickid/
Submitting Ticks

• Contact physician for medical advice

• Send ticks in crushproof, waterproof container in rubbing alcohol.

• Tick species and degree of engorgement will be identified

• Ticks will not be tested to see if they carry Lyme
tick ID
KNOW THEM. PREVENT THEM.

Deer Tick (Black-Legged Tick)
- Nymph
- Adult male
- Adult female

- Deer ticks may transmit the agents that cause Lyme disease, anaplasmosis, and babesiosis
- What bites: nymphs and adult females
- When: anytime temperatures are above freezing, greatest risk is spring through fall

Dog Tick
- Adult male
- Adult female

- Dog ticks do not transmit the agent that causes Lyme disease
- What bites: adult females
- When: April–August through fall

Prevent the Bite
- Wear light-colored protective clothing
- Use EPA-approved insect repellent on skin or clothing
- Use caution in tick infested areas
- Perform daily tick checks
- Protect your pets, use repellents, acaricides, and a Lyme disease vaccine for dogs

Tick Removal
- Remove ticks immediately. They usually need to attach for 24 hours to transmit Lyme disease. Consult a physician if you remove an engorged deer tick.

Using a Tick Spoon:
- Place the wide part of the notch on the skin near the tick (hold skin taut if necessary)
- Applying slight pressure downward on the skin, slide the remover forward so the small part of the notch is framing the tick
- Continuous sliding motion of the remover detaches the tick

Using Tweezers:
- Grasp the tick close to the skin with tweezers
- Pull gently until the tick lets go

1-800-821-5821 | www.maine.gov
Mosquito Borne Diseases
Mosquito-borne diseases

- **Eastern Equine Encephalitis**
  - One of the most serious mosquito-borne diseases in the United States
  - Many persons infected will have no obvious symptoms

- **West Nile virus**
  - Occurs throughout the United States
  - Many persons infected will have no obvious symptoms
Mosquito Species

- 45 mosquito species in Maine, however less than half are considered to be likely vectors for EEE and WNV

Maine Center for Disease Control and Prevention
**EEE vector habitat**

- *Cs. melanura* primary vector of EEE
- Bogs and swamps
  - Mature hemlock, immature red maple, yellow birch, beech, winterberry, shrubs
  - Clear or tea colored water
  - Peat bottom
  - Acidic
- Early emergence in spring, overwinter as larvae, multiple generations
- Also WNV competent
- Primarily bird biters

Photo courtesy of Kim Foss, Swamp Inc
WNV vector habitat

Cx. *pipiens/restuans*
common WNV vector
– Artificial containers
  • Catch basins
  • Flower pots
  • Discarded tires
– Stagnant temporary pools
– Holes in trees
– Multiple generations
  • Can overwinter as adults
– Generalist feeders

Maine Center for Disease Control and Prevention
EEEV and WNV Transmission Cycle

Amplification cycle

Bridge mosquito vectors

Incidental & “dead-end” hosts

Maine Center for Disease Control and Prevention
Most people infected with an arbovirus will not have symptoms.

Symptoms can be very mild to very severe and appear 3-18 days after infection.

- **Mild**
  - Fever
  - Head and body aches
  - Lack of energy
- **Neuroinvasive Disease**
  - Central nervous system involvement
  - Stiff neck, altered mental status, inflammation of the brain, respiratory distress, paralysis, coma, death

Symptoms usually last 1-2 weeks, no treatment, only support.
go ahead

fight

the

bite

You can protect yourself against West Nile virus and Eastern equine encephalitis

- Wear long sleeves and long pants.
- Use repellent on skin and clothes.
- Take extra precautions at dusk and dawn.
- Use screens on your windows and doors
- Drain artificial sources of standing water where you live, work and play.

For more information about mosquito-borne diseases visit www.maineepublichealth.gov
• Maine CDC disease reporting and consultation line: 1-800-821-5821

• Maine Medical Center Research Institute – Vector-borne Disease Lab: 207-396-8246 ticklab@mmc.org

• UMaine Cooperative Extension: 207-581-3880

• Maine CDC Vector-Borne Disease Website: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/index.shtml

• Disease.reporting@maine.gov
Thank You!

Emer S. Smith, MPH
Field Epidemiologist, Cumberland District
Maine Center for Disease Control and Prevention
emer.smith@maine.gov
(207) 822-2369