Deer Ticks...One bite can change your life...

Cape Cod Cranberry Growers Association
March 8, 2017

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Incidence Rate Lyme: 2014

State Ranking

1. Maine - 88*
2. Vermont - 71
3. Massachusetts - 54
4. Rhode Island - 54
5. Pennsylvania - 51
6. Connecticut - 48
7. New Hampshire - 47

U.S. - 8

* Confirmed cases Per 100,000
CDC - 300,000 Cases per Year
American Dog Tick
Dermacentor variabilis
Lone Star Tick

*Amblyomma americanum*
Lone Star Tick Distribution
Lone Star Tick

- Aggressive biter
  - Erlichiosis
  - STARI
  - Tularemia

Bite can trigger allergy to red meat consumption

Beef, Pork, Lamb and by-products...gelatin
Deer Tick, or Blacklegged Tick
Ticks are designed to stay a while...
About Hosts…

125 vertebrate species

Complex Ecosystem…

Rodents are KEY infective hosts – Mice, chipmunks, rats are extremely “competent”

Birds play a role

“Incompetent” hosts – Deer, raccoons, dogs, people
Tick SIZE WISE?
check your bagels

Adult

Nymph
Risk of infection is year round, but the greatest risk…

is NOT the tick adults

Fall thru Spring, 50% infected

Bite more likely to be detected

…it’s from the nymph stage

Late May into August, 25% infected

Bite is more difficult to detect
Number of Confirmed and Probable Lyme Disease Cases Reported in Massachusetts by Month of Onset, 2014

Month of Onset

Number of Cases

- Probable Cases
- Confirmed Cases
Incidence Rates of Confirmed and Probable Lyme Disease Cases in Massachusetts by Age Group, 2014

Cases (per 100,000)

Age (years)

Probable
Confirmed
Southeastern MA Winters: Kill Ticks?
Ticks make glycerol...

...antifreeze

Glycerol prevents ice crystal formation in cells

Lyme bacteria use glycerol as a carbon (= energy) source
“Jamie...I’ve been told that if you agitate a tick with something like a chemical, it will throw up and infect you with Lyme...”

“Well Adam...I think that it’s time to take a serious look at tick morphology...”
Pharyngeal Valve

Saliva Out

Blood In

FIGURE 6.1: Diagram illustrating the mouthparts of a representative ixodid tick (*Dermacentor andersoni*) as seen in tangential and cross-section. Tangential section through the capitulum. ala, Alae (indicated by the heavy black line; alar muscles indicated by fine parallel lines on either side of the alae); b. cav., buccal cavity (mouth); ch, chelicera; c.s., cheliceral sheath (inner sheath or cone sheath in Gregson [1960]); di, cheliceral digits; G.o., Gene's organ; hd, hood; hyp., hypostome; i.c.b., inter-coxal bridge; lab, labrum; mb, membrane over preoral canal; o.c.s., outer cheliceral sheath; o.m., oval membrane-covered area of chelicera; P. II, palpal segment II; p.a., porose areas (indicated by lines through the cuticle); p.c.s., posterior cheliceral sheath; Pr.c., preoral canal; ph., pharynx; p.o., pharyngeal orifice; p.v., pharyngeal valve (indicated by curved semicircle); R.ch., retractor muscle; sal., salivarium; s.d., salivary duct; s.ch.p., subcheliceral plate (epistome); Te, tectum. Redrawn and labeled from Gregson, J.D. (1960) Morphology and functioning of the mouthparts of *Dermacentor andersoni* Stiles. Part I. The feeding mechanism in relation to the tick. Acta Tropica 17:48–72, with permission from Elsevier.
“Upon further examination the complexity of this problem continues to grow....”
Babesiosis

- Invades Red Blood Cells

- Symptoms include fever/chills, severe anemia

- Blood Transfusion
Incidence Rates (per 100,000 population*) for Confirmed and Probable Babesiosis in Massachusetts: 2010-2014*

* Data as of 17FEB2015 and are subject to change
* Using 2010 Census data
* Case counts less than 5 in populations less than 50,000 are suppressed to maintain patient confidentiality.
- **Anaplasmosis (HGA)**
  - Invades White Blood Cells
  - Symptoms include fever, nausea, headache, muscle pain, abdominal pain, confusion...
Incidence Rates (per 100,000 population\textsuperscript{*}) for Confirmed and Probable Anaplasmosis in Massachusetts: 2010-2014\textsuperscript{*}

* Data as of 17MAR2015 and are subject to change.

\textsuperscript{*} Using 2010 Census data

\textsuperscript{*} Case counts less than 5 in populations less than 50,000 are suppressed to maintain patient confidentiality.
Borrelia miyamotoi

- First linkage to human disease in 2012 – Russia
- U.S. cases followed…Relapsing Fever
- Found in 2.3% of ticks tested from Cape - 2016
Massachusetts Powassan
2013 - 2015

- 9 cases
- Residents of: Barnstable, Essex, Middlesex and Norfolk counties
- Exposure occurred in Massachusetts
- Encephalitis requiring hospitalization
- One fatality
Phase 1 Game Plan - Protect Yourself
Protect Yourself

- Long pants - tucked into socks
- Light colors...easier to see ticks
- Tumble-dry clothes for 20 minutes
- Shoes
Phase 1 Game Plan - Protect Yourself

- Proper Tweezers
- Proper Removal
- Record Date...Save the Tick

- Infection Test Available
  - Laboratory of Medical Zoology...UMass-Amherst
  - www.TickReport.com
<table>
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<th>Pathogen</th>
<th>Date Ordered</th>
<th>Result</th>
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<tbody>
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<td>Borrelia mayonii</td>
<td>4/6/2016</td>
<td>NEGATIVE</td>
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<tr>
<td></td>
<td>Borrelia burgdorferi</td>
<td>3/30/2016</td>
<td>POSITIVE</td>
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<tr>
<td></td>
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<td>Borrelia miyamotoi</td>
<td>3/30/2016</td>
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</tbody>
</table>

**Patient Information:**
- Host Source: human
- Gender: male
- Age: 3
- City: Norwell
- State: MA
- Zip: 02061
- Attached: Yes
- Site of Attachment: Head
- Rash Present: No

**Tick Information**
- Species: *Ixodes scapularis*
- Sex: female
- Stage: adult
- Feeding State: engorged
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Patient Information:

Host Source: human
Gender: 
Age: 
City: Eastham
State: MA
Zip: 02642
Attached: Yes
Site of Attachment: Upper Leg
Rash Present: No

Tick Information
Species: *Ixodes scapularis* (Deer tick)
Sex: female
Stage: adult
Feeding State: partially fed
Deet, Picaridan, IR3535, Oil of Lemon Eucalyptus to treat *exposed skin*

“All Natural”?
FIFRA Section 25(c) Minimum Risk Pesticides

- Active Ingredient *List*
- Claims Linking Pest to Specific Diseases – **NO**
- False or Misleading Statements – i.e. “Chemical Free”
  - Federal Trade Commission

**EPA Registration Exemption**

- Performance Data **NOT** Required

**Note:** Some actives ID’d as known human allergens

Negative interaction observed with sunscreens
Tick Repellent Clothing – Permethrin

Fabric only...Active thru 6 washings
Pre-treated Tick Repellent Clothing

- 70 Washings EPA Claim
- Many brands...one supplier

Or, send clothing to Insect Shield for treatment
Permethrin Facts

- 2,250 times more toxic to ticks than humans

- EPA: Reasonable certainty that permethrin-treated clothing poses no harm to infants, children, pregnant women or nursing mothers

- Low skin absorption…metabolized quickly

- Exposure data also studied by National Academy of Sciences

- Also used for scabies and head lice control
Phase 2 Game Plan - Protect Your Yard

- Wildlife and habitat management ???
- Perimeter sprays effective
  …NOT the entire yard
  Consider all “edges”
Damminix Tubes

- Several initial university studies looked promising
  - Fewer ticks on mice

- Follow-up studies, NY & CT
  - Replicated, multi-year
  - No significant effect on *nymph* tick populations
    
      ...not all tick-carrying animals take cotton

- Company website – testimonial driven, no baseline data in company trial
Phase 3 Game Plan - Protect Your Pets

- Tick check
- Topical products: K9 Advantix II, Frontline
- Seresto collar
I make this vest look GOOD!!!
Don’t Let...one bite change your life...

Simplified Game Plan Summary

- Tick Checks and Use of Permethrin-Treated Clothing
- Perimeter Yard Spray
- Pet Protection
Questions?