Ticks and Tick-borne Diseases in New York State

Town of Bethlehem Deer and Tick-borne Diseases Committee Meeting
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Melissa Prusinski
Research Scientist and Laboratory Supervisor
New York State Department of Health
Bureau of Communicable Disease Control
Vector Ecology Laboratory
Tick Bio 101:

Hard-bodied ticks
Taxonomic family: Ixodidae

4 life stages:
Egg, Larva, Nymph, and Adult

Each active life-stage must feed once on blood in order to develop into the next life-stage.
Ticks in New York State:

- 30 species of ticks
- 10 species commonly bite humans
- 4 species can transmit diseases

**Deer tick**
*Ixodes scapularis*

**Lone Star tick**
*Amblyomma americanum*

**American Dog tick**
*Dermacentor variabilis*

**Woodchuck tick**
*Ixodes cookei*
# Tick-borne Diseases in NY:

<table>
<thead>
<tr>
<th>Disease (causative agent)</th>
<th>Reported NY Cases 2001-2013*</th>
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<tbody>
<tr>
<td>Lyme Disease (<em>Borrelia burgdorferi</em>)</td>
<td>57,047</td>
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<tr>
<td>Human Granulocytic Anaplasmosis (<em>Anaplasma phagocytophilum</em>)</td>
<td>2,784</td>
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<tr>
<td>Babesiosis (<em>Babesia microti</em>)</td>
<td>2,596</td>
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<tr>
<td>Human Monocytic Ehrlichiosis (<em>Ehrlichia chaffeensis</em>)</td>
<td>693</td>
</tr>
<tr>
<td>Rocky Mountain Spotted fever (<em>Rickettsia rickettsii</em>)</td>
<td>179</td>
</tr>
<tr>
<td>Powassan encephalitis (Powassan virus or Deer Tick virus)</td>
<td>18</td>
</tr>
<tr>
<td>Tick-borne relapsing fever (<em>Borrelia miyamotoi</em>)</td>
<td>5 **</td>
</tr>
<tr>
<td>Tularemia (<em>Francisella tularensis</em>)</td>
<td>4</td>
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</tbody>
</table>

* Reported to the NYSDOH by medical providers and clinical laboratories

** Identified in a NYSDOH retrospective study of patients screening negative for anaplasmosis
Lyme Disease cases reported in New York State* 2001 - 2013

n = 57,047

Number of cases

- 0
- 1 - 100
- 101 - 250
- 251 - 500
- 501 - 1,000
- 1,001 - 3,000
- 3,001 - 6,000
- 10,352

*Exclusive of New York City. Sentinel surveillance conducted in 19 counties in at least one year. Confirmed and probable cases, 2013 provisional data.
The Deer tick can potentially transmit **5 diseases:** (in New York State)

- **Lyme disease**
  Most common tick-borne disease in New York State (and the nation)

- **Babesiosis**
  Expanding northward in NY

- **Anaplasmosis**
  Expanding north and westward in NY

- **Powassan encephalitis (Deer Tick virus/DTV)**
  Emerging pathogen, sporadic cases

- **Tick-borne Relapsing Fever** (*Borrelia miyamotoi*)
  Emerging pathogen, sporadic cases identified retrospectively – no commercial lab test available

*As determined from NYSDOH ABDP Tick Identification Service/Passive surveillance*

Number of *I. scapularis*

- 1 - 5
- 6 - 15
- 16 - 25
- 26 - 45
- 46 - 75
- 76 - 105
- 106 - 125
- 126 - 145
- 146 - 185
- 186 - 235

Griffin Laboratory

N = 1886

*As determined from NYSDOH ABDP Tick Identification Service/Passive surveillance*
Locally Acquired *Ixodes scapularis* Mapped by Zip Code 1997-1999*

* As determined from NYSDOH ABDP Tick Identification Service/Passive surveillance

N = 3829
Locally Acquired *Ixodes scapularis* Mapped by Zip Code 2000 - 2002*

Number of *I. scapularis*

- 1 - 5
- 6 - 15
- 16 - 25
- 26 - 45
- 46 - 75
- 76 - 105
- 106 - 125
- 126 - 145
- 146 - 185
- 186 - 235

Griffin Laboratory

N = 4312

*As determined from NYSDOH ABDP Tick Identification Service/Passive Surveillance*
Locally acquired *Ixodes scapularis*
by zip code 2003 – 2004*

N = 3,992

**As determined from NYSDOH AEDP Tick Identification Service / Passive Surveillance**
Locally Acquired Deer Ticks (*Ixodes scapularis*) Mapped by ZIP code*

New York State** 2003 - 2005

*As determined from NYS BCDC Tick Identification Service passive surveillance activities

**Exclusive of New York City
Locally Acquired Deer Ticks (*Ixodes scapularis*) Mapped by ZIP Code*

New York State** 2006 - 2008

Number per ZIP code

- **0**
- 1 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 150
- 151 - 200
- 201 - 319

*As determined from NYSDOH BCDC Tick Identification Service passive surveillance activities
**Exclusive of New York City
Most Lyme cases acquired thru the bite of a nymph
The Seasonal Life cycle of the Deer tick*:

* CT Agricultural Experimental Field Station
Deer tick “questing”

How a Deer tick finds and attaches to a host…

…they do not jump, fly or drop out of trees
Common (and important) hosts of the Deer tick:

Mice, chipmunks, shrews, and other small mammals

larvae and nymphs

white-tailed deer

adult ticks
Integrated Tick Management for control of *Ixodes scapularis*

- Personal protection
- Landscape management
- Management of host abundance
- Host-targeted acaricides
- Area application acaricides
- Biological control
Personal protection:
Personal protection:

Correct Tick Removal Technique:

**Grasp tick with tweezers, as close to the skin as possible (i.e. by the mouthparts or “head” of the tick)**

Pull slowly, with a constant motion away from the skin (perpendicular to skin surface)

**Do not** use petroleum jelly, gasoline, lit match or cigarette, nail polish or any other method.

You may be increasing your risk of acquiring a tick-borne disease!
Landscape management:

- Wood chips along stone wall & under foundation plantings
- 3' wide or greater barrier
- Deer resistant flower garden or vegetable garden with fence
- 3 yard tick migration zone
- Stone wall with tick barrier

* CT Agricultural Experimental Field Station
Landscape management:

* CT Agricultural Experimental Field Station
Landscape management:

* CT Agricultural Experimental Field Station
Management of host abundance:

Eliminate bird feeders or relocate to distant area of yard (reduce mice)

Use of deer fencing (excludes deer)
Host-targeted acaricides:

Deer may harbor hundreds of ticks, transporting and dispersing them over many miles!
Host-targeted acaricides:

- Small mammals serve as hosts to hundreds of immature ticks.

- Many infected nymphs and adult ticks result if the mouse is carrying *B. burgdorferi*. 
Host-targeted acaricides:

“Maxforce Baitbox” applies pesticide to rodents as they go through a maze to locate bait inside.

“4 Poster” deer feeding station applies pesticide as deer eat.
Area application acaricides:

Target tick “hot-spots”: edges of lawns & woods in May/early June for nymphs & October for adult *I. scapularis*
Biological control:

- Minute parasitic wasp (*Ixodiphagus hookeri*) parasitizes *I. scapularis*, but usefulness is limited.

- Engorged *I. scapularis* susceptible to certain nematodes; but to sensitive to ↓ autumn temps.

- Some birds (chickens, guinea fowl, etc.) will eat ticks

- Entomopathogenic fungi most promising, some (*Beauveria bassiana* & *Metarhizium anisopliae*) pathogenic to *I. scapularis*.
Future Option?

Reservoir Targeted Vaccination of Mice

• OspA-based oral vaccine

• 5-year field trial

• 23% reduction in nymphal infection prevalence by year 2

• 76% reduction by year 5

Resources:


Cornell Cooperative Extension of Suffolk County. Integrated Pest Management for the Deer Tick.  

http://wildlifecontrol.info/TickStudy/Documents/PDF/Final%20Report/4-PosterFinalReportpart2.pdf

Questions?