Tick IPM Series
Part 5: Pathogens Found in Ticks Collected on School Grounds and Public Parks

September 14, 2020
Welcome

A recording of this webinar will be available within a week at
http://www.neipmc.org/go/ipmtoolbox
We Welcome Your Questions

• Please submit a question **at any time** using the Q&A feature to your right at any time

• If you’d like to ask a question anonymously, please indicate that at the beginning of your query.
Presenters

Dr. Jody Gangloff-Kaufmann
Senior Extension Associate NYS IPM Program at Cornell University

Dr. Laura Goodman
Assistant Research Professor, College of Veterinary Medicine at Cornell University

Dr. Matt Frye
Extension Educator NYS IPM Program at Cornell University
Some Questions for You
Don’t Get Ticked NY!
A campaign for tick avoidance

Matt Frye, PhD
NYS IPM and Tick Education

2014: NYS IPM receives requests for tick education
-review literature & evaluate outreach efforts-
Tick outreach efforts are “inaccessible” to key audiences - text heavy, overwhelming, must be retrieved - limited information available for children despite risk
Misconceptions about ticks & tickborne disease common - tick prevention, removal and identification

www.americanhunter.org/articles/2017/3/28/a-simple-safe-way-to-remove-ticks/

How to Remove Ticks with Peppermint Oil
What do you do to get rid of one when it latches on to you...
www.wideopenspaces.com
about a year ago · 941 shares

www.amazon.com/TickTwister-Remover-Small-Large/dp/B00X7072HY
Prevention is possible - strategies ignored/overlooked

“Too busy” “I’m Lazy” “Forget” “I’ll feel them crawling on me” “Depends on exposure and risk” “I’m too hairy” “I’ve had Lyme already..”
NYS IPM and Tick Education

2017: Senate Task Force (Serino) funds NYS IPM to create tick outreach and education program

Don’t Get Ticked NY campaign launched
- reduce human exposure to ticks and TBD
- promote IPM: monitoring, personal protection, BMPs

Make tick avoidance easy to understand and accomplish
Ticks and tick-borne diseases have become a significant public health issue in New York, with different tick species and diseases currently present and spreading within the state and region.

More ticks in more places also increases your risk of tick encounters. Changes in land use such as construction of new neighborhoods and shopping centers leave small patches of wooded areas, and these are great habitat for deer and mice. More hosts means more ticks! In addition, a warming climate expands the areas and seasons where ticks actively feed and reproduce.

We help you use IPM to avoid ticks and tick-borne disease.

What Do Ticks Look Like?
TICK IDENTIFICATION CARD

A quick guide to the 3 most common ticks in New York:

- Blacklegged (Deer) Tick
- American Dog (Wood) Tick
- Lone Star Tick

DAILY TICK CHECKS

- Along hairline
- Inside and behind ears
- Armpits
- Belly button
- Between fingers
- Groin
- Behind knees
- Legs
- Between toes

TICK REMOVAL

1. Use fine-tipped tweezers to grasp the tick as close to the skin as possible.
2. Pull upward with steady, even pressure.
3. If mouthparts break off, treat like a splinter.

WHAT TO DO IF YOU HAVE BEEN BITTEN

If you have been bitten by a tick, follow these simple steps:

- Remove tick and save it in a container with the date.
- Disinfect the bite site with soapy water, peroxide or rubbing alcohol.
- Visit NYS DOH at tinyurl.com/ybanravn for symptoms of tick-borne disease.
- Visit “Don’t Get Ticked NY” website for tick avoidance tips.
- Do NOT apply kerosene, vaseline or a lit match to attached ticks.
- Do NOT squeeze a tick’s body during removal.

ACTUAL TICK SIZE

Larger when fed

- Black Legged
- American Dog
- Lone Star

<table>
<thead>
<tr>
<th></th>
<th>Black Legged</th>
<th>American Dog</th>
<th>Lone Star</th>
</tr>
</thead>
<tbody>
<tr>
<td>larva</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>nymph</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>adult</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>female</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

dontgettickedny.org • nysipm.cornell.edu
IDENTIFICACIÓN DE GARRAPATAS

UNA GUÍA PARA LAS GARRAPATAS MÁS COMUNES EN NUEVA YORK

Garrapata de patas negras
Garrapata canina americana
Garrapata estrella solitaria

TAMAÑO REAL

<table>
<thead>
<tr>
<th></th>
<th>Garrapata de patas negras</th>
<th>Garrapata canina americana</th>
<th>Garrapata estrella solitaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>larva</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>la ninfa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>el adulto macho</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>el adulto la hembra</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INSPECCIÓN DIARIA

1. Use una pinza de punta fina para agarrar la garrapata lo más cerca posible de la superficie de la piel.
2. Jale hacia arriba con presión constante.
3. Si partes de la boca se quedan pegadas en la piel, tratar esto como una astilla.

QUITAR UNA GARRAPATA

EN EL CABELO
DENTRO Y DÉTRAS DE LAS OREJAS
LAS AXIAS
EL OMBlIGO
ENTRE LOS DEDOS
LA INGLE
DETRÁS DE LAS RODILLAS
LAS PIERNAS
LOS DEDOS DE LOS PIES

QUÉ HACER EN CASO DE UNA PICADURA DE GARRAPATA

Si usted tiene una picadura de garrapata seguir estos pasos simples:

- Quite la garrapata y guárdela en un frasco con la fecha.
- Desinfecte el lugar de la picadura con alcohol, peróxido, o con agua y jabón.
- Visite NYSDOH en tinyurl.com/ybanravv para los síntomas de la enfermedad transmitida por garrapatas.
- Visite dontgettickedny.org para consejos para evitar garrapatas.
- No aplique queroseno, vaselina ni encienda un fósforo sobre las garrapatas en la piel.
- No apriete el cuerpo de una garrapata durante la extracción.

dontgettickedny.org • nysipm.cornell.edu

Financiado por NY State Ticks in Lyme and Tick-borne Diseases.
Tick Infographic Posters (13)

Communicate 1-2 key ideas each

Image-based information accessible to more audiences

Captures interest compared to text-based documents

Less “work” to understand concept
Daily Tick Check

When to look?
Where to look?
What to look for?
How to look?

What to do with attached tick?
daily tick check – target audience variants
Where are Ticks?

What habitats support ticks (three common species)?

What activities might expose someone to ticks?

Interpretation and learning
Personal Protection

Permethrin treatments for clothing to kill ticks
[or lower chance of attachment]
- DIY treatment
- Professional treatment
Personal Protection

Options for repellent use to reduce risk of tick encounter

- What products work?
- How products work
- How to apply?
- READ THE LABEL!
Pet Protection

Pets are affected by ticks too

▪ Options for pet protection
▪ How to remove a tick
▪ Reduce exposure to ticks
Monitor for Ticks in your School Yard

1. See slowness in the clothes
2. Slide clothes into covering
3. Or staple cloth to clothes
4. Tie rope to clothes

Dress Accordingly:
- Long Shirts
- Skirts
- Long Pants
- Covering with cloth
- Ties with cloth

1. Use air conditioner
2. Use dehumidifier

Minimize Ticks in School Yard

- Groundcover replaced with hardcover near building
- Extra property surrounded by a deer fence
- Bird feeders attract mice, which carry ticks. Keep area clear of debris
- Mow playground away from wooded area to reduce people in order ticks
- Bird feeders at risk areas from where ticks
- Keep shrubs trimmed, and remove branches and hard flips
- Keep a school athletic field and other trimmed
- Remove invasive plants such as barberry, honeysuckle, and rattlesnake
- Netting or fencing along sports fields to prevent ticks from reaching into risk habitat
- Seal openings in stone walls and clear vegetation
- Planting 3 feet mulch/live barrier between tick habitat and playground

dontgettickedy.org • nysipm.cornell.edu

Funded by NYS Senate Task Force on Lyme and Tick- borne Diseases.
Illustrations by Christopher Madden, Coburn Design.
Protecting Campers

What to do before and after camp to reduce risks for kids
Tick Removal Kits

Data collection on tick removal
How have you removed embedded ticks in the past?

- Other:
- Go to doctor for removal
- Pointy tweezers
- Tick spoon
- Tick key
- Tick twister/tornado
- Petroleum oil
- Burning match or other heat source
- Fingers
- I have never removed a tick
Survey Results

What avoidance techniques have you used?

- Avoid tick habitat
- Stay on trails
- Tuck pants into socks
- Repellent
- Clothing treatment with permethrin
- Heat clothes in dryer after being outdoors
- Shower after being outdoors
- Daily tick check
- Apply tick repellent to pets (i.e., collars, topicals, ...)
- Use a lint roller to remove crawling ticks
- Other:

Use a lint roller to remove crawling ticks
Apply tick repellent to pets (i.e., collars, topicals, ...)
Daily tick check
Shower after being outdoors
Heat clothes in dryer after being outdoors
Clothing treatment with permethrin
Repellent
Tuck pants into socks
Stay on trails
Avoid tick habitat
Survey Results

What avoidance techniques have you used?

- Avoid tick habitat
- Stay on trails
- Tuck pants into socks
- Repellent
- Clothing treatment with permethrin
- Heat clothes in dryer after being outdoors
- Shower after being outdoors
- Daily tick check
- Apply tick repellent to pets (i.e., collars, topicals,...)
- Use a lint roller to remove crawling ticks
- Other:
Survey Results

Do you plan to change your tick avoidance or tick removal behavior as a result of what you learned?

No

Yes
Expanding the Reach

Education Kits

feel cards

tick vials
tick bagels
tick tattoos
Mirror and Window Clings

Prompt tick check at critical times/places [bathroom/car]
Expanding the Reach

YouTube Videos: presentations & tips

How to Remove a Tick
Expanding the Reach

Branded slide sets for various audiences

- General public
- Landscapers
- Schools (maintenance staff/administration)
- Hunter/naturalist
- Campers
- Children
- Others?

Partnering with statewide agencies: NYSTA | NYPMA
Expanding the Reach

community forums

monitoring workshops
Future Directions

• Follow-up survey to assess impact and guide further outreach

• K–12 Activities
  • Classroom lessons
  • Research projects
The New York State IPM Program

@NYSIPM

& NYSIPM

www.dontgettickedny.org
nysipm.cornell.edu
https://blogs.cornell.edu/nysipm/
Research Project

Surveillance: schools & parks
  - Hudson Valley
  - Nassau County

What ticks are present?
Abundance
Distribution
Test for pathogens

Collected by A. Albam, CCE Westchester
Questions?
Questions?
ACTIVE SURVEILLANCE OF PATHOGENS FROM TICKS
IN NEW YORK STATE SUBURBAN PARKS & SCHOOL YARDS

Laura Goodman
Cornell University College of Veterinary Medicine
Animal Health Diagnostic Center &
NY State Veterinary Diagnostic Laboratory Ithaca, NY

Jody Gangloff-Kaufmann
The New York State Integrated Pest Management
Program, Cornell University

Qin Yuan,
Cornell MPH 2019
Project support by NY Senator Sue Serino – NYS Senate Lyme and TBD Task Force
Objectives of the project

- Test TBD risks thru transects of school properties (woods to field), tick abundance,
- TBD testing of ticks collected in a variety of efforts in NY,
- Describe tick distribution in Nassau County, NY,
- Characterize TBD in Nassau County, NY.
Study aims

- Improve the understanding of tick-borne pathogen prevalence on school properties and in parks in NYS;
- Highlight the importance of active surveillance for tick-borne diseases.
Study limitations

- Funding came in October 2018, period of funding ended March 2019.
- Fall sampling hindered by very cold weather, rain, snow.
- Sampling - Oct 18 to December 21
- Mainly *Ixodes scapularis* adults collected.
- Schools in Nassau generally urban, lacking habitat
Fences around suburban LI schools limited deer, transects and tick abundance in fields...
Sampling Methods

- Selection of study area sites
  - School grounds (mainly Capitol region),
  - State and county parks,
  - Public and private wildlife preserves,
  - Added ticks collected from a Christmas tree farm survey.
- A total of 19 schoolyards and 32 parks were sampled.
We visualized sites using Google Maps
Sampling method for school transects

- Flannel cloth (1 Y²)
- Temperature > 37°F, no rainfall
School transect sampling scheme

Dates
October 23 to Nov 29

Recorded:
• Date, time
• Temperature
• Humidity
• Cloud cover/sun
• Previous rainfall
Sampling method for HV and NC parks/preserves

- Nassau - Document presence/absence of ticks, not abundance.
- 1 Y^2 cloth drag along pathways, into brush,
- Sampled most of Nassau’s wooded parks and a few HV locations.
- HV - low tick collections
• Many locations lacked ticks.
• Many other places were loaded with ticks.
• Deer and wildlife were noted via anecdotes and physical evidence.
• Deer are more abundant than is obvious.
Urban nature of Nassau County

- As you’d expect, greener spaces have more ticks.
- Many neighborhoods cannot support large wildlife.
Takeaways from prelim surveillance work

- Urban and suburban areas should not be overlooked for tick surveillance.
- Nassau County, while low TBD rates, has ample tick populations.
- Distribution of ticks and risk of TBD is unknown for school properties in NY.
Questions?
Pathogen Testing

- Dr. Laura Goodman’s team at AHDC tested a total of 769 *Ixodes scapularis* collected in 2017 (Christmas tree project) and 2018 (all other sites).
Pathogen testing

- Homogenization with hollow brass beads followed by zirconia beads + chemical lysis
- Extracted DNA and RNA using magnetic bead based robotic method
- Tested for the presence of 17 pathogens by nanochip tick array
County-level prevalence was calculated using the percentage of ticks carrying any one pathogen in question.

Fisher’s exact test was used to evaluate if carriage of any pathogen differed by:

- Life stage (Nymph vs. Adult; Westchester Co. 2017)
- Adult tick sex (Female vs. Male; all sites)
- Habitat (edge of woods, 3 m into woods, not in woods; Capital Region 2018)
## Results – Tick collection (769 in total)

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Simple size</th>
<th>Collection period</th>
<th>Female (%)</th>
<th>Male (%)</th>
<th>Nymph (%)</th>
<th>Collect in the morning (%)</th>
<th>Clear sky cover (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Albany</td>
<td>47</td>
<td>Oct 25</td>
<td>38.3</td>
<td>61.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Westchester*^</td>
<td>45</td>
<td>Apr 26 - Jun 23</td>
<td>32.6</td>
<td>23.9</td>
<td>41.3</td>
<td>42.2</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>Long Island Region</td>
<td>594</td>
<td>Oct 18 - Dec 4</td>
<td>51.7</td>
<td>48.1</td>
<td>0</td>
<td>40.9</td>
<td>67.3</td>
</tr>
<tr>
<td></td>
<td>Nassau</td>
<td>573</td>
<td>Oct 18 - Dec 4</td>
<td>51.3</td>
<td>48.5</td>
<td>0.2</td>
<td>38.9</td>
<td>68.8</td>
</tr>
<tr>
<td></td>
<td>Queens</td>
<td>11</td>
<td>Nov 12</td>
<td>81.8</td>
<td>18.2</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Suffolk</td>
<td>10</td>
<td>Nov 1 - Nov 7</td>
<td>40</td>
<td>60</td>
<td>0</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Capital Region</td>
<td>72</td>
<td>Oct 23 - Nov 11</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>8.3</td>
<td>30.6</td>
</tr>
<tr>
<td></td>
<td>Albany</td>
<td>4</td>
<td>Oct 23</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Rensselaer</td>
<td>42</td>
<td>Nov 8 – Nov 11</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>14.3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Saratoga</td>
<td>19</td>
<td>Oct 25 – Oct 30</td>
<td>47.4</td>
<td>52.6</td>
<td>0</td>
<td>0</td>
<td>63.2</td>
</tr>
<tr>
<td></td>
<td>Schoharie</td>
<td>7</td>
<td>Oct 31</td>
<td>57.1</td>
<td>42.9</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Lower Hudson Valley</td>
<td>11</td>
<td>Nov 29 – Dec 4</td>
<td>72.7</td>
<td>27.3</td>
<td>0</td>
<td>72.7</td>
<td>72.7</td>
</tr>
<tr>
<td></td>
<td>Westchester</td>
<td>7</td>
<td>Nov 29 – Dec 4</td>
<td>71.4</td>
<td>28.6</td>
<td>0</td>
<td>85.7</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Rockland</td>
<td>4</td>
<td>Nov 29 – Dec 3</td>
<td>75</td>
<td>25</td>
<td>0</td>
<td>50</td>
<td>71.4</td>
</tr>
</tbody>
</table>

*1 nymph tick was lost and not tested.
^1 larva tick was not list in the table
Pathogen positive tick distribution

Capital Region

Long Island Region + Lower Hudson Valley
Prevalence of \textit{B. burgdorferi} in adult \textit{I. scapularis} in Southern Counties in 2018

<table>
<thead>
<tr>
<th>County</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nassau</td>
<td>50</td>
</tr>
<tr>
<td>Queens</td>
<td>60</td>
</tr>
<tr>
<td>Suffolk</td>
<td>55</td>
</tr>
<tr>
<td>Albany</td>
<td>65</td>
</tr>
<tr>
<td>Rensselaer</td>
<td>55</td>
</tr>
<tr>
<td>Saratoga</td>
<td>60</td>
</tr>
<tr>
<td>Schoharie</td>
<td>90</td>
</tr>
<tr>
<td>Westchester</td>
<td>80</td>
</tr>
</tbody>
</table>

\textbf{Note:} Prevalence values are based on data from AHDC and NY Gov sources.
Prevalence of *B. microti* in adult *I. scapularis* in Southern Counties in 2018

<table>
<thead>
<tr>
<th>County</th>
<th>AHDC</th>
<th>NY Gov</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nassau</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suffolk</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Albany</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Rensselaer</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Saratoga</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Schoharie</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Westchester</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
Prevalence of *A. phagocytophilum* in adult *I. scapularis* in Southern Counties in 2018

<table>
<thead>
<tr>
<th>County</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nassau</td>
<td>0</td>
</tr>
<tr>
<td>Queens</td>
<td>0</td>
</tr>
<tr>
<td>Suffolk</td>
<td>10</td>
</tr>
<tr>
<td>Albany</td>
<td>15</td>
</tr>
<tr>
<td>Rensselaer</td>
<td>20</td>
</tr>
<tr>
<td>Saratoga</td>
<td>25</td>
</tr>
<tr>
<td>Schoharie</td>
<td>20</td>
</tr>
<tr>
<td>Westchester</td>
<td>30</td>
</tr>
</tbody>
</table>

Legend:
- **AHDC**
- **NY Gov**
Prevalence of *B. miyamotoi* in adult *I. scapularis* in Southern Counties in 2018
Pathogen Carriage by Life Stage

Higher pathogen prevalence in adults than nymphs (p < 0.001)
Pathogen Carriage by Sex

No difference in pathogen prevalence by sex (p = 0.56)
Pathogen Carriage by Habitat

No difference in pathogen prevalence by habitat (p = 0.14)
Powassan virus in Nassau county, Hudson Valley
First documented *Haemaphysalis longicornis* in New York State

<table>
<thead>
<tr>
<th>NY County</th>
<th>First collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronx</td>
<td>June 2018</td>
</tr>
<tr>
<td>Dutchess</td>
<td>August 2018</td>
</tr>
<tr>
<td>Richmond</td>
<td>June 2017</td>
</tr>
<tr>
<td>Rockland</td>
<td>June 2018</td>
</tr>
<tr>
<td>Suffolk</td>
<td>August 2018</td>
</tr>
<tr>
<td>Westchester</td>
<td>June 2017</td>
</tr>
</tbody>
</table>
Summary

- High prevalence of *B. burgdorferi*, presence of POWV in ticks in Nassau county

- Pathogen prevalence was equivalent in turf and woods

- Coordinated strategic surveillance collaborations are needed
Active surveillance of pathogens from ticks collected in New York State suburban parks and schoolyards

Qin Yuan, Sebastian G. Llanos-Soto, Jody L. Gangloff-Kaufmann✉, Joellen M. Lampman, Matthew J. Frye, Meghan C. Benedict ... See all authors

First published: 22 July 2020 | https://doi.org/10.1111/zph.12749

Yuan and Llanos-Soto contributed equally.

Funding information:
This work was supported by a grant from the New York State Senate Task Force on Lyme and Tick-Borne Disease to the New York State Integrated
## Acknowledgments

### Cornell MPH Program
- Qin Yuan
- Yihong Li
- Gen Meredith

### Cornell Animal Health Diagnostic Center / NY State Veterinary Diagnostic Laboratory
- Sebastian Llanos-Soto
- Meghan Benedict
- Rebecca Tallmadge
- Patrick Mitchell
- Renee Anderson
- Brittany Chilson
- Bryce Stanhope
- Mani Lejeune
- Randall Renshaw
- Melissa Laverack
- Amy Glaser

### NYS IPM Program
- Jody Gangloff-Kaufmann
- Joellen Lampman
- Matt Frye
- Betsy Lamb

### Other organizations
- American Association of Veterinary Laboratory Diagnosticians (AAVLD)
- Northeast Regional Center for Excellence in Vector-Borne Diseases (NEVBD)

### Funding
- New York State Senate Task Force on Lyme and Tick-Borne Disease
Questions?
Some Questions for You
Request for Proposals

• Due date: November 12, 2020
• https://www.northeastipm.org/grant-programs/ipm-center-grants/ipm-partnership-grants/
Find a Colleague

• To post a profile about yourself and your work:
  • http://neipmc.org/go/APra
  • “Find a Colleague” site
  • http://neipmc.org/go/colleagues
Upcoming Webinars

• **Tick IPM #6: Host-Targeted Tick Control – What Works, What Doesn’t, and What’s New**
  Dr. Andrew Li, Research Entomologist, USDA-ARS Invasive Insects Biocontrol and Behavior Laboratory, Beltsville, MD. September 30, 2020, 11:00 am

• **Tick IPM #7: Leaf Litter/Snow Removal for Tick Reduction**
  Dr. Kirby C. Stafford III, Connecticut Agricultural Experiment Station, October 7, 2020 – 11:00 a.m.

For Updates: https://www.northeastipm.org/ipm-in-action/the-ipm-toolbox/
Recording of Tick IPM Webinar Series

• Past recordings and today’s Webinar will be available to view on demand in a few business days.

• [http://www.neipmc.org/go/ipmtoolbox](http://www.neipmc.org/go/ipmtoolbox)

• You can watch as often as you like.
Acknowledgements

This presentation was funded in part by the Northeastern IPM Center through Grant #2018-70006-28882 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.