Vectorborne Diseases and Prevention in NH

NH Health Officers Spring Workshop
May 24, 2018

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Vectorborne Disease

Three components of vectorborne disease

- Pathogen
- Host
- Vector

https://www.sercc.com/climate_health/
Tickborne Disease Program
NH DHHS Tickborne Disease Activities

- Human case surveillance
- Tick surveillance as funding allows
- Distribution of surveillance data
  - Maps, Data Reports, Incidence by County
- Healthcare provider clinical messaging
  - Annual health alert message with clinical, diagnosis, and treatment information
- Public education and prevention messaging
  - NH DHHS website
  - Annual Press Release
  - Availability of public health staff to respond to public inquiries by phone or email
Ticks in NH

Common human-biting species in NH
- American dog tick: Dermacentor variabilis
- Blacklegged tick (deer tick): Ixodes scapularis

Other ticks
- Winter tick: generally does not bite humans, looks similar to dog tick – moose impacted
- Lone star tick: may be moving north to NH eventually

Photo credit: Centers for Disease Control and Prevention (CDC)
Occupations and Activities at Risk

Some of the more common occupations that have a higher risk of tick bites and becoming infected with tickborne diseases include:

- Construction
- Landscaping
- Forestry
- Working with brush
- Working with yard waste
- Land surveying
- Farming
- Railroad work
- Oil field work
- Utility line work
- Park or wildlife management
- Hunting
- Hiking
- Other outdoor work
Lyme Disease
Symptoms of Lyme Disease

Early localized disease
- Incubation: 3 to 32 days
- Early localized disease
  - within 1 month of infection
- Slowly expanding skin lesion (60-80%): erythema migrans (bull’s eye) rash
- Usually accompanied by influenza-like illness: headache, arthralgias, myalgias, fever, lymphadenopathy.

Early disseminated disease
- Weeks to months after initial infection and can involve skin, joints, heart, CNS
- Neurologic disease in 15% of untreated patients - Neuroborreliosis
- Cardiac disease in 5% of untreated patients
  - Recent publication on Lyme carditis deaths
- Musculoskeletal involvement in 60% of untreated patients

Late disseminated disease
- Months to years after initial infection
- Lyme arthritis – 60% (untreated)
- Neuroborreliosis – 5% (untreated)
Number of Reported Lyme Disease Cases by Year, New Hampshire, 2001-2016

Year

Number of Reported Cases

- Confirmed
- Probable

Change in Case Definition
Number of Reported Lyme Cases by Month, New Hampshire, 2012-2016

Month of Disease Onset

Number of Reported Cases

- 2012
- 2013
- 2014
- 2015
- 2016
Distribution of Lyme Disease - 2016

Source: CDC
Reported Cases of Lyme Disease in New Hampshire, 2014

Rates per 100,000

- 0
- 1-49
- 50-99
- 100-199
- ≥200
- Rate not calculated

*Rates not calculated for towns with between 1 and 4 cases.

Note: County/town is based upon residence at the time of disease diagnosis and includes no additional information regarding exposure location. Data are complete as of March 1, 2016.
Presence of the *Borrelia* bacteria in the NH Blacklegged Ticks 2013-2014
Anaplasmosis and Babesiosis
Anaplasmosis and Babesiosis

- Transmitted by the blacklegged tick
- Main reservoir is the white footed mouse
- Flu-like symptoms (most common presentation)
  - Fever, headache, muscle pain, malaise, chills, nausea/abdominal pain, cough, confusion, sweats, headache, body aches, loss of appetite, nausea, fatigue

Image from
http://www.fcps.edu/islandcreekes/ecology/white-footed_mouse.htm
Number of U.S. Anaplasmosis Cases
Distribution of Anaplasmosis, 2010

Source: CDC
Number of U.S. Babesiosis Cases

Source: CDC
Distribution of Babesia, 2013
Powassan Virus
Powassan Virus

- Viral encephalitis
- Incubation from 1 week to 1 month
- Two strains associated with human disease
  - Powassan Virus (POW) – Lineage 1
  - Deer Tick Virus (DTV) – Lineage 2
    - Ixodes scapularis – white-footed mice (DTV)
- Possible symptoms: Drowsiness, headache, confusion, fever, vomiting, weakness, speech difficulties
- Illness could progress to encephalitis (brain), meningitis (membranes), or meningoencephalitis
- Severe, long lasting sequelae in ≥ 50%
- Case fatality ~ 10% (encephalitis)

Source: cdc.gov and ArboNET
Distribution of Powassan Virus 2006-2016

Source: cdc.gov and ArboNET
Mosquitoborne Diseases in NH

- West Nile Virus
- Eastern Equine Encephalitis
- Jamestown Canyon Virus
NH DHHS Arboviral Surveillance Activities

Surveillance and control
- Mosquito
- Town-based program decisions and financing
- Human and veterinary
  - Outreach and coordination with healthcare providers (Health Alert Network messaging)

Public education and prevention messaging
- Distribution of surveillance data
- Test results and risk map updated weekly July-Sept
- Press releases

NH Public Health Laboratories testing
- Mosquito, human, veterinary samples
West Nile Virus
West Nile Virus

- Most commonly transmitted through the bite of an infected mosquito
  
  - *Culex spp*

- Rarely transmitted by:
  
  - Blood transfusions
  - Organ transplants
  - Exposure in a lab
  - From mother to baby during pregnancy, delivery or nursing

- Birds are the main reservoir host
Symptoms of West Nile Virus

- 3-14 days after bite from infected mosquito
- “West Nile Fever”
  - About 20% of those people infected will have mild illness
  - Fever, headache, body aches, swollen lymph nodes
- WNV Neuroinvasive Disease
  - About 1 in every 150 people infected
  - High fever, headache, neck stiffness, muscle weakness, disorientation, meningitis, encephalitis
- People over 50 years of age are at higher risk of developing serious symptoms
2017 WNV Activity - National

121 of 2,002 cases were fatal

Data: CDC ArboNET
Current as of 1/09/2018
NH WNV Activity: 2001-2017

The graph shows the number of WNV (West Nile Virus) cases from 2001 to 2017. The y-axis represents the number of cases, ranging from 0 to 45. The x-axis represents the years from 2001 to 2017.

Legend:
- Human
- Veterinary
- Mosquito

Key observations:
- The highest number of human cases was in 2012.
- The highest number of veterinary cases was in 2012.
- The highest number of mosquito cases was in 2012.
- The number of cases fluctuates year by year.
Eastern Equine Encephalitis
Eastern Equine Encephalitis

- Most commonly transmitted through the bite of an infected mosquito
  - *Aedes, Coquillettidia, Culex spp, Culesita melanura*
- Rarely transmitted by:
  - Lab exposure
  - Bird to bird (emu, pheasants)
- Birds are the main reservoir host
Symptoms of EEE

- Rare but serious disease
- 4-10 days after bite from infected mosquito
- Severe EEE: Encephalitis
  - Sudden high fever, severe headache, stiff neck, can be followed by seizures, coma
  - Approximately 33% mortality
  - Survivors often suffer long-term to permanent brain damage
- May also appear as milder, flu-like illness
- Persons < 15 and >50 are most at risk for severe disease
2017 EEE Activity - National

1 of 3 cases was fatal

Data: CDC ArboNET
Current as of 1/09/2018
Mosquito Testing initiated in 2004
Jamestown Canyon Virus
Jamestown Canyon Virus

- Most commonly transmitted through the bite of an infected mosquito
  - *Aedes, Coquillettidia, Culex, and Culiseta* mosquitoes
- Circulates primarily between deer and mosquitoes
Symptoms of JCV

- Incubation period is unknown
- Symptoms may include: fever, muscle aches, fatigue, dizziness, and headache
- Severe JCV: Encephalitis and meningitis
  - Sudden high fever, severe headache, stiff neck, can be followed by seizures, coma
NH JCV Activity 2013-2017

- **2013**: 1 human case
  - Co-infected with Powassan Virus
- **2015**: 1 human case
- **2017**: 3 human cases
Prevention and Control Measures
Personal Protective Measures: EPA Registered Repellents

- **DEET**
  - Mosquitoes and Ticks

- **Oil of Lemon Eucalyptus**
  - Mosquitoes and Ticks

- **Picaridin**
  - Mosquitoes only!

- **Permethrin**
  - Mosquitoes and Ticks
  - Applied to clothing
  - Permethrin impregnated clothing

Source: CDC
Mosquito and Tick Repellent

Always use according to the product label
For information on EPA registered repellents and their active ingredients:

https://www.epa.gov/insect-repellents/find-insect-repellent-right-you
Protect Yourself Against Tick Bites

- **EVERYONE** should be doing/advocating for these
- Use an EPA registered repellent
- Stay on cleared trails and out of tall grass when possible
- Wear long pants, long sleeves, hat, closed-toe shoes
  - Tuck shirts into pants and pants into socks
  - Light colors may make ticks on clothing easier to spot
- Daily tick checks for you and your pets, remove promptly
- Shower after returning indoors
- Dry clothes in hot dryer
Tick Habitat

Ticks prefer sheltered, humid areas away from direct sunlight

- Tall grass
- Brush
- Leaf litter

All make great tick habitat
Create a “Tick-Safe Zone”

1. **Tick zone**
   - Avoid areas with forest and brush where deer, rodents, and ticks are common.

2. **Wood chip barrier**
   - Use a 3 ft. barrier of wood chips or rock to separate the “tick zone” and rock walls from the lawn.

3. **Wood pile**
   - Keep wood piles on the wood chip barrier, away from the home.

4. **Tick migration zone**
   - Maintain a 9 ft. barrier of lawn between the wood chips and areas such as patios, gardens, and play sets.

5. **Tick safe zone**
   - Enjoy daily living activities such as gardening and outdoor play inside this perimeter.

6. **Gardens**
   - Plant deer resistant crops. If desired, an 8-ft. fence can keep deer out of the yard.

7. **Play sets**
   - Keep play sets in the “tick safe zone” in sunny areas where ticks have difficulty surviving.

Source: CDC

*Based on a diagram by K. Stafford, Connecticut Agricultural Experiment Station*
Prevention Methods and Priorities

- Management of landscaping for schools and communal use areas
- Treatment and/or exclusion of deer
  - An option, but requires extensive maintenance and other considerations
- Treatment and exclusion of mice
  - Owner based decisions
- What about host elimination?
- Area wide acaricide treatment
Tick Removal

- Grasp tick’s mouth parts close to the skin with tweezers
- Pull the tick slowly upwards using a gentle, straight-up motion
- Cleanse your hands and the area around the tick
- Apply an antiseptic to the site
Tick Removal

Do NOT:
- Twist or jerk the tick
- Squeeze the tick
- Rub petroleum jelly on the tick
- Pour kerosene or nail polish on the tick
- Use a hot match or cigarette
- Use dish soap
- Use peanut butter
Mosquito-proofing

Don’t give mosquitoes a place to breed!

- No standing, stagnant containers of water
- Treat standing water
- Dump small containers and put away if possible
- Turn over wheelbarrows, kiddie pools, portable containers
- Clean gutters
- Change water in bird-baths/fountains weekly
- Fold and store tarps
- Drill holes in tires
Additional Information

- The CDC has more national surveillance information and disease specific information
  - [www.cdc.gov](http://www.cdc.gov)

- The State of New Hampshire Arboviral Illness Surveillance, Prevention and Response Plan can be found here:
    - This document has additional information about arboviruses, vectors, and control
    - Updated annually

- The State of New Hampshire Tickborne Disease Prevention Plan
Acknowledgments

NH DHHS Division of Public Health Services
- Benjamin Chan, Elizabeth Talbot, Elizabeth Daly, Katrina Hansen, Abigail Mathewson, Tylor Young

NH Public Health Laboratories
- Christine Bean, Fengxiang Gao, Denise Bolton, Carol Loring, Rebecca Lovell, Trevor Lester
Questions?

Helpful resources
- http://www.cdc.gov/ncezid/dvbd/

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