Update on Vector & Vector-borne Disease Activity in West Virginia 2017

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2018 Mid-Atlantic Mosquito Control Association Meeting
February 14, 2018
Objectives

- Present an update on mosquito and mosquito-borne disease activity in West Virginia
- Provide an update on tick and tick-borne disease activity in West Virginia
Mosquito surveillance conducted May 17 through October 26 in 97 localities in 23 counties

- Regular weekly sampling at counties with high La Crosse encephalitis (LAC) incidence (Raleigh, Fayette, and Nicholas) and low LAC incidence (Kanawha and Wood)
- Outlying areas were surveyed on semi-regular basis by state or local West Virginia Department of Health and Human Resources’ (DHHR) agents

Unsmoothed and smoothed cumulative incidence of La Crosse virus (LACV) infections at the county and census tract levels in children 15 years and younger, West Virginia 2003-2007

Mosquito Surveillance 2017 (cont’d)

- Standardized gravid trap and CDC light trap (CO₂ trap)
- Mosquitoes tested for pathogens by West Virginia Office of Laboratory Services
  - West Nile virus (WNV)
  - LACV
  - St. Louis encephalitis virus (SLEV)
  - Zika Virus (ZIKV)
Utilized BG Sentinel Trap to capture *Aedes albopictus* and *Aedes aegypti*
Sixty-five (65) mosquito pools were infected with WNV
- 49 *Culex* spp.
- 12 *Aedes albopictus*
- 3 *Aedes* spp.
- 1 *Psorophora* spp.

WNV positive mosquito pools by county: Cabell (27), Kanawha (17), Berkeley (6), Jefferson (4), Wayne (3), Wetzel (3), Wood (2), Fayette (1), Putnam (1), and Morgan (1)
The first WNV-positive mosquito pool contained *Culex restuans* active in Cabell County on May 25, 2017.

In the adult mosquitoes, WNV activity began to increase during the middle of July (MMWR Week 28) with WNV MIR value 5.0 during the third week of July (MMWR Week 29).

Across the State, WNV activity in *Culex* mosquitoes reached its peak in September (MMWR Weeks 34-39).
Although statewide the WNV MIR in the *Culex* mosquito population remained low and human risk of WNV infection was moderate from middle of July through August, western and northeastern West Virginia experienced high WNV activity in *Culex* mosquitoes.
Western and northeastern West Virginia experienced high WNV activity in the *Culex* mosquito populations.
Increased WNV activity in mosquitoes prompted the release of a health advisory to health care professionals.
Mosquito Surveillance 2017 (cont’d)

- Two (2) *Aedes japonicus* mosquito pools and one *Culex* mosquito pool tested positive for LACV
- LACV was first detected in *Aedes japonicus* in South Charleston, Kanawha County on June 26
- LACV was also detected in *Aedes japonicus* in different site in South Charleston, Kanawha County on September 22
- *Culex erraticus* and *Culex restuans* collected from Berkeley Springs, Morgan County on August 11 were also infected with LACV
- *Aedes albopictus* was detected in 69 localities in 21 counties surveyed
- *Aedes albopictus* was active throughout the mosquito surveillance season
- *Aedes aegypti* was not detected

Location of *Aedes albopictus* pools in West Virginia (counties shown in blue)
Confirmed and probable human cases of mosquito-borne disease in West Virginia

- One (1) ZIKV cases (travel associated)
- Two (2) malaria cases (travel associated)
- Four (4) LAC cases from Kanawha, Raleigh, and Summers counties
- One (1) WNV case from Cabell County
# Tick-borne Disease

## Tick-borne Diseases by Causative Organism(s) and Presence of Tick Vectors in West Virginia

<table>
<thead>
<tr>
<th>Tick-borne Disease</th>
<th>Pathogen(s)</th>
<th>Tick Vector(s) Present in WV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tularemia</td>
<td><em>Franciscella tularensis</em></td>
<td>American dog tick (<em>Dermacentor variabilis</em>)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lone star tick (<em>Amblyomma americanum</em>)</td>
</tr>
<tr>
<td>Anaplasmosis</td>
<td><em>Anaplasma phagocytophilum</em></td>
<td>Blacklegged tick (<em>Ixodes scapularis</em>)</td>
</tr>
<tr>
<td>Ehrlichiosis</td>
<td><em>Ehrlichia chaffeensis</em></td>
<td>Lone star tick (<em>Amblyomma americanum</em>)</td>
</tr>
<tr>
<td></td>
<td><em>Ehrlichia ewingii</em></td>
<td>Gulf Coast tick (<em>Amblyomma maculatum</em>)</td>
</tr>
<tr>
<td></td>
<td>Panola Mountain <em>Ehrlichia</em> sp.</td>
<td>Blacklegged tick (<em>Ixodes scapularis</em>)</td>
</tr>
<tr>
<td></td>
<td><em>Ehrlichia muris</em>-like agent</td>
<td></td>
</tr>
<tr>
<td>Lyme disease</td>
<td><em>Borrelia burgdorferi</em></td>
<td>Blacklegged tick (<em>Ixodes scapularis</em>)</td>
</tr>
<tr>
<td></td>
<td><em>Borrelia mayonii</em></td>
<td></td>
</tr>
<tr>
<td>Relapsing fever*</td>
<td><em>Borrelia miyamotoi</em></td>
<td>Blacklegged tick (<em>Ixodes scapularis</em>)</td>
</tr>
<tr>
<td>Powassan encephalitis*</td>
<td>Powassan virus</td>
<td>Groundhog tick (<em>Ixodes cookei</em>)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blacklegged tick (<em>Ixodes scapularis</em>)</td>
</tr>
<tr>
<td>Babesiosis</td>
<td><em>Babesia microti</em></td>
<td>Blacklegged tick (<em>Ixodes scapularis</em>)</td>
</tr>
</tbody>
</table>

*This tick-borne disease has not been detected in West Virginia*
Tick-borne Disease Surveillance

Tick-borne Disease Cases for Lyme Disease (2017) (as of January 12, 2018)

<table>
<thead>
<tr>
<th>Tick-borne Disease</th>
<th>Confirmed or Probable Cases (2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lyme disease</td>
<td>637</td>
</tr>
<tr>
<td>Spotted fever group rickettsioses</td>
<td>15</td>
</tr>
<tr>
<td>Ehrlichiosis</td>
<td>6</td>
</tr>
<tr>
<td>Ehrlichiosis/Anaplasmosis Undetermined</td>
<td>1</td>
</tr>
<tr>
<td>Anaplasmosis</td>
<td>1</td>
</tr>
<tr>
<td>Q Fever</td>
<td>3</td>
</tr>
<tr>
<td>Babesiosis</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>664</td>
</tr>
</tbody>
</table>

*aTable includes only confirmed or probable cases that have been reviewed and closed by the Zoonotic Disease Epidemiologist

*bIncludes Rocky Mountain spotted fever
Reported Cases of Lyme Disease by Year - West Virginia
2000-2017

*Updated as of January 12, 2018
Council of State and Territorial Epidemiologists Lyme disease case definition

- Epidemiologic criteria distinguishes exposure in a high incidence vs. low incidence state
- High incidence state: a state having an average of at least ten confirmed cases/100,000 for the previous three reporting years

<table>
<thead>
<tr>
<th>Year</th>
<th># of Confirmed Cases</th>
<th>Incidence per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>112</td>
<td>6.1</td>
</tr>
<tr>
<td>2015</td>
<td>243</td>
<td>13.2</td>
</tr>
<tr>
<td>2016</td>
<td>297</td>
<td>16.1</td>
</tr>
</tbody>
</table>

Average three-year incidence rate 11.8

As of 2017, West Virginia is a high incidence Lyme disease state
Lyme Disease Surveillance (cont’d)

- In response to the increase in Lyme disease cases, West Virginia DHHR released health advisories, press releases, and trainings for local health departments.
West Virginia Veterinary Tick Submission Project

- Created in 2013 as a sentinel surveillance system for detection of vectors of human tick-borne disease
- Veterinarians are invited early in the year to submit tick specimens for identification
- *Ixodes scapularis* ticks are tested for *Borrelia burgdorferi*
  - Cornell University College of Veterinary Medicine (2013)
  - West Virginia University (2014-2016)
Interactive “Story Map” combines active, passive, and sentinel tick surveillance data from 2011–2015

Ticks Surveillance in West Virginia (2011-2015)

Ixodes scapularis

Ixodes scapularis, also known as the “deer tick” or “blacklegged tick,” is widely distributed in the upper midwest and northeastern parts of the United States. The nymph and adult female life stages are most commonly associated with disease transmission. Diseases transmitted by I. scapularis include anaplasmosis, babesiosis, Lyme disease, and Powassan virus.

Over 1,480 I. scapularis have been reported in the 45 blue counties shown on the map on the left. This tick is widely distributed across West Virginia but is limited in southwestern counties. WVWSP and WVDNR submissions have contributed to the majority of I. scapularis identified in West Virginia.

For more information on this tick visit: http://www.cdc.gov/ticks/index.html.

//arcg.is/1QmBrad
County-level data is available for individual tick species

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//arcg.is/1QmBrad
An interactive map function shows distribution of tick species across the State

//arcg.is/1MUxag4
### Summary of veterinary tick submissions for the current reporting period in West Virginia

1. **Dermacentor variabilis**
   - (2013): 472 (77.4) ticks
   - (2014): 994 (85.5) ticks
   - (2015): 699 (54.0) ticks
   - (2016): 723 (51.0) ticks
   - (2017): 803 (35.1) ticks

2. **Amblyomma americanum**
   - (2013): 5 (0.8) ticks
   - (2014): 16 (1.3) ticks
   - (2015): 84 (6.5) ticks
   - (2016): 109 (7.7) ticks
   - (2017): 144 (6.3) ticks

3. **Ixodes scapularis**
   - (2013): 121 (19.8) ticks
   - (2014): 134 (11.5) ticks
   - (2015): 436 (33.7) ticks
   - (2016): 434 (30.6) ticks
   - (2017): 953 (41.7) ticks

4. **Ixodes cookei**
   - (2013): 7 (1.1) ticks
   - (2014): 10 (0.9) ticks
   - (2015): 71 (5.5) ticks
   - (2016): 28 (2.0) ticks
   - (2017): 20 (0.9) ticks

5. **Haemaphysalis leporispalustris**
   - (2013): 5 (0.8) ticks
   - (2014): 8 (0.7) ticks
   - (2015): 0 ticks
   - (2016): 3 (0.2) ticks
   - (2017): 27 (1.2) ticks

6. **Amblyomma maculatum**
   - (2013): 0 ticks
   - (2014): 1 (0.0) ticks
   - (2015): 0 ticks
   - (2016): 1 (0.0) ticks
   - (2017): 1 (0.0) ticks

7. **Rhipicephalus sanguineus**
   - (2013): 0 ticks
   - (2014): 0 ticks
   - (2015): 4 (0.3) ticks
   - (2016): 119 (8.4) ticks
   - (2017): 315 (13.8) ticks

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**Summary of veterinary tick submissions for the current reporting period in West Virginia**

1. **Tick Species**
2. **# of ticks submitted and identified (2013) (%)**
3. **# of ticks submitted and identified (2014) (%)**
4. **# of ticks submitted and identified (2015) (%)**
5. **# of ticks submitted and identified (2016) (%)**
6. **# of ticks submitted and identified (2017) (%)**
In 2016, data was collected on tick-borne diseases present in veterinary patients through WVVTSP

- Patients with submitted samples:
  - 22.2% had 4DX SNAP testing done
  - 15.6% were positive for a tick-borne disease
  - 90.9% of those cases were Lyme positive

*B. burgdorferi 4DX SNAP positive dogs by veterinary practice – WVVTSP, 2016

*Lyme cases marked by clinic geographic coordinates
Positive ticks were removed from three cats
Summary

- WNV activity in the *Culex* mosquito population was low in West Virginia except for counties in western and northeastern West Virginia
- LAC is the major mosquito-borne disease in West Virginia
- The Asian tiger mosquito (*Aedes albopictus*), another competent mosquito vector for ZIKV, is established in most West Virginia counties
- Although the yellow fever mosquito (*Aedes aegypti*) is established in neighboring states, this Zika competent vector has not been recorded in West Virginia
- Human cases of Lyme disease are increasing in West Virginia
- Lyme disease infection in humans and ticks is predominantly in the eastern half of West Virginia
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