Georgia’s response to arboviruses: The vector surveillance program and increased statewide mosquito surveillance

Presentation to: MAMCA Conference
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Date: February 14, 2018
What does Environmental Health have to do with mosquito control?

• Historically, EH had been tasked with dealing with mosquito complaints
  – Many of these programs have been lost as other, mandated, programs took precedence
  – Only 2 county EH programs (Richmond & Muscogee) still did mosquito control prior to the arrival of WNV

• Mosquitoes were largely a nuisance in most of Georgia until WNV came along (2001)
  – Programs developed within EH to deal with vector species
  – An entomologist was hired at the State DPH to assist with mosquito surveillance activities

• WNV funding diminished and “new” mosquito control programs in EH were lost or downsized
Most Common Arboviral Diseases in Georgia

- **West Nile Virus** *
- **Lacrosse Encephalitis** *
- **Eastern Equine Encephalitis** *

**Primary Vectors**
- WNV – *Culex quinquefasciatus* (Southern House Mosquito)
- LAC – *Aedes triseriatus* (treehole mosquito)
- EEE – *Culiseta melanura* (birds); many others (mammals)

* zoonotic diseases

We Protect Lives.
Then, along came ZIKV

• The State EH was tasked with providing mosquito surveillance, and potentially control, in Georgia’s 159 counties.
  – at that time, only a few counties still had WNV programs or worked with local mosquito control to monitor mosquito populations
  – the State Public Health Entomologist provided mosquito surveillance for other WNV higher risk areas in Georgia

• Our response
  – the Vector Surveillance Coordinator program
  – training for EH Strike Teams
  – cross-training local EH to assist with surveillance as needed
**Aedes (Stegomyia) spp: Container Breeders**

**Ae. aegypti**
- Associates closely with people
- Primary vector of a number of viruses
- Urban mosquito
- Daytime biting mosquito
- Shy biter - takes multiple small blood meals
- Found in a few locations in Columbus, GA

**Ae. albopictus**
- Aggressive, daytime biting mosquito
- Associated with used automobile tires
- Suburban species
- Broad host selection
- Found everywhere in Georgia
Where is the Highest Risk?

*Aedes albopictus* is found everywhere in Georgia

This is Georgia’s number one pest species after the saltmarsh mosquitoes

Because it feeds on a variety of hosts, the greatest risk of disease transmission occurs in urbanized areas where humans are the most abundant host

*Aedes aegypti* has recently only been found in Columbus and Savannah (not since 2012)

While this used to be a common species in Georgia, it is currently rare

It feeds exclusively on humans and may feed on multiple people to get a blood meal, making it a very competent vector for ZIKV
Vector Surveillance Coordinator (VSC)

This position has primary responsibility to conduct and coordinate mosquito surveillance for arboviral diseases such as West Nile Virus, Eastern Equine Encephalitis, Lacrosse Encephalitis, Zika and other arboviral diseases in a multi-county region. Duties include:

- establishing surveillance locations throughout the PH Districts,
- setting up traps and collecting mosquitoes,
- mosquito identification,
- community assessments, and
- education programs.

When necessary, this position will coordinate mosquito control activities with existing city/county/contracted mosquito control agencies and assist with localized control efforts.
Environmental Health Strike Teams

- Regional Team Coordination
  - 5 Regions
    - Two (6) six person teams per region
    - 80 members on the roster
- Environmentalists
  - Trained
  - Credentialed
  - Prepared to Deploy
    - Member Go Bags
    - Team Go Bags
    - Incubators
    - Supplies
- Supply trailers support Strike Team activities
- EH Strike Teams function within the ICS under ESF 8- Public Health
Vector Surveillance Training

Complaint Investigation
  – Education
    • Tip and Toss
    • Personal protection
  – Surveillance & ID
    • Surveillance
      – Light traps with CO²
      – Gravid traps
      – BGS traps
      – Larval dipping
    • Species Identification
  – Control
    • Larviciding
    • Barrier spray
Vector Control Training

• Primarily for locally-acquired cases
• Limited site treatment
  – Larvicide Dunks
  – Mosquito Back Pack Sprayer
    • Maverick barrier spray
    • Larvicide pellets
Mosquito Control Support

– 11 total trailers (10 new)
– Mosquito Trailer (Statesboro)
  • moveable lab
  • contains surveillance & ID equipment
– Additional trailers
  • Surveillance Equipment
  • Control Equipment & Supplies
Other Considerations

Besides training and personnel, what has been missing from EH programs tasked with doing mosquito surveillance and control?

– Equipment
– Pesticide

• VSC Regions & non-VSC Districts were supplied with:
  – mosquito traps
  – dissecting microscopes
  – backpack mister/blowers
    • larvicide
    • barrier spray
Number of Counties with Mosquito Surveillance Per Year

What We Did in 2016

<table>
<thead>
<tr>
<th>mosquitoes</th>
<th># mosquitoes</th>
<th># counties</th>
<th>count/county</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aedes albopictus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other sites</td>
<td>3038</td>
<td>32</td>
<td>95</td>
</tr>
<tr>
<td>ZIKV sites</td>
<td>224</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>Aedes aegypti</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other sites</td>
<td>26</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>ZIKV sites</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>year</th>
<th># counties</th>
</tr>
</thead>
<tbody>
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<td>12</td>
</tr>
<tr>
<td>2007</td>
<td>10</td>
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<tr>
<td>2008</td>
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<td>2009</td>
<td>10</td>
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<td>2010</td>
<td>16</td>
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<td>2011</td>
<td>14</td>
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<td>2012</td>
<td>6</td>
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<td>2013</td>
<td>8</td>
</tr>
<tr>
<td>2014</td>
<td>10</td>
</tr>
<tr>
<td>2015</td>
<td>13</td>
</tr>
<tr>
<td>2016</td>
<td>60</td>
</tr>
</tbody>
</table>
2017

• In 2016 we had 4 VSCs, we now have 5
  – they are placed in areas of potential higher risk
  – they are in areas with little to no mosquito control in most of the counties in their region

• We have an assistant entomologist

• There has been additional & more comprehensive training (Larval & Adult ID class)

**GOALS FOR 2017**

• Do some level of mosquito surveillance in every county in Georgia

• Provide mosquito surveillance equipment and train interested people in every Health District to do mosquito surveillance, ID, and control
*Nuisance Complaints*

Communicate with State, District, & County EH

Perform Surveillance (CDC Light Traps and Gravid Traps) and ID Breeding Sites

Tip N Toss/Community Education

**ONLY LARVICIDE IF** there were mosquitoes found through surveillance AND

a) it’s a property of an elderly person who may be unable to clean up their mosquito breeding sites
b) it’s requested by the EH County/District Director
 c) it’s in an area where a great number of people congregate (shopping center, church, school, park, etc)

**DO NOT ADULTICIDE**

*WNV+ (Human/Animal/Mosquito pools)*

Communicate with State, District, & County EH

Perform Surveillance (CDC Light Traps and Gravid Traps) and ID Breeding Sites

Tip N Toss/Community Education

**ONLY LARVICIDE IF, there were mosquitoes found through surveillance**

ONLY APPLY BARRIER SPRAY WITH ADULTICIDE IF there were mosquitoes found through surveillance AND

a) it’s a property of an elderly person who may be unable to clean up their mosquito breeding sites
b) it’s requested by the EH County/District Director
 c) it’s in an area where a great number of people congregate (shopping center, church, school, park, etc)

*Travel-associated Zika Transmission*

Communicate with State, District, & County EH

Perform Surveillance (CDC Light Traps and BG Sentinel Traps) and ID Breeding Sites

Tip N Toss/Community Education

**ONLY LARVICIDE IF, there were mosquitoes found through surveillance**

ONLY APPLY BARRIER SPRAY WITH ADULTICIDE IF there were mosquitoes found through surveillance AND

a) it’s a property of an elderly person who may be unable to clean up their mosquito breeding sites
b) it’s requested by the EH County/District Director
 c) it’s in an area where a great number of people congregate (shopping center, church, school, park, etc)

*Local Zika Transmission and ZikaV+ Mosquito Pools*

Communicate with State, District, & County EH

Barrier Spray and Larvicide (once you have identified Breeding Sites)

Perform Surveillance (CDC Light Traps and BG Sentinel Traps)

Tip N Toss/Community Education

Send Ae. albopictus, Ae. aegypti, and Ae. vexans specimens to UGA for viral testing

**For all situations, be sure to always work with mosquito control if a local program is present.**

If the local program is a spray-only program, surveillance and larvicideing should still be performed.

For locally-acquired zika, treatment is still performed, even if local mosquito control is also involved. If there is no local mosquito control agency, and there is more than one case, contact state EH to set up treatment by the mosquito control company contracted by the state. For one case, see above.
Georgia Mosquito Surveillance

- Counties doing surveillance
- # positive counties
- % WNV+

*6 counties doing testing
**5 counties doing testing
<table>
<thead>
<tr>
<th>Year</th>
<th>Virus</th>
<th>No. of Cases</th>
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<tbody>
<tr>
<td>2014</td>
<td>CHIK</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>DEN</td>
<td>4</td>
</tr>
<tr>
<td>2015</td>
<td>CHIK</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>DEN</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ZIKV</td>
<td>1</td>
</tr>
<tr>
<td>2016</td>
<td>CHIK</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>DEN</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>ZIKV</td>
<td>113</td>
</tr>
<tr>
<td>2017</td>
<td>CHIK</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>DEN</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>ZIKV</td>
<td>11</td>
</tr>
</tbody>
</table>
ZIKV Surveillance

**Aedes albopictus**

2001-2017

**Aedes aegypti**

2001-2017

Chart showing the number of mosquitoes per trap night for **Aedes albopictus** and **Aedes aegypti** from 2001 to 2017.
Human Arboviral Cases in GA
In 2017, Georgia reported 48 cases of WNV and 16 WNV presumptive viremic blood donors (*PVD), with 7 deaths.

- Forty-three (89.5%) of the 48 cases experienced WNV neurologic illness (altered mental status, paralysis, encephalitis, GBS and/or meningitis) and 5 (10.2%) were diagnosed with WNV fever.
- The average age of cases was 61.4 years (range 17-87).
  - The average age of those with WNV neurologic illness was 64.6 years (range 26-87).
- Forty (83%) of the 48 cases were male.
- The majority of cases were reported in July, August, and September, with the peak in August.

WNV in Georgia

# DEATHS

# CASES

# cases  #PVD  all deaths


0 10 20 30 40 50 60 70 80 90 100 110 120

0 1 2 3 4 5 6 7 8
WNV in Companion Animals/Livestock (GA 2001-2017)

WNV in Veterinary Cases, Georgia 2001-2017

Veterinary Surveillance

<table>
<thead>
<tr>
<th>Year</th>
<th>WNV</th>
<th>EEE</th>
</tr>
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<tbody>
<tr>
<td>2016</td>
<td>0</td>
<td>4</td>
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<td>6</td>
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<td>2014</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2013</td>
<td>2</td>
<td>24</td>
</tr>
</tbody>
</table>

The chart shows the number of WNV cases in veterinary cases from 2001 to 2017 in Georgia. The highest number of cases was in 2002.
Eastern Equine Encephalitis in Veterinary Cases, Georgia 1993-2017

mean = 13.8

Veterinary Surveillance

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>WNV</td>
</tr>
<tr>
<td></td>
<td>EEE</td>
</tr>
<tr>
<td>2015</td>
<td>WNV</td>
</tr>
<tr>
<td></td>
<td>EEE</td>
</tr>
<tr>
<td>2014</td>
<td>WNV</td>
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<td></td>
<td>EEE</td>
</tr>
<tr>
<td>2013</td>
<td>WNV</td>
</tr>
<tr>
<td></td>
<td>EEE</td>
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## WNV Surveillance Summary

<table>
<thead>
<tr>
<th>year</th>
<th>WNV+ mosquito pools</th>
<th>counties doing mosquito surveillance</th>
<th># WNV+ counties (mosquitoes)</th>
<th>total mosquitoes pools tested</th>
<th>% WNV+ mosquito pools</th>
<th>WNV+ humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>30</td>
<td>2</td>
<td>1</td>
<td>597</td>
<td>5.03%</td>
<td>6</td>
</tr>
<tr>
<td>2002</td>
<td>91</td>
<td>11</td>
<td>6</td>
<td>4032</td>
<td>2.26%</td>
<td>36</td>
</tr>
<tr>
<td>2003</td>
<td>106</td>
<td>26</td>
<td>6</td>
<td>6177</td>
<td>1.72%</td>
<td>55</td>
</tr>
<tr>
<td>2004</td>
<td>126</td>
<td>56</td>
<td>7</td>
<td>10161</td>
<td>1.24%</td>
<td>23</td>
</tr>
<tr>
<td>2005</td>
<td>67</td>
<td>55</td>
<td>5</td>
<td>15248</td>
<td>0.44%</td>
<td>24</td>
</tr>
<tr>
<td>2006</td>
<td>81</td>
<td>28</td>
<td>5</td>
<td>4785</td>
<td>1.69%</td>
<td>11</td>
</tr>
<tr>
<td>2007</td>
<td>75</td>
<td>28</td>
<td>7</td>
<td>6513</td>
<td>1.15%</td>
<td>55</td>
</tr>
<tr>
<td>2008</td>
<td>51</td>
<td>28</td>
<td>5</td>
<td>6383</td>
<td>0.80%</td>
<td>12</td>
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<tr>
<td>2009</td>
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<td>26</td>
<td>4</td>
<td>4446</td>
<td>0.54%</td>
<td>6</td>
</tr>
<tr>
<td>2010</td>
<td>99</td>
<td>22</td>
<td>5</td>
<td>5990</td>
<td>1.65%</td>
<td>14</td>
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<tr>
<td>2011</td>
<td>438</td>
<td>19</td>
<td>7</td>
<td>7622</td>
<td>5.75%</td>
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<td>2012*</td>
<td>125</td>
<td>13</td>
<td>5</td>
<td>6042</td>
<td>2.07%</td>
<td>117</td>
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<tr>
<td>2013*</td>
<td>166</td>
<td>13</td>
<td>6</td>
<td>7453</td>
<td>2.23%</td>
<td>20</td>
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<tr>
<td>2014*</td>
<td>56</td>
<td>15</td>
<td>4</td>
<td>5038</td>
<td>1.11%</td>
<td>13</td>
</tr>
<tr>
<td>2015*</td>
<td>40</td>
<td>13</td>
<td>3</td>
<td>3366</td>
<td>1.19%</td>
<td>15</td>
</tr>
<tr>
<td>2016*</td>
<td>36</td>
<td>60</td>
<td>2</td>
<td>5620</td>
<td>0.64%</td>
<td>13</td>
</tr>
<tr>
<td>2017**</td>
<td>276</td>
<td>159</td>
<td>4</td>
<td>6418</td>
<td>4.3%</td>
<td>64</td>
</tr>
</tbody>
</table>

*6 counties doing testing

**5 counties doing testing to date
## 2017 WNV+ and EEE+ pools by species

<table>
<thead>
<tr>
<th>Species</th>
<th>WNV+ pools</th>
<th>EEE+ pools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cs. melanura</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Cx. nigripalpus</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cx. quinquefasciatus</td>
<td>262</td>
<td></td>
</tr>
<tr>
<td>Cx. restuans</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Culex spp.</td>
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</tbody>
</table>
## 2017 GA WNV+ Pools by County

<table>
<thead>
<tr>
<th>County</th>
<th># submitted Mosquitoes</th>
<th>WNV+ pools</th>
<th>MIR</th>
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<tbody>
<tr>
<td>Chatham</td>
<td>46126</td>
<td>93</td>
<td>2.02</td>
</tr>
<tr>
<td>DeKalb</td>
<td>13719</td>
<td>155</td>
<td>11.30</td>
</tr>
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<td>Fulton</td>
<td>5042</td>
<td>27</td>
<td>5.36</td>
</tr>
<tr>
<td>Glynn</td>
<td>23912</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowndes</td>
<td>30936</td>
<td>1</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Improvements to the Program for next year

- Perform surveillance earlier
- Identify more and higher yielding surveillance sites
- Provide more Identification classes
- More counties/districts are now equipped with more surveillance and control equipment
- Surveillance performed in each counties more than once by VSCs
ANY QUESTIONS?

This Bus War is ON!

404-408-1207
rosmarie.kelly@dph.ga.gov
www.GAmosquito.org

678-832-8820
thuy-vithi.nguyen@dph.ga.gov

ANY QUESTIONS?
We Protect Lives.