ZIKA IN FLORIDA– PART 2

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http://fmel.ifas.ufl.edu/
http://mosquito.ifas.ufl.edu/
https://www.facebook.com/Florida-Medical-Entomology-Laboratory
Understanding Zika and Mosquito-borne Illnesses

- Humans (and other “hosts”)
- Mosquitoes
- Pathogens (viruses, etc.)
- Environment

Mosquito-borne diseases in Florida

- Dengue
- Dog heartworm
- EEE
- Malaria
- SLE
- Chikungunya
- Dengue
- Dog heartworm
- EEE
- Malaria
- SLE
- West Nile
- Zika

1800s
1900s
2000s
Mosquito biology

Mosquito biology: variation among species

• Feeding
• Type of egg
• Time of activity
• Water source for oviposition/larval habitats
• Length of time to develop through the 4 life stages
• Number of generations per year
• Flight range
• Ability to transmit pathogens (e.g., viruses)
The Mosquito Life Cycle

1. Eggs
2. Larvae
3. Pupa
4. Adult

Floodwater eggs
It is during the act of blood feeding that a mosquito becomes infected with a virus or other pathogen.
Mosquito-borne Disease Cycles

- One host – Dengue, Chikungunya, Zika

Transmission

- Healthy person
- Infected mosquito
- Infected person

Incubation Period: 3 to 14 days
Most commonly 4 to 7 days

Zika Virus

- One host cycle
- 2 potential vector species in Florida
Zika Virus

• Zika is a virus that can be transmitted by the bite of infected female mosquitoes
• The virus is cycled between mosquitoes and humans
• Infection with the virus may or may not cause sickness in humans
• Currently there is no vaccine against Zika virus

Zika Virus

• Other routes of transmission
  • Transmission in womb and at time of birth
  • Sexual (both male and female)
  • Transfusion-acquired cases documented
  • Lab exposures
  • Detected in breast milk, saliva, urine
    • Though no documented transmission
Symptoms

- The symptoms of the disease can include:
  - Fever
  - Joint pain
  - Rash
  - Conjunctivitis
  - Muscle Pain
  - Headache

- Four out of five infected persons do not develop any symptoms

- Incubation period – 2-14 days
  - Persistent in semen (active up to 6 months)
  - **NEW INFORMATION CONTINUES...**

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Zika Virus caused Microcephaly

Guillain-Barre Syndrome
Imported vs local transmission (mosquito)

- Where was the individual infected with the virus?
- Imported cases
  - Travel related
- Local transmission/Locally acquired
  - Means FLORIDA populations of mosquitoes are transmitting the virus

Container/Domestic Mosquitoes

<table>
<thead>
<tr>
<th>Yellow fever mosquito</th>
<th>Asian Tiger Mosquito</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aedes aegypti</td>
<td>Aedes albopictus</td>
</tr>
</tbody>
</table>

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Biology

- *Aedes aegypti*
  - Blood meals: Humans
  - Egg to adult = 7 – 14 days
  - Minimal flight range (500 – 800m)
  - Present in US since we began documenting mosquitoes

- *Aedes albopictus*
  - Blood meals: Humans & other animals
  - Egg to adult = 7 – 14 days
  - Minimal flight range (500 – 800m)
  - Introduced into US in 1980s

EDIS

EDIS is the Electronic Data Information Source of UF/IFAS Extension, a collection of information on topics relevant to you

http://edis.ifas.ufl.edu

Florida Container Mosquitoes
Jorge R. Rey and C. Roxanne Connelly

http://edis.ifas.ufl.edu/in851
LARVAL HABITATS OF CONTAINER MOSQUITOES
Larval habitats of container mosquitoes

Larval habitats of container mosquitoes

[Images of various habitats]
Larval habitats of container mosquitoes

Larval habitats of container mosquitoes
Larval habitats of container mosquitoes
Larval habitats of container mosquitoes

- Bromeliad plants can house container mosquitoes in the water-holding tanks
Managing the mosquitoes that transmit Zika

• Adulticides
• Larvicides
• Repellents
  • Prevents infection
  • Could help reduce mosquito population
• Source Reduction
  • Reducing water-holding containers around homes and communities

Active ingredient: Bti – bacteria
Mosquito bits, dunks, *Must be ingested*
Entomologically speaking….what do we NEED to know about Zika in Florida?

- Which mosquito species can transmit Zika virus to humans?
- What sort of behavior do the Zika vectors exhibit? Egg laying, time of feeding, what they like to feed on, declines and increases in populations, geographic location
- How do environmental factors drive mosquito populations and mosquito-borne diseases?
- How do we best manage/control the mosquitoes that transmit Zika virus to humans?

Entomologically speaking….what do we know about Zika in Florida?

- Zika virus has only been reported from one mosquito species – *Aedes aegypti*
- *Aedes aegypti* feeds on humans, lay eggs in containers, can live indoors, produce many generations per year, feeds daytime and can be active at night
- *Aedes aegypti* are resistant to many of the insecticides approved for use in Florida
Distribution of *Aedes aegypti* and *Aedes albopictus* in Florida
Update distribution information on *Aedes albopictus* and *Aedes aegypti* in Florida

Estimated range of Aedes aegypti (left) and Aedes albopictus (right).

http://www.cdc.gov/chikungunya/resources/vector-control.html

Distribution data points represent collections made from January 2016 to March 2017.
“The practice of using an insecticide until resistance becomes a limiting factor is rapidly eroding the number of suitable insecticides for vector control.”

--Hemingway and Ranson, 2000

| Species: *Aedes aegypti*  
| Active Ingredient: Permethrin |

![Species: Aedes aegypti Active Ingredient: Permethrin](http://www.floridamosquito.info/insecticide-susceptibility-testing-results/)

Funded by Florida Department of Health; 2016 – 2017; #C0064
Advanced Mosquito Identification Certification
EDEN’s Zika team
• Dr. Roxanne Connelly, University of Florida - lead
• Dr. Kristen Bartlett-Healy, Louisiana State University AgCenter
• Elmer Gray, University of Georgia
• Dr. Jorge Rey, University of Florida
• Dr. Dan Suiter, University of Georgia
• Dr. Becky Trout Fryxell – University of Tennessee

ZIP Campaign
USDA Special Needs Grant

Utilizing community leaders to provide educational messaging
What can you do to prevent these container mosquitoes?

There are several simple options:

- Apply Mosquito Bites® (a bacteria that is specific for killing mosquito larvae) every 7 days to the water-holding leaf axils of the plants. Follow the instructions on the package for the correct amount to apply, or
- Apply Amdro Pro-U (methoprene, an insect growth regulator) every 30 days to the water-holding leaf axils of the plants. Follow the instructions on the package for the correct amount to apply, or
- Use water to flush out the mosquitoes that may be living in the water-holding leaf axils. This must be done every 5 – 7 days to be effective. Make sure that the aquatic mosquito larva is in a dry area and that you are not just moving them from plant to plant. Removal of mosquito eggs from the plant leaves will require directed water pressure to dislodge and move them out of the plant into a dry area, or
- Remove the water-holding source
- For more information, visit http://mosquitoes.ifas.ufl.edu

Mosquito larvae

Do you have mosquitoes in your yard?

Mosquito larvae grow in small water-holding containers, both natural and human-made, including items like plant pots, buoys, used tires, buckets and more. These include containers such as tires, bowls, and the leaf axils of hibiscus plants. There are several types of mosquitoes that can cause problems in Florida. The main life stages are larva, pupa, and adult mosquito. The adult mosquito is typically the most important because they can transmit diseases that can be life-threatening, such as Chikungunya, Dengue, West Nile, and Zika.
Where do we stand today?

• Likely to see local transmission again in 2017
• Awareness is high; but does that mean behavior change?
• Major vector is resistant to most commonly used insecticides approved for use in Florida

Where do we stand today?

• Everyone can help to increase awareness and promote behaviors to provide protection from mosquito bites:
  • Wear repellents
    • [http://edis.ifas.ufl.edu/in419](http://edis.ifas.ufl.edu/in419)
  • Dump the water from containers; remove containers
# Zika in Florida - 2017

<table>
<thead>
<tr>
<th>County</th>
<th>Number of Cases (all travel related)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broward</td>
<td>10</td>
</tr>
<tr>
<td>Collier</td>
<td>1</td>
</tr>
<tr>
<td>Flagler</td>
<td>1</td>
</tr>
<tr>
<td>Franklin</td>
<td>1</td>
</tr>
<tr>
<td>Hillsborough</td>
<td>3</td>
</tr>
<tr>
<td>Marion</td>
<td>1</td>
</tr>
<tr>
<td>Monroe</td>
<td>1</td>
</tr>
<tr>
<td>Orange</td>
<td>1</td>
</tr>
<tr>
<td>Palm Beach</td>
<td>2</td>
</tr>
<tr>
<td>St. Johns</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: This includes pregnant women and non-Florida residents who acquired Zika outside of Florida, but were diagnosed in Florida.


<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Infection Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel-Related Infections of Zika 2016</td>
<td>1,117</td>
</tr>
<tr>
<td>Locally Acquired Infections of Zika 2016</td>
<td>285</td>
</tr>
<tr>
<td>Undetermined 2016</td>
<td>45</td>
</tr>
<tr>
<td>Pregnant Women with Lab-Evidence of Zika 2016</td>
<td>295</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Infection Type</th>
<th>Infection Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel-Related Infections of Zika 2017</td>
<td>33</td>
</tr>
<tr>
<td>Locally Acquired Infections of Zika 2017</td>
<td>2</td>
</tr>
<tr>
<td>Undetermined exposed 2016, tested 2017</td>
<td>6</td>
</tr>
<tr>
<td>Pregnant Women with Lab-Evidence of Zika 2017</td>
<td>22</td>
</tr>
</tbody>
</table>
‘We didn’t expect this’: A historic yellow fever outbreak spreads in Brazil

DREW PHILLIPS / APRIL 10, 2017
PHOTOGRAPH BY LUCAS MELTON FOR STAT

[Map of Brazil showing areas at risk for yellow fever transmission]

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Areas at risk for yellow fever transmission
- Areas January 2017
- Areas 2013
- Brazil State Limits

Data Source
Brazil Ministry of Health

Map production
Health Emergency Information & Risk Assessment (HIRA), PAHO Health Emergency Department (PADE)

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