PREPARING FOR THE INTRODUCTION OF CHIKUNGUNYA VIRUS..IN YOUR COMMUNITY?

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Henry Lewandowski

Chatham County Mosquito Control
FUN FACTS

- Alphavirus in the family Togoviridae
- EEE
- Three Genotypes
  - Asian
  - East/Central/South African
  - West African
- *Aedes aegypti* is the principal vector
- Found in wild populations of *Aedes albopictus*
- Dengue-like symptoms with prolonged joint pain
- Amazing 72% - 93% infections with symptoms
RECENT ACTIVITY

- Confined to Africa, Asia and Europe until 2013
- October 2013 first found on St. Martin (Asian genotype)
- By December 2013 caught the attention of main stream media
- October 3, 2014: 739,410 cases; 34 countries and territories
- US statistics, October 7, 2014: 1326 travel associated, 21 in Georgia; 11 locally acquired in Florida
WHAT CAN WE EXPECT?

- Roger Nasci “urban epidemic cycles transmitted by *Aedes aegypti* and *Aedes albopictus*”

- Southeast U.S. is especially vulnerable

- First indications of local activity likely to be human illness

- Walter Tabachnick, “localized outbreaks with a low number of total cases.” (Like recent Dengue outbreaks)

- Walter Tabachnick, “Florida agencies not well prepared to control container-breeding mosquitoes.”
METHODS OF "TRADITIONAL" MOSQUITO CONTROL

"TRADITIONAL" HABITAT:
- ISOLATED
- CONCENTRATED BREEDING
- ADULTS HAVE LONG FLIGHT RANGE
- EASILY ACCESSIBLE
- REMOTE/RURAL

AE. AEGYPTI/ALBOPICTUS HABITAT:
- AMONGST HUMAN RESIDENTS
- LARVAL AND ADULTS ARE DIFFUSE
- ADULTS HAVE VERY SHORT FLIGHT RANGE = AREA OF LARVAL BREEDING
- BREEDING HABITAT IS DIFFICULT TO ACCESS
- URBAN, BUT CAN ENDO- OR EXOPHILIC
WHAT CAN WE EXPECT?

- Can human to human transmission be sustained in the United States

- Sustaining viral transmission: three scenarios.
  1. Re-introduction
  2. Transovarial/Venereal
  3. Non-human host maintenance
WHAT DO WE NEED TO KNOW?

- Know your virus

Caribbean outbreak caused by the Asian genotype. *Aedes aegypti* is a more important vector.

The Réunion strain is a mutation of the ECSA genotype which facilitates replication in *Aedes albopictus*

Fulton County *Aedes albopictus* had 22% infection rates with the Asian genotype (McTighe & Vaidyanathan, 2012)
WHAT DO WE NEED TO KNOW?

- Know your vectors and their biology:
  
  * *Aedes aegypti* (rare in Chatham County)
  
  * *Aedes albopictus*
    
    100% infection rate; 74% transmission rate
    (ECSA genotype) (Mangiafico, 1971)
  
  * *Ochlerotatus triseriatus*
    
    99% infection rate; 69% transmission rate
    (ECSA genotype) (Mangiafico, 1971)
WHAT DO WE NEED TO KNOW?

- Know your vectors and their biology
- We will focus our initial efforts on:

  Aedes albopictus

  Ochlerotatus triseriatus
WHAT DO WE NEED TO KNOW?

- Know your vectors and their biology:
  
  *Aedes albopictus*
  
  Containers, natural and artificial
  Vegetated areas vs. open areas
  Mammalian, but opportunistic feeder
  Diminishes vector potential?
  Peak feeding time must be determined locally
  Calcutta - 1 hr after daybreak
  Japan – Dusk, but nighttime feeding > daytime
  Wide distribution in Chatham County
WHAT DO WE NEED TO KNOW?

- Know your vectors and their biology:
  - *Ochlerotatus triseriatus*
  - Natural vs. artificial, prefers tree holes
  - Mammalian, but opportunistic feeder
  - Peak feeding
  - Daytime in TX with peak at dusk
  - Afternoon before 1800 hrs. in Wisconsin
  - Wide distribution in Chatham County
WHAT DO WE NEED TO KNOW?

- Trap preferences

**Figure 10. Aedes albopictus trap preference, 2003-2013**

**Figure 11. Ochlerotatus triseriatus trap preference 2003-2013.**

*Aedes albopictus* Gravid Trap

*Ochlerotatus triseriatus* CDC Trap
WHAT DO WE NEED TO KNOW?

- Trap preferences (Collection Bottle Rotator, John W. Hock)
PREPARING FOR CHIKUNGUNYA

● Reducing the risk of Chikungunya (WHO Dengue Guidelines)
  ○ Vector surveillance.
  ○ Measure vector populations over time.
  ○ To make timely control decisions.
    - Egg production
    - Larval abundance
    - Pupal abundance
    - Adult abundance
PREPARING FOR CHIKUNGUNYA

- Vector surveillance
  - Egg production
PREPARING FOR CHIKUNGUNYA

- Deploying ovitraps.
- 350’ Centers

Figure 5. A zone map such as this is used to calculate grid points.
PREPARING FOR CHIKUNGUNYA

- Vector surveillance
  - Larval sites (Pupae)

House Index - % of houses with larvae

Container Index - % of containers with larvae

Breteau Index - # positive containers per 100 houses inspected
Preparation for Chikungunya

- **Vector surveillance**
  - **Adult abundance**
    - Lethal Ovitrap

![Diagram showing a lethal ovitrap](image)

- Black funnel entrance
- Clear Collar
- Screen
- Water level
- Drain Hole
- Black “Tumbler” Base

*Chatham County Mosquito Control*
PREPARING FOR CHIKUNGUNYA

- Other methods of adult mosquito surveillance.
- BG Sentinel Trap

Aedes albopictus
Aedes aegypti
PREPARING FOR CHIKUNGUNYA

- Other methods of adult mosquito surveillance.

*Ochlerotatus triseriatus*
● Quantifiable thresholds for proactive vector control efforts to minimize WNV transmission. (300/100)

● Relating survey results to human risk.

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PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Source reduction
  - Household prevention
  - Community prevention

- “Sanitation is most effective, but it doesn’t happen” - Chris Lesser
PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Adulticiding
PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Larviciding and Adulticiding.

2011: Efficacy of Aerial Larviciding upon Ae. aegypti/albopictus Populations
(Values Indicate Average # of Eggs & Larvae at 15 Sampling Sites within each group)

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<th>Date</th>
<th>Treatment</th>
<th>Control</th>
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<td>5/2 - 8/15</td>
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<td>47.11</td>
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<td>8/16 - 10/10</td>
<td>26.20</td>
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<td>Percent Change</td>
<td>-73.00%</td>
<td>3.30%</td>
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Aerial Larvicide - Methoprene on 8/16, 8/31 and 9/14; Midnight - 2am 128-acres
PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Larviciding and Adulticiding.

Lesser and Latham

Effects of Aerial Adulticiding on Ae. aegypti/albopictus Populations

- 98.6% Reduction, Day 1 - Post Spray
- 71.3% Reduction Over 2.5 weeks
- 97.9% Reduction
- 57.9% Reduction
- 97.1% Reduction
- 54.6% Reduction
- 100% Reduction
- 78.2% Reduction
PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Larviciding and Adulticiding.

![Graph showing effects of aerial larviciding and adulticiding on Ae. aegypti/albopictus populations. The graph illustrates a 89.3% overall population reduction.](image)

Lesser and Latham
PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Personal protection
PREPARING FOR CHIKUNGUNYA

- Mosquito Control
  - Public education

CHIKUNGUNYA FEVER:
What You Should Know
PREPARING FOR CHIKUNGUNYA

● Dr. Walter Tabachnick’s thoughts on controlling Chikungunya
  ○ Establish a relationship with your local health Dept.
  ○ Know the distribution of the vectors
  ○ Know their peak activity times
  ○ Choose an efficient surveillance technique
  ○ Establish a public information campaign
  ○ Use an integrated approach to control
    - Source reduction
    - Larviciding with truck or aircraft
    - Adulticiding with truck or aircraft
    - Small area control with hand foggers
PREPARING FOR CHIKUNGUNYA

• Summary
  ○ It’s coming….to a town near you!
  ○ Lessons learned from WNV will be useful
  ○ Know the biology of the mosquito species involved
  ○ Know how to survey for the mosquitoes
  ○ Determine the value of survey methods
  ○ How or if the virus will become established is unknown
  ○ Control may be a challenge, be prepared to try several options
PREPARING FOR THE INTRODUCTION OF CHIKUNGUNYA VIRUS IN YOUR COMMUNITY

Thank You!