Agenda

- Dr. Amy Vittor, MD, Infectious Diseases specialist, UF College of Medicine and UF Health

- Dr. Michael Weiss, MD, Neonatologist, UF College of Medicine and UF Health

- Dr. John Lednicky, PhD, virologist, UF College of Public Health and Health Professions

- Dr. Jorge Rey, PhD, Interim Director, UF Florida Medical Entomology Laboratory

- Dr. Danielle Stanek, DVM, Zoonotic and Vector-borne Disease Program Manager, Florida Department of Health Division of Disease Control and Health Protection

- Dr. Glenn Morris, MD, Infectious Diseases specialist and Director, UF Emerging Pathogens Institute
Amy Vittor, MD, PhD
Assistant Professor of Medicine
College of Medicine
University of Florida
Where did Zika virus come from?
20 or so dimmable recessed lights, which allows for amazing control over the lighting.
How is Zika virus spread?

Primary route of transmission

Secondary routes of transmission
(extent of contribution to overall transmission unknown)

- Semen
- Urine
- Saliva

Zika Symptoms

- 80% of people who are infected do not have any symptoms at all
- 20% who have symptoms are sick for 2-7 days, and have fever, rash, joint pains, red eyes, muscle pain and/or headache
- No specific therapies exist
- No vaccine available, but development underway by Sanofi Pasteur, Inovio, Bharat Biotech (at least 18 months away from large scale trials)

**Figure 1**
Conjunctivitis in a case of imported Zika virus infection from French Polynesia, Japan, January 2014

**Figure 2**
Maculopapular rash on the back in a case of imported Zika virus infection from French Polynesia, Japan, January 2014

Although the patient was afebrile upon examination, both bulbar conjunctivae appeared congested.

http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20683
Guillain-Barré Syndrome

• Neurological condition causing muscle weakness and possibly paralysis
• In severe cases, patients need ICU care to support breathing
• Guillain-Barré syndrome is seen following numerous types of infections, and is due to our own immune response that damages neurons
• Spikes in cases of Guillain-Barré have been seen in Polynesia, Brazil, El Salvador and Colombia following the arrival of Zika virus
• Whether Zika virus causes Guillain-Barré syndrome is not yet known
Microcephaly

- A condition in which an infant’s head is smaller than expected, caused by infection, toxins, or genetic disorders
- 20-fold increase seen in microcephaly in Brazil late 2015
- Zika virus has been found in the brain tissue of some deceased infants and in amniotic fluid
- Babies with microcephaly in Brazil have additional brain damage that is consistent with an infectious cause
- Greatest risk appears to be associated with infection during first trimester
- Insecticide exposure is not likely to have caused the increase in microcephaly. Pyriproxyfen, the larvicide in question, has not been associated with fetal abnormalities in animals.
- Rigorous epidemiological and laboratory studies are needed to establish causation
Michael Weiss, MD

Associate Professor in the Department of Pediatrics – Neonatology Division
College of Medicine
University of Florida
MICROCEPHALY

• Michael D. Weiss, MD  |  Associate Professor, Department of Pediatrics
What is Microcephaly?

- Clinical finding of a small head when compared to infants of same sex and age.
- Usually less than the 3 Percentile.
  - Not a diagnosis
- When present at birth called congenital microcephaly.
What is Microcephaly?

- Head growth is a reliable indicator of intracranial brain volumes.
- When present at birth, called congenital microcephaly.
- Often leads to cognitive and/or long-term neurodevelopmental problems.
- Seizures
- Developmental Delay
- Feeding problems
- Hearing loss
- Vision problems

Difficult to monitor because of inconsistent definition and use of terminology.
Causes of Microcephaly

- Primary due to abnormal development
  - Genetic Etiology
- Secondary due to arrest or destruction of normally formed or forming brain.
  - Vascular
  - Teratogenic
  - Infection
    - Cytomegalovirus (CMV)
    - Toxoplasmosis Gondii
    - Rubella (German Measles)
    - Zika
Microcephaly

Normal

Child with microcephaly from Zika
Zika and Microcephaly

**What we know**

- Small number of positive test results for Zika virus.
- Microcephaly pattern consistent with disruption sequence.

**What we don’t know**

- Causal relationship between Zika and microcephaly.
- Impact of timing of infection.
- Impact of severity of maternal infection.
John Lednicky, PhD

Associate Professor and Co-Chair
Environmental and Global Health College
of Public Health and Health Professions
University of Florida
**Zika virus: Some basic information**

- *Zika virus (ZIKV)* is a type of flavivirus that is mosquito-borne.
- ZIKV is highly related to *Yellow Fever, Dengue* and *West Nile* viruses.
- ZIKV particles are about 40 nm in diameter and thus cannot be seen using a regular microscope (a transmission electron microscope [TEM] is usually used to visualize them).
Virus Detection

Whole Blood + EDTA

Centrifuge to pellet blood cells

Transfer plasma to storage tube and freeze at $\leq -70^\circ$C

Virus isolation
- Virus discovery
- Signal amplification
  $\geq 6$ cell lines
  $\geq 2$ incubation temperatures
  +serum, - serum in cell media
  +trypsin, -trypsin in cell media
Requires extensive training
Biocontainment an issue
Virus ID costs can be high

Purify nucleic acids

RT-PCR/PCR-based detection
- Usually a targeted approach
  - Specific PCR primers
  - Universal primers

Real-time RT-PCR Detection of *Dengue virus*-1 RNA
Chikungunya and Dengue Fevers Occurred in Haiti in 2014 - 2015
Timelines

• The EPI detected ZIKV in May 2015 from Haitian blood collected in Dec. 2014.
• Jan. 23, 2016 – Dominican Republic reports cases of ZIKV infections.
Identification of Zika virus

- Nuclease (degrades nucleic acids not within virions)
- Extract vRNA/vDNA
- Random primers
  - PCR
  - RT
  - PCR
  - Sequence amplicons
- Virus ID
  - Primer walking approach
  - 5’ and 3’ RACE (Rapid amplification of 5’ and 3’ complementary ends)
5’ is capped by a 5’-type 1 structure (m7G5’ppp5’A) and that must be removed
3’ is not polyadenylated
RNA ligase-mediated RACE is used
Genetic analyses indicate that ZIKV Haiti predates 2015 Brazil strains
Jorge Rey, PhD

Interim Director of the Florida Medical Entomology Laboratory

University of Florida – IFAS
Mosquito Vectors in Florida

- **Aedes aegypti**
  - African origin
  - Invaded 13-14th Century

- **Aedes albopictus**
  - Asian origin
  - Invaded 1980s

- **Yellow fever mosquito**
  - African origin
  - Invaded 13-14th Century

- **Asian Tiger Mosquito**
  - Asian origin
  - Invaded 1980s
The Mosquito Life Cycle

1. Eggs

2. Larvae
   - 1st – 4th Instar

3. Pupa

4. Adult
   - *Culex nigripalpus*
Container Mosquitoes
Container mosquito management

- Chemical (adulticiding)
  - pyrethroids
  - malathion
  - naled
- Biological
  - Sterile males
  - Gm mosquitoes
  - Wolbachia

Source reduction
Insect growth regulators (methoprene)
Bti
Predators
PREVENTION

Remove, cover, or flush water-holding containers from around the home.

Wear protective clothing when exposed to mosquitoes.

Apply an EPA-approved repellent according to label instructions.
Current Status (2/18/2016)

• To date no cases of locally acquired Zika fever have been reported

• 24 Zika fever cases (travel-associated) acquired outside the US

• 9 counties with imported cases: Alachua (1), Brevard (1), Broward (4), Hillsborough (3), Lee (3), Miami-Dade (9), Osceola (1), Saint Johns (1) and Santa Rosa (1)
DOH Response Partners

• State Arbovirus Task Force
  • Mosquito control representatives
  • State agencies
  • Universities

• Targeted messaging to health care providers
  • Hospitals
  • American Congress of Obstetricians and Gynecologists
  • Midwives/nurses

• Working with internal partners
  • Birth Defects Registry
  • Maternal and Child Health
  • Public Health Tracking
DOH Response Activities

• Response similar to dengue/chikungunya
• During interview
  • Complete travel history
  • Avoid mosquito bites while ill
  • Highlight prevention methods
• Inform local mosquito control officials of suspect cases
• Provide testing for health care providers
• Provide public information on disease, transmission, prevention, protective actions
• Updated information on public web page
Suspected Zika Fever Case Investigation

- **Sick person**
- **Health care provider**
- **County Health Department**
- **Laboratory**
- **State Laboratory**
- **Mosquito Control**
- **Department of Health State Office**
  - Subject Matter Experts
  - Policy Guidance
  - Case Consultation
  - Weekly reports
  - Publish statewide data
- **CDC**
  - Publish nationwide data
- **Public**

**Response**
- Case finding
- Outreach/education
- Alerts/advisories
- Testing Approval

- Case reported
- Interview
DOH Successful Response Model

• Key partnership with local mosquito control districts
• DOH notifies mosquito control upon suspicion of mosquito-borne illness
• Appropriate mosquito control measures are implemented
• Successful partnership demonstrated previously
  • Chikungunya 2014
    • 510 imported cases identified
    • 12 sporadic local cases
    • Coordinated DOH – Local mosquito control activities
    • No sustained local transmission
COVER

Protect yourself from mosquito bites & the diseases they carry.

DRAIN

Feeling the sting of mosquitoes? Then it's time to drain and cover.

USE REPELENTE PARA INSECTOS QUE CONTENGA UNO DE LOS SIGUIENTES INGREDIENTES ACTIVOS

DEET

Ou santi moustik ap pike w? Sa vle di li lè pou drennen epikouvrí.

DRENNEN