

CHALLENGING TOURISTS: DENGUE AND CHIKUNGUNYA IN FLORIDA

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Disclosure

- ▣ I have no conflict of interest nor financial disclosures

Plan

- ▣ Florida Demographics
- ▣ Vectors
- ▣ Dengue
 - Viral Characteristics
 - Disease Symptomology and Treatment
 - Epidemiology in Florida
- ▣ Chikungunya
 - Viral Characteristics
 - Disease Symptomology and Treatment
 - Epidemiology in Florida
- ▣ Dengue and Chikungunya Side by Side
- ▣ Control Measures

Florida Demographics

Population (2012 est.)	19,320,749
Hispanic or Latino (2012)	23.2%
Foreign born (2008-2012)	19.3%
Language other than English at home (age 5+, 2008-2012)	27.3%
Median household income (2008-2012)	\$47,309
Persons below poverty level (2008-2012)	15.6%
Persons per sq. mile	350.6

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Source: US Census <http://quickfacts.census.gov/qfd/states/12/1245000.html> accessed 2/5/2014



Florida Visitors

- ▣ 2013: Over 15 million international visitors
 - >7 million from Dengue-endemic countries in Latin America and the Caribbean



2011: 13.5 million cruise ship passengers

Many have ports of call in the Caribbean

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Vectors

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Aedes albopictus Behavior

- ▣ **Primarily daytime biters**
 - ▣ Feeds on humans as well as other mammals and birds
- ▣ **Very aggressive**
- ▣ **Short flight range**
- ▣ **Eggs can overwinter**

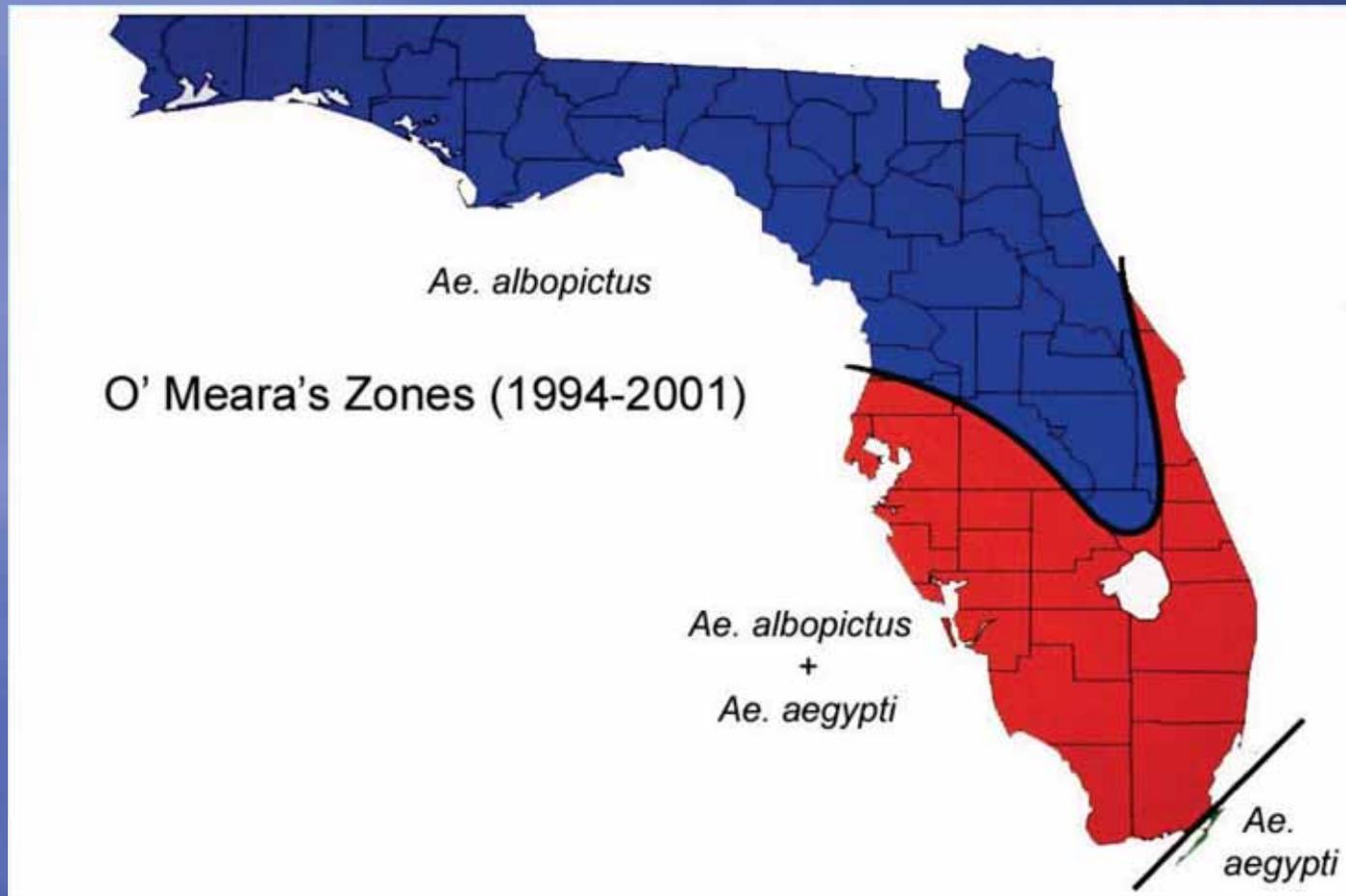


Aedes aegypti Behavior

- ▣ **Primarily daytime biters**
 - ▣ In Key West: Peak activity was recorded between 8:00am-10:00am & 4:00pm-6:00pm
- ▣ **“Stealth” biters**
- ▣ **Not very aggressive**
- ▣ **Ankle-biters**
- ▣ **Short flight range**



General *Aedes aegypti* and *Aedes albopictus* Distribution



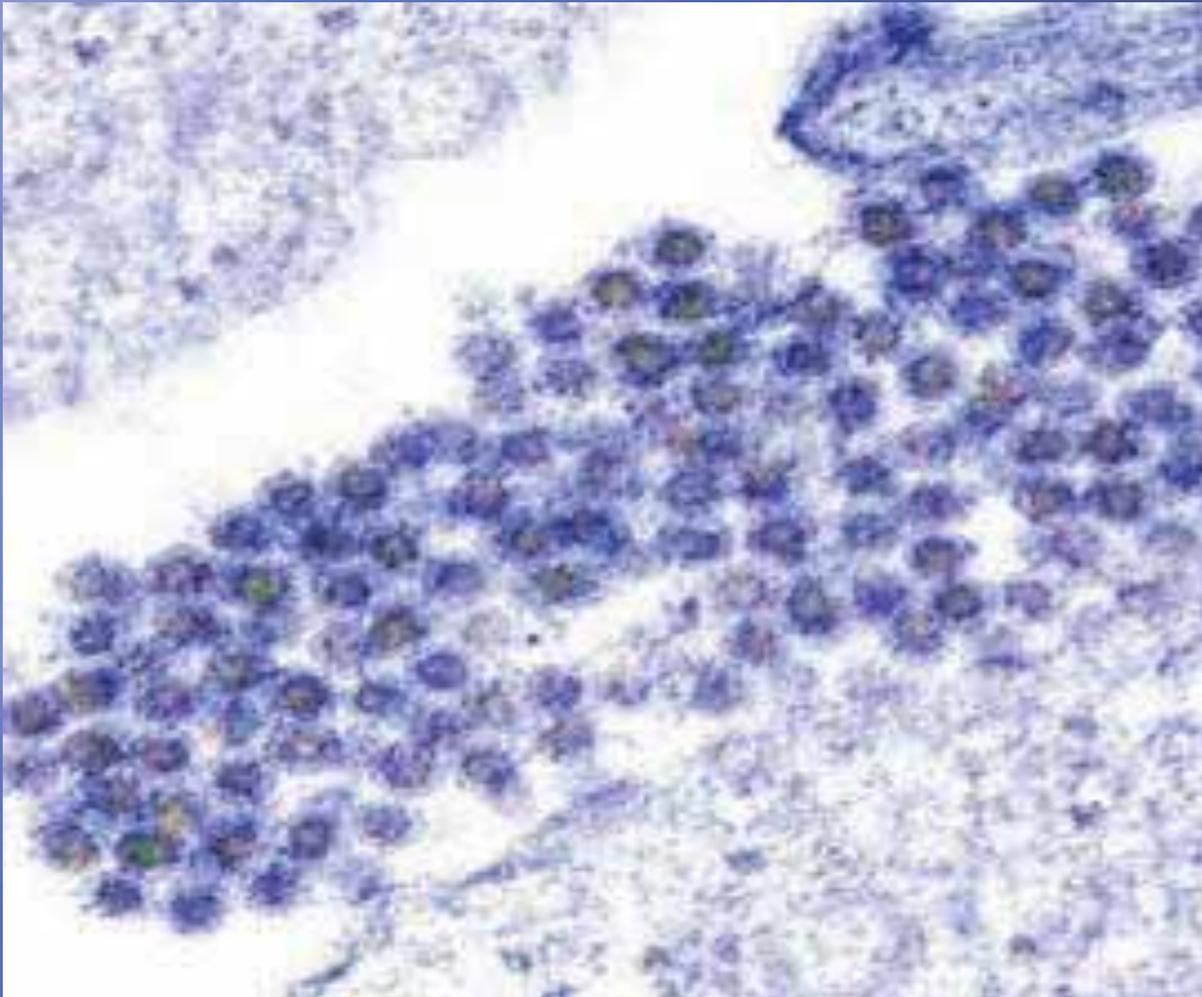
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Common Larval Habitats

- ▣ Anything that can hold a tablespoon of water
 - Plastic containers & bags
 - Plant trivets
 - Flower pots
 - Fountains
 - Garbage cans
 - Tires
 - Tree Holes
 - Rock Holes



Dengue



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Dengue Virus

- ▣ Mosquito-borne Flavivirus
 - + SS RNA
- ▣ Four serotypes – DEN-1, 2, 3, 4 and multiple strains
 - Infection provides lifelong immunity but only to the specific infecting serotype

- ▣ Humans are the reservoir species

Dengue Virus

- Most common vector-borne viral disease worldwide
- Incidence increased 30-fold since resurgence in the 1970s
- From 1946-1980 no cases of dengue reported to have been acquired in the continental United States

Dengue Fever

“Breakbone Fever”

- ▣ Asymptomatic
- ▣ Often mild or non-specific febrile illness with one or more of the following symptoms:
 - Severe headache
 - Severe pain behind the eyes
 - Muscle and bone pain
 - Rash
 - Mild bleeding
- ▣ Severe forms of dengue:
 - Dengue Hemorrhagic Fever
 - Dengue Shock Syndrome



Diagnosis of Dengue

Travel History

Africa/Asia/South America/Caribbean

Clinical Presentation

Laboratory Testing

PCR

Serum for Antibodies

Dengue Fever Treatment

- ▣ No specific medication or vaccine
- ▣ Use acetaminophen for pain relief
 - No aspirin or NSAIDS
- ▣ Rest
- ▣ Drink plenty of fluids

- ▣ If fever subsides and patient feels worse, provide supportive care immediately

Dengue Worldwide

- As many as 400 million people infected worldwide annually
- 500,000 hospitalizations
- 22,000 deaths; therapy has greatly reduced case-fatality rates



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Dengue in Florida

- Colonial Times:
 - Dengue and *Aedes aegypti* mosquitoes were imported to the New World from tropical and subtropical areas

- Through the 1930's:
 - Outbreaks seen throughout the state
 - Epidemics reported in Miami-Dade and Tampa through the 1930's

- 1934: Statewide outbreak
 - ~2000 cases
 - Last known Florida outbreak until 2009

- 1940's onward:
 - Dengue disappeared
 - Widespread use of DDT
 - Improved housing conditions
 - Air conditioning and screened windows and doors.



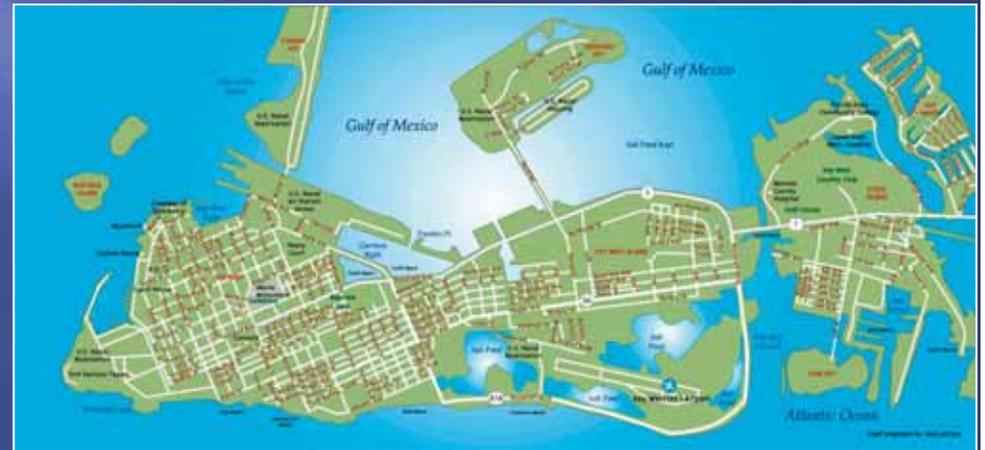
Courtesy of James Claussen

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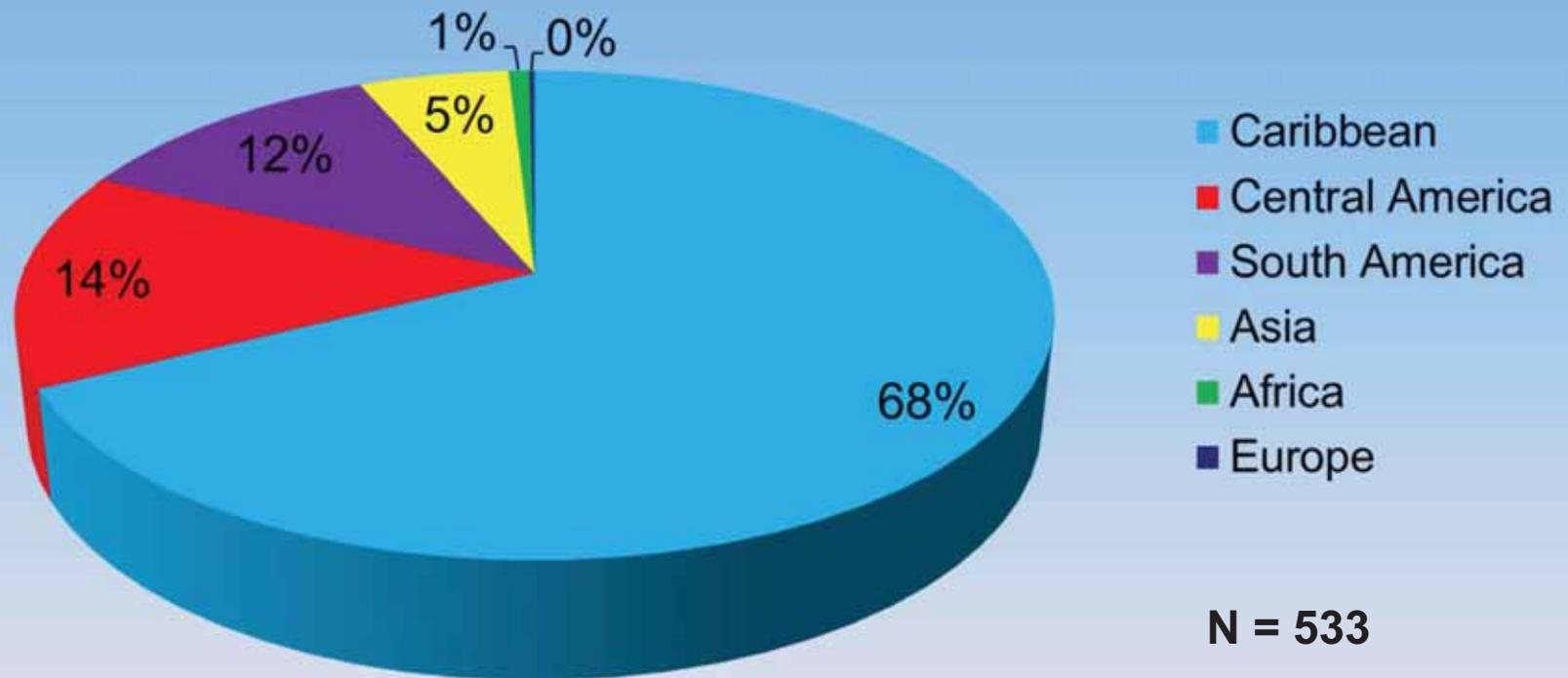


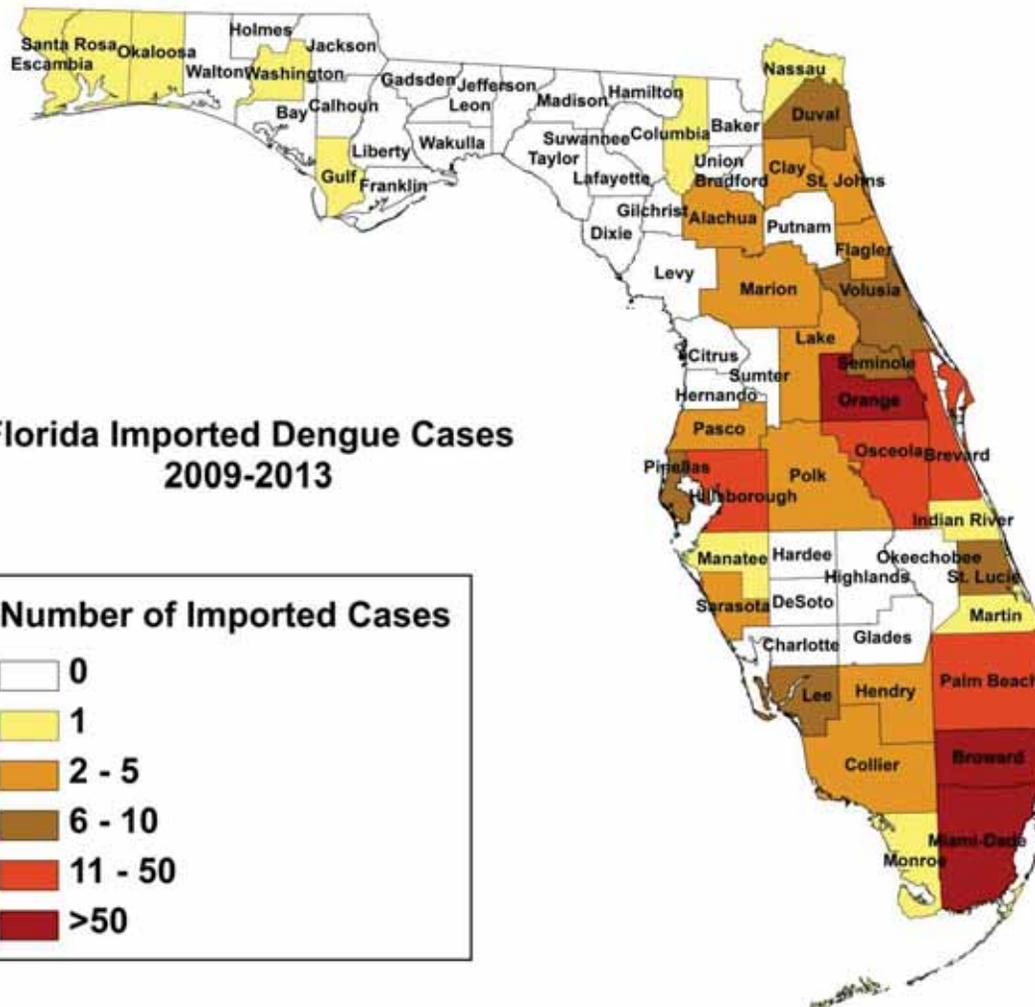
Key West Outbreak 2009-2010

- ▣ 2009
 - 22 cases
 - 5 more from serosurvey
- ▣ 2010
 - 66 cases
- ▣ Vector: *Aedes aegypti*



Imported Dengue Cases, Florida 2009-2013

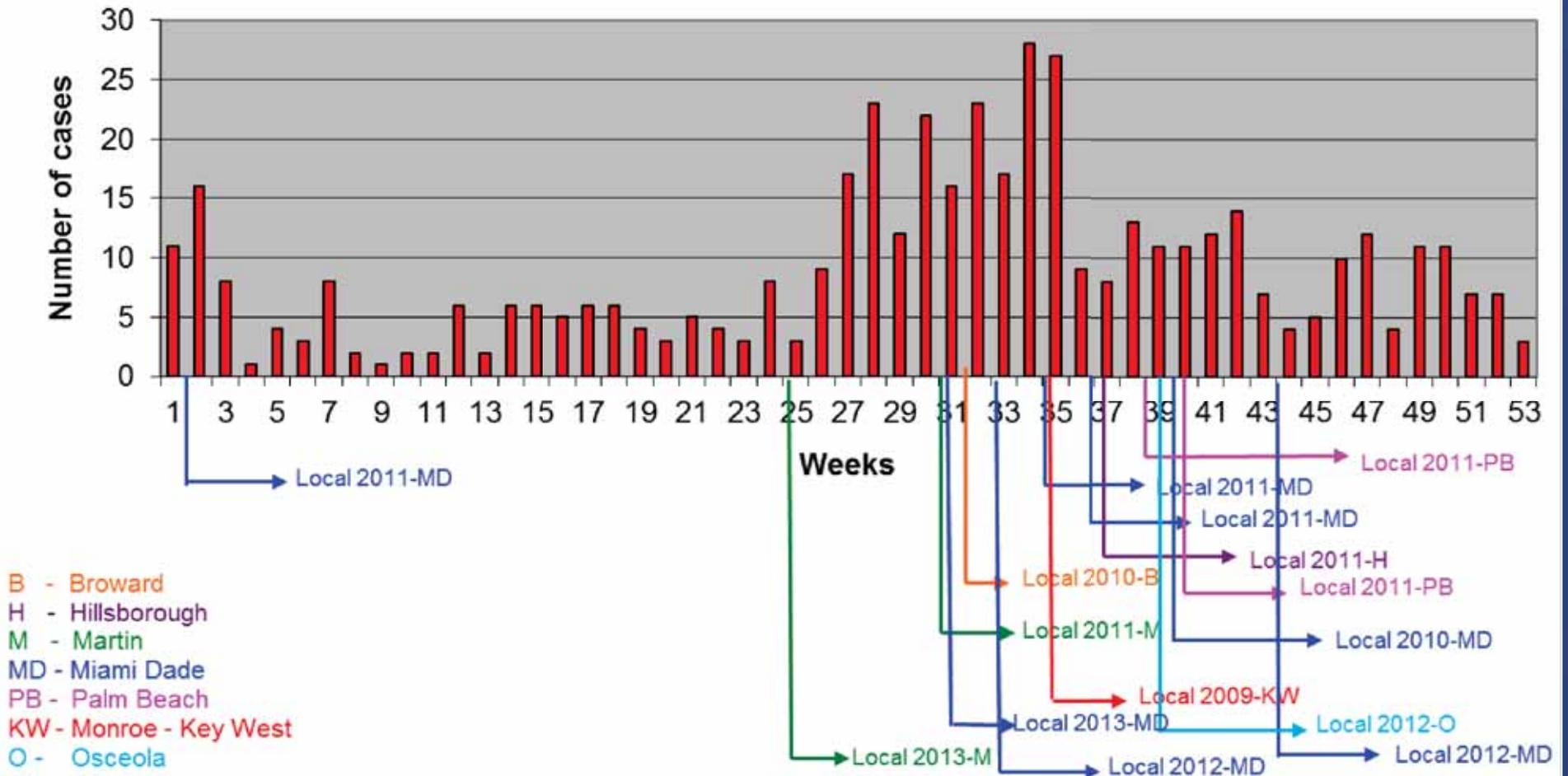




Dengue Cases 2009-2013

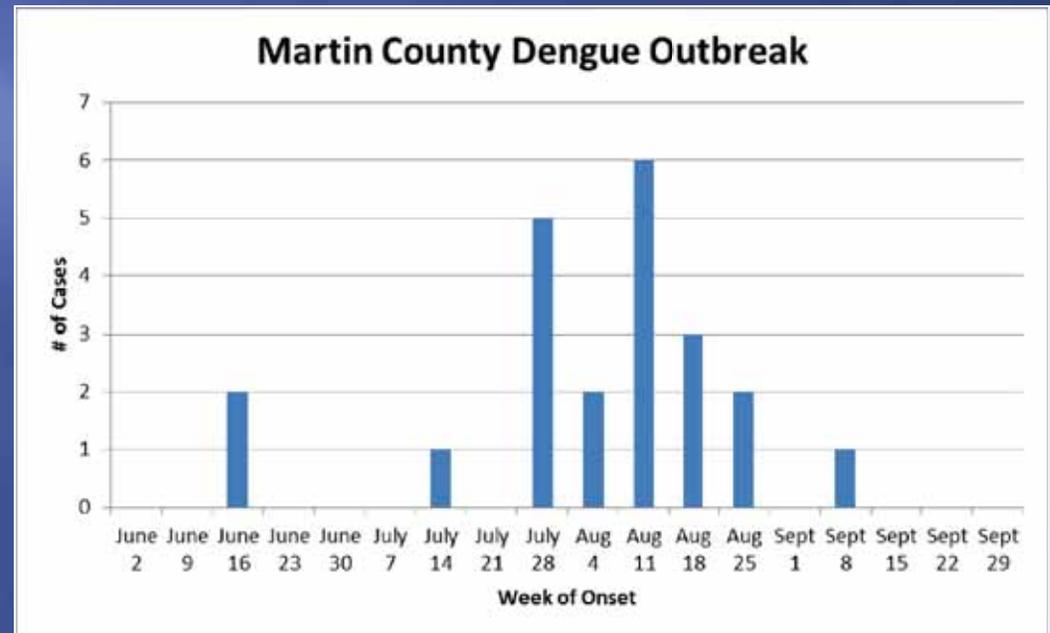
	Local	Imported	Top 5 Travel Origin
2009	22 (5 from Serosurvey)	35	<ol style="list-style-type: none"> 1. Haiti 2. Puerto Rico 3. Dominican Republic 4. Panama 5. India
2010	68	136	<ol style="list-style-type: none"> 1. Puerto Rico 2. Venezuela 3. Nicaragua 4. Dominican Republic 5. Colombia
2011	7	66	<ol style="list-style-type: none"> 1. Bahamas 2. Puerto Rico 3. Trinidad 4. Cuba 5. Bangladesh
2012	3	147	<ol style="list-style-type: none"> 1. Cuba 2. Jamaica 3. Puerto Rico 4. Haiti 5. Dominican Republic
2013	26	149	<ol style="list-style-type: none"> 1. Puerto Rico 2. Dominican Republic 3. Haiti 4. Cuba 5. Jamaica/Colombia

Imported dengue cases 2009-2013



Martin County Outbreak 2013

- ▣ June – September 2013
- ▣ 22 Cases
 - 20 FL residents
 - 2 out of state
- ▣ *Vector: Aedes aegypti*



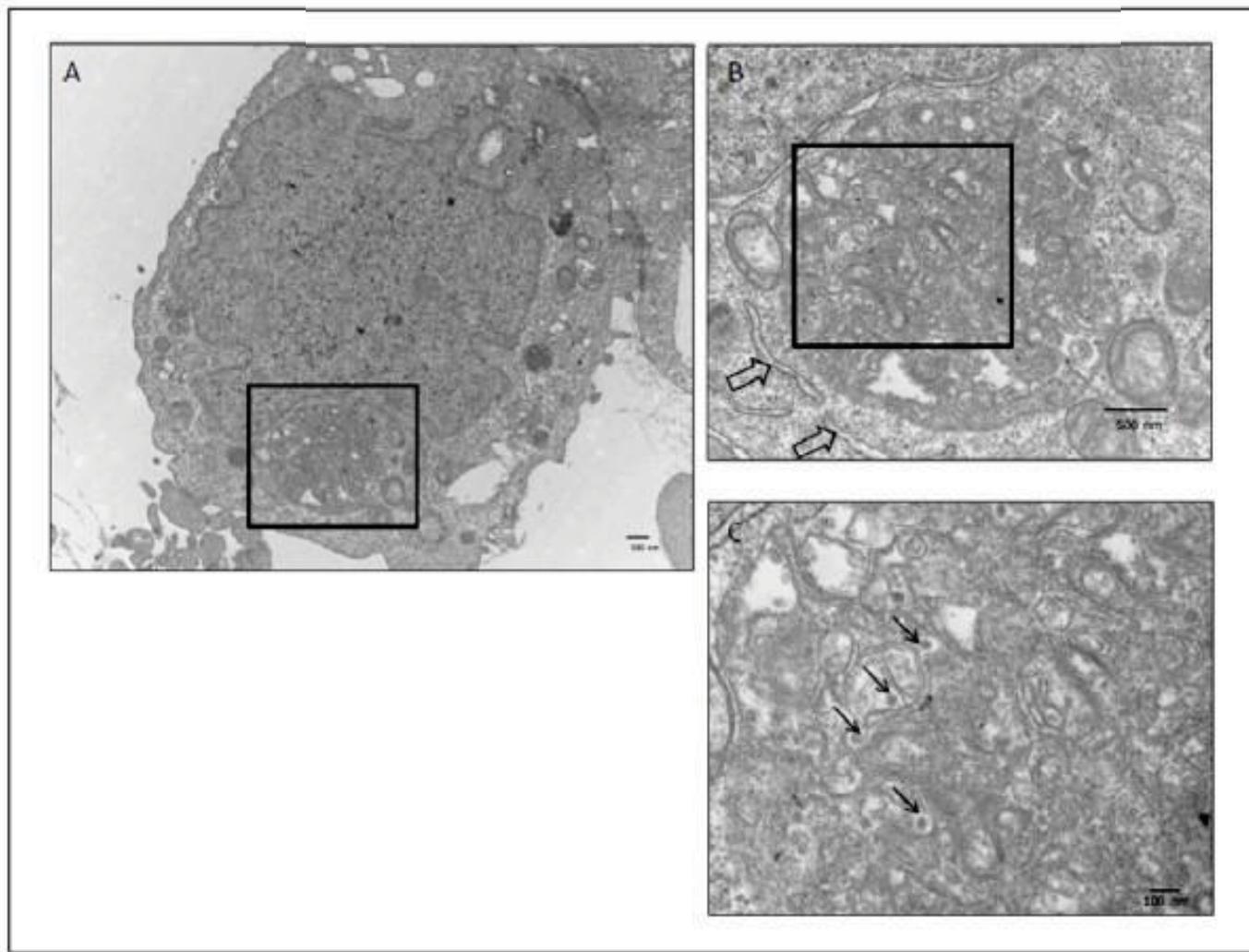
Martin County Seroprevalence Survey

- ▣ Determine prevalence of Dengue in Jensen Beach and Rio areas of Martin County
 - Blood collection
- ▣ Identify risk factors for infection
 - Household and individual questionnaires
- ▣ Mosquito Control Household survey

- ▣ Participation
 - 254 Households
 - 364 Individuals



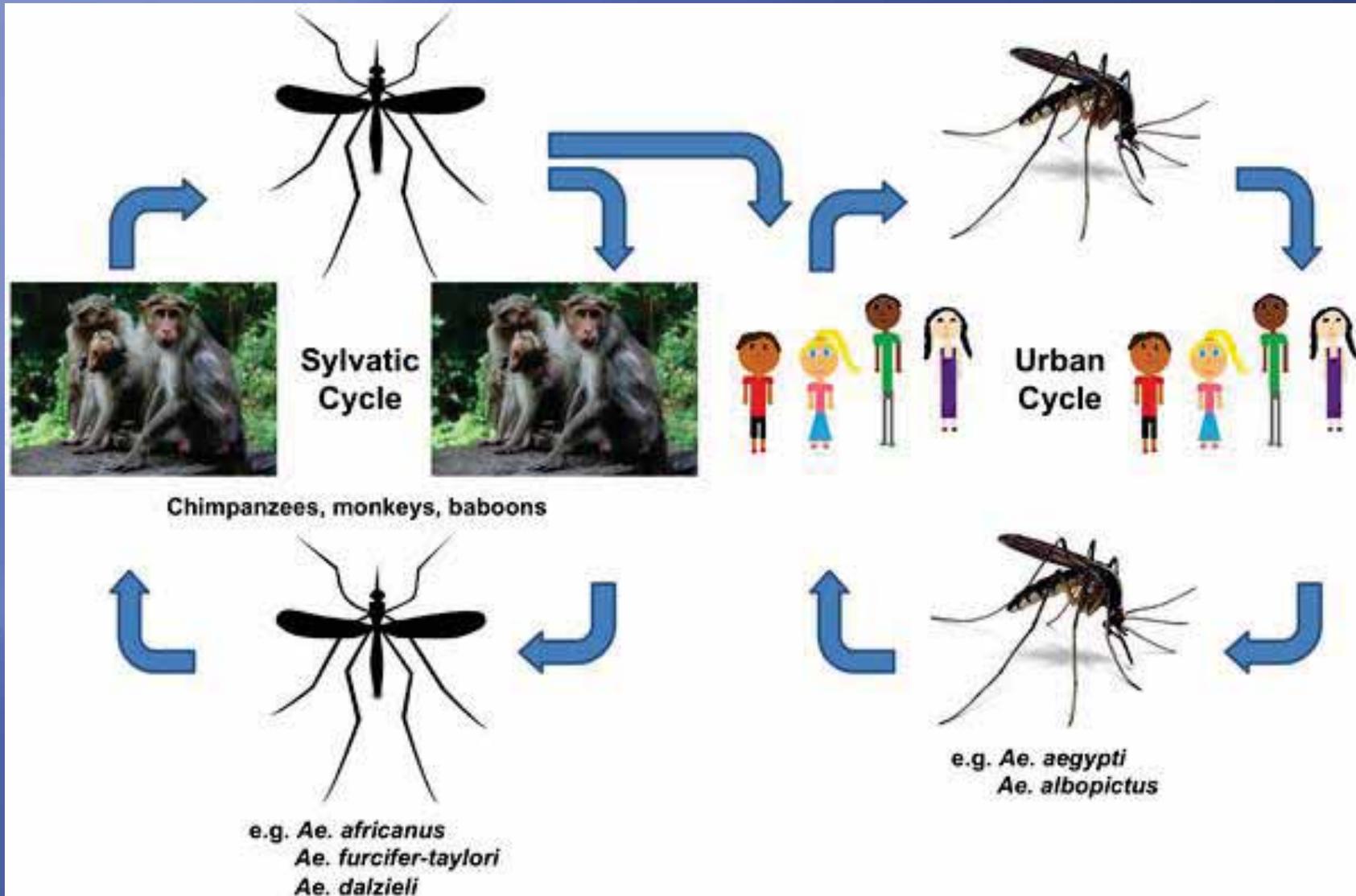
Chikungunya



Chikungunya virus

- ▣ Mosquito-borne Alphavirus
 - + SS RNA
- ▣ Closely related to Mayaro, O'nyong-nyong, and Ross River viruses
- ▣ Tanzania, 1952
- ▣ Cyclic epidemics every 7-20 years in Africa and Asia.

Chikungunya virus



Other modes of transmission

- ▣ Documented rarely
 - *In utero* transmission resulting in abortion
 - Intrapartum from viremic mother to child
 - Percutaneous needle stick
 - Laboratory exposure

- ▣ Theoretical concern
 - Blood transfusion
 - Organ or tissue transplantation

- ▣ No evidence of virus in breast milk

Chikungunya virus infection “illness of the bended man”

- ▣ Majority (72%–97%) of infected people develop clinical symptoms
- ▣ Incubation period usually 3–7 days (range 1–12 days)
- ▣ Primary clinical symptoms are fever and polyarthralgia

Fever and polyarthralgia

- ▣ Fever
 - Abrupt onset
 - Typically $\geq 39.0^{\circ}\text{C}$ ($\geq 102.2^{\circ}\text{F}$)

- ▣ Joint pain
 - Often severe and debilitating
 - Involves multiple joints
 - Usually bilateral and symmetric
 - Most common in hands and feet

Additional Symptoms May Include

- ▣ Headache
- ▣ Back pain
- ▣ Muscle pain
- ▣ Rash
- ▣ Conjunctivitis
- ▣ Effusions

Chikungunya rash



Chikungunya Knee Effusion



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Persisting joint problems

- ▣ Can be erratic, relapsing and incapacitating
 - Adults
- ▣ Migratory, pain from movement of small joints of hands, wrists, ankles and feet
- ▣ Resolves slowly
 - Weeks to months
 - 12% with lingering pain 3 years after onset

Atypical disease manifestations

- ▣ Uveitis
- ▣ Retinitis
- ▣ Hepatitis
- ▣ Nephritis
- ▣ Myocarditis
- ▣ Hemorrhage

- ▣ Myelitis
- ▣ Cranial nerve palsies
- ▣ Guillain-Barre syndrome
- ▣ Meningoencephalitis
- ▣ Bullous skin lesions*

- ▣ *Primarily described in neonates

Clinical laboratory findings

- ▣ Lymphopenia
- ▣ Thrombocytopenia
- ▣ Elevated creatinine
- ▣ Elevated hepatic transaminases

Risk factors for hospitalization or atypical disease

- ▣ Neonates exposed intrapartum
- ▣ Older age (e.g., >65 years)
- ▣ Underlying medical conditions (e.g., diabetes, hypertension, or cardiovascular disease)

Treatment

- ▣ No specific antiviral therapy
- ▣ Supportive care with rest and fluids
- ▣ Non-steroidal anti-inflammatory drugs (NSAIDs) for acute fever and pain
 - In dengue endemic areas (or travelers returning from endemic areas), use acetaminophen until dengue can be ruled out
- ▣ Persistent joint pain may benefit from use of NSAIDs, corticosteroids, or physiotherapy

Clinical outcomes

- ▣ Acute symptoms typically resolve in 7–10 days
- ▣ Mortality is rare; occurs mostly in older adults
- ▣ Some patients have relapse of rheumatologic symptoms* in the months following acute illness
- ▣ Studies report variable proportions of patients with persistent joint pains for months or years

- ▣ *Polyarthralgia, polyarthritis, tenosynovitis, Raynaud's syndrome

Diagnostic testing

- ▣ Culture for virus*
- ▣ Reverse transcriptase-polymerase chain reaction (RT-PCR) for viral RNA
- ▣ Serology for IgM and confirmatory neutralizing antibodies
- ▣ Serology for ≥ 4 -fold rise in virus-specific quantitative antibody titers on paired sera†

- ▣ *Virus should be handled under biosafety level (BSL) 3 conditions
- ▣ †Determined by plaque reduction neutralization test (PRNT) or immunofluorescence assay (IFA)

Laboratories for diagnostic testing*

- ▣ Florida DOH BPHL
- ▣ Two other state health departments (CA and NY)
- ▣ CDC Arboviral Diseases Branch
- ▣ One commercial laboratory (Focus Diagnostics)

State Lab Testing

- All specimens that come to BPHL for dengue testing with travel to the Caribbean will also be tested for chikungunya and vice versa.
- Suspect local dengue cases will also be tested for chikungunya.

Chikungunya in Florida

- December 2006-Miami Dade
- January 2007-Volusia
- January 2010-Miami Dade
- November 2013-Miami Dade
- December 2013-Sarasota

3 from India/SriLanka

1 from Philipines

Chikungunya in Florida 2014

- ▣ 10 Cases
 - Dominica (1)
 - Dominican Republic (1)
 - Haiti (6)
 - Martinique (2)

Dengue vs Chikungunya

- ▣ Viruses transmitted by same mosquitoes
- ▣ Diseases have similar clinical features
- ▣ Viruses can circulate in same areas and cause co-infections
- ▣ Important to rule out dengue, as proper clinical management can improve outcome*

*WHO dengue clinical management guidelines:

http://whqlibdoc.who.int/publications/2009/9789241547871_eng.pdf

Dengue vs Chikungunya Clinical Features

	Chikungunya	Dengue
▣ Fever (>39°C)	+++	++
▣ Arthralgia	+++	+/-
▣ Arthritis	+	-
▣ Headache	++	++
▣ Rash	++	+
▣ Myalgia	+	++
▣ Hemorrhage	+/-	++
▣ Shock	-	+

Dengue vs Chikungunya Laboratory Features

	Chikungunya	Dengue
▣ Lymphopenia	+++	++
▣ Neutropenia	+	+++
▣ Thrombocytopenia	+	+++
▣ Hemoconcentration	-	++

Preventive measures

- ▣ No vaccine or medication available to prevent infection or disease
- ▣ Primary prevention measure is to reduce mosquito exposure
- ▣ Advise persons at risk for severe disease to avoid travel to areas with ongoing outbreaks
- ▣ Protect infected people from further mosquito exposure during first week of illness

Information-sharing MOA

**Agreed protocol for reporting arbovirus human cases to Mosquito Control jurisdictions
by County Health Departments**

HIPAA BUSINESS ASSOCIATE AGREEMENT

The Florida Department of Health and its xxxxxxxxx COUNTY HEALTH DEPARTMENT, hereinafter Covered Entity, and xxxxxxxxxxxx (mosquito control), hereinafter Business Associate agree to the following terms and conditions in addition to an existing agreement to perform services that involve the temporary possession of protected health information to develop a product for the use and possession of Business Associate. After completion of the contracted work all protected health information is returned to the Covered Entity or destroyed as directed by the Covered Entity.

Thank You

**“To Cure Disease is Glory;
To Prevent Disease is Victory”**

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