



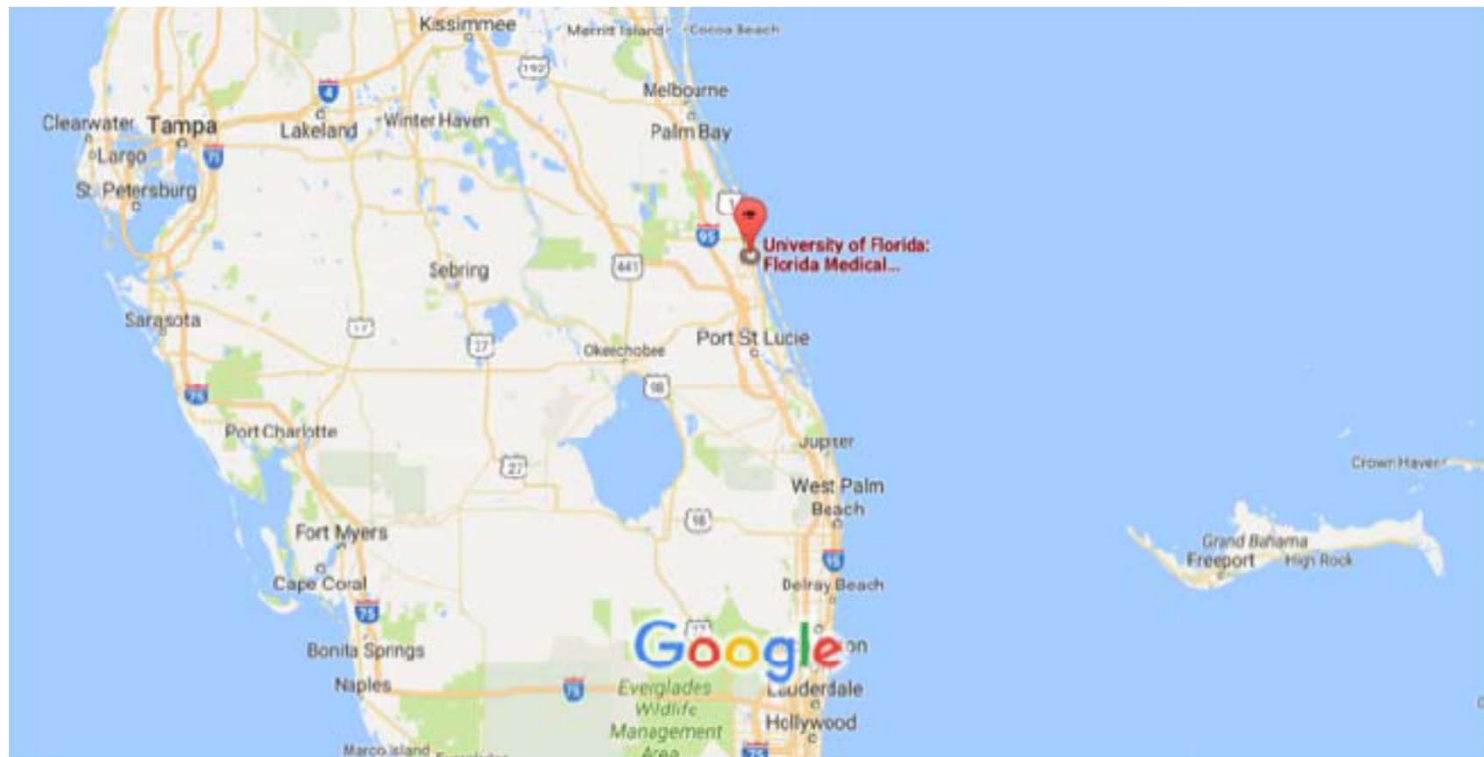
UNDERSTANDING ZIKA AND MOSQUITO-BORNE ILLNESSES

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<http://fme1.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
- Malaria
- Yellow Fever

1800s

- Dengue
- Dog heartworm
- EEE
- Malaria
- SLE

1900s

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

2000s

Mosquito biology



80

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)



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The Mosquito Life Cycle



Larvae

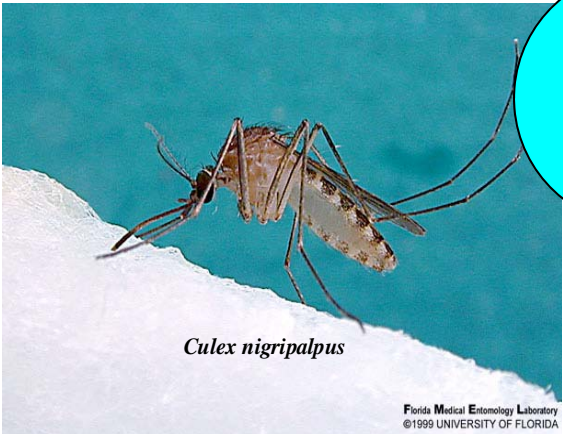
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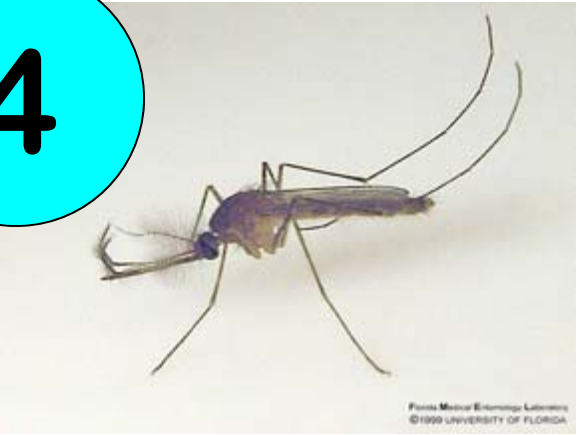
Pupa

1st – 4th Instar



Adult

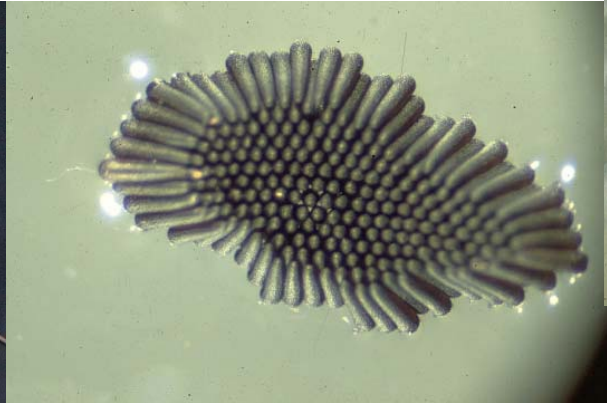
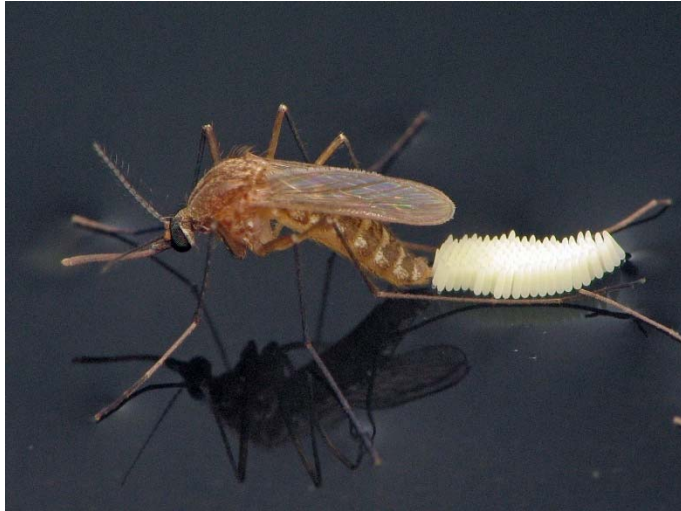
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Permanent water eggs



Floodwater eggs



Mosquito eggs and water sources

Permanent Water

- Ponds
- Lakes (edges)
- Rivers (backwaters)
- Swamps
- Standing water
- Eggs cannot dry out
- Hatch 24-48 hours

Floodwater

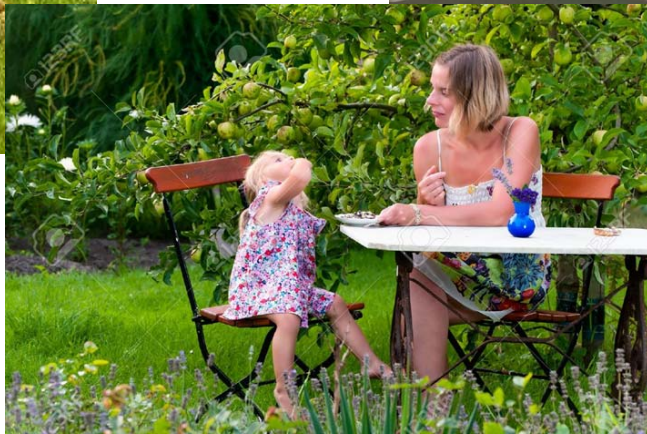
- Low lying areas of pastures
- Salt marsh
- **Containers**
- Moist soils
- Eggs must dry out
- Sides of containers
- “Future” flooding



Painted turtle photographed by CARL R. SAMS II

FLORIDA: Miami-Dade Co.
Everglades National Park
11 October 2015; *leg.* L.E. Reeves





It is during the act of
blood feeding that a
mosquito becomes
infected with a virus or
other pathogen

What happens after the blood meal?

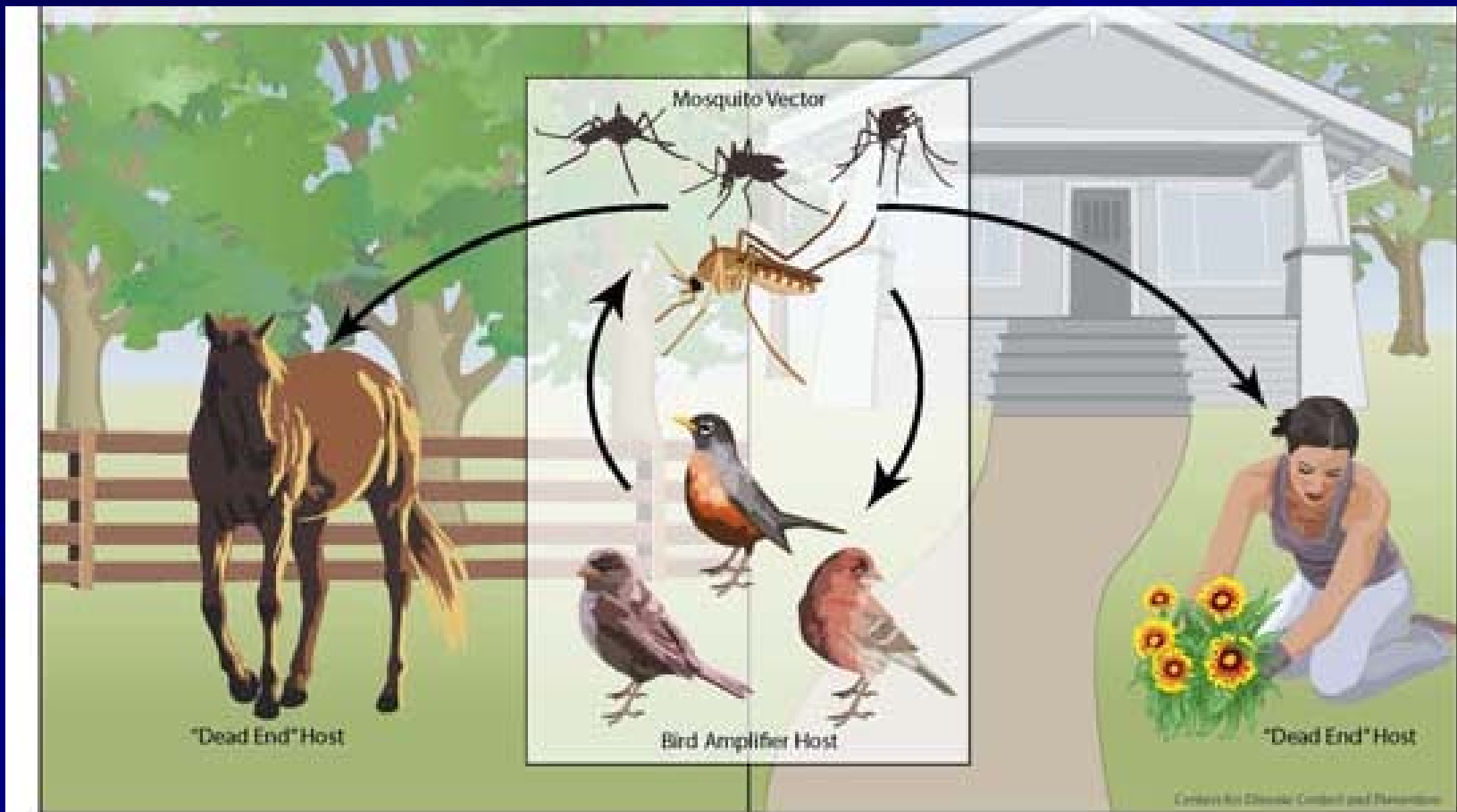
- ~3 days to digest the meal
- Eggs deposited
- Female mosquito begins to search for another blood meal
- If the initial blood meal contained virus
 - Virus enters mosquito midgut and begins to increase in number
 - Virus begins to show up in other parts of the mosquitoes
 - Virus makes it back to the salivary glands

What happens after the blood meal?

- Virus makes it back to the salivary glands
- This process can take 2 – 3 weeks (extrinsic incubation)
- If she bites during this extrinsic incubation time, she is not infective – can't pass on the virus
- After the extrinsic incubation period, she can infect with every bite for the remainder of her life

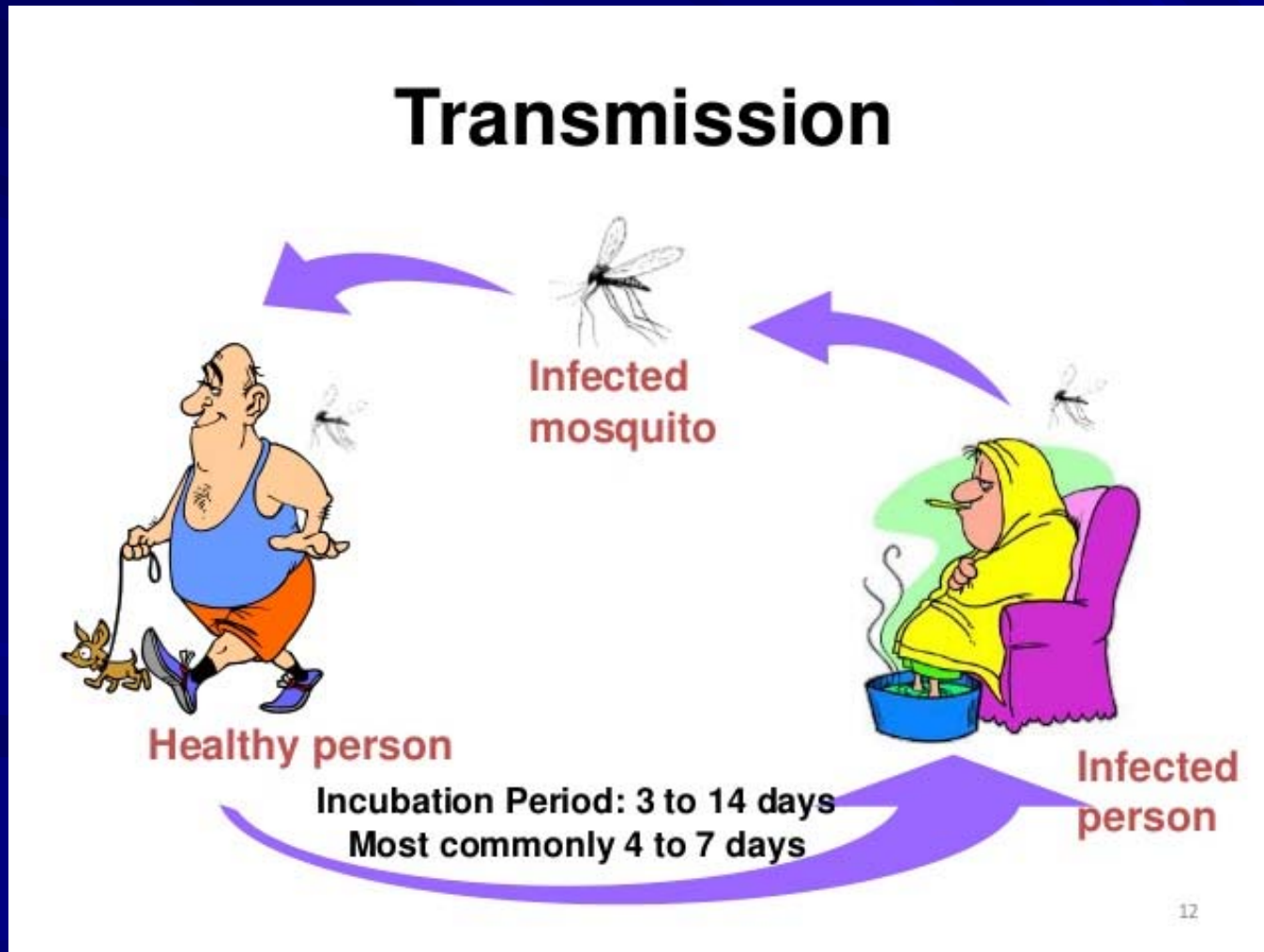
Mosquito-borne Disease Cycles

- Two Host – West Nile, St. Louis Encephalitis, Eastern equine encephalitis



Mosquito-borne Disease Cycles

- One host – Dengue, Chikungunya, Zika



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

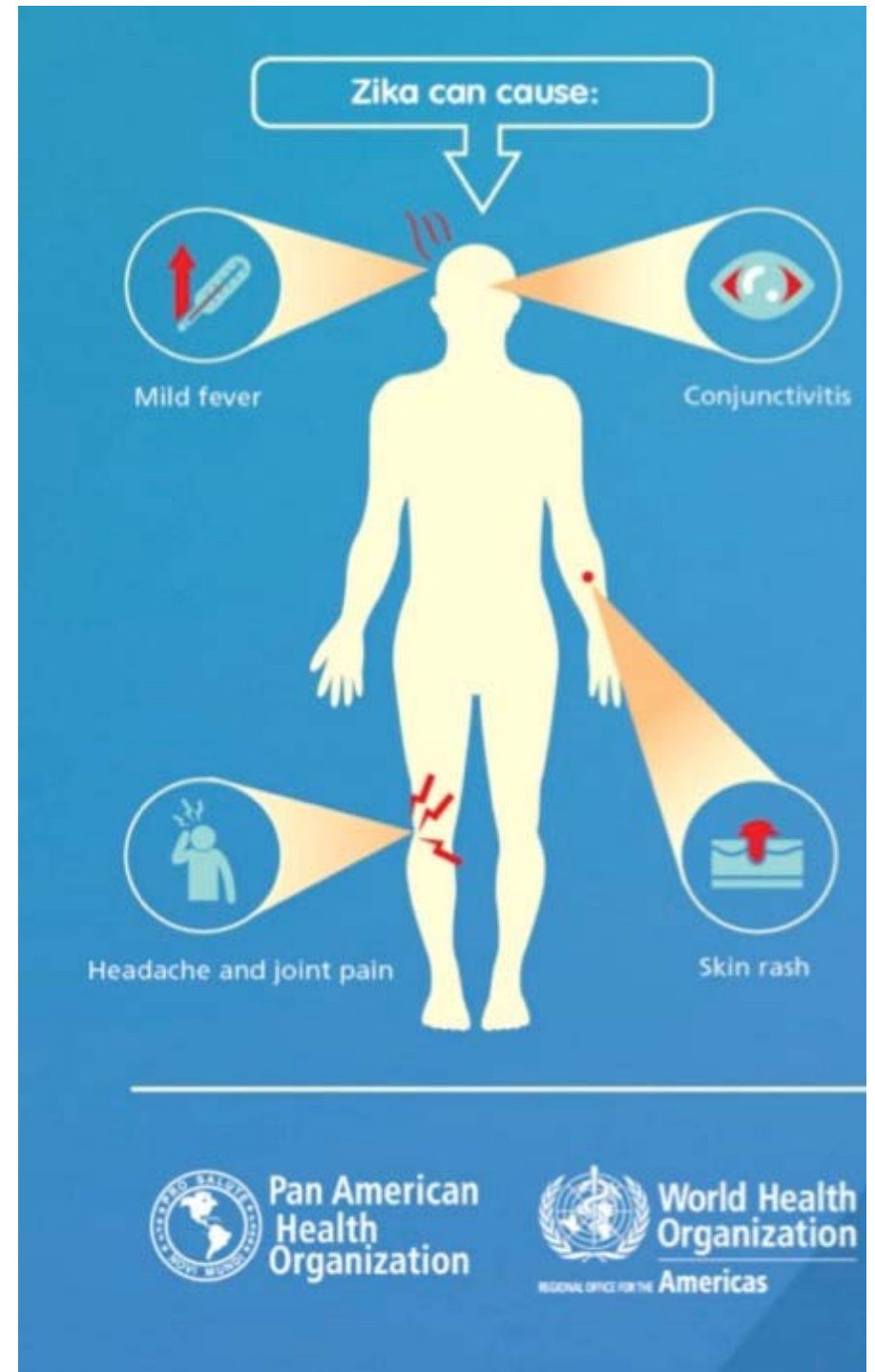
Zika Virus

- 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...**



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

Zika virus - Florida

The total number of Zika cases reported in Florida as of today is 1,228

<http://www.floridahealth.gov/newsroom/2016/11/111516-zika-update.html>

Infection Type	Infection Count
Travel-Related Infections of Zika	969
Locally Acquired Infections of Zika	244
Undetermined	15
Pregnant Women with Lab-Evidence of Zika	178



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Aedes aegypti

Aedes albopictus

Container/Domestic Mosquitoes

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 Mosquitoes¹

Jorge R. Rey and C. Roxanne Connelly²

<http://edis.ifas.ufl.edu/in851>

Florida Container Mosquitoes

The major container species in Florida are:

Aedes aegypti (Linn.)—Yellow fever mosquito (Figure 2). Common container mosquito that will feed during the daytime indoors and out. Common in urban and suburban areas. This species can transmit yellow fever, dengue, chikungunya and Zika viruses, and the nematode that causes dog heartworm. This species is present throughout the state of Florida.



Figure 2. *Aedes aegypti*.

Credit: Jim Newman

[Click thumbnail to enlarge.]

Aedes albopictus (Skuse)—Asian tiger mosquito (Figure 3). Similar habitat requirements as the yellow fever mosquito, although may be more common in suburban and rural areas. This exotic, invasive species can be found in every Florida county; however, it has not been able to establish long-term populations in the Florida Keys.



Figure 3. *Aedes albopictus*.

Credit: Jim Newman

LARVAL HABITATS OF CONTAINER MOSQUITOES



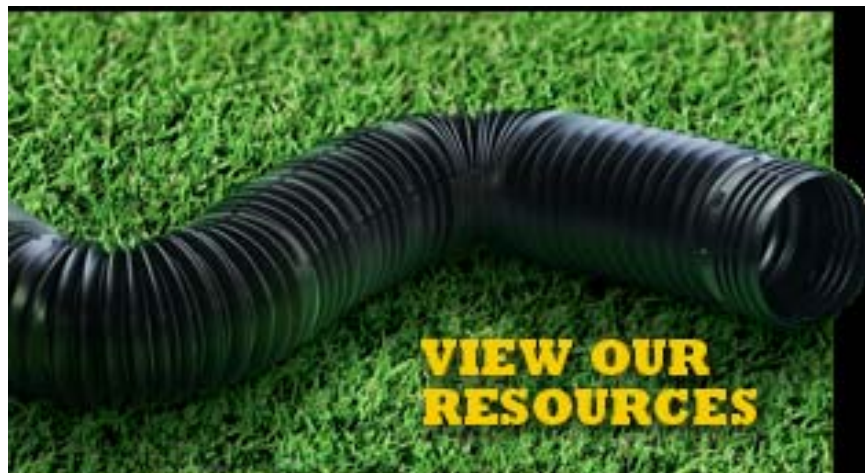
Larval habitats of container mosquitoes



Larval habitats of container mosquitoes



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*

