



**Department  
of Health**

# **Zika Virus Outbreak**

**An Update and Overview of the New  
York State Response**

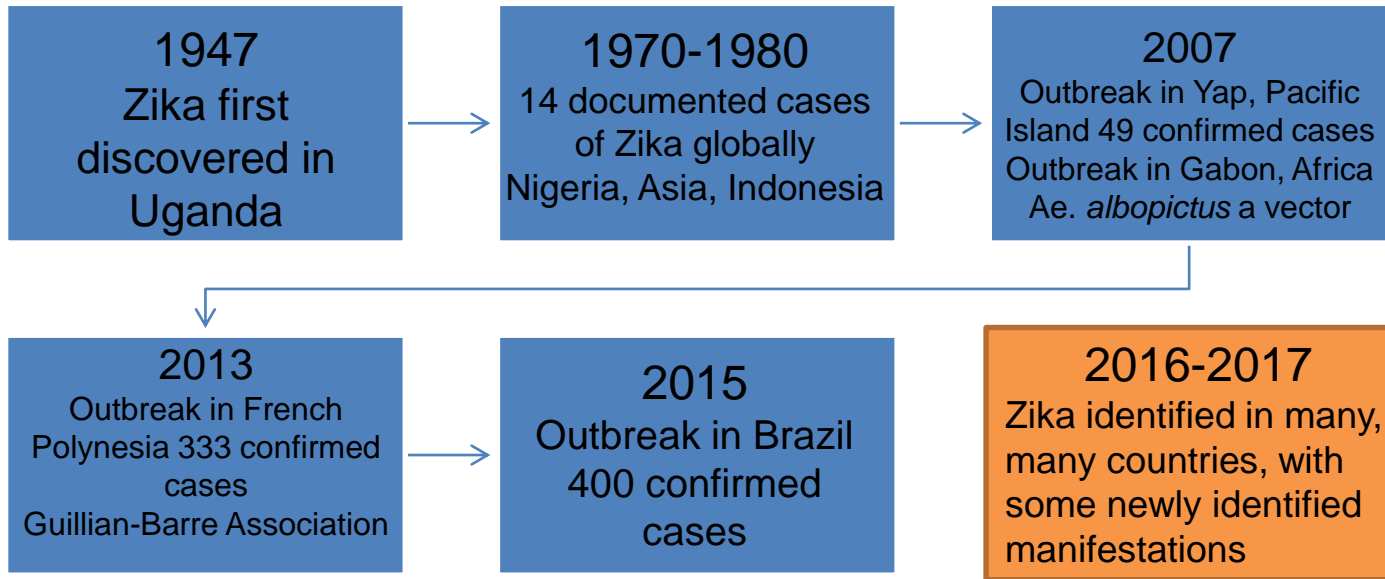
Elizabeth Dufort, MD, FAAP  
Medical Director  
Division of Epidemiology  
New York State Department of Health  
May 2, 2017

# Zika Virus- The Basics

- Arthropod-borne virus (arbovirus)
- Single stranded RNA Virus of the Genus *Flavivirus*
- Closely related to dengue, yellow fever, Japanese encephalitis and West Nile viruses
- Primarily transmitted by the *Aedes* species mosquitoes
  - *Aedes aegypti* (Yellow fever mosquito): efficient vectors for Zika
  - *Aedes albopictus* (Asian tiger mosquito): possible vector for Zika



# Zika Virus Timeline



# Zika in January 2016: we knew very little

## Zika in April 2017: we know a lot, but still not everything

- Zika can cause microcephaly
- Zika can cause GBS
- Zika can impact pregnancies at any point in the pregnancy
- Problems can show themselves after birth
- Zika can be sexually transmitted

- How long is someone infectious?
- Does Zika behave differently with coinfections? Cross reactivity?
- What mosquito species are involved?
- What made Zika so nasty?



# Clinical Presentation – Zika Virus Disease

- Infection rate: 73%
- Symptomatic attack rate among infected: 18%
- All age groups affected
- Adults more likely to present for medical care
- No severe disease, hospitalizations, or deaths

Note: Rates based on serosurvey on Yap Island, 2007 (population 7,391)

Duffy M. N Engl J Med 2009

# Reported Clinical Symptoms Among 31 Confirmed Zika Virus Disease Cases

Symptoms	N	%
Macular or papular rash	28	90%
Subjective fever	20	65%
Arthralgia	20	65%
Conjunctivitis	17	55%
Myalgia	15	48%
Headache	14	45%
Retro-orbital pain	12	39%
Edema	6	19%
Vomiting	3	10%

Yap Island, 2007

Duffy M. N Engl J Med 2009



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# Zika Virus Disease Outcomes

- Clinical illness usually mild, lasting for several days to a week
- Severe disease requiring hospitalization uncommon, fatalities rare
- Neurologic complications are a concern, specifically Guillain-Barré syndrome
- Congenital infection is a concern



# Initial Assessment and Treatment

- No specific antiviral therapy
- Treatment is supportive (i.e., rest, fluids, analgesics, antipyretics)
- Suspected Zika virus infections should be evaluated and managed for possible dengue or chikungunya virus infections
- Aspirin and other NSAIDs should be avoided until dengue can be ruled out to reduce the risk of hemorrhage



## Zika Virus Disease Cases — 50 States and the District of Columbia, January 1–July 31, 2016

2,382 confirmed and probable cases reported

- 65 (3%) of patients were hospitalized
  - Median duration 3 days (range 1-7 days)
  - 11 patients diagnosed viral illness, 2 possible respiratory infection, 6 further clinical evaluation, 1 exacerbation of underlying condition, and 1 septic shock
  - 6 patients neurologic manifestations
    - 5 patients with Guillain-Barre Syndrome
    - 1 patient with paresthesia
- One patient died
  - Septic shock, multiple organ failure

# Pediatric (Non-Congenital) Zika Infection

## Morbidity and Mortality Weekly Report (*MMWR*)

Characteristics of Children Aged <18 Years with Zika Virus Disease Acquired Postnatally – U.S. States, January 2015–July 2016

*Weekly* / October 7, 2016 / 65(39);1082-1085

- Through July 2016, there were 158 pediatric Zika cases
- Median age was 14 years, 56% female, five (3%) pregnant
- Most had rash and more than half had fever and rash
- Two (1%) were hospitalized
- None with GBS
- No deaths



# Modes of Transmission

- Mosquito bite
  - From infected to uninfected humans and primates by bite of a mosquito
- Maternal-fetal
  - Intrauterine
  - Perinatal
- Other
  - Sexual transmission
  - Blood transfusion
- Theoretical
  - Organ or tissue transplantation
  - Breast milk
  - Other?




# CDC-published Distribution Maps

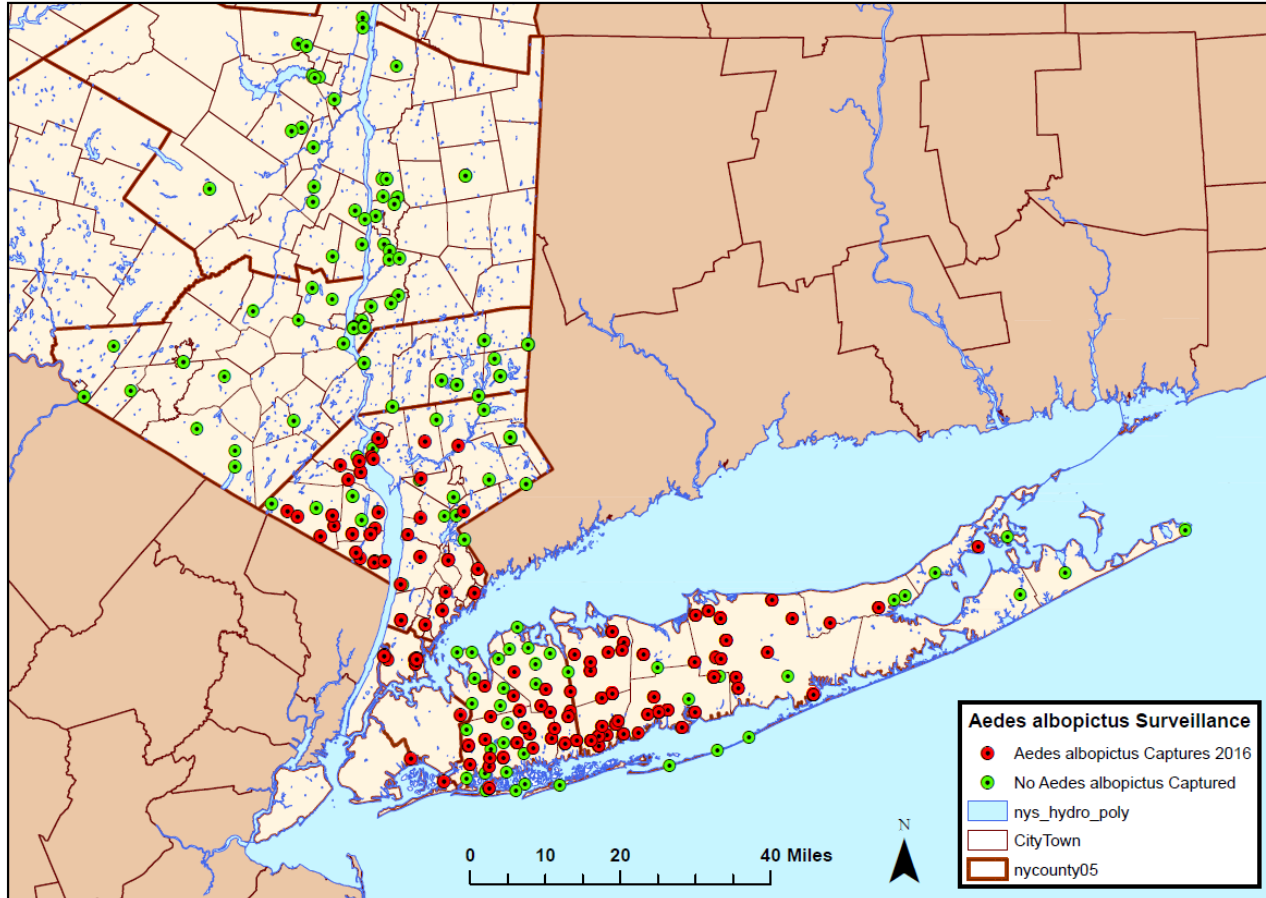


 *Aedes aegypti*



 *Aedes albopictus*

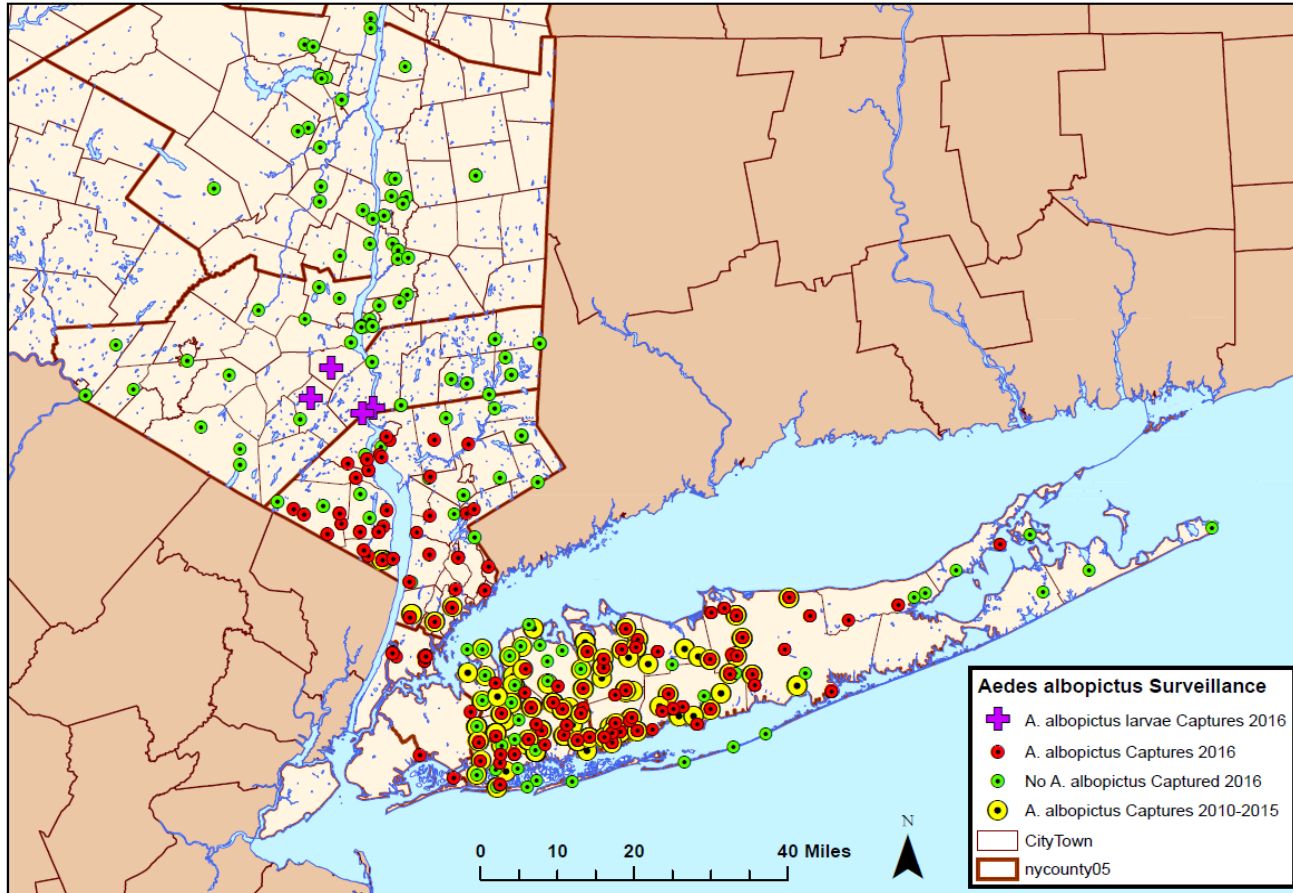
## Aedes albopictus Captures, Metropolitan Region - 2016



# Aedes albopictus collections in NY, 2016

## Aedes albopictus Captures, Metropolitan Region: 2010-2016

# Aedes albopictus collections in NY, 2016



# Mosquitoes: Take-Home Messages

- *Aedes aegypti* is best vector for Zika
  - Not present in NY
- *Aedes albopictus* may be able to transmit Zika
  - Unclear if involved in transmission
  - Present in certain parts of NY
  - Temperature-limited
  - Different behavioral characteristics make it less like to produce outbreaks
- Approximately 75 different mosquito species in NY
  - Only *Ae. albopictus* potentially implicated in Zika transmission



# Countries and Territories with Active Zika Virus Transmission

**CDC** Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People™

SEARCH

CDC A-Z INDEX ▾

## Travelers' Health

CDC > Home

Destinations

Travel Notices

Zika Travel Information +

Find a Clinic +

Disease Directory

Resources +

Yellow Book +

Partners +

Mobile Apps

RSS Feeds

**For Travelers**

Where are you going?  
-- Select One -- ▾

What kind of traveler are you?  
*(optional)*

- Traveling with Children
- Chronic Disease
- Cruise Ship
- Extended Stay/Study Abroad
- Immune-Compromised Travelers
- Pregnant Women
- Mission/Disaster Relief
- Visiting Friends or Family

**For Clinicians**

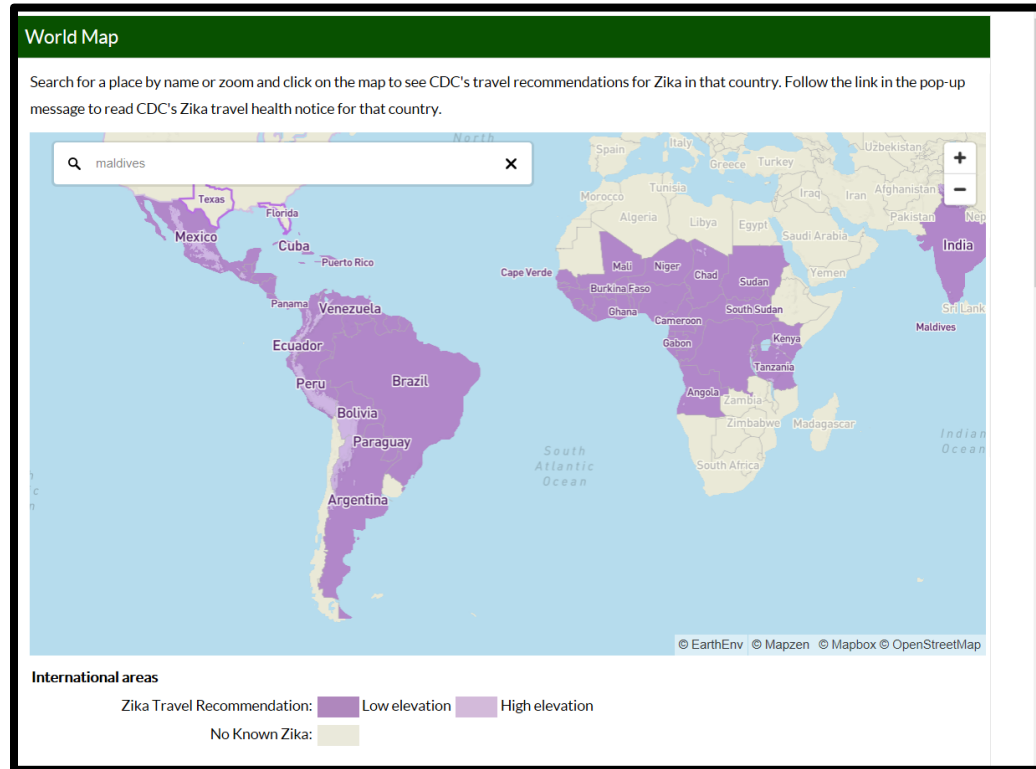
Traveler destination  
-- Select One -- ▾

Special travel needs  
*(optional)*

- Traveling with Children
- Chronic Disease
- Cruise Ship
- Extended Stay/Study Abroad
- Immune-Compromised Travelers
- Pregnant Women
- Mission/Disaster Relief
- Visiting Friends or Family



# Countries and Territories with Active Zika Virus Transmission



# Zika Virus: New Classification System

## Zika Travel Notices

**Zika Virus in Cape Verde**

**Zika Virus in Mexico**

**Africa:** Angola, Guinea-Bissau

**Asia:** Maldives, Singapore

**The Caribbean:** Anguilla; Antigua and Barbuda; Aruba; The Bahamas; Barbados; Bonaire; British Virgin Islands; Cayman Islands; Cuba; Curaçao; Dominica; Dominican Republic; Grenada; Guadeloupe; Haiti; Jamaica; Martinique; Montserrat; the Commonwealth of Puerto Rico, a US territory; Saba; Saint Barthelemy; Saint Kitts and Nevis; Saint Lucia; Saint Martin; Saint Vincent and the Grenadines; Sint Eustatius; Sint Maarten; Trinidad and Tobago; Turks and Caicos Islands; US Virgin Islands

**Central America:** Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama

**The Pacific Islands:** American Samoa, Fiji, Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga

**South America:** Currently includes: Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Venezuela

## Other Areas with Zika Risk

**Africa:** Benin, Burkina-Faso, Burundi, Cameroon, Central African Republic, Chad, Congo (Congo-Brazzaville), Côte d'Ivoire, Democratic Republic of the Congo (Congo-Kinshasa), Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Kenya, Liberia, Mali, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Tanzania, Togo, Uganda

**Asia:** Bangladesh, Burma (Myanmar), Cambodia, India, Indonesia, Laos, Malaysia, Philippines, Timor-Leste (East Timor), Thailand, Vietnam

# Zika Virus: New Classification System

## Other Areas with Zika Risk

Because Zika infection in a pregnant woman can cause severe birth defects, pregnant women should not travel to these areas. All travelers should strictly follow [steps to prevent mosquito bites](#) and [prevent sexual transmission](#) during and after the trip. Zika has likely been present in these areas for years with ongoing transmission. Check this page for the most up-to-date information before you make travel plans.

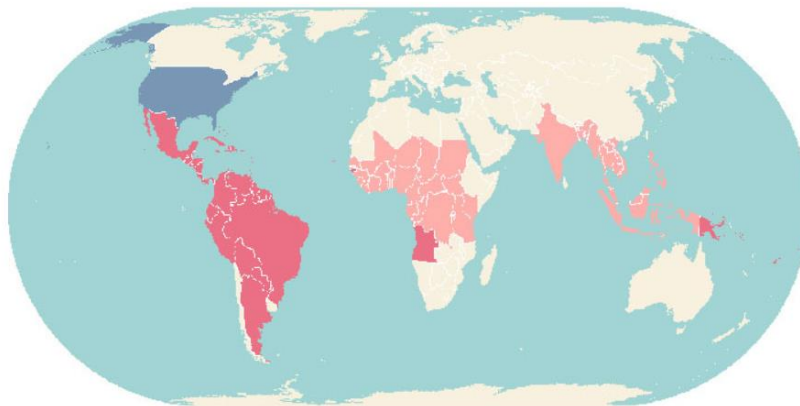
# Zika Virus: New Classification System

## Testing Pregnant Women

### When should pregnant women be tested?

CDC has designed an [algorithm](#) based on current recommendations to assist in clinical decision making about testing for Zika virus infection. Testing recommendations by area of travel are outlined below.

CDC Zika Testing Recommendations for Pregnant Women



**Areas with a [CDC Zika travel notice](#):** Areas where the virus has been newly introduced or reintroduced and mosquitoes in the area are infected with Zika virus and are spreading it to people.

**Areas with [risk of Zika but no CDC Zika travel notice](#):** Areas where the virus was present before 2015 and there is no evidence transmission has stopped and areas where the virus is likely to be circulating but has not been documented. Travel notices would be considered if the number of cases rises to the level of an outbreak.

**For exposure\* in the United States, please visit [this webpage](#) for current maps and guidance.**

\*Exposure means living in or traveling to this area or having sex without a condom with someone who lives in or has traveled to this area.

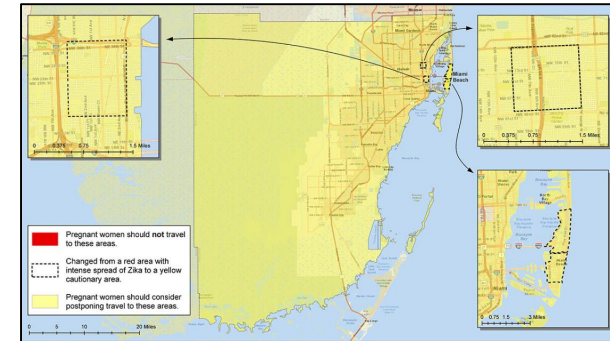
# Zika Virus: New Classification System

If your patient...	When to be tested
Traveled to an area with risk of Zika virus infection that has a CDC <a href="#">Zika travel notice</a>	Pregnant women who traveled to an area with a Zika travel notice should be tested for Zika after their return from travel, regardless of whether or not they have symptoms.
Traveled to an area with risk of Zika virus infection but <b>no</b> CDC <a href="#">Zika travel notice</a>	Pregnant women who traveled to an area with risk of Zika but no CDC Zika travel notice should be tested if they develop <a href="#">symptoms</a> of Zika or if their fetus has abnormalities on an ultrasound that may be related to Zika infection. Because the level of risk of Zika virus infection is unknown in areas with Zika risk but without travel notices, routine testing is not recommended for pregnant women who have traveled to those areas but who do not have symptoms. However, testing may be offered on a case-by-case basis.

# Locally-acquired Zika Virus Cases in the United States

## South Florida

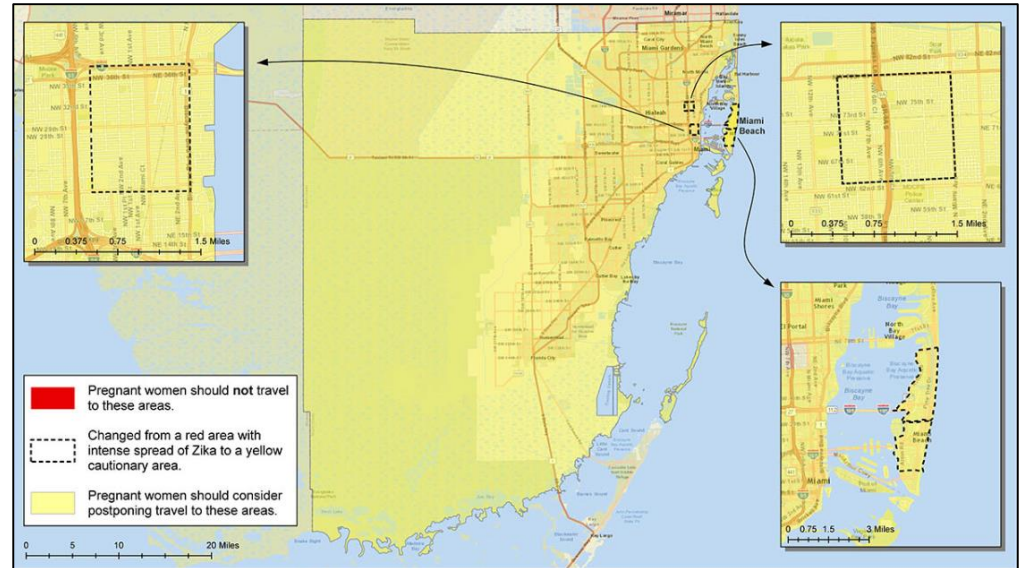
- Miami-Dade county, Florida
  - Mid-June to current
  - Red to yellow
- Zika cautionary area (yellow area)
  - Pregnant women should consider postponing travel
  - A geographic area where local transmission has been identified, but evidence is lacking that the intensity of transmission is comparable to that in a red area
  - Although the specific level of risk in yellow areas is unknown, there is still a risk to pregnant women
- Pregnant women who lived in, traveled to, or had sex without a condom with someone who lived in or traveled to Miami-Dade County should be tested for Zika virus
- Increased surveillance efforts and vector control



# Locally-acquired Zika Virus Cases in the United States

## South Florida

- Areas of concern in Miami-Dade County, Florida
  - Wynwood neighborhood
  - Miami Beach
  - Little River (north of Little Haiti)
- For specifics, call the Florida Health Department Zika Hotline:  
**855-622-6735**



# Locally-acquired Zika Virus Cases in the United States

## Texas

- Nov. 28<sup>th</sup> 2016 Texas DOH reported the first case of local mosquito-borne transmission of Zika virus in a resident of Brownsville, Texas
- Additional cases identified, suggesting a risk of continued spread of Zika virus
- Zika cautionary area (yellow area)
- Pregnant women should consider postponing travel
- Increased surveillance efforts and vector control





# Modes of Transmission

- Mosquito bite
  - From infected to uninfected humans and primates by bite of a mosquito
- Maternal-fetal
  - Intrauterine
  - Perinatal
- Other
  - Sexual transmission
  - Blood transfusion
- Theoretical
  - Organ or tissue transplantation
  - Breast milk
  - Other?



# Sexual Transmission - Recommendations

- Male to female, male to male, oral sexual contact, symptomatic or asymptomatic
- Length of infectivity in the semen under study, reports up to 6 months
- If partner is pregnant
  - Abstain or condom use throughout the duration of the pregnancy
  - Consider same for non-pregnant partners
- If not pregnant and not trying to get pregnant → use contraception/condoms
- **Suggested timeframe to wait before trying to conceive →**
  - **Women should wait at least 8 weeks after possible exposure**
  - **Men should wait at least 6 months after possible exposure**



# Future Pregnancies

**No evidence Zika virus will cause congenital infection in pregnancies conceived after resolution of maternal Zika viremia**

- Incubation: approximately 3-14 days
- Viremia: after symptom onset, approximately few days to 1-2 weeks (limited data)
- *Must still be concerned about male partner travel*

# Modes of Transmission

- Mosquito bite
  - From infected to uninfected humans and primates by bite of a mosquito
- Maternal-fetal
  - Intrauterine
  - Perinatal
- Other
  - Sexual transmission
  - Blood transfusion
- Theoretical
  - Organ or tissue transplantation
  - Breast milk
  - Other?



## Preliminary Findings from an Investigation of Zika Virus Infection in a Patient with No Known Risk Factors — Utah, 2016

### • Clinical history (Patient A)

- Fever, rash, conjunctivitis
- Positive PCR and antibody testing for Zika virus
- No travel, sexual exposure, blood transfusions, mosquito bites
- He had cared for an elderly family member (index patient) who had contracted Zika virus abroad
  - The index patient developed septic shock and multiple organ failure
  - 2 days before his death, the index patient's blood viremia level was 100,000 times higher than the average level reported in persons with Zika virus infection

### • CDC and Utah DOH epidemiologic investigation

- Tested multiple other family members with contact (all negative to date)
- Serosurvey of healthcare providers (all negative to date)
- Community serosurvey around locations of index patient (all negative to date)
- Active vector surveillance near residencies (no *Aedes aegypti* or *Aedes albopictus* identified)

### Conclusions:

It remains unclear how patient A was infected; however patient A was known to have had close contact (i.e. kissing and touching) with the index patient while the index patient's viral load was found to be very high. Although it is not certain that these types of close contact were the source of transmission, family contacts should be aware that blood and body fluids of severely ill patients might be infectious. Given recognition of high levels of viremia during illness, it is essential that health care workers continue to apply standard precautions while caring for all patients, including those who might have Zika virus disease (3).

# Zika Virus Cases

## US

Total Zika virus cases reported: 5,197

Locally acquired cases reported: 222

Florida: 216

Texas: 6

Travel-associated cases reported: 4,946

Sexually transmitted: 45

Laboratory-acquired cases reported: 1

Pregnant women: 1,716

Birth Defects: 56

Total Cases as of April 5, 2017

The “NY Experience” to date; NY has 20% of US Zika cases.

## NYS

Travel-associated cases reported: 1,342

**Locally acquired cases reported: 0**

Laboratory-acquired cases reported: 0

Pregnant women: 463

Birth Defects: 8



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Total Cases as of April 10, 2017

# Clinical Care: Evaluation of Pregnant Women

- Obtain recent travel history from all pregnant women about their travel and their sexual partner's travel
- NYSDOH recommends providers offer testing for all pregnant women who may have been exposed to Zika virus
  - Whether pregnant woman is symptomatic OR asymptomatic
  - Any time after travel\* (NYS specific)
  - Ideally as soon as possible after symptoms
  - Whether or not the partner had symptoms

# Zika Testing in the United States

## January 3 – March 5, 2016

- 4,534 Zika tests done
- 1,541 symptomatic
  - 182 (11.8%) had confirmed Zika virus infection
- 2,557 asymptomatic
  - 2,425 (95%) were pregnant women
    - Seven (0.3%) had confirmed Zika virus infection
      - Five resided in areas of active Zika virus transmission during pregnancy
  - Most asymptomatic pregnant who receive testing do not have Zika virus infection
- Low proportion in asymptomatic pregnant women is reassuring
- However, given severe consequences still recommend testing asymptomatic pregnant women





# Diagnostic Testing for Zika Virus

## 1. PCR assay:

- To detect viral RNA in serum and urine

## 2. Antibody testing:

- Screening antibody tests (Zika IgM ELISA and Flavivirus Total Antibody (WNV MIA))
  - If negative (and correct timing) → done
- If either screen is positive → a more specific antibody test - PRNT
  - Plaque reduction neutralization test (PRNT) to determine if neutralizing antibodies to Zika or Dengue

# Arbovirus

## Plaque Reduction Neutralization Test (PRNT)

- More specific diagnostic assay
- It is a biological assay based on the interaction of virus and antibody resulting in inactivation of virus so it is no longer able to infect and replicate in cell culture
- This assay measures the titer of the antibodies in the serum of the infected individual
  - Ideally comparing an acute and a convalescent specimen
  - Total antibody test (mostly IgG)
  - Cross reacting antibodies

# Zika Virus: Diagnostic Testing at Wadsworth

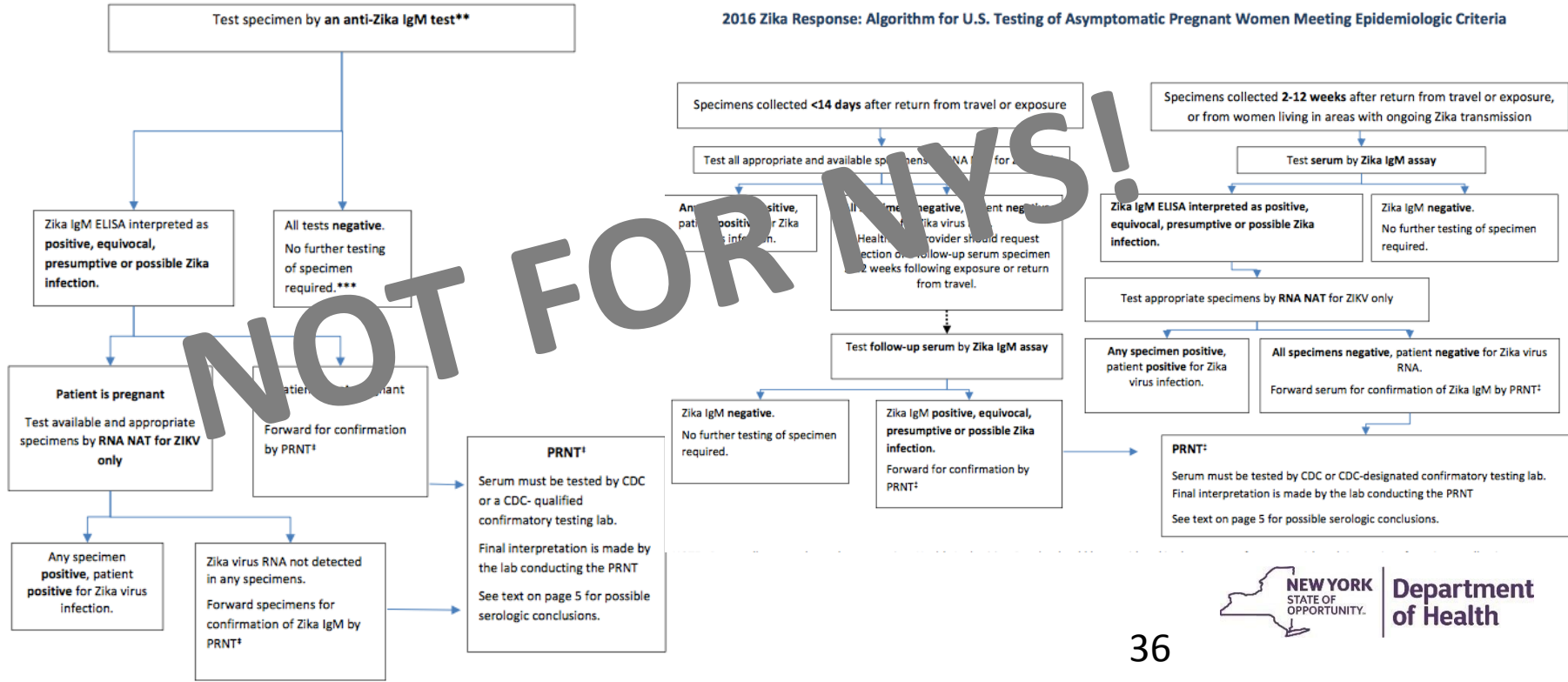
Test	Purpose	Results	Next steps
<u>POLYMERASE CHAIN REACTION:</u> (serum or urine)			
--PCR	Detect Zika virus genetic material	Detected or not detected (indeterminate, equivocal)	If Zika virus detected, infection is confirmed. No further testing needed
<u>SEROLOGY: (serum)</u>			
--Zika IgM ELISA antibody	Screening test for IgM antibodies to flaviviruses	Presumptive positive, negative (inconclusive, equivocal)	Results interpreted in conjunction with MIA and exposure history to determine if convalescent titers and PRNT needed
--Arbovirus Total Antibody Microsphere Immunofluorescence Assay (MIA)	Screening test for total antibodies to flaviviruses	Reactive, nonreactive	Results interpreted in conjunction with IgM and exposure history to determine if convalescent titers and PRNT needed
--Plaque Reduction Neutralization Testing (PRNT)	Quantifies amount of neutralizing antibody to viruses of interest	Positive, negative, titers (for each flavivirus tested)	Usually conducted on paired sera in follow-up of possible IgM presence and/or reactive MIA. May be done on single specimen to provide preliminary information in pregnant women



# Guidance for U.S. Laboratories Testing for Zika Virus Infection

## November 16, 2016

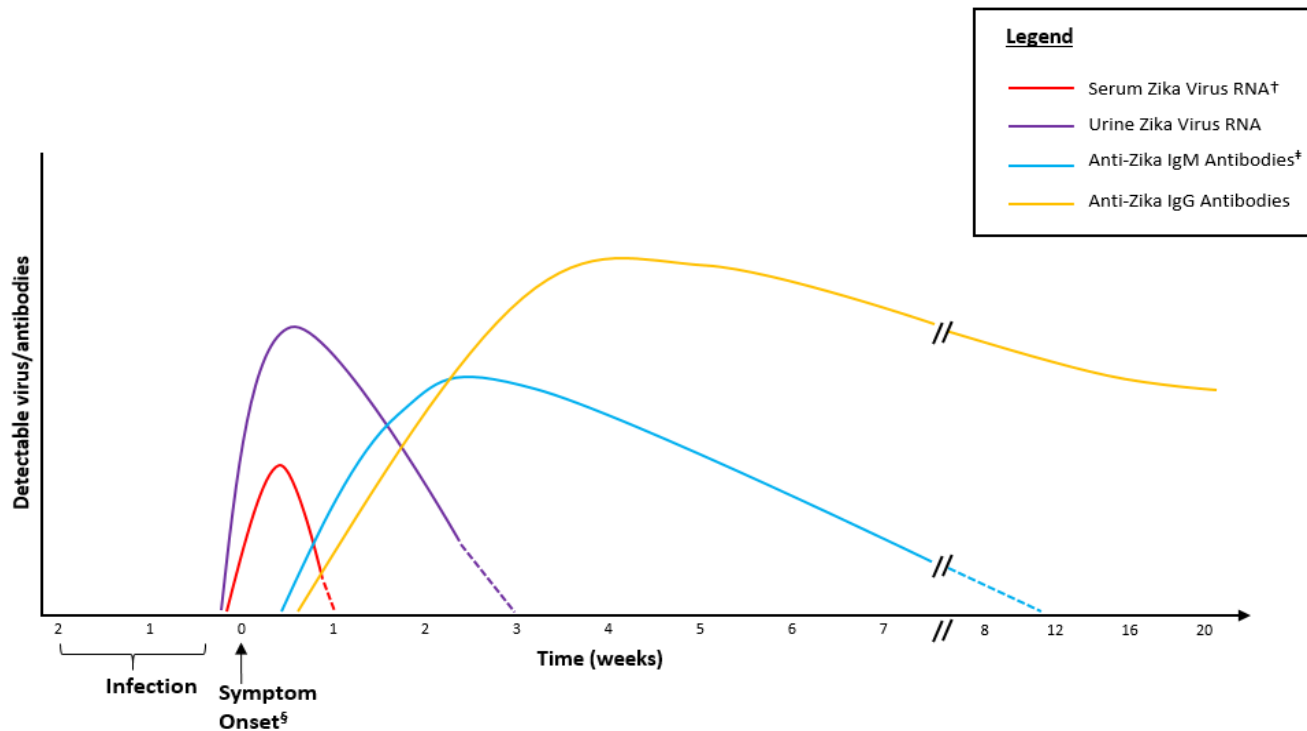
2016 Zika Response: Algorithm for U.S. Testing of Asymptomatic Pregnant Women Meeting Epidemiologic Criteria



# Commercial Laboratories and Zika Virus Testing

- Commercially available testing varies by laboratory
  - Serum PCR, urine PCR, and/or Zika IgM
- Negative predictive value of a given test is highly dependent on timing since exposure
- Zika IgM titers can be affected by cross-reactivity with other flaviviruses (ex. Dengue virus)
- Comprehensive serologic evaluation (ie, evaluation of total antibodies against specific flaviviruses by microsphere immunofluorescence assay and plaque reduction neutralization testing) is not available through commercial laboratories

## Detecting Zika Virus RNA and Antibodies\*



\*These are estimates based on limited data available at this time.

† This curve may not be representative of pregnant women. Some pregnant women have been reported to exhibit prolonged viremia.

‡ When Zika infection occurs following a prior Flavivirus infection, such as dengue, the Zika IgM antibody response may be lower and last for a shorter amount of time than shown in this graph.

§ Approximately 80% of those infected are asymptomatic.



# Persistent Viremia in Pregnant Women



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MICROBIOLOGY

Journal of  
Clinical Microbiology®

## Zika Virus Testing Considerations: Lessons Learned from the First 80 Real- Time Reverse Transcription-PCR-Positive Cases Diagnosed in New York State

✉ Kirsten St. George,<sup>a</sup> Inderbir S. Sohi,<sup>b</sup> Elizabeth M. Dufort,<sup>b</sup> Amy B. Dean,<sup>a</sup>  
Jennifer L. White,<sup>b</sup> Ronald Limberger,<sup>a</sup> Jamie N. Sommer,<sup>b</sup> Stephanie Ostrowski,<sup>b</sup>  
Susan J. Wong,<sup>a</sup> P. Bryon Backenson,<sup>b</sup> Daniel Kuhles,<sup>b</sup> Debra Blog,<sup>b</sup> Jill Taylor,<sup>a</sup>  
Brad Hutton,<sup>c</sup> Howard A. Zucker<sup>d</sup>

February 2017 Volume 55 Issue 2

- Viremia typically lasts approximately one week after symptom onset
- Pregnant women with serum PCR positivity at up to 10 weeks after symptom onset (Driggers) and 16, 17, 25, 33 and 53 days post-travel or symptom onset (St. George)
- Prognostic significance?
- No restriction by NYSDOH Wadsworth Center on PCR testing in pregnant women based on timing after exposure

Driggers et al. N Engl J Med 2016;374:2142-51. DOI:  
10.1056/NEJMoa1601824

## Research Paper

## A Multiplex Microsphere Immunoassay for Zika Virus Diagnosis

Susan J. Wong <sup>a,\*</sup>, Andrea Furuya <sup>a,1</sup>, Jing Zou <sup>b,1</sup>, Xuping Xie <sup>b</sup>, Alan P. Dupuis II <sup>a</sup>,  
Laura D. Kramer <sup>a</sup>, Pei-Yong Shi <sup>b,c,d,e,\*\*</sup>

<sup>a</sup> Wadsworth Center, New York State Department of Health, Albany, New York, USA

<sup>b</sup> Department of Biochemistry & Molecular Biology, University of Texas Medical Branch, Galveston, TX, USA

<sup>c</sup> Department of Pharmacology & Toxicology, University of Texas Medical Branch, Galveston, TX, USA

<sup>d</sup> Sealy Center for Structural Biology & Molecular Biophysics, University of Texas Medical Branch, Galveston, TX, USA

<sup>e</sup> Institute for Translational Science, University of Texas Medical Branch, Galveston, TX, USA



- Wadsworth is transitioning to a new MIA based on antibodies to Zika virus NS-1 (nonstructural protein)
  - Greater specificity for Zika virus
  - Procedurally a simpler test than PRNT



# Zika - Current Testing Challenges

- Determining the timing of Zika virus infection
  - 80% asymptomatic infections
  - Cross-reactivity in current IgM assays
  - Persons with previous Dengue virus infection may have a muted IgM response to Zika virus
  - Wadsworth is exploring the role of avidity assays in determining recency of infection
- Absence of commercially available Zika IgG assay
- Testing protocols for pregnant women and their sexual partners with recurrent travel to or residence in areas with active Zika spread
- Transition from routine public health testing to testing through commercial laboratories
- Optimal testing for infants exposed prenatally or perinatally
- Role of testing in pre-conception planning; testing of semen

# What is the Risk?

Centers for Disease Control and Prevention

# MMWR

Early Release / Vol. 66

Morbidity and Mortality Weekly Report

April 4, 2017

**Vital Signs: Update on Zika Virus–Associated Birth Defects  
and Evaluation of All U.S. Infants with Congenital Zika Virus Exposure —  
U.S. Zika Pregnancy Registry, 2016**

- In the U.S. in 2016, nearly 1,000 pregnant women with evidence of Zika virus infection completed their pregnancies
- Most women were diagnosed with ‘possible Zika infection’ due to some laboratory evidence of recent Zika infection
  - 5% of women in this group had reported fetal/infant birth defects
- A subgroup of those women were defined as ‘confirmed Zika infection’ due to laboratory evidence of the presence of Zika virus on molecular testing or antibodies specific to Zika virus
  - 10% of women in this group had reported fetal/infant birth defects
  - Out of these women, 15% of mothers with confirmed Zika virus infection in the first trimester had reported fetal/infant birth defects



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# Study: Zika Virus (ZKV) Infection in Pregnant Women in Rio de Janeiro



- 345 women enrolled from September 2015 through May 2016; of these, 182 (53%) women tested positive for ZIKV in blood, urine, or both.
- Timing of acute ZIKV infection ranged from 6 to 39 weeks of gestation.
- Among 117 live infants born to 116 ZIKV- positive women, 42% with grossly abnormal clinical or brain imaging findings or both, including 4 infants with microcephaly.

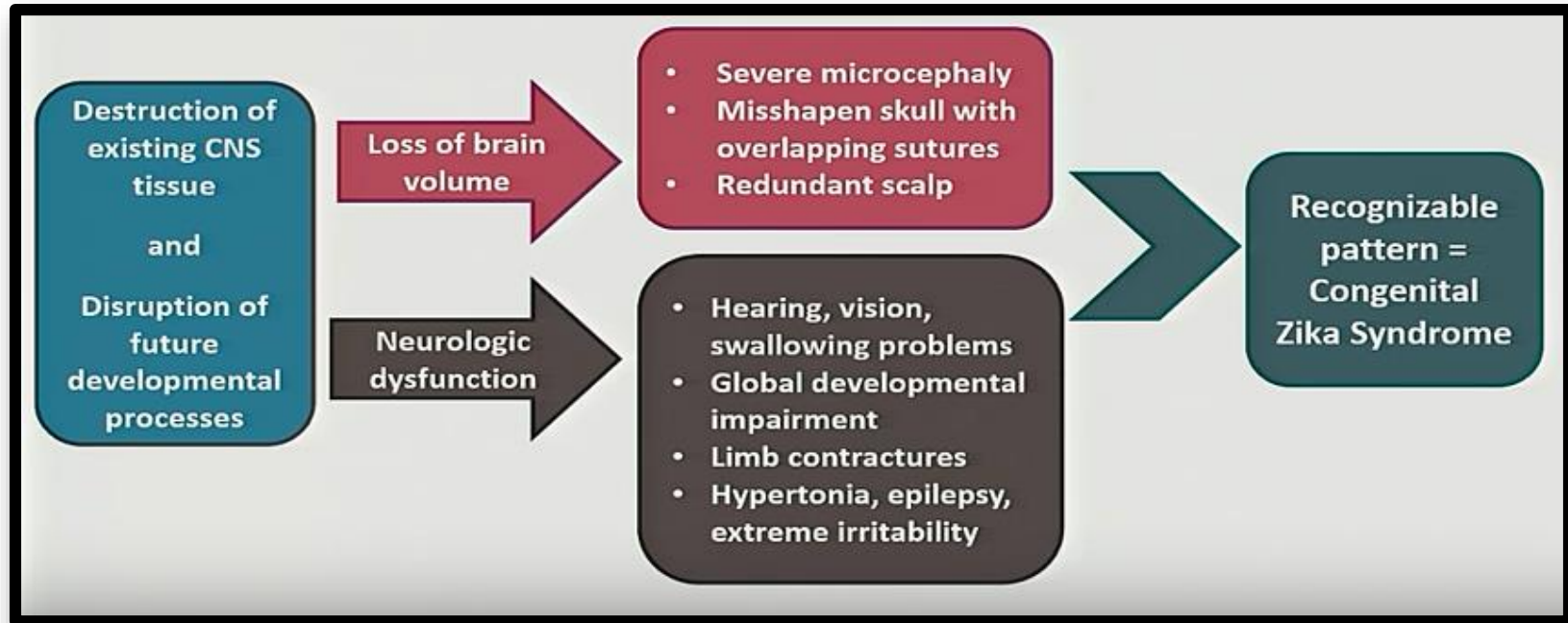
## Study: Characterizing the Pattern of Anomalies in Congenital Zika Syndrome (CZVS) for Pediatric Clinicians

Features differentiating CZVS from other congenital infections:

- Severe microcephaly with partially collapsed skull
- Thin cerebral cortices with subcortical calcifications
- Macular scarring and focal pigmentary retinal mottling
- Congenital contractures
- Marked early hypertonia with symptoms of extrapyramidal involvement



# Congenital Zika Virus Syndrome



Courtesy of CDC: <https://www.youtube.com/watch?v=6P6008JbfIE>

# Cranial Morphology

Biparietal depression

Skin rugae

Prominent occiput

- ❑ Partial collapse of the skull with overlapping sutures
- ❑ Consistent with fetal brain disruption sequence (FBDS)
- ❑ Not all severe microcephaly will look like this



**A** Lateral view of skull irregularities



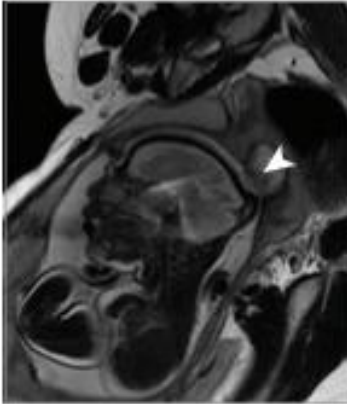
**B** Excessive scalp with folds



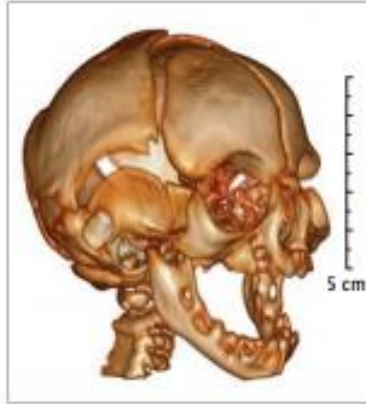
**C** Lateral skull radiograph



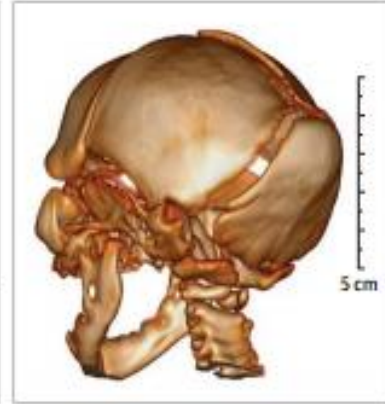
**D** MRI at 29 wk gestation



**E** 3-Dimensional skull reconstruction

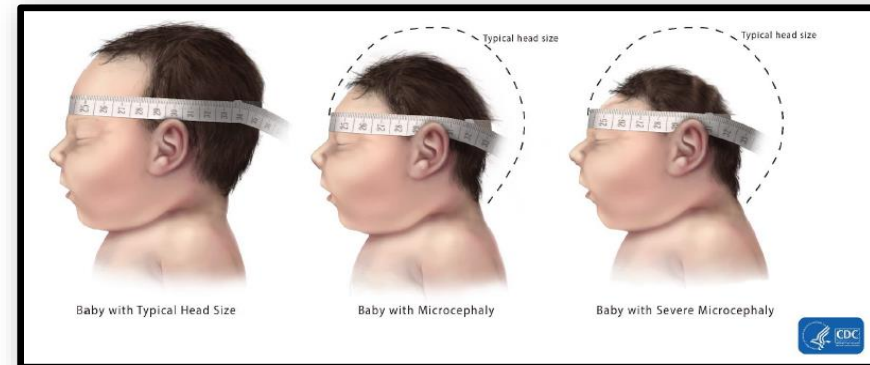


**F** 3-Dimensional skull reconstruction



# Microcephaly Diagnosis

- Prenatally:
  - Can be difficult to diagnose
  - May be detected by routine ultrasound at 18-20 weeks
  - However, best identified on ultrasound later in pregnancy (late second trimester, early third trimester)
- Infant:
  - CDC defines as head circumference  $< 3^{\text{rd}}$  percentile
  - CDC recommends INTERGROWTH-21<sup>st</sup> standards
    - <http://intergrowth21.ndog.ox.ac.uk/>
      - Standard growth charts by gestation, sex, and age





## Management of Infants with Abnormalities Consistent with Congenital Zika Syndrome

- Consultation with:
  - Neurologist for determination of appropriate neuroimaging and additional evaluation.
  - Infectious disease specialist for diagnostic evaluation of other congenital infections (e.g., syphilis, toxoplasmosis, rubella, cytomegalovirus infection, lymphocytic choriomeningitis virus infection, and herpes simplex virus infection).
  - Ophthalmologist for comprehensive eye exam and evaluation for possible cortical visual impairment prior to discharge from the hospital or within 1 month of birth.
  - Endocrinologist for evaluation for hypothalamic or pituitary dysfunction.
  - Clinical geneticist to evaluate for other causes of microcephaly or other anomalies if present.
- Consider consultation with:
  - Orthopedist, physiatrist, or physical therapist for the management of hypertonia, club foot or arthrogrypotic-like conditions.
  - Pulmonologist or otolaryngologist for concerns about aspiration.
  - Lactation specialist, nutritionist, gastroenterologist, or speech or occupational therapist for the management of feeding issues.
- Perform auditory brainstem response to assess hearing.
- Perform complete blood count and metabolic panel, including liver function tests.
- Provide family and supportive services.

- Zika virus testing
  - Maternal testing, if not previously completed
  - Infant urine for PCR
  - Infant serum for PCR and serology
  - Placenta/umbilical cord
    - Fixed tissue for PCR and IHC
    - Fresh frozen tissue for PCR
- Evaluation for other causes of microcephaly
- Consultation and evaluation as indicated, with attention to neurologic, ophthalmologic and auditory status

# Breast Feeding

- Zika virus has been identified in breast milk
- No reports of Zika virus infection associated with breastfeeding
- Current evidence suggests that the benefits of breastfeeding outweigh the theoretical risks of Zika virus transmission.
- Current recommendations from both the CDC and the WHO are that women should be encouraged and supported to breastfeed their infants, regardless of maternal or infant Zika virus testing results.

# CDC Zika Pregnancy Registry

- Goals
  - To collect information about pregnancy and infant outcomes following Zika virus infection during pregnancy
  - To update recommendations for clinical care, plan for services for pregnant women and families, and improve prevention of Zika virus infection during pregnancy
- Inclusion criteria: Any pregnant women with laboratory evidence of possible Zika virus infection and their infants
  - Infants of women who meet inclusion criteria will be followed at regular intervals for the first year of life
- Women followed through ZPR in New York State (4/14/2017)
  - NYC – 385
  - NYS outside of NYC – 92
- Congenital Zika virus syndrome (4/14/2017)
  - NYC – 7
  - NYS - 1



# Congenital Malformations Registry (CMR)

- The NYS CMR will be reviewing medical records on infants with defects potentially related to Zika virus
- Purpose:
  - To assist in the identification of all infants potentially infected with Zika virus *in utero*
  - To provide background information on the prevalence of these conditions



# Surveillance Challenges

- Timely testing of pregnant women at risk of Zika virus
- Appropriate public health approach to pregnant women with initial potential exposure to Zika >12 weeks before testing who have no evidence of recent infection but who have antibodies to Zika virus
- Timely infant testing
- Definition and appropriate identification of microcephaly
  - Consistent measurements
  - Appropriate standards
  - Disproportionate, proportionate, “relative” microcephaly
  - Congenital vs acquired microcephaly
- Range of congenital anomalies associated with Zika virus
  - Example: recent description of severe spinal cord malformations

# Prevention - Repellent/Advice For Patients

- If travel to areas with active local Zika transmission, individuals (particularly pregnant women) should take precautions to avoid mosquito bites
- EPA-registered repellents:
  - DEET (typically 20-35%)
  - Picaridin
  - IR-3535
  - Oil of Lemon Eucalyptus (OLE) or (PMD)
    - PMD=para-menthane-3,8-diol the synthesized version of OLE)
    - Not for < 3 yo
- Wear long-sleeved shirts and pants
- Consider permethrin-impregnated clothing
- Check screens, consider bed netting
- Don't forget condoms and contraception!

<https://wwwnc.cdc.gov/travel/yellowbook/2016/the-pre-travel-consultation/protection-against-mosquitoes-ticks-other-arthropods>



# Zika Resources

## CDC Zika Virus Information Page

[www.cdc.gov/zika](http://www.cdc.gov/zika)

## NYSDOH Zika Virus Information Page

[www.health.ny.gov/diseases/zika\\_virus/](http://www.health.ny.gov/diseases/zika_virus/)

## NYC DOHMH Zika virus Information Page

[www.nyc.gov/zika/provider](http://www.nyc.gov/zika/provider)

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- **NYSDOH Division of Epidemiology and Bureau of Communicable Disease Control**
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- **NYSDOH Congenital Malformations Registry**
- **NYC DOHMH**
- **Centers for Disease Control and Prevention**



# Questions??



Contact the NYSDOH Zika Information Line at:

**1-888-364-4723**

**9AM-5PM weekdays**

**[Elizabeth.Dufort@health.ny.gov](mailto:Elizabeth.Dufort@health.ny.gov)**



**Department  
of Health**