Zika Virus

Ingrid Rabe
Medical Epidemiologist
Arboviral Diseases Branch
Centers for Disease Control and Prevention

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Zika Virus

- Single stranded RNA virus
- Genus *Flavivirus*, family *Flaviviridae*
- Closely related to dengue, yellow fever, Japanese encephalitis, and West Nile viruses
- Transmitted to humans primarily by *Aedes (Stegomyia)* species mosquitoes

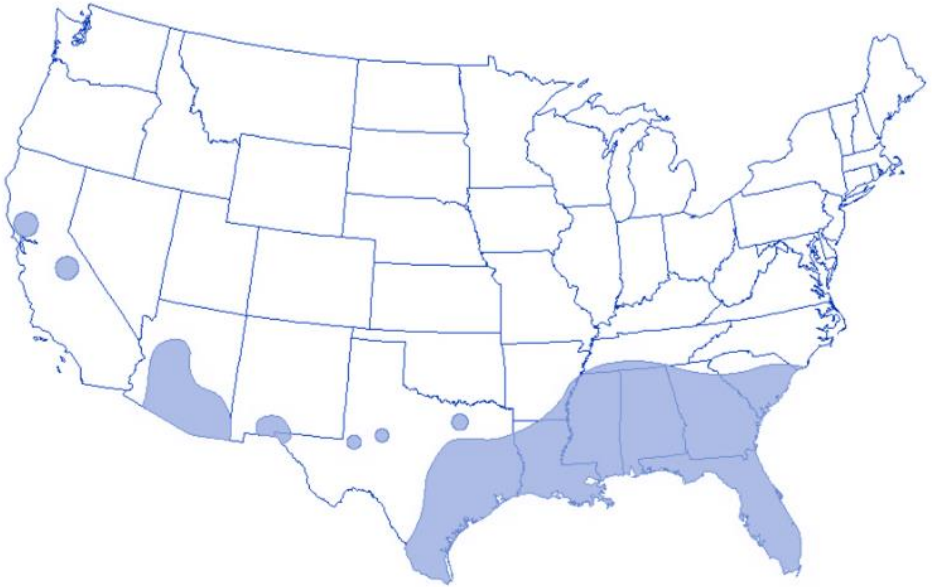
Zika Virus Vectors:
Aedes Mosquitoes

- *Aedes* (*stegomyia*) species mosquitoes
  - *Ae. aegypti* more efficient vectors for humans
  - *Ae. albopictus*
- Also transmit dengue and chikungunya viruses
- Lay eggs in domestic water-holding containers
- Live in and around households
- Aggressive daytime biters; can also bite at night

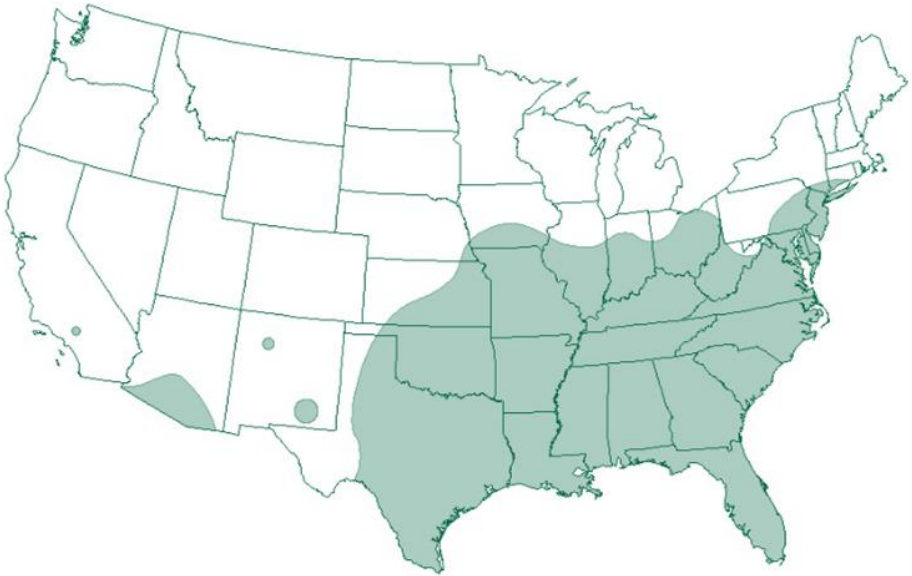
Aedes aegypti

Aedes albopictus

Aedes aegypti and *Aedes albopictus* Mosquitoes: Geographic Distribution in the United States

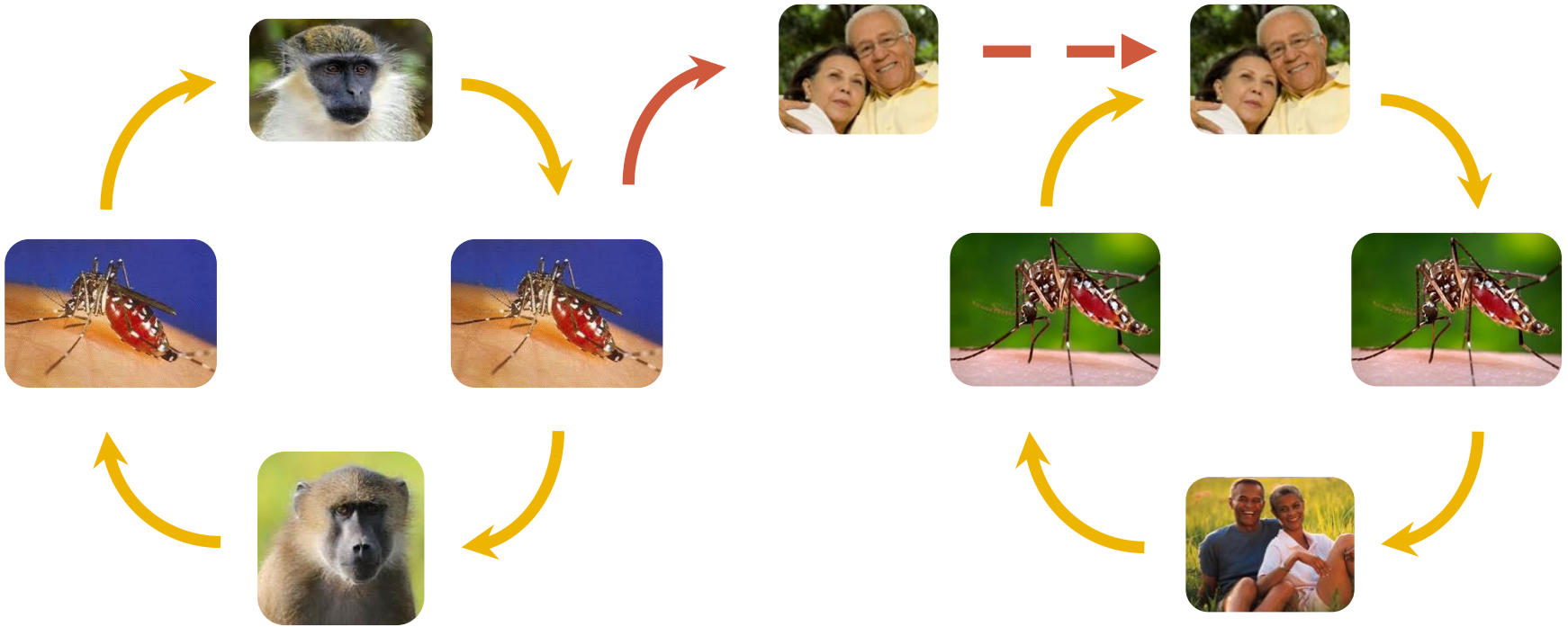


Aedes aegypti



Aedes albopictus

Zika Virus Transmission Cycles



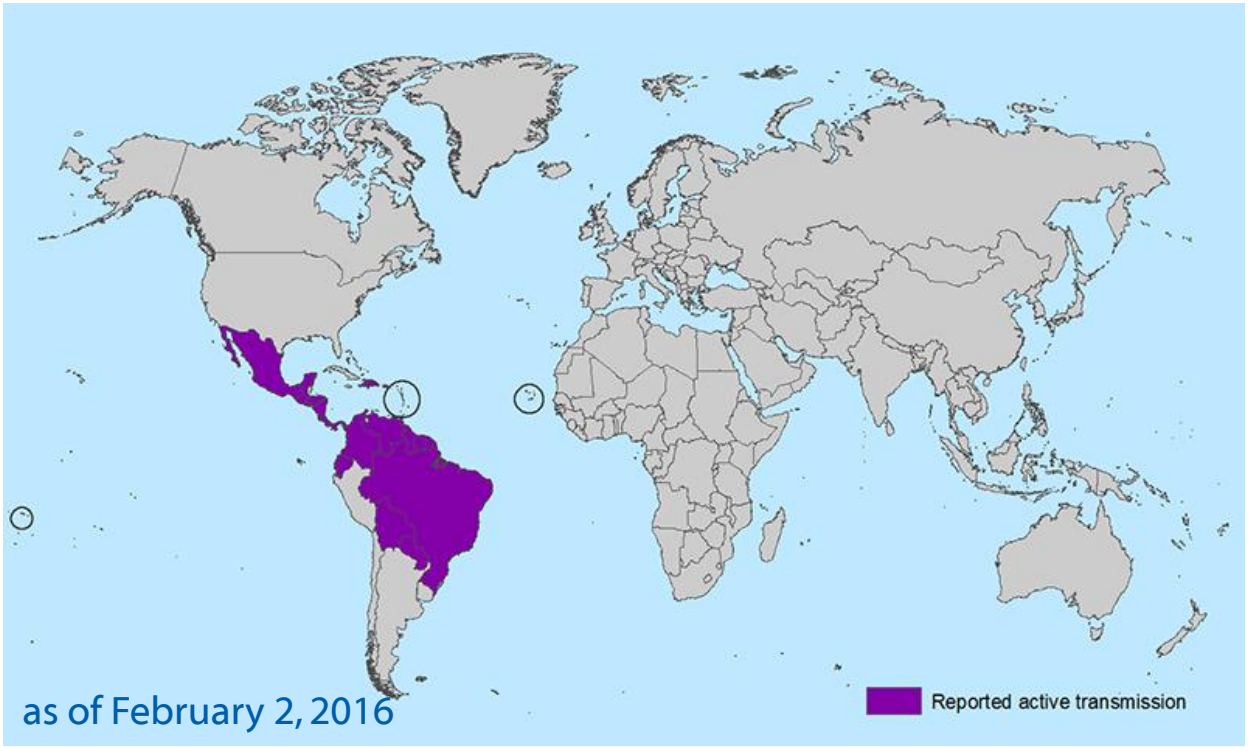
Sylvatic (jungle) cycle

Epidemic (urban) cycle

Other Modes of Transmission

- Maternal-fetal
  - Intrauterine
  - Perinatal
- Other
  - Sexual
  - Blood transfusion
  - Laboratory exposure
- Theoretical
  - Organ or tissue transplantation
  - Breast milk

Zika Virus:
Countries and Territories with Active Zika Virus Transmission



http://www.cdc.gov/zika/geo/ Updated regulary

Zika Virus Epidemiology

- First isolated from a monkey in Uganda in 1947
- Prior to 2007, only sporadic human disease cases reported from Africa and southeast Asia
- In 2007, first outbreak reported on Yap Island, Federated States of Micronesia
- In 2013–2014, >28,000 suspected cases reported from French Polynesia*

*http://ecdc.europa.eu/en/publications/Publications/Zika-virus-French-Polynesia-rapid-risk-assessment.pdf

Zika Virus in the Americas

- In May 2015, the first locally-acquired cases in the Americas were reported in Brazil
- Currently, outbreaks are occurring in many countries or territories in the Americas, including the Commonwealth of Puerto Rico and the U.S. Virgin Islands
- Spread to other countries likely

Zika Virus in the Continental United States

- Local vector-borne transmission of Zika virus has not been reported in the continental United States
- Since 2011, there have been laboratory-confirmed Zika virus cases identified in travelers returning from areas with local transmission
- With current outbreaks in the Americas, cases among U.S. travelers will most likely increase
- Imported cases may result in virus introduction and local spread in some areas of U.S.

Zika Virus Incidence and Attack Rates

- Infection rate: 73% (95% CI 68–77)
- Symptomatic attack rate among infected: 18% (95% CI 10–27)
- 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 Confirmed Zika Virus Disease Cases

Symptoms	N (n=31)	%
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

Zika Virus Clinical Disease Course and Outcomes

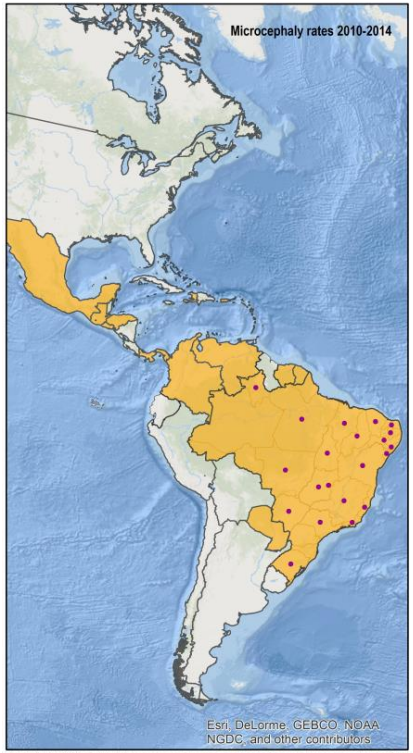
- Clinical illness usually mild
- Symptoms last several days to a week
- Severe disease requiring hospitalization uncommon
- Fatalities are rare
- Guillain-Barré syndrome reported in patients following suspected Zika virus infection
  - Relationship to Zika virus infection is not known

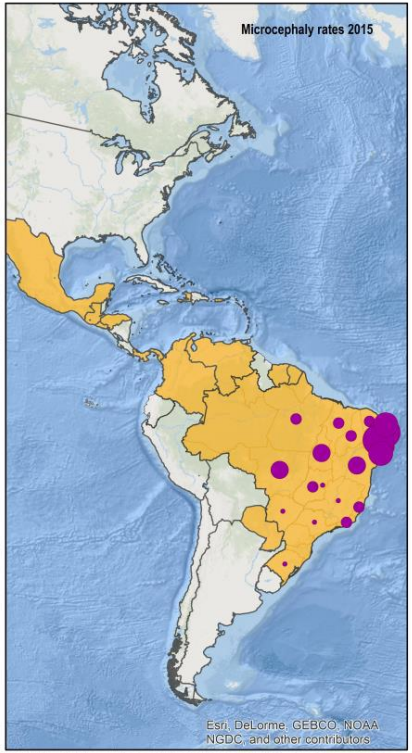
Zika Virus and Microcephaly in Brazil

- Reports of a substantial increase in number of babies born with microcephaly in 2015 in Brazil; true baseline unknown
  - Zika virus infection identified in several infants born with microcephaly (including deaths) and in early fetal losses
  - Zika virus detected prenatally in amniotic fluid from two pregnant women (≈30 weeks gestation) with fetal microcephaly and intracranial calcifications detected on ultrasound
  - Some of the infants with microcephaly have tested negative for Zika virus
- Incidence of microcephaly among fetuses with congenital Zika infection is unknown

Rates of Microcephaly Over Time: the Americas and the Caribbean

Comparison of the rates of microcephaly in the Americas and Caribbean from 2010-2014 and 2015





Updated as of Epidemiological Week 52 (December 27, 2015 – January 2, 2016)

Microcephaly rates by state in Brazil (cases per 1,000 live births)

- 0.1-1.0
- 1.1-15.0
- 15.1-30.0
- 30.1-45.0
- 45.1-88.6
- Countries

Countries with Zika confirmed cases

- Epi Week 52 2015
- Country limits
- Brazil State Boundaries

0 1,000 2,000 4,000 Km

Data Source: Reported from the IHR National Focal Points and through the Ministry of Health websites.

Map Production: PAHO-WHO AD CHA IR ARO

Source: Pan American Health Organization, Epidemiological update, 17 January 2016

Distinguishing Zika from Dengue and Chikungunya

- Dengue and chikungunya viruses transmitted by same mosquitoes with similar ecology
- Dengue and chikungunya can circulate in same area and rarely cause co-infections
- Diseases have similar clinical features
- 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

Clinical Features:
Zika Virus Compared to Dengue and Chikungunya

Features	Zika	Dengue	Chikungunya
Fever	++	+++	+++
Rash	+++	+	++
Conjunctivitis	++	-	-
Arthralgia	++	+	+++
Myalgia	+	++	+
Headache	+	++	++
Hemorrhage	-	++	-
Shock	-	+	-

Diagnostic Testing for Zika Virus

- Reverse transcriptase-polymerase chain reaction (RT-PCR) for viral RNA in serum collected ≤7 days after illness onset
- Serology for IgM and neutralizing antibodies in serum collected ≥4 days after illness onset
- Plaque reduction neutralization test (PRNT) for ≥4-fold rise in virus-specific neutralizing antibodies in paired sera
- Immunohistochemical (IHC) staining for viral antigens or RT-PCR on fixed tissues

Serology Cross-Reactions with Other Flaviviruses

- Zika virus serology (IgM) can be positive due to antibodies against related flaviviruses (e.g., dengue and yellow fever viruses)
- Neutralizing antibody testing may discriminate between cross-reacting antibodies in primary flavivirus infections
- Difficult to distinguish infecting virus in people previously infected with or vaccinated against a related flavivirus
- Healthcare providers should work with state and local health departments to ensure test results are interpreted correctly

Laboratories for Diagnostic Testing

- No commercially-available diagnostic tests
- Testing performed at CDC and a few state health departments
- CDC is working to expand laboratory diagnostic testing in states
- Healthcare providers should contact their state health department to facilitate diagnostic testing

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

Differential Diagnosis for Zika Virus Disease

- **Dengue**
- **Chikungunya**
- Leptospirosis
- Malaria
- Rickettsia
- Parvovirus
- Group A streptococcus
- Rubella
- Measles
- Adenovirus
- Enterovirus

*** Similar clinical features**

Zika Virus Disease Surveillance

- Consider in travelers with acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis within 2 weeks after return
- Inform and evaluate women who traveled to areas with Zika virus transmission while they were pregnant
- Evaluate fetuses/infants of women infected during pregnancy for possible congenital infection and microcephaly
- Be aware of possible local transmission in areas where *Aedes* species mosquitoes are active

Reporting Zika Virus Disease Cases

- As an arboviral disease, Zika virus disease is a nationally notifiable disease
  - Healthcare providers encouraged to report suspected cases to their state health department
- State health departments are requested to report laboratory-confirmed cases to CDC
- Timely reporting allows health departments to assess and reduce the risk of local transmission or mitigate further spread

Zika Virus Preventive Measures

- No vaccine or medication to prevent infection or disease
- Primary prevention measure is to reduce mosquito exposure
- Pregnant women should consider postponing travel to areas with ongoing Zika virus outbreaks
- Protect infected people from mosquito exposure during first week of illness to prevent further transmission

Possible Future Course of Zika Virus in the Americas

- Virus will continue to spread in areas with competent vectors
  - Transmission increasing in Central America, Mexico, and Caribbean
  - Anticipate further spread in the Commonwealth of Puerto Rico and U.S. Virgin Islands
- Travel-associated cases introduce virus to U.S. states
  - Imported cases will result in some local transmission and outbreaks
  - Air conditioning may limit the size and scope of outbreaks
  - Colder temperatures will interrupt and possibly stop further spread
- Experience from dengue might be predictive
  - From 2010–2014, 1.5 million dengue cases reported per year to PAHO
  - 558 travel-related and 25 locally transmitted cases in U.S. states

Zika Virus Remaining Questions

- Incidence of maternal- fetal transmission by trimester
  - Factors that influence (e.g., severity of infection, maternal immune response)
- Risk of microcephaly and other fetal and neonatal outcomes
- Risk of Guillain-Barré syndrome
- Potential for long-term reservoirs of Zika

CDC Guidance - published

- Interim Guidelines for the Evaluation and Testing of Infants with Possible Congenital Zika Virus Infection — United States, 2016 (Jan 29, 2016)
- Interim Guidelines for Pregnant Women During a Zika Virus Outbreak — United States, 2016 (Jan 22, 2016)
- HAN: Recognizing, Managing, and Reporting Zika Virus Infections in Travelers Returning from Central America, South America, the Caribbean, and Mexico (Jan 15, 2016)
- Travel health notices http://wwwnc.cdc.gov/travel/notices/ (continually updating)

CDC Guidance - soon to be released

- Interim guidance for women of reproductive age in areas with local transmission of Zika virus
- Interim guidance for Zika virus disease case investigation, diagnosis, and response for U.S. state and territorial health departments
  - Procedures following different scenarios
  - Case data collection form
  - Draft case definitions and classifications
  - Diagnostic testing

CDC Activities

- Coordinate response with PAHO and other regional partners
- Assist with investigations of microcephaly and Guillain-Barré syndrome
- Continue to evaluate and revise guidance as new data emerge
- Distribute guidance through health notices, MMWR publications and the CDC website
- Communicate regularly with clinicians (e.g., COCA calls), professional organizations and state and local partners

Additional resources

- CDC Zika virus information: http://www.cdc.gov/zika/
- PAHO Zika virus pages: http://www.paho.org/hq/index.php?option=com_topics&view=article&id=427&Itemid=41484&lang=en
- Zika virus information for clinicians: http://www.cdc.gov/zika/hc-providers/index.html
- Zika virus information for travelers and travel health providers: http://wwwnc.cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/zika
- Travel notices: http://wwwnc.cdc.gov/travel/notices

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Thank you

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.