

# Dengue virus infection

## Epidemiology

# INTRODUCTION

- Records of dengue-like illness date back more than 200 years and the viral etiology of dengue virus (DENV) was established in the 1940s
- Major changes in the epidemiology of dengue virus infections began after World War II, and geographic expansion of transmission has continued to date
- estimates of 390 million infections worldwide each year and over 2.5 billion individuals at risk for infection

# CLASSIFICATION

- Dengue viruses are members of the family Flaviviridae, genus *Flavivirus*
- Both epidemic and endemic transmission of the DENVs are maintained through a human-mosquito-human cycle involving mosquitoes of the genus *Aedes*

# MOSQUITO VECTORS

- *Aedes (Stegomyia) aegypti* mosquitoes
- *Ae. albopictus* mosquitoes are also a competent vector for the transmission of the DENVs under both experimental and natural conditions



# OTHER ROUTES OF TRANSMISSION

- **Nosocomial transmission**

- needle stick injury
- mucocutaneous exposure
- Blood transfusion

- **Vertical transmission**

- Delivery
- Breastfeeding
- Sexual transmission

# DISTRIBUTION OF AE. AEGYPTI MOSQUITOES



## Dengue, countries or areas at risk, 2008\*



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Data Source: World Health Organization  
Map Production: Public Health Information  
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# Asia and Pacific

- **Southeast Asia**

- southern China
- south of the island of Taiwan
- Thailand, Vietnam, and Indonesia
- Malaysia
- Philippines
- Japan

- **South Asia**

- India, Pakistan, and Sri Lanka

- **Western Pacific islands**

- American Samoa, Cook Islands, French Polynesia, New Caledonia, and Tonga

- **Australia**

- north Queensland



# Africa and Eastern Mediterranean

- sub-Saharan Africa
- Central Africa, East Africa, and the Middle East

# Europe

- southern France and Croatia
- Madeira Island (Portugal)
- Spain
- northeast Italy

# Americas

- **North America**

- Mexico
- southern United States

- **Central America**

- Nicaragua and Honduras

- **Caribbean**

- Dominican Republic
- Jamaica
- Guadeloupe
- Cuba
- Martinique

- **South America**

- Brazil and Venezuela
- Colombia

# PATTERNS OF TRANSMISSION

- Epidemic dengue
- Hyper endemic dengue

# FACTORS INFLUENCING TRANSMISSION

- population growth
- poor urban planning with overcrowding and poor sanitation
- modern transportation
  - Increased movement of mosquito vectors
- global climate change
  - (El Niño/Southern Oscillation events )
  - Increased vector density
  - Shorter mosquito incubation
  - increase the length of time that a mosquito remains infective

# Zika virus infection Epidemiology

# INTRODUCTION

- Zika virus is an :

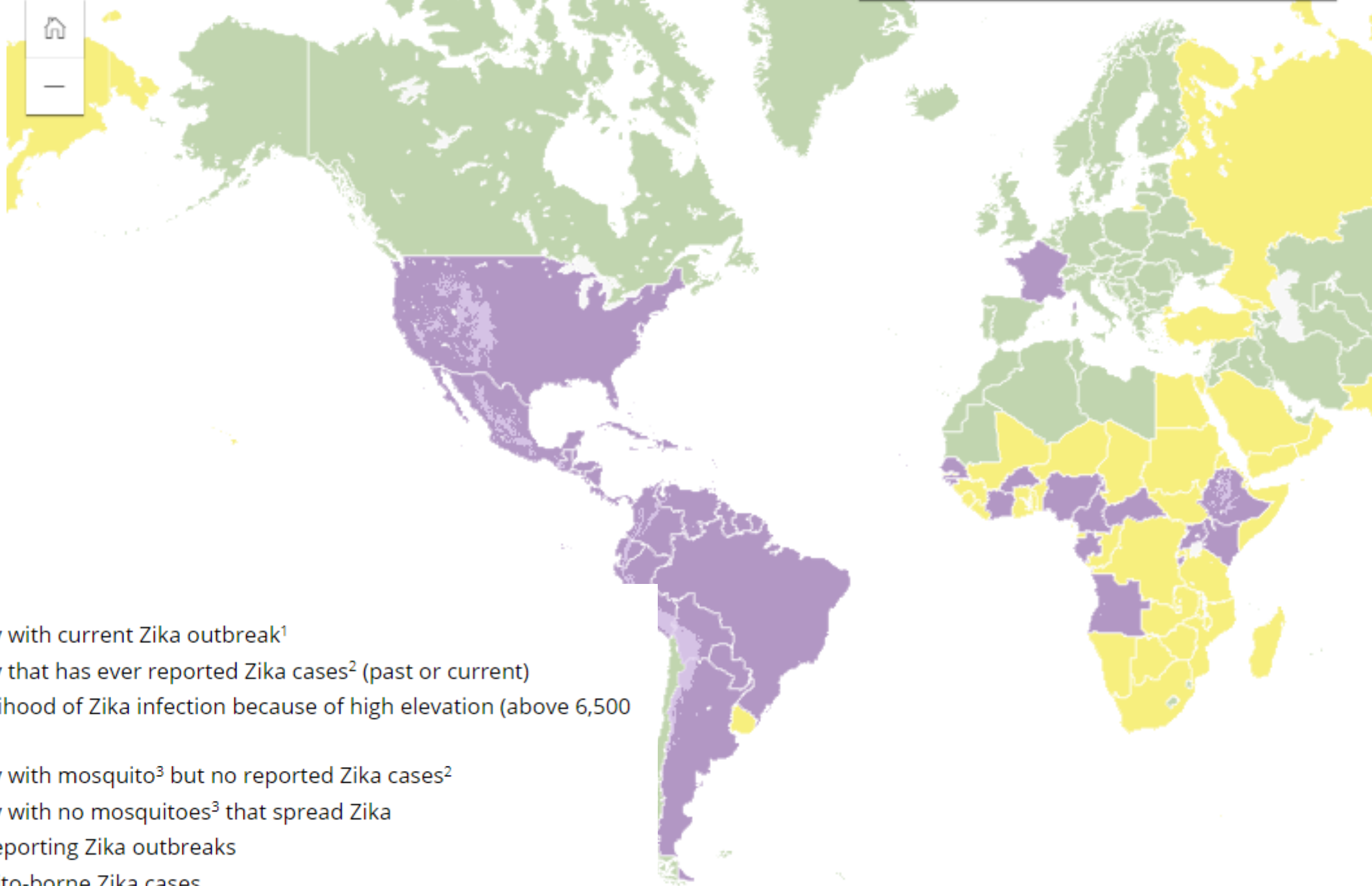
arthropod-borne flavivirus transmitted by mosquitoes

- Zika virus is named after the Ugandan forest where it was first isolated from a rhesus monkey in 1947
- The first human cases were detected in 1952 in Uganda and Tanzania.

# Geographic distribution

- Outbreaks of Zika virus infection have occurred in :
  - Africa
  - Southeast Asia
  - The Pacific Islands
  - The Americas
  - The Caribbean.





#### Map Legend

- Country or territory with current Zika outbreak<sup>1</sup>
- Country or territory that has ever reported Zika cases<sup>2</sup> (past or current)
- Areas with low likelihood of Zika infection because of high elevation (above 6,500 feet/2,000 meters)
- Country or territory with mosquito<sup>3</sup> but no reported Zika cases<sup>2</sup>
- Country or territory with no mosquitoes<sup>3</sup> that spread Zika

<sup>1</sup> No areas are currently reporting Zika outbreaks

<sup>2</sup> Locally acquired, mosquito-borne Zika cases

<sup>3</sup> *Aedes aegypti*

# Transmission

- Zika virus is carried by the :
  - *Aedes aegypti*
  - *Aedes albopictus*
- Zika virus may be transmitted to humans via the following
  - Bite of an infected mosquito
  - Maternal-fetal transmission
  - Sex
  - Blood product transfusion
  - Organ transplantation
  - Laboratory exposure
- Zika virus RNA has been detected in blood, urine, semen, saliva, female genital tract secretions, cerebrospinal fluid, amniotic fluid, and breast milk

# Chikungunya fever: Epidemiology

# INTRODUCTION

- Chikungunya virus is an arthropod-borne alphavirus transmitted by mosquitoes

# Geographic distribution

- Chikungunya virus is endemic in parts of West Africa; human serosurveys have identified antibodies to chikungunya virus in 35 to 50 percent of the population in some areas
- Outbreaks in Africa, Asia, Europe, islands in the Indian and Pacific Oceans, and subsequently in the Americas
- Chikungunya can cause large outbreaks with high attack rates, affecting one-third to three-quarters of the population in areas where the virus is circulating

# Transmission

- Mosquito bites
  - *Ae. aegypti*
  - *Ae. albopictus*
- Rarely via maternal-fetal transmission
- Rarely via blood products

# Yellow fever: Epidemiology

# INTRODUCTION

- Yellow fever is a mosquito-borne viral hemorrhagic fever with a high case-fatality rate
- 1 percent of individuals with severe hepatitis in endemic areas of Africa may be caused by yellow fever
- there were 130,000 cases with viscerotropic disease and 78,000 deaths in Africa in 2013



# Geographic distribution

- tropical regions of sub-Saharan Africa and South America
- Angola
- Democratic Republic of the Congo
- South/central Africa
- West Africa
- Fewer cases occur in South America than in Africa

# Transmission

*Aedes aegypti* and *Aedes simpsoni*

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