Status of chikungunya in the Americas: Where do we stand today?

45th ANNUAL CONFERENCE OF SOCIETY FOR VECTOR ECOLOGY
SAN ANTONIO, TEXAS
SEPTEMBER 28 – OCTOBER 2, 2014

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Centers for Disease Control and Prevention
Chikungunya virus

- Single-stranded RNA virus
- Genus *Alphavirus*
- Family *Togaviridae*
- Closely related to Mayaro, O’nyong-nyong, and Ross River viruses

Organization of the chikungunya virus genome from: Expert Rev. Vaccines 11(9), (2012)
Cryo-EM from: Mukhopadhyay S et al., Structure 2006
Chikungunya Phylogenetic Groups

India 1960's-1970's

East/Central/South African (ECSA) genotype

Asian genotype

Malaysia

India 2006

Indian Ocean 2005-2006

Central Africa

South Africa

West African genotype

1% divergence

India 2006

Indian Ocean 2005-2006

Central Africa

South Africa

West African genotype

1% divergence
Location of the major CHIKV genotypes in Africa, historical introductions into Asia. Subsequent importation via travelers to other areas.
Sylvatic and urban transmission cycles of CHIKV demonstrating the vectors and vertebrate hosts used.

**Sylvatic CHIKV Transmission Cycle**

- *Aedes furcifer*, *Aedes africanus*
- Non-human primates

**Urban CHIKV Transmission Cycle**

- *Aedes aegypti*, *Aedes albopictus*
- Humans, other vertebrates (?)

Global Risk of Dengue Virus Infection
Likelihood of Transmission

Approximate U.S. Distributions of \textit{Ae. aegypti} and \textit{Ae. albopictus} 

Both are competent vectors of chikungunya Asian genotype*

\textit{Aedes aegypti} \hspace{1cm} \textit{Aedes albopictus}

Chikungunya Virus Disease

- Characterized by acute onset of fever and severe polyarthralgia
  - Acute symptoms typically resolve in 7–10 days
  - Mortality is rare; occurs mostly in older adults with comorbidities

- Variable proportions of patients report:
  - Relapse of rheumatologic symptoms* in the months following acute illness
  - Persistent joint pains for months or years

- Often occurs as large outbreaks with high attack rates
  - 40-60% of population infected
  - Majority (72-97%) of infected persons are symptomatic

*Polyarthralgia, polyarthritis, tenosynovitis, Raynaud’s syndrome
Preparedness and Response for Chikungunya Virus Introduction in the Americas

Topics

• Epidemiology
• Clinical
• Laboratory
• Case Management
• Surveillance And Outbreak Response
• Vector Surveillance And Control
• Risk And Outbreak Communication

http://www.cdc.gov/chikungunya/resources/index.html
Countries/territories with autochthonous transmission or imported cases of Chikungunya in the Americas

Legend
- Countries/Territories with autochthonous transmission
- Sub-national areas with confirmed autochthonous transmission

December 6 2013

St. Martin
This is an official

**CDC HEALTH ADVISORY**

Distributed via the CDC Health Alert Network
December 13, 2013, 1400.00 (2:00 PM ET)
CDCHAN-00358

**Notice to Public Health Officials and Clinicians: Recognizing, Managing, and Reporting Chikungunya Virus Infections in Travelers Returning from the Caribbean**

**Summary**
On December 7, 2013, the World Health Organization (WHO) reported the first local (autochthonous) transmission of chikungunya virus in the Americas. As of December 12th, 10 cases of chikungunya have been confirmed in patients who reside on the French side of St. Martin in the Caribbean. Laboratory testing is pending on additional suspected cases. Onset of illness for confirmed cases was between October 15 and December 4. At this time, there are no reports of other suspected chikungunya cases outside St. Martin. However, further spread to other countries in the region is possible.

Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially those who have recently traveled to the Caribbean. Healthcare providers are encouraged to report suspected chikungunya cases to their state or local health department to facilitate diagnosis and to mitigate the risk of local transmission.

**Background**
Chikungunya virus is a mosquito-borne alphavirus transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes. Humans are the primary reservoir during epidemics. Outbreaks have been documented in Africa, Southern Europe, Southeast Asia, the Indian subcontinent, and islands in the Indian and Pacific Oceans. Prior to the cases on St. Martin, the only chikungunya cases identified in the Americas were in travelers returning from endemic areas.

**Clinical Disease**
A majority of people infected with chikungunya virus become symptomatic. The incubation period is typically 3–7 days (range, 2–12 days). The most common clinical findings are acute onset of fever and polyarthralgia. Joint pains are often severe and debilitating. Other symptoms may include headache, myalgia, arthritis, or rash. Persons at risk for more severe disease include neonates (aged <1 month) exposed intrapartum, older adults (e.g., > 65 years), and persons with underlying medical conditions (e.g., hypertension, diabetes, or cardiovascular disease).

**Diagnosis**
Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia who recently returned from the Caribbean. Laboratory diagnosis is generally accomplished by testing serum to detect virus, viral nucleic acid, or virus-specific immunoglobulin M (IgM) and neutralizing antibodies. During the first week of illness, chikungunya virus infection can often be diagnosed by using viral culture or nucleic acid amplification on serum. Virus-specific IgM and neutralizing antibodies normally develop toward the end of the first week of illness. To definitively rule out the diagnosis, convalescent-phase samples should be obtained from patients whose acute-phase samples test negative.

Chikungunya virus diagnostic testing is performed at CDC, two state health departments (California and New York), and one commercial laboratory (Focus Diagnostics). Healthcare providers should contact their state or local health department to facilitate testing.
Countries/territories with autochthonous transmission or imported cases of Chikungunya in the Americas

Legend
- Countries/Territories with autochthonous transmission
- Sub-national areas with confirmed autochthonous transmission

January 2014

Br. Virgin Islands
Dominica
Anguilla
Asian CHIKV genotype circulating in Caribbean

Similar to strains circulating in Asia, Pacific Islands

Countries/territories with autochthonous transmission or imported cases of Chikungunya in the Americas

Legend
- Countries/Territories with autochthonous transmission
- Sub-national areas with continued autochthonous transmission

March 2014

Dominican Republic
Infectious Diseases

**Crippling Virus Set to Conquer Western Hemisphere**

The world of infectious diseases is full of unpleasant surprises. But the explosive outbreak of a virus called chikungunya now happening on a string of Caribbean islands isn’t.

Nasci, who heads the Arboviral Diseases Branch of the Centers for Disease Control and Prevention in Fort Collins, Colorado. In early December, health authorities on

**Island hopping.** Chikungunya, whose main vector is the *Aedes aegypti* mosquito, is spreading fast in the Caribbean.

Chikungunya remained obscure until about a decade ago, in part because most cases occurred in Africa. Then in 2004, a big outbreak in East Africa spilled over into islands in the Indian Ocean; among them was La Réunion, a French département and a popular tourist destination, where almost 40% of the population fell ill in a matter of months. That helped raise global awareness and research euros (Science, 21 December 2007, p. 1860). Since then, the virus has been on a global rampage. Outbreaks in India have sickened millions; the virus has also moved into Southeast Asia and some islands in the Pacific.

The massive spread was fueled in part by genetic changes that enabled the virus to replicate efficiently in a second vector, *A. albopictus*, better known as the Asian tiger mosquito. That species has invaded countries around the world over the past 3 decades (Science, 16 May 2008, p. 864), so the mutations gave the virus a ticket to many new destinations. The tiger mosquito
Countries/territories with autochthonous transmission or imported cases of Chikungunya in the Americas

Legend
- Countries/Territories with autochthonous transmission
- Sub-national areas with confirmed autochthonous transmission
- Countries/Territories sin transmisión autóctona, con casos importados

June 2014

Aruba
Grenada
Turks and Caicos
U.S. Virgin Islands

El Salvador
Venezuela
Suriname
July 2014

Bahamas
Barbados
Cayman Islands
Trinidad and Tobago

Panama
Costa Rica
United States

Countries/territories with autochthonous transmission or imported cases of Chikungunya in the Americas

Legend
- Countries/territories with autochthonous transmission
- Sub-national areas with confirmed autochthonous transmission
- Countries/territories with imported cases but no autochthonous transmission

Data source: PAHO/WHO. Number of reported cases of Chikungunya Fever in the Americas
http://www.paho.org/chikungunya

Map production: PAHO/CHAI/RIARO
Countries/territories with autochthonous transmission or imported cases of Chikungunya in the Americas

Legend
- Countries/Territories with autochthonous transmission
- Sub-national areas with confirmed autochthonous transmission
- Countries/Territories with imported cases but no autochthonous transmission

August 2014
Curacao
Jamaica
Chikungunya in the Americas

37 countries*
747,721 reported cases

PAHO: http://www.paho.org/

* as of 9/26/14
# CHIKV Cases – Incidence

<table>
<thead>
<tr>
<th>Country</th>
<th>Reported Cases</th>
<th>Incidence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominican Republic</td>
<td>486,390</td>
<td>4,675</td>
</tr>
<tr>
<td>Guadalupe</td>
<td>78,550</td>
<td>16,856</td>
</tr>
<tr>
<td>Martinique</td>
<td>65,765</td>
<td>50,588</td>
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</tbody>
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*Cases/100,000

As of September 26, 2014
Chikungunya in the Contiguous United States

From 2006–2013:
- An average 28 people/year with positive tests for recent CHIKV infection
- (Range 5–65 per year)

2014*:
- 46 states reporting cases
- 1200 travel-associated cases†
  - 19% Florida
  - 23% New York
- 11 locally-acquired cases (FL)

* As of Sept. 30, 2014

† returning from the Americas (1184), Pacific Islands (8), Asia (8)

http://www.cdc.gov/chikungunya/geo/index.html
Chikungunya in U.S. Territories

Puerto Rico
• 9446 locally-acquired cases
  – 2140 confirmed
  – 7,306 suspect
• http://www.salud.gov.pr/Pages/default.aspx

U.S. Virgin Islands
• 702 locally-acquired cases
  – 45 confirmed/probable
  – 657 suspect
• http://www.healthvi.org/
Future Outlook

• CHIKV will continue to expand and cause large outbreaks in Latin America and Caribbean.
  – Puerto Rico and USVI
• Travel introductions will increase.
• Increased risk of local transmission in areas with *Ae. aegypti* and *Ae. albopictus*.
  – Limited to areas where these mosquitoes are present.
  – Little chance of permanent establishment.
• Unlikely to achieve containment through vector control.
Chikungunya virus

Click here to view a Digital Press Kit on chikungunya from the CDC News Room.

Chikungunya (pronunciation: chik-un-gun-yay) virus is transmitted to people by mosquitoes. The most common symptoms of chikungunya virus infection are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, or rash. Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, chikungunya virus was found for the first time in the Americas on islands in the Caribbean. There is a risk that the virus will be imported to new areas by infected travelers. There is no vaccine to prevent or medicine to treat chikungunya virus infection. Travelers can protect themselves by preventing mosquito bites. When traveling to countries with chikungunya virus, use insect repellent, wear long sleeves and pants, and stay in places with air conditioning or that use window and door screens.

Chikungunya Topics

- Prevention
- Geographic Distribution
- Transmission
- For Health Care Providers and Laboratories
- Symptoms & Treatment
- Fact Sheets and Posters
- Resources
- For Travelers

Chikungunya Virus Distribution

Updates of chikungunya case counts are publicly released every Wednesday by 12 p.m. MT.
- Chikungunya in the U.S.
- Chikungunya in the Caribbean
- Chikungunya in the Americas

For Travelers

CDC Travelers' Health

http://www.cdc.gov/chikungunya/