

# Chikungunya Virus – An Emerging Threat to the Americas

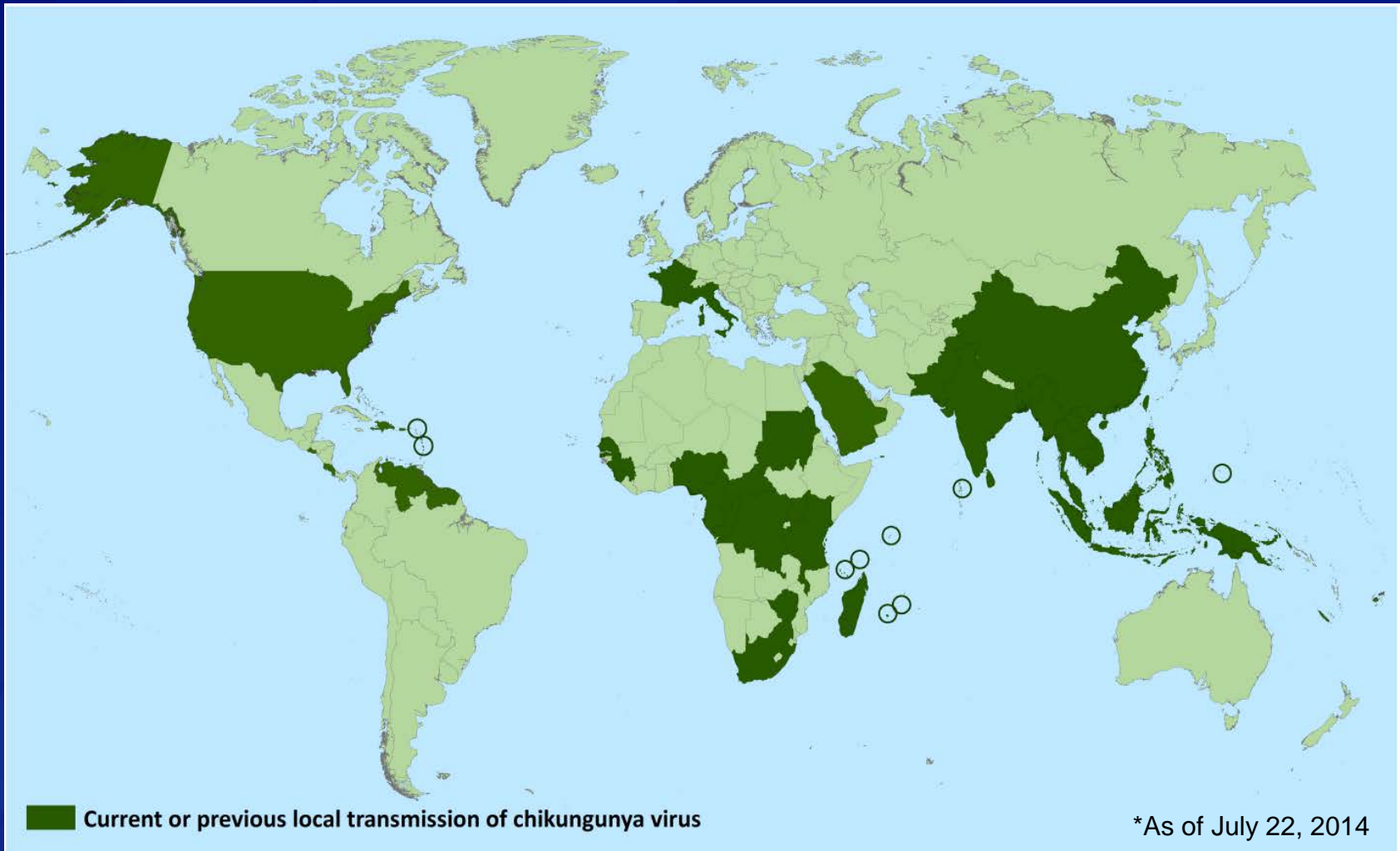
Arboviral Diseases Branch  
Centers for Disease Control and Prevention

July 22, 2014

# Chikungunya virus disease

- ❑ Mosquito-borne viral disease characterized by acute onset of fever and severe polyarthralgia
- ❑ Often occurs in large outbreaks with high attack rates
- ❑ Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans
- ❑ In 2013, first locally-acquired cases in the Americas reported on islands in the Caribbean

# Countries with reported local transmission of chikungunya virus\*



# Chikungunya virus in the Americas\*

- ❑ 24 countries/territories in the Americas have reported locally-acquired cases
- ❑ 442,000 suspected and laboratory-confirmed cases reported
- ❑ Virus expected to spread to new areas



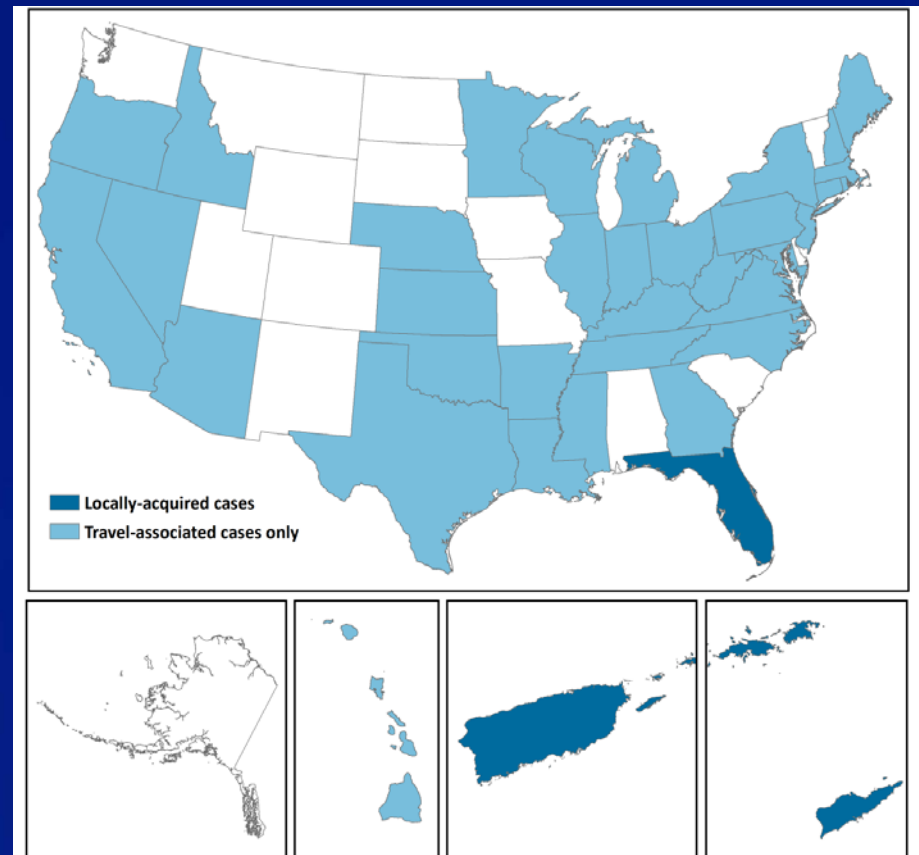
\*As of July 22, 2014

# History of Chikungunya virus in the U.S.

- ❑ From 2006-2013, average of 28 (range 5-65) laboratory-confirmed chikungunya cases identified in travelers visiting or returning to U.S. per year
  - None triggered a local outbreak in U.S.
- ❑ In April 2014, locally-acquired cases of chikungunya identified in Puerto Rico and then US Virgin Islands
- ❑ In July 2014, locally-acquired cases of chikungunya reported in continental U.S. (Florida)
- ❑ Number of locally-acquired and travel-related chikungunya cases in U.S. will likely continue to increase

# Chikungunya virus in the United States\*

- ❑ As of July 22, 497 chikungunya cases have been reported to CDC from states and territories
- ❑ 197 locally-transmitted cases reported from Florida, Puerto Rico, and US Virgin Islands
- ❑ 300 cases among travelers returning from affected areas mostly in Caribbean



\*As of July 22, 2014

# Chikungunya virus

- ❑ Single-stranded RNA virus
- ❑ Genus *Alphavirus*; Family *Togaviridae*
- ❑ Three clades: West African, East-South-Central African (ESCA) and Asian
  - ESCA includes Indian Ocean Lineage (IOL)
  - Asian clade circulating in Americas
- ❑ Closely related to Mayaro, O'nyong-nyong, and Ross River viruses



# Mosquito vectors

- ❑ Predominantly *Aedes aegypti* and *Aedes albopictus*
- ❑ Same mosquitoes that transmit dengue
- ❑ Widely distributed throughout Americas
- ❑ Aggressive daytime biters



*Aedes aegypti*



*Aedes albopictus*



# Primary transmission cycle



Anthroponotic transmission  
(person to mosquito to person)



# Other modes of transmission

- ❑ Documented rarely
  - *In utero* transmission resulting in abortion
  - Intrapartum from viremic mother to child
  - Percutaneous needle stick
  - Laboratory exposure
- ❑ Theoretical concern
  - Blood transfusion
  - Organ or tissue transplantation
- ❑ No evidence of virus in breast milk

# Chikungunya virus infection

- ❑ Majority (72%–97%) of infected people develop clinical symptoms
- ❑ Incubation period usually 3–7 days (range 1–12 days)
- ❑ Primary clinical symptoms are fever and polyarthralgia

# Fever and polyarthralgia

## □ Fever

- Abrupt onset
- Typically  $\geq 39.0^{\circ}\text{C}$  ( $\geq 102.2^{\circ}\text{F}$ )

## □ Joint pain

- Often severe and debilitating
- Involves multiple joints
- Usually bilateral and symmetric
- Most common in hands and feet

# Other clinical signs and symptoms

- ❑ Headache
- ❑ Myalgia
- ❑ Arthritis
- ❑ Conjunctivitis
- ❑ Nausea/vomiting
- ❑ Maculopapular rash

# Clinical laboratory findings

- ❑ Lymphopenia
- ❑ Thrombocytopenia
- ❑ Elevated creatinine
- ❑ Elevated hepatic transaminases

# Atypical disease manifestations

- Uveitis
- Retinitis
- Hepatitis
- Nephritis
- Myocarditis
- Hemorrhage
- Myelitis
- Cranial nerve palsies
- Guillain-Barre syndrome
- Meningoencephalitis
- Bullous skin lesions\*

\*Primarily described in neonates



# Risk factors for hospitalization or atypical disease

- ❑ Neonates exposed intrapartum
- ❑ Older age (e.g., >65 years)
- ❑ Underlying medical conditions (e.g., diabetes, hypertension, or cardiovascular disease)

# Clinical outcomes

- ❑ Acute symptoms typically resolve in 7–10 days
- ❑ Mortality is rare; occurs mostly in older adults
- ❑ Some patients have relapse of rheumatologic symptoms\* in the months following acute illness
- ❑ Studies report variable proportions of patients with persistent joint pains for months or years

\*Polyarthralgia, polyarthritis, tenosynovitis, Raynaud's syndrome

# Diagnostic testing

- ❑ Culture for virus\*
- ❑ Reverse transcriptase-polymerase chain reaction (RT-PCR) for viral RNA
- ❑ Serology for IgM and confirmatory neutralizing antibodies
- ❑ Serology for  $\geq 4$ -fold rise in virus-specific quantitative antibody titers on paired sera<sup>†</sup>

\*Virus should be handled under biosafety level (BSL) 3 conditions

<sup>†</sup>Determined by plaque reduction neutralization test (PRNT) or immunofluorescence assay (IFA)

# Optimal timing for diagnostic assays

Diagnostic assay

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Days post-illness onset

Viral culture

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$\leq 3$  days

RT-PCR

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$\leq 8$  days

IgM antibody tests

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$\geq 4$  days

# Laboratories for diagnostic testing\*

- ❑ Testing performed at:
  - CDC Arboviral Diseases Branch
  - Several state health departments†
  - One commercial laboratory (Focus Diagnostics)‡
- ❑ Contact your state health department for information or to facilitate testing

\*As of April 2014

† California, Florida, and New York

‡ Testing may be ordered through other commercial laboratories and will be forwarded to Focus Diagnostics for testing

# Distinguishing chikungunya from dengue

- ❑ Viruses transmitted by same mosquitoes
- ❑ Diseases have similar clinical features
- ❑ Viruses can circulate in same area and cause co-infections
- ❑ 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](http://whqlibdoc.who.int/publications/2009/9789241547871_eng.pdf)

# Clinical features of chikungunya virus infections compared with dengue virus infections

	Chikungunya	Dengue
Fever (>39°C)	+++	++
Arthralgia	+++	+/-
Arthritis	+	-
Headache	++	++
Rash	++	+
Myalgia	+	++
Hemorrhage	+/-	++
Shock	-	+



# Laboratory features of chikungunya virus infections compared with dengue virus infections

	Chikungunya	Dengue
Lymphopenia	+++	++
Neutropenia	+	+++
Thrombocytopenia	+	+++
Hemoconcentration	-	++

# Differential diagnosis for chikungunya

- Dengue
- Leptospirosis
- Malaria
- Rickettsia
- Parvovirus
- Enterovirus
- Other alphavirus infections (e.g., Mayaro, Ross River, Barmah Forest, O'nyong-nyong, and Sindbis viruses)
- Group A streptococcus
- Rubella
- Measles
- Adenovirus
- Post-infectious arthritis
- Rheumatologic conditions

# Clinical management

- ❑ Assess hydration and hemodynamic status
- ❑ Evaluate for other serious conditions and treat or manage appropriately
- ❑ Collect specimens for diagnostic testing
- ❑ Manage as dengue until dengue ruled out
  - Proper clinical management of dengue reduces risk of severe disease and death
  - Aspirin and other NSAIDs can increase risk of hemorrhage in patients with dengue

# Treatment

- ❑ No specific antiviral therapy
- ❑ Treatment is supportive
- ❑ Use acetaminophen or paracetamol for initial fever and pain control
  - If inadequate, consider using narcotics or NSAIDs
  - Do not use aspirin or other NSAIDs if suspect dengue until afebrile  $\geq 48$ hrs and no dengue warning signs\*
- ❑ Persistent joint pain may benefit from use of NSAIDs, corticosteroids, or physiotherapy

\* Warning signs for severe dengue include severe bleeding, pleural effusion or ascites, lethargy, enlarged liver, and increased hematocrit with decrease in platelet count

# Surveillance

- ❑ Inform travelers going to areas with known virus transmission about risk of disease
- ❑ Consider chikungunya in patients with acute onset of fever and polyarthralgia
- ❑ Be aware of possible local transmission in areas where *Aedes* species mosquitoes are active

# Reporting of chikungunya cases

- ❑ Suspected cases should be reported to state or local health departments to
  - Facilitate diagnosis
  - Mitigate risk of local transmission
- ❑ State health departments encouraged to report laboratory-confirmed cases to CDC

# Preventive measures

- ❑ No vaccine or medication available to prevent infection or disease
- ❑ Primary prevention measure is to reduce mosquito exposure
- ❑ Advise people at risk for severe disease to avoid travel to areas with ongoing outbreaks
- ❑ Protect infected people from further mosquito exposure during first week of illness



# Mosquito prevention and control

- ❑ Use air conditioning or window/door screens
- ❑ Use mosquito repellents on exposed skin
- ❑ Wear long-sleeved shirts and long pants
- ❑ Empty standing water from outdoor containers
- ❑ Support local vector control programs

# Selected references

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- ❑ World Health Organization. Outbreak and spread of chikungunya. *Wkly Epidemiol Rec*; 82(47): 409–415.

# Additional resources

- ❑ General information about chikungunya virus and disease:  
<http://www.cdc.gov/chikungunya/>
- ❑ Protection against mosquitoes:  
<http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-2-the-pre-travel-consultation/protection-against-mosquitoes-ticks-and-other-insects-and-arthropods>
- ❑ Travel notices: <http://wwwnc.cdc.gov/travel/notices>
- ❑ Information for travelers and travel health providers:  
<http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/chikungunya>
- ❑ Chikungunya preparedness and response guidelines:  
[http://new.paho.org/hq/index.php?option=com\\_docman&task=doc\\_download&gid=16984&Itemid](http://new.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=16984&Itemid)

# Questions

For more information please contact Centers for Disease Control and Prevention

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: [cdcinfo@cdc.gov](mailto:cdcinfo@cdc.gov)

Web: <http://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.