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*

*As of July 22, 2014
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 $\geq 39.0 ^\circ C$ ($\geq 102.2 ^\circ F$)

- 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 ≥4-fold rise in virus-specific quantitative antibody titers on paired sera†

*Virus should be handled under biosafety level (BSL) 3 conditions
†Determined by plaque reduction neutralization test (PRNT) or immunofluorescence assay (IFA)
Optimal timing for diagnostic assays

<table>
<thead>
<tr>
<th>Diagnostic assay</th>
<th>Days post-illness onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral culture</td>
<td>≤3 days</td>
</tr>
<tr>
<td>RT-PCR</td>
<td>≤8 days</td>
</tr>
<tr>
<td>IgM antibody tests</td>
<td>≥4 days</td>
</tr>
</tbody>
</table>
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*

Clinical features of chikungunya virus infections compared with dengue virus infections

<table>
<thead>
<tr>
<th></th>
<th>Chikungunya</th>
<th>Dengue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever (&gt;39°C)</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Arthralgia</td>
<td>+++</td>
<td>+/-</td>
</tr>
<tr>
<td>Arthritis</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Headache</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Rash</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Myalgia</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>+/-</td>
<td>++</td>
</tr>
<tr>
<td>Shock</td>
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<tr>
<td>Lymphopenia</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Neutropenia</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Hemoconcentration</td>
<td>-</td>
<td>++</td>
</tr>
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Differential diagnosis for chikungunya

- Dengue
- Leptospirosis
- Malaria
- Rickettsia
- Parvovirus
- Enterovirus
- Group A streptococcus
- Rubella
- Measles
- Adenovirus
- Post-infectious arthritis
- Rheumatologic conditions
- Other alphavirus infections (e.g., Mayaro, Ross River, Barmah Forest, O’nyong-nyong, and Sindbis viruses)
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 ≥48hrs 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

Additional resources

- General information about chikungunya virus and disease: http://www.cdc.gov/chikungunya/
- Travel notices: http://wwwnc.cdc.gov/travel/notices
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  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.