# Chikungunya Virus

Quiz Button

## Chikungunya

2.0 Contact Hours

Course Objectives:

1. Define the chikungunya virus.

2. Learn how to prevent the chikungunya virus

3. Explore the prevention of mosquito bites.

4. Identify means by which the virus is transmitted.

5. List clinical signs and symptoms of the virus.

6. Understand the process of diagnosing and reporting.

7. Identify the differences and similarities of chikungunya and dengue viruses.

8. Indicate how to perform diagnostic testing.

9. Understand the process of submitting samples for testing to the CDC.

10. Discuss treatment of the virus and its symptoms.

**Introduction**

Chikungunya (pronunciation: chik-en-gun-ye) is a virus that is transmitted to people by mosquitoes. Fever and joint pain are the most common symptoms of chikungunya virus infection.

Headache, muscle pain, joint swelling, or rash are other symptoms that may occur. It often occurs as large outbreaks with high attack rates. Outbreaks have developed in African, Asian, and European countries, as well as countries in the Indian and Pacific Oceans. Chikungunya virus was found for the first time in the Americas on islands in the Caribbean in late 2013. There is a risk that infected travelers can and will transport the virus to new areas.

Chikungunya virus infection currently has no vaccine to prevent or medicine to treat it. Travelers can safeguard themselves through mosquito bite prevention. Use insect repellent, wear long sleeves and pants, and stay in places with air conditioning or that use window and door screens when traveling to countries with chikungunya virus. Humans are the primary host of chikungunya virus during epidemic periods.

**Preventing Chikungunya**

- No vaccine exists to prevent chikungunya virus infection or disease.
- Avoid mosquito bites to prevent chikungunya virus infection
- The mosquitoes that spread the chikungunya virus bite mostly during the daytime (and are known as *Aedes aegypti* and *Aedes albopictus*)
- Consider not traveling to areas with ongoing chikungunya outbreaks if people are at increased risk for severe disease.

**Preventing Mosquito Bites**

1. Keep mosquitoes outside through use of air conditioning or window/door screens. If it is not possible to secure yourself from mosquitoes inside your home or hotel,

sleep under a mosquito bed net.

- You are can assist lessening the number of mosquitoes outside your home or hotel room by making sure to regularly empty containers with standing water, such as flowerpots or buckets.
- Wear long-sleeved shirts and long pants when weather permits.
- Other means to curtail mosquito exposure:

o Use mosquito repellents on exposed skin

- Repellents containing DEET, picaridin, IR3535, and oil of lemon eucalyptus and para-menthane-diol products provide long lasting protection.
- If you use both sunscreen and insect repellent, apply the sunscreen first and then the repellent.
- Do not spray repellent on the skin under your clothing.
- Treat clothing with permethrin or purchase permethrin-treated clothing.
- Always follow the label instructions when using insect repellent or sunscreen.

o Wear long-sleeved shirts and long pants

o Wear permethrin-treated clothing

o Support local vector control programs

**Transmission**

Chikungunya virus is transmitted to people through mosquito bites. When uninfected mosquitoes feed on a person already infected with the virus, those mosquitoes become infected. Infected mosquitoes can then spread the virus to other people through bites. This is known as an anthroponotic transmission cycle.

Chikungunya virus is most often spread to people by *Aedes aegypti* and *Aedes albopictus* mosquitoes. These are the same mosquitoes that transmit dengue virus. They bite mostly during the daytime, or when there is artificial light present. These types of mosquitoes are found throughout much of the world. The risk of a person transmitting the virus to a biting mosquito or through blood is highest when the patient is viremic during the first week of illness.

Other means of transmission include:

- Chikungunya virus is transmitted rarely from mother to newborn around the time of birth.
- In utero transmission has been documented mostly during the second trimester.
- Intrapartum transmission has also been documented when the mother was viremic around the time of delivery.
- Studies have not found chikungunya virus in breast milk.
- Blood-borne transmission is possible; It is possible that the virus could be spread through a blood transfusion. However up until now, there are no known reports of this happening.
- Cases have been documented among laboratory personnel handling infected blood and a health care worker drawing blood from an infected patient.

**Clinical Signs & Symptoms**

Most people infected with chikungunya virus will develop a fever and joint pain. Those are the most common symptoms. Other symptoms may include headache, muscle pain, joint swelling, or rash.

Symptoms usually begin 3–7 days after being bitten by an infected mosquito. Though the symptoms can be severe and disabling, chikungunya disease does not often result in death. Within a week’s time, most patients will feel better. In some

people, the joint pain may persist for months. Once a person has been infected, he or she is likely to be guarded against infections in the future.

Newborns infected around the time of birth, older adults (≥65 years), and people with medical conditions such as high blood pressure, diabetes, or heart disease are considered people at risk for more severe cases.

The majority of people, approximately 72%-97%, infected with chikungunya virus become symptomatic. The incubation period is typically 3–7 days (range, 1–12 days). The disease is most often characterized by acute onset of fever (typically >39°C [>102°F]) and polyarthralgia. Joint symptoms are usually bilateral and symmetric, and can be severe and debilitating. Other symptoms may include headache, myalgia, arthritis, conjunctivitis, nausea/vomiting, or maculopapular rash. Clinical laboratory findings can include lymphopenia, thrombocytopenia, elevated creatinine, and elevated hepatic transaminases.

Acute symptoms typically resolve within 7–10 days. Rare complications, or atypical disease manifestations, include uveitis, retinitis, myocarditis, hepatitis, nephritis, bullous skin lesions (primarily described in neonates), hemorrhage, meningoencephalitis, myelitis, Guillain-Barré syndrome, and cranial nerve palsies. Persons at risk for severe disease and risk factors for hospitalization or atypical disease include neonates exposed intrapartum, older adults (e.g., > 65 years), and persons with underlying medical conditions (e.g., hypertension, diabetes, or cardiovascular disease). Some patients might have relapse of rheumatologic symptoms (e.g., polyarthralgia, polyarthritis, tenosynovitis) in the months following acute illness. Studies report variable proportions of patients with persistent joint pains for months to years. Mortality is rare and occurs mostly in older adults.

The frequency of acute symptoms of the virus is as follows:

| Symptom or sign | Frequency range (% of symptomatic patients) |
|---|---|
| Fever | 76-100 |
| Polyarthralgias | 71-100 |
| Headache | 17-74 |
| Myalgias | 46-72 |
| Back pain | 34-50 |
| Nausea | 50-69 |
| Vomiting | 4-59 |
| Rash | 28-77 |
| Polyarthritis | 12-32 |
| Conjunctivitis | 3-56 |

**Diagnosis**

For the purposes of accurate diagnosis of chikungunya, be aware that the symptoms of chikungunya are similar to those of dengue, another disease spread by the same kinds of mosquitoes. All patients that have developed the symptoms described above need to see a doctor immediately. If the patient has recently traveled, advise him or her to tell the doctor. The doctor may order blood tests to look for chikungunya or other similar diseases.

**Reporting**

Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially travelers who recently returned from areas with known virus transmission. Healthcare providers are encouraged to report suspected chikungunya cases to their state or local health department to facilitate diagnosis and mitigate the risk of local transmission. Health departments should perform surveillance for chikungunya cases in returning travelers and be aware of the risk of possible local transmission in areas

where *Aedes* species mosquitoes are active. State health departments are encouraged to report confirmed chikungunya virus infections to CDC.

The differential diagnosis of chikungunya virus infection varies based on place of residence, travel history, and exposures. Dengue and chikungunya viruses are transmitted by the same mosquitoes and have similar clinical features. The two viruses can circulate in the same area and can cause occasional co-infections in the same patient. Chikungunya virus infection is more likely to cause high fever, severe arthralgia, arthritis, rash, and lymphopenia, while dengue virus infection is more likely to cause neutropenia, thrombocytopenia, hemorrhage, shock, and death. It is important to rule out dengue virus infection because proper clinical management of dengue can improve outcome.

**Chikungunya and Dengue**

It is very difficult to distinguish chikungunya and dengue based on clinical findings alone. The same mosquitoes transmit both the chikungunya and dengue viruses. The viruses can circulate in the same area and occasionally result in co-infections in the same patient. Chikungunya virus more likely to cause high fever, severe polyarthralgia, arthritis, rash, and lymphopenia.

Dengue virus is more likely to cause neutropenia, thrombocytopenia, hemorrhage, shock, and deaths. Patients with suspected chikungunya should be managed as dengue until dengue has been ruled out. Proper clinical management of dengue reduces the risk of medical complications and death. ***Aspirin and other NSAIDs can increase the risk of hemorrhage in patients with dengue.***

**Differential diagnoses for chikungunya:**

- Dengue
- Leptospirosis

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

**Diagnostic Testing**

Chikungunya virus testing is performed at the CDC Arboviral Diseases Branch, at state health departments in Florida, California, and New York State, and at one commercial laboratory- Focus Diagnostics. Testing may be ordered through other commercial laboratories and will be forwarded to Focus Diagnostics for testing.

Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially travelers who recently returned from areas with known virus transmission.

Laboratory diagnosis is generally completed by testing serum or plasma to detect virus, viral nucleic acid, or virus-specific immunoglobulin (Ig) M and neutralizing antibodies. Viral culture may detect virus in the first 3 days of illness. However, chikungunya virus should be handled under biosafety level (BSL) 3 conditions. During the first 8 days of illness, chikungunya viral RNA can often be identified in serum. Chikungunya virus antibodies usually evolve as the end of the first week of illness is approached. Accordingly, to

definitively rule out the diagnosis, convalescent-phase samples should be obtained from patients whose acute-phase samples test negative.

The best type of tube is serum separator (typically tiger/speckled-top). The blood should be permitted to coagulate and tubes should be spun to separate the serum from the clot before shipping.

If a red-top is used (no additive), the blood must be allowed to coagulate, the tube centrifuged, and the serum drawn off into a clean tube prior to shipping. Heparin (green top) and EDTA (purple top) are unsuitable for CHIK testing.

*Source: CDC, 2014.*

**CDC Submissions**

Those sending specimens to CDC for laboratory testing should supply all pertinent information associated with the specimen(s). This information will allow the laboratory to adequately review the test order and perform the appropriate test(s). The information supplied will be included in the laboratory report. Specimens submitted for testing must be accompanied by CDC Form 50.34.

As chikungunya virus testing is not listed in the drop-down menu for the Test Order Name field of form 50.34 (located on 1st page, top left), so you will have to select “ARBOVIRUS SEROLOGY” and then type “CHIK testing” in the Brief Clinical Summary field located at the top of the second page of the form.

You will find the following on the form:

- Pick-lists to select the correct form, order valid tests, enter accurate information
- Interactive Test Directory

- Easier data entry and printing using your computer
- Accurate data transfer using barcodes
- Download and save the form with your data

**Testing will not be initiated without the inclusion of:**

- **Date of onset** of symptoms
- **Date of specimen** collection
  **NOTE**: If the specimen collection occurs within 8 days after the onset of symptoms, a convalescent specimen will be requested.
- Any **pertinent travel history** (3 months prior to the date of symptom
  onset)
- The **patient's name** (**REQUIRED** for submitting specimens)

To enable printing of CDC submission form 50.34, each of the following fields must be completed, as directed:

- Specimen Origin field (located on 1st page, top left corner), select "HUMAN" from the drop-down menu
- Test Order Name field (located on 1st page, top left), select "ARBOVIRUS SEROLOGY" from the drop-down menu
- Original Submitter e-mail field (located on 1st page, middle right box), type your e-mail address
- Brief clinical summary (located on 2nd page, top of page), include the name(s) of the arbovirus(es) for which you are requesting testing, if known. Also, if you would like to request testing other than serology, please note the type of test requested in this field

*Source: CDC, 2014.*

**Specimen Types and Amounts**

- Acute and convalescent specimens, if available, should be sent together.
- Ideal timing of specimens for serology:

| Specimen | Timing |
|---|---|
| Acute | 3 to 10 days after onset of symptoms |
| Convalescent | 2-3 weeks after acute sample |

- At least 0.5 mL of serum and/or 1.0 mL of CSF is required for serology testing. CSF specimens are routinely tested undiluted and therefore require larger amounts. Whole blood will not be accepted for serology testing.
- For serology testing, the specimen should be kept cold or frozen. The sample may be placed in an insulated container with blue ice packs. Additional blue ice packs should be used in the summer to ensure specimen integrity in hot weather.
- For virus isolation and/or nucleic acid amplification testing, acceptable specimens are fresh frozen tissue, serum, or cerebrospinal fluid. Tissue specimens should be approximately 1 cm⊃3;, frozen as soon as possible at -70ºC, and shipped on enough dry ice so that specimens remain frozen until received. Formalin-fixed specimens are not tested at DVBD and can be submitted to the Special Pathogens Laboratory in Atlanta, GA for immunohistochemistry:Infectious Disease Pathology Branch
  Centers for Disease Control and Prevention (MS-G32)
  1600 Clifton Rd, NE
  Atlanta, GA 30333

*Source: CDC, 2014.*

**Testing Results**

Test results are normally available 4 to 14 days after specimen receipt. Reporting times for test results may be longer during summer months when arbovirus activity increases. Receipt of a hard copy of the results will take at least 2 weeks after testing is completed. Initial serological testing will be performed using IgM capture ELISA and IgG ELISA. If the initial results are positive, further confirmatory testing may delay the reporting of final results. ALL RESULTS WILL BE SENT TO THE APPROPRIATE STATE HEALTH DEPARTMENT. Notify your state health department of any submissions to CDC.

Send all specimens to:

CDC-DVBD
ATTN: Arbovirus Diagnostic Laboratory, DRA
CDC/DVBD/ADB
3156 Rampart Road
Fort Collins, CO 80521

Test results are normally available 4 to 14 days after specimen receipt. Reporting times for test results may be longer during summer months when arbovirus activity increases. Receipt of a hard copy of the results will take at least 2 weeks after testing is completed. Initial serological testing will be performed using IgM-capture ELISA and IgG ELISA. If the initial results are positive, further confirmatory testing will be performed and it may delay the reporting of final results. **ALL RESULTS WILL BE SENT TO THE APPROPRIATE STATE HEALTH DEPARTMENT**. Notify your state health department of any direct submissions to CDC.

*Source: CDC, 2014.*

**Treatment**

**Treatment for Acute Disease**

There is no specific medicine or antivural therapy to treat chikungunya virus infection or disease. Treatment is supportive. It is the symptoms that are treatable. Therapies can include rest, fluids, and use of non-steroidal anti-inflammatory drugs to relieve acute pain and fever.

Persistent joint pain may benefit from use of NSAIDs, short-term corticosteroids, or physiotherapy.

o Be sure to ***never*** use aspirin or other NSAIDs if you suspect dengue until afebrile >48 hours and there are no dengue warning signs (e.g. severe bleeding, plueral effusion or ascites, lethargy, enlarged liver, and increased hematocrit with decreases in platelet count).

o Furthermore, using aspirin is not advised because of the risk of bleeding in a small number of patients and the risk of developing Reye's syndrome in children under 12 years of age.

People infected with chikungunya should make sure they are sheltered from further mosquito exposure during the first week of illness to reduce the risk of local transmission.

In order to decrease the symptoms, make sure the patient:

o Receives plenty of rest

o Drinks fluids to prevent dehydration (fluid will have been lost from sweating, vomiting, and other insensible losses).

o Take medicines, such as ibuprofen, naproxen, acetaminophen, or paracetamol, to relieve fever and pain.

o If the above medicines are inadequate, the doctor *may* consider using narcotics (such as morphine) or NSAIDs (***remember to never use NSAIDs if dengue is suspected***).

**Treatment for Subacute and Chronic Disease**

The likely outcome from chikungunya will be full recovery. Still, it is important to be aware that it may take a patient sometimes a year or longer to fully convalesce. Persistent joint pain may require pain management, including long-term and anti-inflammatory therapy.

Chloroquine phosphate has been shown to afford some benefits according to older studies. A double-blind randomized trial done more recently has established that it was of not helpful for healing joint pain. Disabling peripheral arthritis may continue for months, if unmanageable by other agents, and may occasionally respond to short-term corticosteroids. Local injection (intra-articular) of corticosteroids or topical NSAID therapy (***see NSAID warnings above***) can be used to limit the use of oral corticosteroids. Alternative therapies such as methotrexate can be assessed for treatment in patients with refractory joint symptoms. Cases that have prolonged arthralgia and joint stiffness may benefit from a program of advanced physical therapy along with drug therapy. Although heavy exercise may aggravate symptoms, some movement and mild exercise tend to improve morning stiffness and pain.

**Clinical Management**

- You must ***assess*** the hydration and hemodynamic status of the patient.
- ***Evaluate*** for other serious conditions and treat or manage them appropriately.
- ***Collect*** specimens for diagnostic testing.
- ***Manage*** as dengue until dengue is ruled out.

**Patient Isolation Recommendations**

To prevent the infection of others in the household, the community, or the healthcare facility, a patient with acute chikungunya needs to avoid being bitten by the infecting mosquitos during the viremic phase, which is usually the first week of illness. Since these mosquitos bite during daylight hours, or even in the evening when in the presence of artificial light, to remain in an insecticide treatment (IT) bed net or remaining in place with intact screens is highly recommended. Furthermore, all health care workers who are regular visitors to chikungunya patients at home need to be careful to avoid being bitten by mosquitoes by using insect repellent and wearing long sleeves and pants. Remember, mosquitos or linger in the environments of humans who are infected can then pass the virus to other humans if the have already bitten the infected humans.

One hospital-associated infection of chikungunya has been identified in a health care worker who was accidentally stuck with a needle stick from a patient infected with chikungunya. Several laboratory workers have also contracted chikungunya after handling infected blood. These exposures indicate that direct contact transmission can occur. However, other modes of transmission, such as through respiratory droplets or particles, have not been documented.

**Chikungunya virus in the Americas**

Locally-acquired cases have been reported in 24 countries and territories in the Americas as of July 2014. There are 442,000 suspected and laboratory-confirmed cases that have been reported. According to the CDC, the virus is expected to spread to new areas.

In the United States, from the years 2006 through 2013 there were an average of 28 (range 5-65) laboratory-confirmed chikungunya cases identified in travelers visiting or

returning to the United States each year. However, none of these have triggered a local outbreak within the United States. Still, by April of 2014 there were locally-acquired cases of chikungunya that the authorities were able to identify in Puerto Rico and subsequently, in the U.S. Virgin Islands. Then in July of 2013, locally-acquired cases of chikungunya were reported in Florida, within the continental U.S. The CDC believes that the number of locally-acquired and travel-related chikungunya cases in the U.S. is likely to continue to increase.

As of July 2014, there have been 497 chikungunya cases reported to the CDC from the states and the territories in the U.S. Of these cases, 197 reported from Florida, Puerto Rico, and the U.S. Virgin Islands were locally-transmitted. Among travelers returning from affected areas mostly in the Caribbean there were 300 cases.

**Resources**

Chikungunya: Information for healthcare providers

http://www.cdc.gov/chikungunya/pdfs/CHIKV_Clinicians.pdf July 22, 2014

Pan American Health Organization. Preparedness and Response for Chikungunya Virus: Introduction in the Americas. Washington, D.C.: PAHO, copyright 2011.

Staples JE, et al. Chikungunya fever: an epidemiological review of a re-emerging infectious disease. Clin Infect Dis 2009; 49(6): 942-948.

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

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