

The Chikungunya virus (CHIKV) is an alphavirus carried by arthropods and a member of the Togaviridae family, which is spread by *Aedes* mosquitoes. Chikungunya fever, an acute febrile sickness, rash, and arthralgia are known to be caused by the virus. Subsequently, the infection may result in chronic and incapacitating arthritis symptoms, which can persist for months or years. Historically, CHIKV was primarily found in Africa and Asia. In 1952, it was first discovered alone on Tanzania's Makonde Plateau.

Chikungunya comes from a Makonde word that means "that which bends up." In Reunion Island, the worst outbreak on record struck in 2005–2006, affecting about 35% of the population. Chikungunya fever cases began to spread in tropical and subtropical areas in 2005, and in 2013, the Caribbean island of St. Martin was the route via which the disease finally made its way to the Americas. These days, CHIKV is a major global public health issue that is present everywhere.

### **Causative agents**

Asian Tiger mosquitoes, or *Aedes aegypti* and *Ae. albopictus*, are the main vectors of CHIKV. These mosquitoes' biological traits offer them the ability to effectively invade new areas and serve as competent vectors, setting the stage for the spread of Chikungunya fever around the world. The species' predilection for human blood and its track record of successfully establishing outside of their natural area serve to emphasize how invasive they are.

The physiological traits of the species that facilitate transmission—such as virus ingestion with blood meal and subsequent salivary gland infection in mosquitoes—determine the vector competence of a certain species. Most significantly, vector capacity, which is primarily impacted by extrinsic (environmental problems) and internal (mosquito infection barriers and genetics) variables, impacts the likelihood for outbreaks. Infectivity is directly determined by vector competence variables, which include vector density in relation to the host, the likelihood that a vector would feed on a host in a single day, vector survivability, and extrinsic incubation period.

*Aedes aegypti* has been known to exist in the United States for almost 300 years, whereas *Aedes albopictus* has been around since 1985. The two species differ in their vector properties, which allows for the potential for global disease spread. In particular, it was discovered that CHIKV had just recently evolved to fit *Ae. albopictus* during the 2005–06 Indian Ocean outbreak, when it obtained a mutation that made it possible for it to infect the urban mosquito vector.

Generally speaking, the focussed feeding on and relationship with humans, together with the ability of the human host and mosquito vector to migrate, are what make *Ae. aegypti* and *Ae. albopictus* mosquitoes a hazard to public health.

## Epidemiology

CHIKV was first discovered in Tanzania in 1952, has since spread effectively reaching the Americas in 2013, Florida in July 2014, and severely affecting various Caribbean, Central, and South American countries after that. Although the CHIKV virus is considered to be endemic in certain parts of West Africa, global distribution has been facilitated by both human and vector travel. Infected travelers import CHIKV into new areas where local *Aedes* mosquitoes initiate local transmission. Mosquito larvae and egg transport by ships and air traffic has also been described as dissemination means for mosquitoes into naive and suitable environments.

Transmission is mostly via mosquito bites, although maternal-fetal and blood product transmission was also described during the Reunion Island outbreaks. *Ae. aegypti* and *Ae. albopictus* are also the vectors responsible for other notable diseases such as Dengue and Zika, causing coinfection in some cases. Given the similarity in clinical presentation and nearly identical geographic distribution, and differentiation of disease has become an issue.

CHIKV is known to transmit in 2 cycles: urban and sylvatic. Urban transmission is from human to mosquito to human and is the main source of the current Western Hemisphere epidemic. Sylvatic transmission can be found in Africa and is based on animal to mosquito to human. CHIKV is an arthropod-carried pathogen of the genus alphavirus and the family

Togaviridae that possesses 3 known genotypes: Asian, West African, and East Central South African. The virus is described as a positive-sense, single-stranded RNA virus, and sensitive to temperatures greater than 58 C.

## Symptoms



Chikungunya fever often manifests as non-specific high-grade fever and myalgia, lasting approximately three to five days after an incubation period of three to seven days. Two to five days after fevers start, bilateral symmetrical polyarthralgia develops, with a preference for distal over proximal joints. The hands are the most commonly afflicted, with reports of

involvement extending to the knees, ankles, and axial bones. Severe discomfort lasting one to three weeks is also common.

A widespread maculopapular rash, which typically appears on the limbs first and appears three days following the feverish symptoms, is another typical clinical feature.

Vesiculobullous and mucocutaneous lesions have also been recorded, but infrequently.

There may also be other symptoms like vomiting, diarrhea, stomach pain, and widespread lymphadenopathy. It is not thought to be a neurotropic virus, although it has long been linked to neurological symptoms, the most frequent of which is encephalitis in babies infected by mother-to-child transmission. Numerous research have shown red eyes, conjunctivitis, and anterior uveitis in patients with Chikungunya fever; further investigations have reported renal manifestations, sepsis/septic shock, recurrent retinitis, and congenital ocular abnormalities.

When comparing Dengue virus (DENV) to Chikungunya, DENV is more likely to result in hemorrhagic shock, mortality, thrombocytopenia, high fever, severe arthralgia, arthritis, rash, and lymphopenia. In order to enhance results, the WHO advises treating everyone for DENV until the contrary is demonstrated.

Depending on when the illness first manifests, the diagnosis of CHIKV can be made or verified by reverse-transcription polymerase chain reaction (RT-PCR) or serology-based detection of viral RNA. For optimal findings, RT-PCR is mostly employed in the initial five days of an acute infection. On the other hand, depending on the disease stage, anti-chikungunya antibodies IgM (present for five days to several weeks) and IgG (present for two weeks to several years) are detected through viral serology using enzyme-linked immunosorbent assay (ELISA) or indirect fluorescent antibody (IFA).

The CDC and WHO recommend gathering serology for CHIKV, DENV, and Zika virus (ZV) for all patients with suspicious clinical symptoms. And Chikungunya fever is a nationally notifiable condition.

## **Treatment / Management**

The primary treatment for Chikungunya fever is symptomatic alleviation, which includes rest, proper hydration, and pain/fever control—preferably with acetaminophen. Because aspirin and most nonsteroidal anti-inflammatory medicines (NSAIDs) might exacerbate platelet dysfunction, especially in situations of suspected DENV coinfection, the World Health Organization (WHO) opposes their use during the first 48 hours of treatment. For the first two months following an acute illness, other research supports the effectiveness of low-dose corticosteroid medications.

Using topical steroids and cycloplegics, ocular symptoms such as anterior and posterior uveitis have been treated. When combined with corticosteroids or other disease-modifying anti-rheumatic medications, hydroxychloroquine has been shown to effectively treat chronic symptoms such as myalgia, polyarthrititis, and persistent or relapsing-remitting polyarthralgia (DMARDs). Although they are not yet licensed for use in humans, certain antivirals that target virus entry/replication and viral replication employing siRNAs are demonstrating encouraging results.

The prevention of mosquito bites is the cornerstone of CHIKV management. Excellent strategies to avoid exposure include using DEET-containing repellents, bed nets, air-conditioned buildings, and protective clothes. Additionally, peri-domiciliary water puddles should be reduced in order to avoid mosquito proliferation. Another method of managing vectors has been the use of insecticides, which come in four different forms: carbamates, organochlorides, organophosphates, and pyrethroids.

However, there has been growing concern over *Ae. albopictus* and *Ae. aegypti*'s resilience to pesticides. While vaccines are a popular subject for study and development, no vaccine has been authorized for use in humans as of yet.





## Differential Diagnosis

With arthralgia, high fever, and rash being non-specific symptoms, there is a wide range of possible differential diagnoses for both acute and chronic forms of Chikungunya fever. Since DENV and ZIKV, as previously indicated, have the same vectors and clinical findings as CHIKV, serology testing for all three viruses is recommended when a patient exhibits the symptoms listed above. Infections such as malaria, yellow fever, leptospirosis, measles, mononucleosis, and African tick bite fever should also be taken into account.

Chikungunya fever can readily be mistaken for other, more prevalent causes of chronic

arthralgia. Additionally, it has been shown that individuals who have underlying joint illness and super-infection with CHIKV had worse results and higher morbidity. Hepatitis C, Systemic Lupus Erythematosus (SLE), Reiter arthritis, rheumatoid arthritis, and seronegative rheumatoid arthritis are among the conditions included in the differential diagnosis for chronic symptoms.

### **Complications and Prognosis**

Chikungunya fever is distinguished by a significant post-chikungunya chronic polyarthralgia, which is defined as joint pain lasting longer than six weeks, even though the case fatality ratio (CFR) is low. According to a 2018 study on Aruba CHIKV cases, 26% of all patients with serology-confirmed infection had post-chikungunya polyarthrititis. Another 2018 study from French Guiana from 2014 found that at 3 and 6 months, post-CHIKV rheumatic or musculoskeletal discomfort affected 40% and 31.3%, respectively, of all RT-PCR confirmed cases.

As previously stated, the most frequent and dangerous side effect of Chikungunya fever is persistent arthritis. Conjunctivitis, optic neuritis, iridocyclitis, episcleritis, retinitis, and uveitis are a few illnesses that might present as ocular symptoms. Iridocyclitis and retinitis are the most frequent side effects, which are usually benign and self-limiting.

### **Consultations**

Chikungunya fever-related chronic arthritis has become a global concern for rheumatologist specialists because of the disease's crippling effects, which resemble rheumatic arthritis and lower quality of life, and its swelling and recurrent pain that does not improve with analgesic treatment.

Mosquitoes are the most influential arthropod vectors globally, spreading diseases ranging from malaria to chikungunya fever, which can have catastrophic consequences. Vector control is still the primary method of prevention because the majority of these diseases lack a specific therapy. Public health campaigns against insecticides have shown promise in the

past, but they have been hampered by strong opposition. Personal protection and individual activities, such as the use of DEET, bed nets, light-colored long sleeves, and the elimination of peri-domiciliary water puddles and reservoirs, have been another focus of prevention that has been demonstrated in Brazilian studies.

In terms of bettering outcomes, the CDC has emphasized the risks associated with co-infection between CHIKV and DENV as well as the variations in treatment approaches, which are crucial for all medical personnel to know in order to prevent deaths from dengue fever. In order to prevent a poor prognosis, a 2018 review emphasized the significance of accurate diagnosis (obtaining DENV, CHIKV, and ZV serology on afflicted persons), surveillance, and care.

### **Source**

Ojeda Rodriguez JA, Haftel A, Walker, III JR. Chikungunya Fever. [Updated 2023 Jan 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK534224/>

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