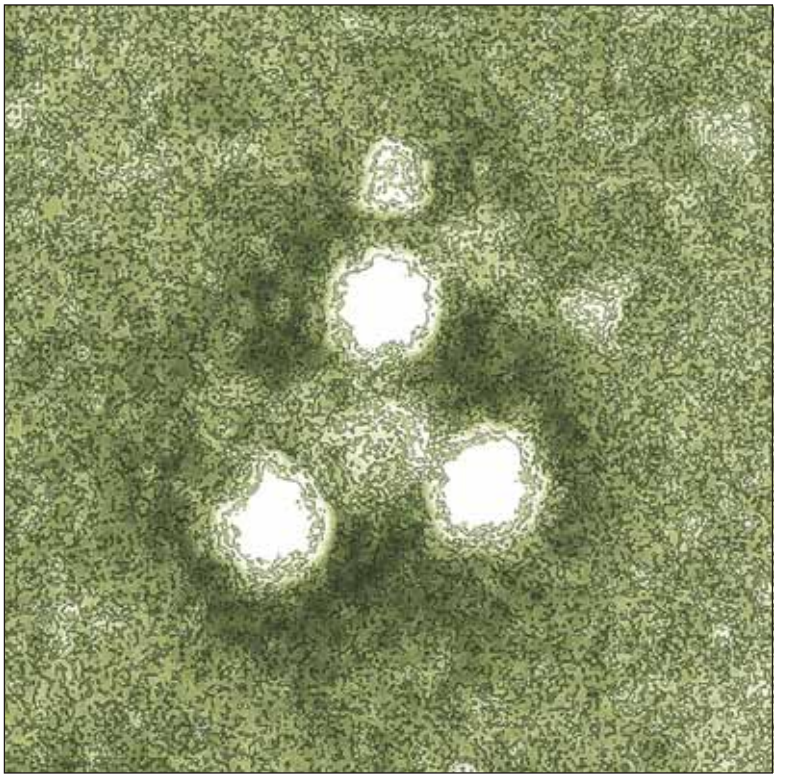


Chikungunya (CHIK)

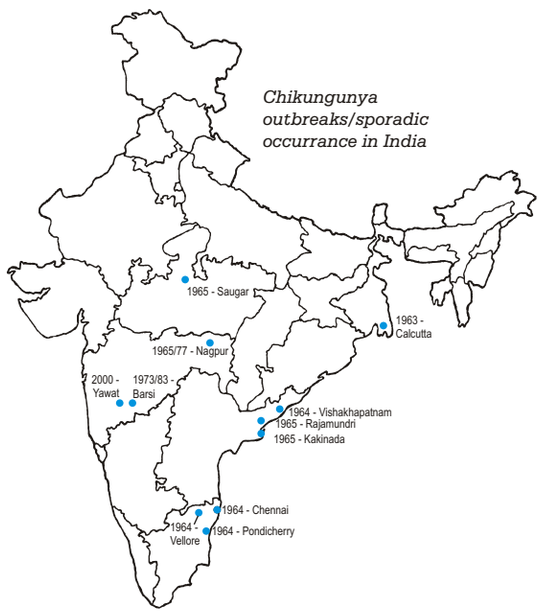
Chikungunya (CHIK)

The disease is a considerably important public health problem in Southeast Asia and Africa. It was first recognized in epidemic form in East Africa in 1952-1953.

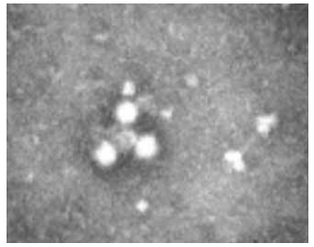
In India, CHIK was first recognized in 1963 in Kolkata. Subsequently, a few outbreaks have been associated with the disease and it is considered as an important re-emerging disease of public health importance.

Clinical features

Disease spectrum ranges from mild fever for a few days to persistent arthralgia for months. In classical disease, incubation period is about 2-4 days and acute phase lasts for 3-5 days. Sudden onset of febrile illness, chills, vomiting, backache, headache, photophobia, lymphadenopathy, arthralgia and rash are symptoms presented in different combinations.



Chikungunya outbreaks/sporadic occurrance in India



The virus

Member of the family *Togaviridae*, genus *Alphavirus*; belongs to Semliki Forest complex of viruses. O'nyong-nyong (ONN) virus, earlier regarded as subtype of this virus, is the nearest relative.

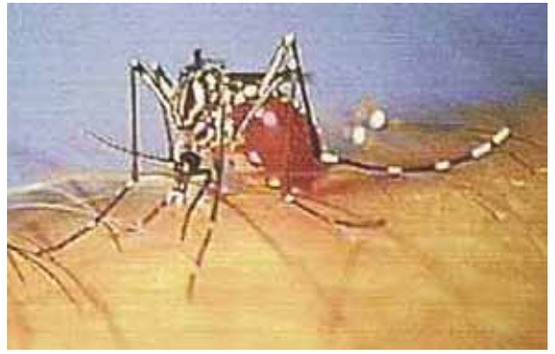
Epidemiology

Basically recognized as an urban disease, clinically very similar to dengue, mis-diagnosis is not unusual.

Infection rates were very high; in 1964, nearly 4,00,000 cases were reported from Chennai. In Barsi, Maharashtra in 1973, the overall morbidity was 37.5%.

Recent CHIK virus activity in India, 2002-03 (n = 865)

Place	MAC ELISA	Haemagglutination Inhibition	PCR
Kolhapur	3/120	2/11	+
Nanded	2/11	1/16	-
Gadchiroli	2/33	4/17	+
PCMC	3/82	1/10	-
Surat	1/116	0/28	-
Kerala	7/94	ND	ND
Hydrabad	3/47	ND	ND



In India, the virus was known to be involved in large-scale epidemics. However, in recent studies, the virus has been isolated in dengue endemic areas, suggesting involvement of the virus in endemic situations.

Ae.aegypti mosquito is the principal vector. *Ae.albopictus* and *Ae.vittatus* also transmit the virus experimentally.

Virus is maintained in nature at a low level in man-mosquito-man cycle.

Sylvatic cycle, involving primates as extra-human reservoir as exists in Africa, is not recognized in India. However, HI antibodies have been detected in wild-caught Indian langurs.

Several strains of virus have been isolated from patients and mosquitoes.

Host range

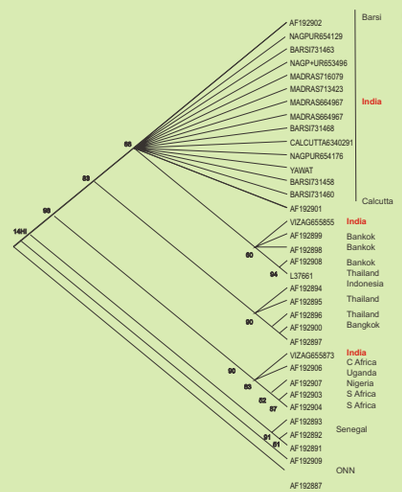
One to four day-old laboratory mice are susceptible. Guinea pigs, hamsters and rabbits survive infection and develop antibodies. Rhesus monkeys and one day-old chicken are susceptible. Adult fowl, cats, domestic sparrows and pigeons are refractory.

Diagnosis

- For virus isolation, infant Swiss albino mice; Vero / BHK-21 cell lines are used.
- Fourfold or greater rise in HI antibody titer.
- IgM capture ELISA using MAbs.
- Indirect immunofluorescence test (IFT) on infected cells.
- Diagnostic RT-PCR.

Genotyping

Genotyping, based on partial E1 gene sequence, has revealed that the majority of Indian strains belong to one clade, closer to Asian strains.



Genotyping of CHIK virus strains from India

Phylogenetic tree based on 257 bp partial E1 gene sequence.

Other studies

Gene(s) determining susceptibility of mosquitoes to virus have been found associated to chromosome of linkage group III.

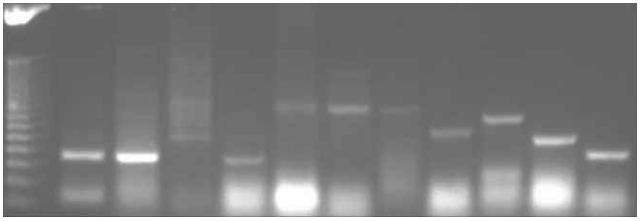
CHIK virus-specific receptors have been found on the mid-gut cells of *Ae.aegypti*.

Susceptibility of *Ae.aegypti* to CHIK virus is polygenic. At least one major susceptibility gene is on linkage group III. Susceptibility is quantitative trait loci (QTL)

Persistence of virus in the oocysts of protozoan parasites of vector mosquito suggests an occult cycle as a possible means of survival of the virus in nature.

The expression / up regulation of several immunoresponsive genes can occur under different stress conditions. These genes are also expressed in mosquitoes and mosquito cell lines on infection with CHIK virus. Two proteins, 38 and 60kDa, on midgut cells were identified as CHIK virus-binding proteins. Glycosylated 38kDa protein (pI 6.8 and 7.2) binds specifically to E1 protein of CHIK virus.

Expression of certain immunoresponsive genes in virus infected Aedes aegypti



1 2 3 4 5 6 7 8 9 10 11 12

1. 50 bp marker
2. Cecropin
3. Defensin
4. Defensin cell line
5. Defensin HSP
6. Nitric oxide synthatase NOS
7. NOS in cell line.
8. Lectin
9. Serine protease
10. Hsp 70
11. Hsp 71
12. Hsp 83

Scanning electron micrograph of midgut cells, expressing higher amount of virus-binding protein.

Location of CHIK virus binding protein