Arboviral Threats Ahead:
Addressing the Global Rise of Chikungunya and Japanese Encephalitis in the Age of Travel and Climate Change

A CME Symposium jointly provided by
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Hilton New Orleans Riverside Conference Hotel, Two Poydras St, New Orleans, Louisiana 70130

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Disclosure Statement

Drs. Marty and McGuinness has no relevant financial relationships with ineligible companies.

Dr. Hamer is a consultant for Bavarian Nordic, Takeda, Valneva; is a speaker for Medscape, Bavarian Nordic; and receives research funding from Merck & Co and Takeda.

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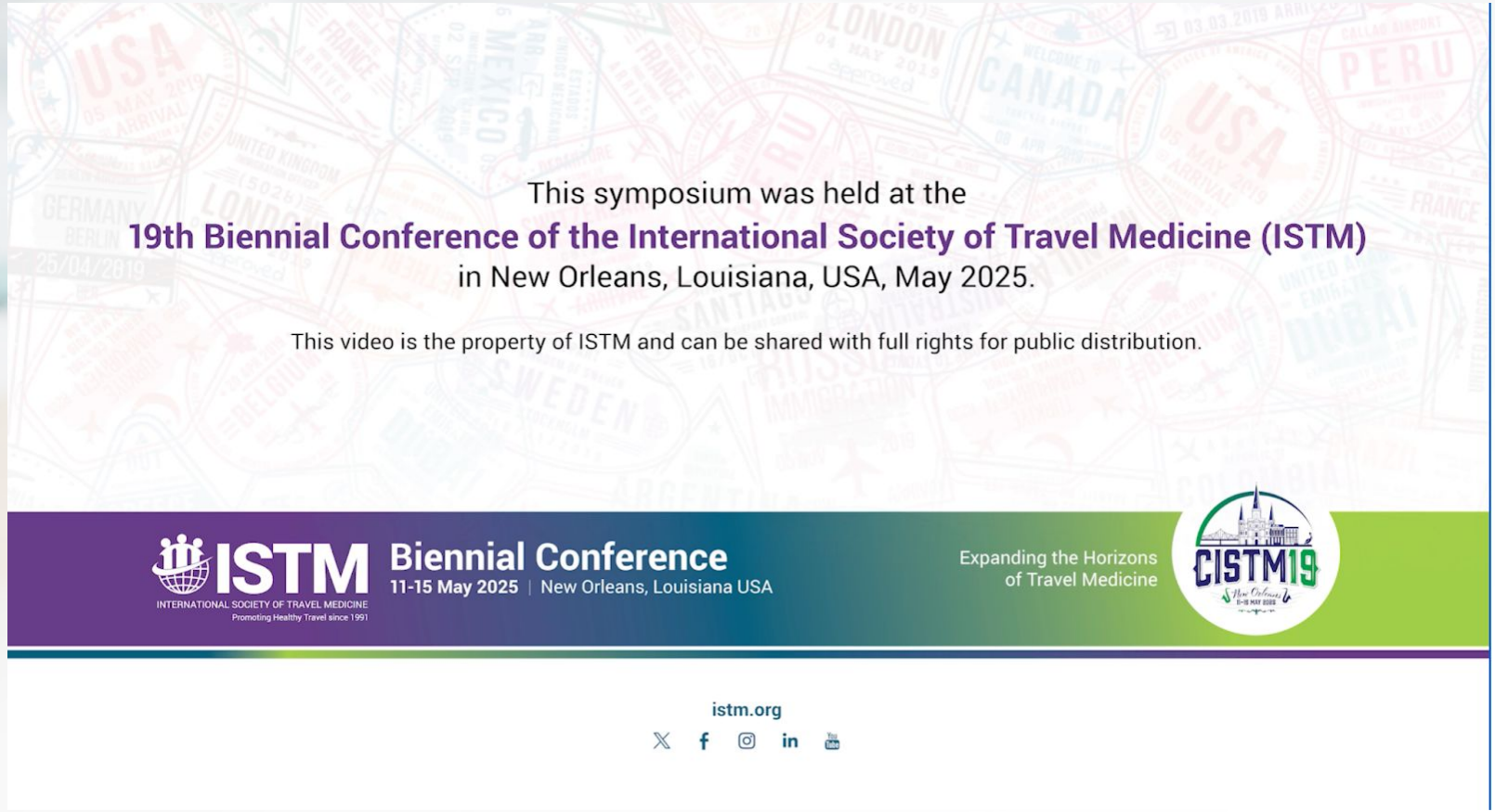
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19th Biennial Conference of the International Society of Travel Medicine (ISTM)
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Physicians	Physician Assistants	Nurse Practitioners
This activity, including a live symposium and two patient vignettes have been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of AffinityCE and SkymedCare. AffinityCE is accredited by the ACCME to provide continuing medical education for physicians.		
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Opening Poll

Before completing this symposium, how confident do you feel about advising travelers on vaccination against arboviruses?

A. Extremely Confident
B. Confident
C. Slightly Confident
D. Neutral
E. Slightly Unconfident
F. Not Confident

Learning Objectives

After completing this activity, participants should be able to:

1. Identify the global epidemiology of CHIKV, JEV, and other arboviruses, their life cycles, and their potential spread to non-endemic areas
2. List and evaluate the effectiveness of various prevention and control measures for CHIK and JEV infections and other arboviruses, including personal and community protective measures to avoid mosquito bites and eliminate breeding places (i.e., insecticide use)
3. Recognize and identify the populations most at risk for CHIK, JE, or other arboviral infections, and offer pre-traveling counseling and vaccinations if indicated
4. Recognize the clinical presentations of CHIK, including both acute and chronic forms, JE symptomatology, and other arbovirus infections, and identify relevant diagnostic tools and investigations to facilitate prompt differential diagnosis
5. Outline therapeutic goals and list symptomatic treatments recommended in cases of infection, and apply best practices in managing different stages of disease, focusing on pain management and disability prevention
6. Apply effective patient education strategies to increase public awareness and reduce the likelihood of transmission in high-risk populations, enhancing patient–doctor pre-travel counselling and providing resources (e.g., WHO, US and European CDCs).
7. Describe the need for and foster collaborative initiatives aimed at ensuring equitable access to affordable vaccines, and establish preventive measures in vulnerable populations.

CDC, Centers for Disease Control and Prevention; CHIK, chikungunya; CHIKV, chikungunya virus; JE, Japanese encephalitis; JEV, Japanese encephalitis virus; US, United States; WHO, World Health Organization.

Agenda

Lunch Symposium
Date: May 13, 2025

Activity		Presenters
Welcome and Introduction to Arboviral Diseases		Dr. David H. Hamer
Impact of Climate Change in Arboviral Expansion		Dr. Aileen Maria Marty
Case Studies of CHIKV and JEV Infections	**CHIK**	Chair: Dr. David H. Hamer Panelist: Dr. Aileen Maria Marty
	JE	Chair: Dr. Tom Solomon Panelist: Dr. Sarah McGuinness
Roundtable discussion & Q&A		All
Ending remarks and Event Wrap up		Dr. David H. Hamer, Dr. Tom Solomon

Arboviral Diseases

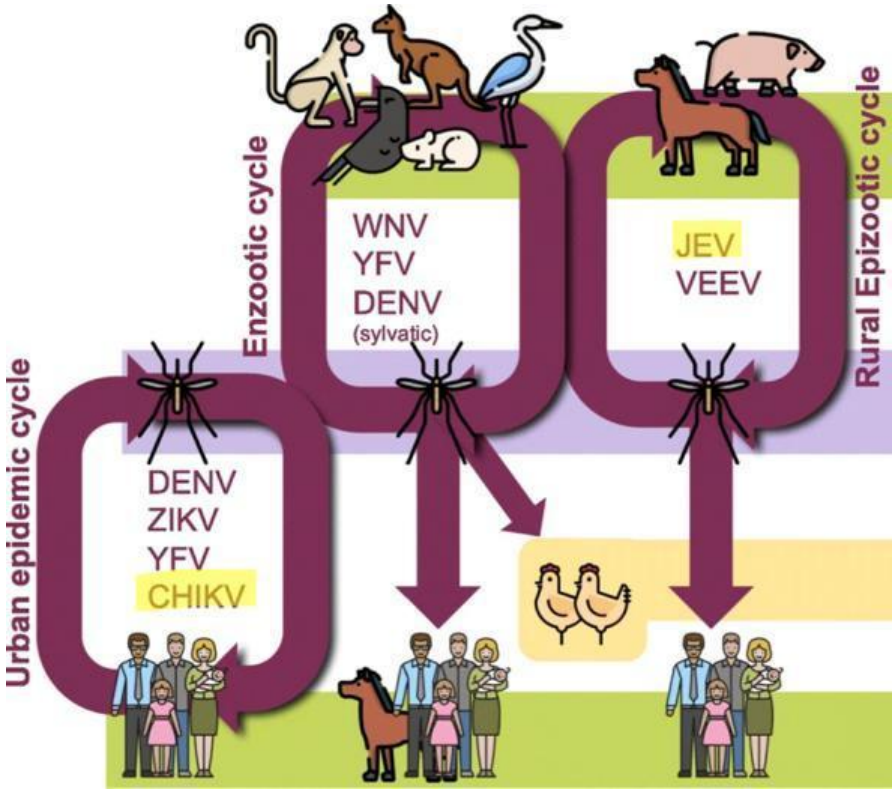
Virus Family	Viral Genus	Virus	Vector Species
	Orthobunyavirus	California serogroup viruses	Mosquito (Aedes sp.)
	Phlebovirus	Rift Valley Fever virus	Mosquito (various)
Bunyaviridae	Phlebovirus	Toscana virus	Sandfly (Phelbotomus sp.)
	Phlebovirus	Phlebotomus fever virus	Sandfly (phelbotomus)
	Phlebovirus	Sandfly Fever Naples virus	Sandfly (phelbotomus)
	Phlebovirus	Sandfly Fever Sicilian virus	Sandfly (phelbotomus)
	Phlebovirus	Heartland virus	Tick (A. americanum)
	Phlebovirus	Severe fever with thrombocytopenia syndrome virus	Tick (H. longicornis)
	Nairovirus	Crimean Hemorrhagic Fever virus	Tick (Hyalomma sp.)
	Flavivirus	Dengue Virus	Mosquito (Aedes sp.)
	Flavivirus	Zika virus	Mosquito (Aedes sp.)
	Flavivirus	Yellow fever virus	Mosquito (Aedes sp.)
	Flavivirus	West Nile Virus	Mosquito (Culex sp.)
	Flavivirus	St. Louis Encephalitis virus	Mosquito (Culex sp.)
Flaviviridae	Flavivirus	Japanese encephalitis virus	Mosquito (Culex sp.)
	Flavivirus	Murray Valley encephalitis virus	Mosquito (Culex sp.)
	Flavivirus	Usutu	Mosquito (various)
	Flavivirus	Omsk Hemorrhagic fever virus	Tick (dermacentor)
	Flavivirus	Kyasanur Forest Diesease virus	Tick (Haemaphysalis sp.)
	Flavivirus	Tick-borne encephalitis virus	Tick (Ixodes and Haemaphysalis sp.)
	Flavivirus	Powassan virus	Tick (Ixodes sp.)
Orthomyxoviridae	Thogotovirus	Bourbon virus	Tick (A. americanum)
Reoviridae	Coltivirus	Colorado tick fever	Tick (dermacentor)
Rhabdoviridae	Vesiculovirus	Vesicular Stomatitis (New Jersey) virus	Sandflies (Lutz. Sp) | Mosquitos (various)
	Vesiculovirus	Chandipura	Sandlfy (Phlebotomus Sp.)
	Alphavirus	Barmah Forest Virus	Mosquito (Aedes and Culex sp.)
	Alphavirus	Chikungunya virus	Mosquito (Aedes sp.)
Togaviridae	Alphavirus	Venezuelan equine encephalitis virus	Mosquito (Culex sp.)
	Alphavirus	Sindbis virus	Mosquito (Culex sp.)
	Alphavirus	Equine encephalitis virus	Mosquito (Culex sp.)
	Alphavirus	Mayaro virus	Mosquito (Haemagogus sp.)

Arbovirus transmission and its vectors

- Arboviruses (arthropod-borne-virus) are transmitted by blood-sucking insects like mosquitoes and multiply in vertebrates.[1]
- Main vector for Japanese encephalitis virus (JEV) is *Culex tritaeniorhynchus*.[1]
- *Aedes* spp. mosquitos are primary vectors for chikungunya virus (CHIKV), dengue virus (DENV), i.e. both commonly transmitted by *Ae aegypti* and *Ae. albopcictus*.[1]

1. Meyding-Lamadé U, et al. *Neurol Res Pract.* 2019 11;1:20. 2 Image extracted from Schneider CA, *et al. J Mol Sci.* 2021 25;22(17):9173; licensed under CC BY 4.0.

Arboviral Diseases



Arbovirus transmission

- Arboviruses share many functional similarities in how they interact with the mammalian host and arthropod vector.[1]

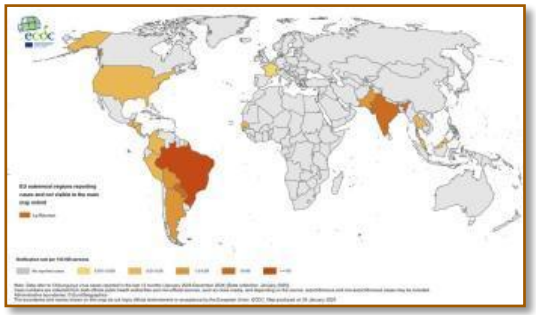
Transmission cycles:[1]

- CHIKV: human-vector-human.
- JEV: animal-vector-human.

CHIKV, chikungunya virus; DENV: Dengue virus; JEV: Japanese encephalitis virus; WNV: West Nile virus; YFV, yellow fever virus; ZIKV: zika virus. 1. Schneider CA, *et al. J Mol Sci.* 2021 25;22(17):9173. 2 Image extracted from Ramírez AL, *et al. Parasit Vectors.* 2018 29;11(1):320; licensed under CC BY 4.0.

Arboviral Diseases

Global burden of CHIK and JE

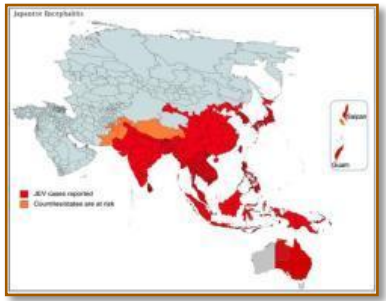


CHIK:

- Common symptoms: fever, rash, joint pain (arthralgia), and muscle pain.[1]
- Severe complications like encephalitis, especially in adults.[1,2]
- In 2024, approximately 620,000 cases and >200 deaths were reported worldwide.[3]

JE:

- JEV crosses the BBB and enters the CNS, potentially causing encephalitis, meningitis, movement disorders, and sometimes acute flaccid paralysis.[4,5]
- 20-30% of patients die, and approximately half the survivors have chronic neurological impairment.[5]
- In endemic countries, JE is primarily a disease of children,[6] but adults and children travelling from non-endemic to endemic areas are at risk.[6,7]
- Reports indicate an estimated annual incidence of approximately 100,000 cases and 25,000 deaths[8]



BBB, blood brain barrier; CHIK, chikungunya; CNS, central nervous system; JE, Japanese encephalitis; JEV, Japanese encephalitis virus. 1. Freppel W, *et al. Virulence*. 2024;15(1):2396484. 2. Lyons, J. L. (2020). Chikungunya virus and Japanese encephalitis virus. *In Clinical Neurovirology* (pp. 237–247). CRC Press. 3. ECDC - Chikungunya worldwide overview. Available at: https://www.ecdc.europa.eu/en/publications-data/chikungunya-virus-disease-case-notification-rate-100-000-population-january-2024 (Accessed Apr 2025). 4. Meyding-Lamadé U, et al. *Neurol Res Pract*. 2019 11;1:20. 5. CDC - Clinical Features and Diagnosis of Japanese Encephalitis. Available at: https://www.cdc.gov/japanese-encephalitis/hcp/clinical-diagnosis/index.html. (Accessed Mar 2025) 6. NaTHNaC - Japanese encephalitis. Available at: https://travelhealthpro.org.uk/factsheet/55/japanese-encephalitis. (Accessed Mar 2025); 7.Turtle L. *J Travel Med*. 2019 14;26(7):taz064. 8. Quan TM, et al. *Elife*. 2020 26;9:e51027. Image: JE distribution map extractedd from: Monath TP. Japanese Encephalitis: Risk of Emergence in the United States and the Resulting Impact. Viruses. 2023 16(1):54. doi: 10.3390/v16010054; licensed under CC BY 4.0.

Impact of Climate Change

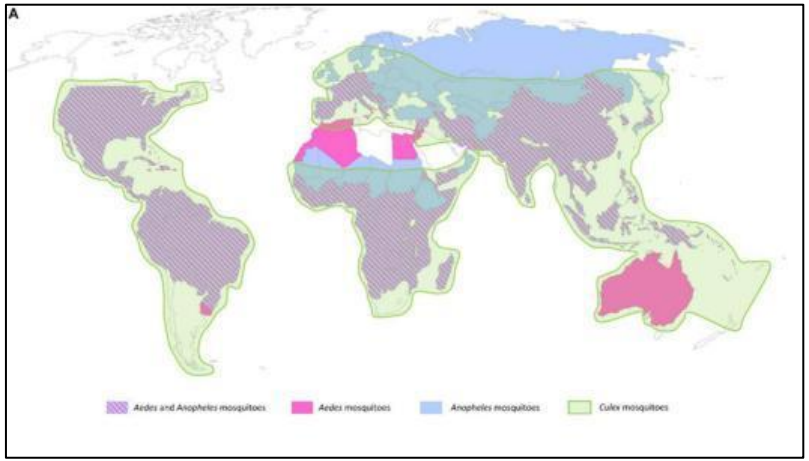
Expansion of *Aedes and Culex* mosquitoes beyond traditional habitats

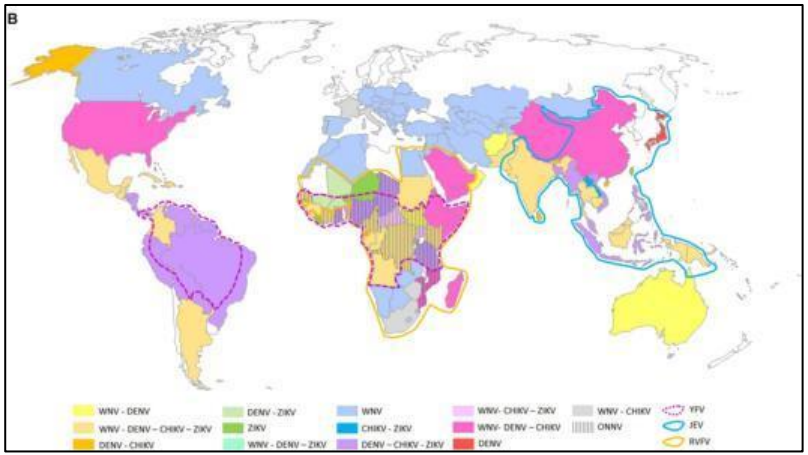
CHIK: *Aedes sp,* especially *Aedes aegypti* and *Aedes albopictus* (Asian tiger mosquito)

- *Aedes* mosquitoes have spread from their natural habitat in Africa to other continents, in the Americas, Asia, Europe, and the Indo-Pacific.[1,2]

JE: *Culex* sp, especially *Culex tritaeniorhynchus*

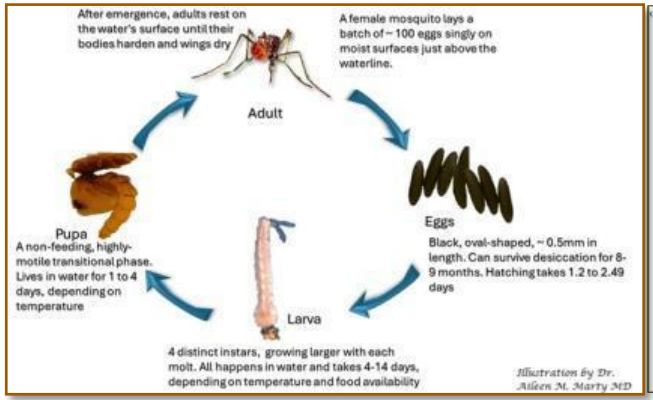
- JV originated in the Indonesia-Malaysia region and, likely via migrating birds and mosquitoes, has spread to over 20 countries across South and Southeast Asia. JEV-infected mosquitoes caused cases in Australia briefly in 1999, and then, after a gap, autochthonous cases re-emerged in Australia in 2022.
- Autochthonous cases of JE have not yet been reported in Europe or the Americas.[4]



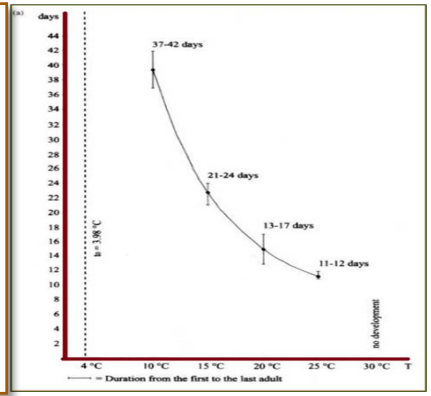


CHIK, chikungunya; JE, Japanese encephailits; JEV, Japanese encephalitis virus. 1. Freppel W, *et al. Virulence*. 2024;15(1):2396484. 2. CDC. Areas at Risk of Chikungunya. Available at: https://www.cdc.gov/chikungunya/data-maps/index.html (Accessed Jan 2025). 3. ECDC - Chikungunya worldwide overview. Available at: https://www.ecdc.europa.eu/en/chikungunya-monthly (Accessed Jan 2025). 4. Monath TP. *Viruses*. 2023;16(1):54. 5. Gossner CM, *et al.* Potential for emergence of Japanese encephalitis in the European Union. Zoonoses Public Health. 2024;71(3):274-280. doi: 10.1111/zph.13103. Image extracted from: Vigiletta M., *et al. Front. Microbiol.* 2021 12:773211; licensed under CC BY 4.0.

Impact of Climate Change

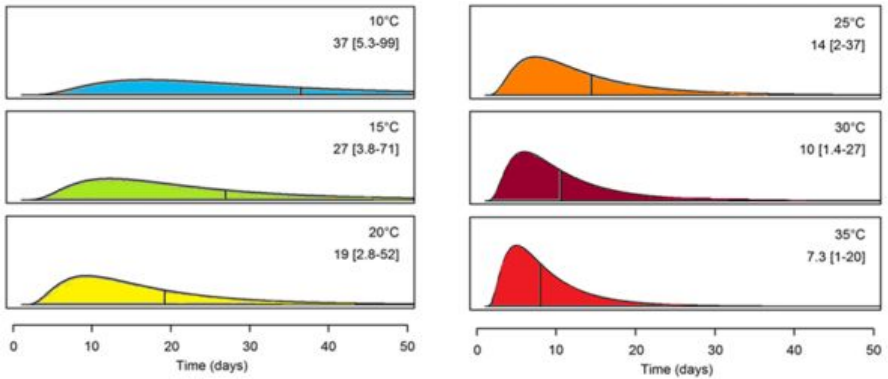


Aedes mosquito cycle



Larval and pupal development of *Aedes vexans* in relation to water temperature

Extrinsic incubation periods at selected temperatures (arboviruses)[1]



Arthropod vectors (e.g., mosquitoes) and heat:[1]

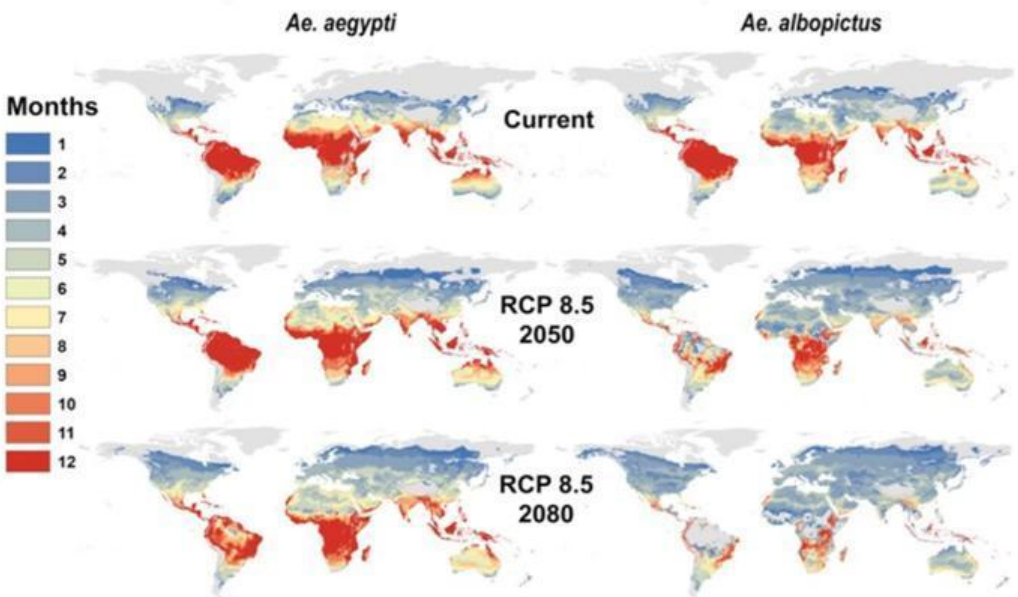
- Elevation in ambient and water temperature increases the speed of all stages of mosquito (e.g., *Aedes*) development (oviposition, embryonic development, larvae, pupae, and adult).
- Heat speeds replication of pathogens harbored by vectors → Increased pathogen load per vector, and each mosquito carries high loads sooner.
- Mosquito biting rates increase at higher temperatures.
- However, very high temperatures can reduce vector survival.

1. Johansson MA, *et al.* Incubation periods of Yellow fever virus. *Am J Trop Med Hyg.* 2010;83(1):183-8.

Larval and pupal development image extracted from: https://beckassets.blob.core.windows.net/product/readingsample/457488/9783540928737_excerpt_001.pdf Biology of Mosquitoes.

Climate Change's Impact on the Area of Distribution

Current and predicted future distribution of *Aedes aegypti* and *Aedes albopictus*



A warmer world with altered precipitation

1. Allows vectors to **expand their geographic ranges** into previously unsuitable areas
2. **Lengthens the season** during which vectors are active

- *This, along with faster development rates, shorter extrinsic incubation, and higher bite rate, will lead to more infections (**increased disease burden**)*.
- **Economic Impact** will rise from the current $8.9 billion/year
- Problem **disproportionately affects vulnerable** populations, e.g., children, outdoor workers, elderly people, and those with limited healthcare access

Geographic distribution of the yellow fever mosquito (A. aegypti) and the Asian tiger mosquito (A. albopictus) in present day (top) and in 2050 (middle) and 2080 (bottom) under a scenario of extreme climate change. Colour is used to indicate the number of months in a year with disease transmission risk and grey indicates absence of risk. Source: Ryan SJ, *et al*. Image: Global expansion and redistribution of Aedes-borne virus transmission risk with climate change. *PLoS Negl Trop Dis*. 2019 13(3):e0007213; licensed under CC BY 4.0.

Response to Infectious Risks from Climate Change

Enhanced integrated surveillance and early warning systems, e.g., Europe's EYWA (Early Warning System for Mosquito-borne diseases), integrate satellite data, models, and interdisciplinary scientific fields to forecast and monitor mosquito-borne diseases.

Vector control strategies including biological Control (e.g., *Wolbachia*-infected mosquitoes) and integrated Mosquito Management (IMM).

Environmental management: Source reduction through improved water management and urban planning is being emphasized to minimize mosquito breeding sites, and urban planning and infrastructure changes are being made to reduce mosquito breeding sites, improve water management systems, and create more resilient urban environments.

Climate-resilient health systems include increasing diagnostic capabilities and updating treatment protocols to handle climate-related changes in disease patterns.

Research and development for new vaccines, Innovative vector control technologies adapted to changing climate conditions, and AI-driven mosquito identification and surveillance tools

Public education and engagement, such as the Mosquito Alert educational program in Europe, engages students and teachers in mosquito surveillance and awareness activities and provides information on mosquito breeding prevention, personal protection measures, and disease symptom recognition.

International cooperation, such as ECDC's collaboration with WHO and other organizations, to develop regional frameworks for surveillance and control of invasive mosquitoes and re-emerging mosquito-borne diseases. The Global Strategic Preparedness, Readiness and Response Plan (SPRP) fosters a coordinated global response to tackle Aedes-borne arboviruses.

Surveillance

Wolbachia-infected mosquitoes

Vaccine Research

Greek City Times. Available at: https://greekcitytimes.com/2022/01/28/greece-based-epidemics-warning-system-wins-top-european-science-prize-videoze; Entomology Today. Available at: https://entomologytoday.org/2019/05/03/wolbachia-infected-mosquito-release-shows-encouraging-results/; IXCHIQ - Available at: https://ixchiqhcp.com; all Accessed Apr 2025.

Patient Cases

Patient Case 1: Klaus' Case

62-year-old man on a trip in a prevalent CHIK outbreak region

- Lack of mosquito bite prevention.
- He developed symptoms of viral infection, including:
  - High-grade fever of 102.2°F (39°C) 10 days after arrival.
  - Intense joint pain, associated with swelling and redness after 2 days, with skin rash and mild GI symptoms.
- Confirmed CHIK infection, treated with supportive care & NSAIDs
- Other risks: Klaus' wife is pregnant

Patient Case 2: Jenny's Case

32-year-old woman traveling to Bali for the first time

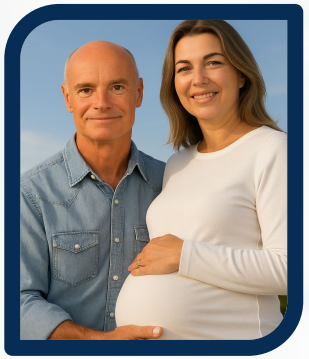
- Pre-travel counseling with her PCP:
  - No prior vaccination for JE
  - 3-week travel plan in Bali, with intention to travel through south-east Asia in the next 1-2 years

CHIK, chikungunya; JE, Japanese encephalitis; PCP, primary care physician; NSAIDs, non-steroidal anti-inflammatory drugs. Images are provided for illustrative purposes only and do not represent the actual patient.

Patient Case 1: Klaus' Case

Panelist: Dr. Aileen M. Marty
Chair: Dr. David H. Hamer

Case 1 - Klaus: Introduction



Klaus, a 62-year-old traveler on a road trip with his wife to Paraguay coinciding with a local CHIK outbreak

- Klaus is a 62-year-old traveler on a February road trip with his wife in Paraguay coinciding with a local CHIK outbreak. Klaus and his 42-year-old wife, Renate, who is 4 months pregnant, are Germans and have lived in Frankfurt for their whole lives. He works as a retail executive and practices outdoor sports every week.
- While engaging in outdoor activities, he did not consistently use mosquito repellents or other protective measures, increasing his exposure risk. Meanwhile, Renate stayed indoors most of the time, and followed preventive measures to minimize the risk of mosquito bites, like using mosquito nets, white clothing, and repellents, as discussed with her family doctor.

Medical history:

- Klaus has well-controlled T2DM, which he manages with oral medication.
- Neither Klaus nor Renate sought pre-travel counseling or vaccinations related to arboviral infections.

Risk factors:

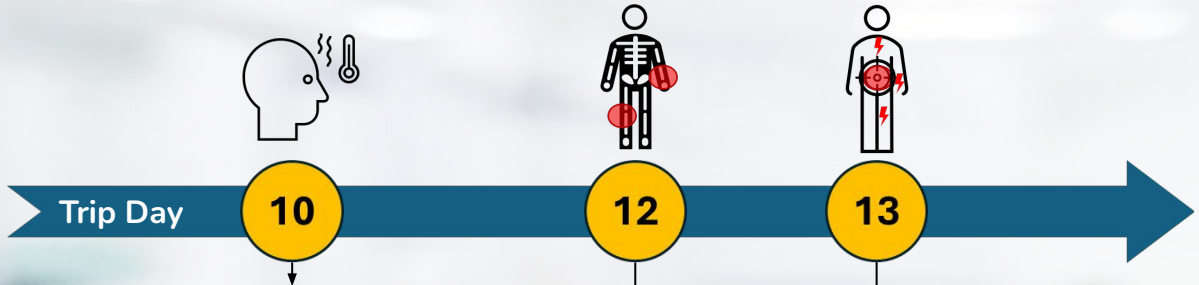
- Age > 60 years, lack of mosquito bite prevention, unfamiliarity with local disease outbreaks, no history of vector-borne diseases. Klaus' wife is pregnant.

**This is a patient case simulation*

CHIK, chikungunya; CHIKV, chikungunya virus; T2DM, type 2 diabetes mellitus.

My-Ime.com

Case 1 - Klaus: Illness



Fever of 102.2°F (39°C), accompanied by severe headaches and generalized fatigue.

Intense joint pain, primarily in the wrists, knees, and ankles, with associated swelling and redness.

Maculopapular rash developed over his trunk and limbs and mild GI symptoms.

Persistent fever, rash, and disabling joint pain prompted him to seek medical attention.

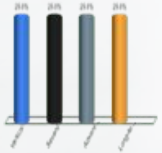
Physical exam:

- Fatigued and in visible discomfort due to joint pain
- **Vital Signs:**
- Mild fever
- Elevated heart rate
- **Musculoskeletal Examination:**
- Tenderness and swelling in multiple joints
- Restricted movement
- **Skin Examination:** Rash consistent with viral infection

**This is a patient case simulation*

GI, gastrointestinal.

Poll Question 1



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What are the most significant complications or adverse neonatal outcomes associated with CHIKV infection, during pregnancy and childbirth?

A. Vertical transmission to the fetus, especially if infected in the last trimester
B. Severe maternal complications, including CHIK-induced sepsis, requiring ICU admission
C. Adverse pregnancy outcomes (e.g., preterm delivery, premature rupture of membranes, or intrauterine death)
D. Long-term arthralgia in the mother persisting beyond the acute phase of infection

ICU, intensive care unit; CHIK, chikungunya; CHIKV, chikungunya virus.

Case 1 - Klaus: Analytics

- His blood tests showed mild thrombocytopenia (platelet count of 140,000/µL) and slightly reduced white blood cell levels, elevated CRP and CK, and mildly elevated transaminases, often associated with arboviral infections. Serological testing confirmed a recent CHIKV infection with positive IgM antibodies.

Laboratory results:

Tests and investigations	Results
Complete Blood Count (CBC)	
•White blood cell (WBC)	4,800/µL
•Neutrophils	60%
•Lymphocytes	30%
•Platelets	140,000/µL*
•Hemoglobin	14.5 g/dL
Liver Function Tests (LFTs)	
•Alanine aminotransferase (ALT)	60 U/L* (reference range: 7-56 U/L)
•Aspartate aminotransferase (AST)	62 U/L* (reference range: 10-40 U/L)
Muscle damage	
•Creatinine kinase (CK)	350 U/L* (reference range: 39-308 U/L for men)
Inflammatory markers	
•C-reactive protein (CRP)	75 mg/L* (Reference range: <10 mg/L])
•Erythrocyte sedimentation rate (ESR)	50 mm/hr* (Reference range: 0-20 mm/hr)

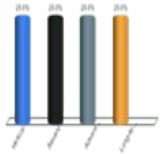
**This is a patient case simulation*

CHIKV, chikungunya virus; IgM, immunoglobulin M. Abnormal values in red – lower than normal, or higher if indicated by an asterisk (*).

Poll Question 2

In a 62-year-old man with mild thrombocytopenia, slightly reduced white blood cell levels, positive anti-CHIKV IgM antibodies, and mildly elevated transaminases, what additional test would you order to confirm the diagnosis of CHIKV infection?

A. RT-PCR
B. Viral culture
C. Plaque reduction neutralization test (PRNT)
D. Chikungunya virus IgG antibody test
E. Complete blood count (CBC) with differential



CHIK, chikungunya; CHIKV, chikungunya virus; IgM, immunoglobulin M.

Case 1 - Klaus: Analytics

Diagnosis confirmation

Laboratory results:

Tests and investigations	Results
Serology and Virology Tests:	
•Anti-Chikungunya virus IgM antibodies	3.2* (positive, reference range < 1.0)
•Anti-Chikungunya virus IgG antibodies	0.8 (negative, reference range < 1.0)
•Dengue virus antibodies	0.6 (negative, reference range < 1.0)
•C3	120 mg/dL (reference range: 90–180 mg/dL)
•C4	32 mg/dL (reference range: 15–45 mg/dL)

The **qRT-PCR** assay detected CHIKV RNA in the patient's sample, **confirming an active CHIKV infection**.

**This is a patient case simulation*

C, complement; CHIKV, chikungunya virus; qRT-PCR, quantitative Reverse Transcription Polymerase Chain Reaction. Abnormal values in red – lower than normal, or higher if indicated by an asterisk (*).

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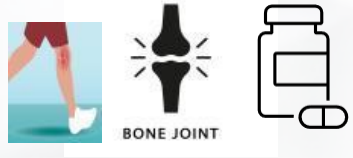
Case 1 - Klaus: Treatment and Prognosis



Acute phase (1-3 weeks): characterized by high fever, severe arthralgia, rash, and other symptoms

- **Supportive care**, including rest, hydration, and acetaminophen/paracetamol for fever and pain management, remains the mainstay of treatment for acute CHIKV infection.
- NSAIDs are avoided during the acute phase until dengue fever is ruled out due to the risk of bleeding complications, especially in endemic areas where both viruses co-circulate.

Post-acute phase (weeks 4-12): characterized by improvement in general symptoms but persistent joint pain

- NSAIDs can be used; once dengue is ruled out, NSAIDs can help manage the severe arthralgia of CHIKV, particularly in the post-acute and chronic phases.

Chronic phase (beyond 3 months): affecting approximately 14-68% of patients (depending on study and population)

- Corticosteroids (short-course), disease-modifying antirheumatic drugs (DMARDs), and physical therapy may be beneficial for persistent arthritis symptoms.
- Referral to a rheumatologist for management of ongoing symptoms is appropriate, as chronic CHIKV arthritis can mimic rheumatoid arthritis and may benefit from similar treatment approaches.

Prognosis:

By the 7th day, Klaus's fever subsided, but joint pain persisted, limiting his mobility. This lingering pain, characteristic of post-viral arthropathy, was expected to improve gradually over weeks to months. He was referred to a rheumatologist for management of ongoing symptoms.

- ❖ Persistence of arthralgia is more common in older people (>65 years, like Klaus), females, those with greater severity of initial disease, and certain comorbidities. While most patients recover completely within weeks to months, a significant proportion (up to 68% in some studies) may experience symptoms for years, particularly older adults.

**This is a patient case simulation*

CHIKV, chikungunya virus; NSAID, non-steroidal anti-inflammatory drugs. Images from: Shutterstock images licences 2170960073; 212429534; 1309908094.

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Patient Case 2: Jenny’s Case

Chair: Dr. Tom Solomon
Panelist: Sarah McGuinness

Case 2 - Jenny: Introduction

Digital Nomad from the US traveling to Bali for the first time for 3 weeks (JEV risk) outbreak

- Jenny is a 32-year-old digital nomad from the US with no significant past medical history or chronic illnesses.
- She visits her primary care physician to discuss an upcoming three-week trip to Bali in December.

Initial risk assessment:

- Short term travel to an endemic area, staying in resort-style accommodation, no prior vaccination for JE, potential exposure to mosquito bites.
- JE transmission in Indonesia is year-round, with peak season varying by island.

**This is a patient case simulation*

JE, Japanese encephalitis; JEV, Japanese encephalitis virus; US, United States. Areas at Risk for Japanese Encephalitis. Available at: https://www.cdc.gov/japanese-encephalitis/data-maps/index.html (Accessed Mar 2025).

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Poll Question 1

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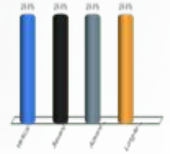
Would you recommend JE vaccination for Jenny, a 32-year-old digital nomad traveling to Bali for three weeks?



A) Yes, given travel to an endemic area in transmission season

B) No, risk is low and mosquito bite prevention is enough

C) Maybe, depending on her future travel plans, activities and risk tolerance

JE, Japanese encephalitis.

Case 2 - Jenny: Travel Counselling

Travel counselor advice:

- Jenny should take precautions to avoid mosquito bites.
- Personal protective measures include the use of mosquito repellents, wearing long-sleeved shirts and pants, treating clothing and gear with permethrin, and choosing lodging with air conditioning, screens on windows and doors, or using a mosquito net. These measures are especially important at night (dusk to dawn), which is when *Culex tritaeniorhynchus* bites

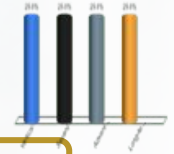
New information:

- Jenny likes spending time outdoors and is planning further trips to south-east Asia (Vietnam, Thailand, etc) in the next 1-2 years.

**This is a patient case simulation*

Poll Question 2

Taking new information into account, would you recommend Jenny to get JE vaccination?



A. Yes, given her outdoor activities and future travel plans
B. No, risk is still low and mosquito bite prevention is enough
C. Maybe, would decide based on further discussion around risk tolerance

JE, Japanese encephalitis.

JE in Travellers[1]

Risks

- JE occurs in ~1 in 400,000 to <1 in 1 million trips to endemic areas.
- Rare compared to other travel health risks (e.g., TD, respiratory viruses).

Consequences

- BUT consequences potentially severe AND there's no specific treatment.
- Almost 50% of cases are in short-term travellers (<1 month):
  - ~25% fatal
  - ~50% long-term sequelae

TD, traveller's diarrhea. 1. McGuinness SL, *et al. Curr Infect Dis Rep* 2023 25:111-122.

JE Vaccine Recommendations

Most advisory bodies issuing JE vaccine guidance for travellers:

- Recommend vaccination for those spending extensive time, i.e., 1 month or more, or making frequent trips to risk areas during the transmission season
- Suggest considering vaccination for those undertaking short-term travel with additional risk factors / uncertain itineraries

JE, Japanese encephalitis; TravelHealthPro. Japanese Encephalitis Fact Sheet & The Green Book – Chapter 20 (Feb 2024); WHO. Japanese Encephalitis Fact Sheet; CDC. JE Vaccine Recommendations; ACIP Recommendations: CDC.Japanese Encephalitis Vaccine: Government of Canada. Canadian Immunization Guide – JE

JE Vaccines[1]

Vaccine type	Inactivated Vero cell derived	Live attenuated chimeric (JE-CV)	Live attenuated (CD-JEV)	Inactivated mouse brain derived
Brands	JEspect® / Ixiaro®, Jenvac®, Encevac®	Imojev®	CD.JEVAX®	Biken®, JE-Vax®
Countries / regions used in (as of 2021)	Australia, Canada, Europe, Japan, South Korea, Taiwan, UK, US	Australia, Malaysia, Philippines, Thailand	Cambodia, China, India, Indonesia, Laos, Myanmar, Nepal, Philippines, South Korea, Sri Lanka, Thailand	Vietnam

Modern JE vaccines are safe and effective
No published reports of JE illness among travellers who have received JE vaccine

JE, Japanese encephalitis; UK, United Kingdom; US, United States. 1. Vannice KS, *et al. NPJ Vaccines.* 2021 Jun;6(1):82.

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Case 2 - Jenny: Case Progression

Case development:

Bali (vacation) → **US (home)** → **Day 5**

Jenny chose not to get vaccinated before her trip. She stayed at a beachside resort, but got mosquito bites.

Jenny began to feel unwell, with lethargy and poor appetite.

Over the next few days, she experienced ongoing lethargy and developed headache, fever, and sweats.

On day 5 of illness, Jenny attended the **emergency department** with difficulty concentrating, increasing confusion and sensitivity to light.

**This is a patient case simulation*

US, United States.

Case 2 - Jenny: Further Tests

	Tests and investigations	Results
Vital signs:	•Temperature •Heart rate •Blood pressure •Respiratory rate	102.5°F (39.2°C) 110 bpm 130/80 mmHg 18 breaths/min
Physical exam:	•Neurological examination •Skin examination	Confused, hyperreflexia in lower limbs, photophobia, positive Kernig's and Brudzinski's sign No rash
Blood tests:	**Complete Blood Count (CBC):** •White blood cell (WBC) •Neutrophils •Lymphocytes •Platelets •Hemoglobin	 12,500/µL* 70% 25% 210,000/µL 13.5 g/dL
	Inflammatory markers •C-reactive protein (CRP) •Erythrocyte sedimentation rate (ESR)	 15 mg/L* 35 mm/hr*

https://www.youtube.com/watch?v=XKu8FxO8i6I&t=30s

https://www.youtube.com/watch?v=XKu8FxO8i6I&t=30s

**This is a patient case simulation*

Abnormal values in red – lower than normal, or higher if indicated by an asterisk (*).

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Poll question 3

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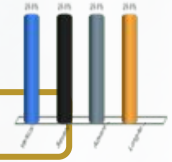
Please select which is your leading diagnosis:



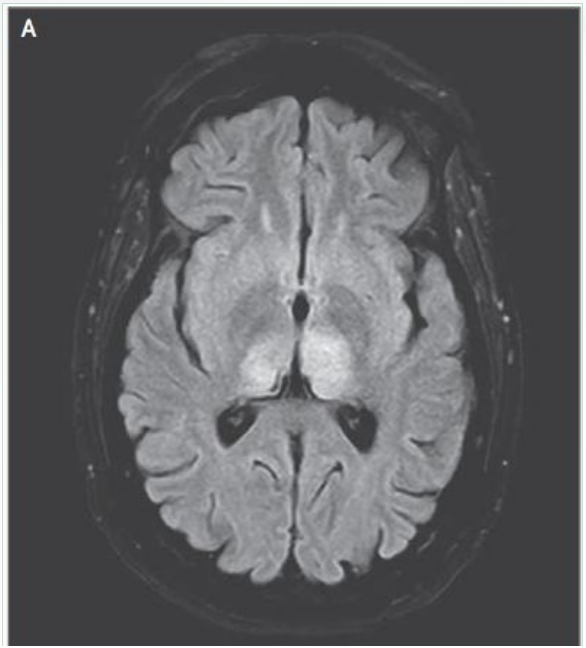
A. Japanese encephalitis
B. Dengue
C. Meningococcal meningitis
D. HIV seroconversion illness
E. Malaria

Case 2 - Jenny: Case Progression

Case development:

- Lumbar puncture (CSF Analysis):
- Normal glucose
- Elevated protein 1.2g/L (normal <0.45)
- White blood cells 150/microL with lymphocytic predominance
- Negative bacterial cultures.
- JEV serology: Positive for JEV-specific IgM in blood and CSF.

- Neuroimaging (MRI):
- Bilateral hyperintensities in the thalamus, consistent with encephalitis



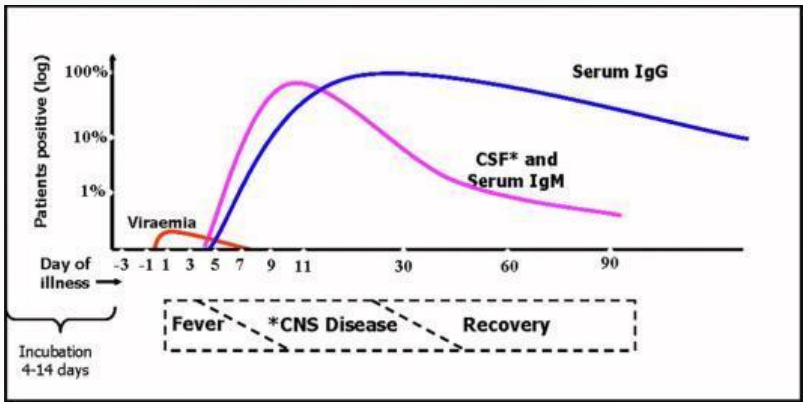
**This is a patient case simulation*

CSF, cerebrospinal fluid; JEV, Japanese encephalitis virus; MRI, magnetic resonance image. Image from. Pichl T et al. *Int J Infec Dis* 2022 https://doi.org/10.1016/j.ijid.2022.03.010; Waller C et al. *N Engl J Med* 2022 https://doi.org/10.1056/NEJMc2207004 .

Case 2 - Jenny: JE diagnosis

Diagnosis:

- Serology primary diagnostic method
- Anti-JEV IgM: typically present in serum by day 7
- Anti-JEV IgM in CSF: sensitivity & specificity >95% for CNS infection after day 9-10 of illness
- Anti-JEV IgG: peaks in serum and CSF on day 30
- PCR: can be performed on whole blood, CSF and urine; often negative due to low-level, short-duration viraemia
- MRI: supportive but not confirmatory



**This is a patient case simulation*

CNS, central nervous system; CSF, cerebrospinal fluid; Ig, immunoglobulin; JEV, Japanese encephalitis virus; MRI, magnetic resonance image; PCR, polymerase chain reaction; TBC. Sources,i.e. Image extracted from Pham D, *et al. Pathology.* 2022 54(6):669-677 licensed under CC BY-NC-ND 4.0.

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Case 2 - Jenny: JE Diagnosis

The patient showed gradual improvement over three weeks but experienced mild residual cognitive deficits, including difficulty with memory and concentration.

She was referred for neurorehabilitation.

**This is a patient case simulation*

Roundtable Discussion and Q&A

Key Topics - Discussion and Q&A

Key Topics:

- Need for rapid point of care diagnostics
- Nuances of current vaccine recommendations
- Importance of vaccinations and pre-travel counseling
- Ensuring equitable access to preventive measures in at-risk regions
- Strengthen surveillance, mapping, and communication about ongoing outbreaks
- Gaps in current vector control efforts
- Future directions in CHIK and JE research and control

CHIK, chikungunya; JE, Japanese encephalitis.

Ending Remarks

Ending Remarks

Key Points for Pre-Travel Consultations

- Provide **pre-travel recommendations for mosquito-borne diseases, including CHIK and JE** well in advance of the trip
- Conduct **individual risk assessment** based on **itinerary, planned activities and future travel plans**
- Review CHIKV & JEV epidemiology at the destination and outbreak alerts
- **Educate travellers on potential health risks and preventive measures, including personal protection measures**
- Based on risk assessment, targeted pre-travel vaccination for JEV or CHIKV

CHIK, chikungunya; CHKV, chikungunya virus; JE, Japanese encephalitis; JEV, Japanese encephalitis virus.

Ending Remarks

Key Points for Post-Travel Consultations

- History of presenting illness and clinical examination
- Review travel destinations, activities, and exposures
- Consider incubation periods and formulate differential diagnosis
- Provide symptomatic treatment and consider hospitalization if severe
- Advise on mosquito bite prevention and future vaccination if indicated

Closing Poll

Having completed this symposium, how confident do you feel about advising travelers on vaccination against arboviruses?

A. Extremely Confident
B. Confident
C. Slightly Confident
D. Neutral
E. Slightly Unconfident
F. Not Confident

Thank you for your attendance

An Enduring and Online version will be available on

My-Ime.com

https://my-ime.com/program/arboviral-threats-ahead-addressing-the-global-rise-of-chikungunya/