



VPH-603

**‘Viral, Fungal and Parasitic agents of
Public Health Significance’**

(Credit Hours-2+1)



Japanese encephalitis (JE) is an in-apparent to acute arthropod-borne viral infection of the central nervous system characterized in man by fever, headache, prostration, neck rigidity, altered sensorium and encephalitis

Introduction

- Japanese encephalitis virus (JEV) is a **flavivirus** related to dengue, yellow fever & West Nile viruses, and is spread by mosquitoes
- Main cause of viral encephalitis in many countries of Asia with an estimated **68 000 clinical cases every year**
- Symptomatic Japanese encephalitis (JE) is rare
- The CFR among those with encephalitis can be as high as 30%
- Permanent neurologic or psychiatric sequelae can occur in 30%–50% of those with encephalitis
- 24 countries in the WHO South-East Asia and Western Pacific regions have endemic JEV transmission, exposing more than 3 billion people to risks of infection
- Treatment is focused on relieving severe clinical signs & supporting the patient to overcome the infection
- Safe and effective vaccines are available to prevent JE

Introduction

- ❖ A re-emerging mosquito-borne **zoonotic** flaviviral encephalitis
- ❖ Transmitted by *Culex vishnui* subgroup of mosquito
- ❖ **68,000 cases** globally each year with **20,400 deaths** annually (WHO, 2019)

❖ Japanese Encephalitis (Greek **enkephalo**= Brain + **itis**, meaning inflammation of the substance of brain)

- ❖ Caused by **Group B arbovirus**
- ❖ Also known as- Japanese B encephalitis
Encephalitis B
Summer encephalitis
Autumn Encephalitis

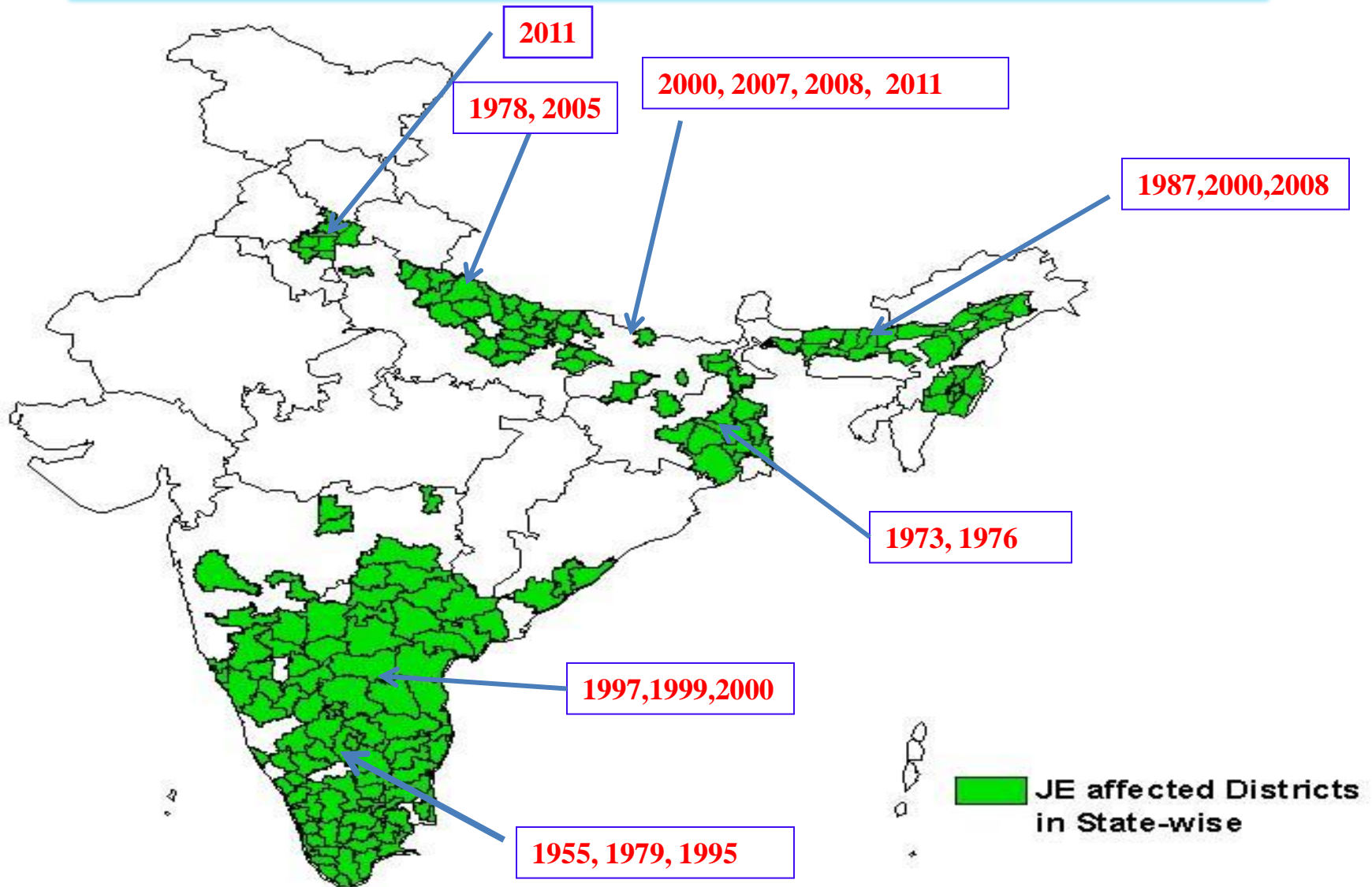
❖ Encephalitis was first recognized **in Japan in early 1871**



History

- Virus of JE was first isolated in 1935 in Tokyo, Japan
- Epidemic in Asian countries
 - Korea- 1935 and 1938
 - Taiwan-1958 and 1961
 - **In India**
 - Serological evidence of JE-1954
 - Disease was first recognized -1955
 - A large scale epidemic of JE was reported in 1973 from Bankura and Burdwan districts of west Bengal

Historical account of JE occurrence and outbreaks in India



(NVBDCEP, Annual Report, 2014-2015)

Emergence of JE in Asian countries

✓ Unprecedented population growth

✓ Pig Rearing

✓ Rice production System

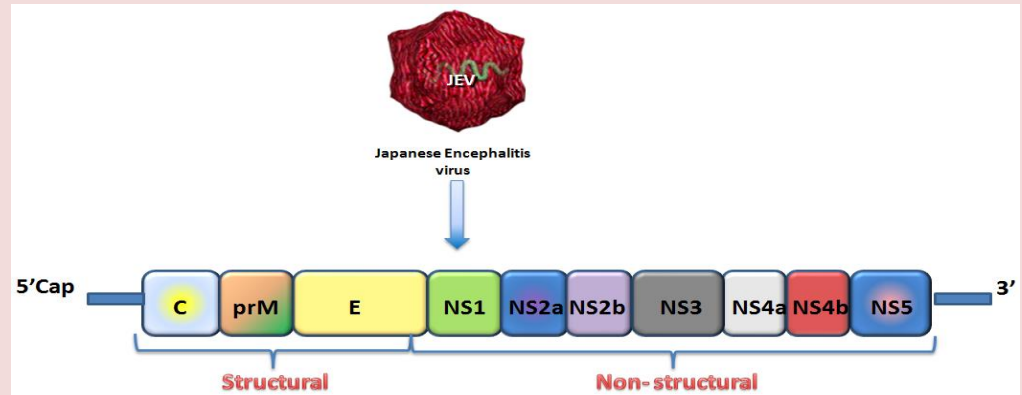
✓ Emergence of spread of new genotypes

✓ Increase in vector dynamics



Etiology

- Group B RNA virus
- Family- Flaviviridae
- Genus- flavivirus



- Shares antigenic relationship with other viruses of B group
St. Louis, Murray Valley, and West Nile

Host Range

- Swine and Domestic and wild birds play an important role in maintaining the virus in nature

Reservoir Hosts



Ardied wading bird

Little egret

Black heron

Plumed egret

Amplifier and Dead end host



Vectors

Culicine mosquitoes mainly *Culex vishnui* group (*Culex tritaeniorhynchus*, *Culex vishnui* and *Culex pseudovishnui*) are the chief vectors of JE in different parts of India



Culex tritaeniorhynchus

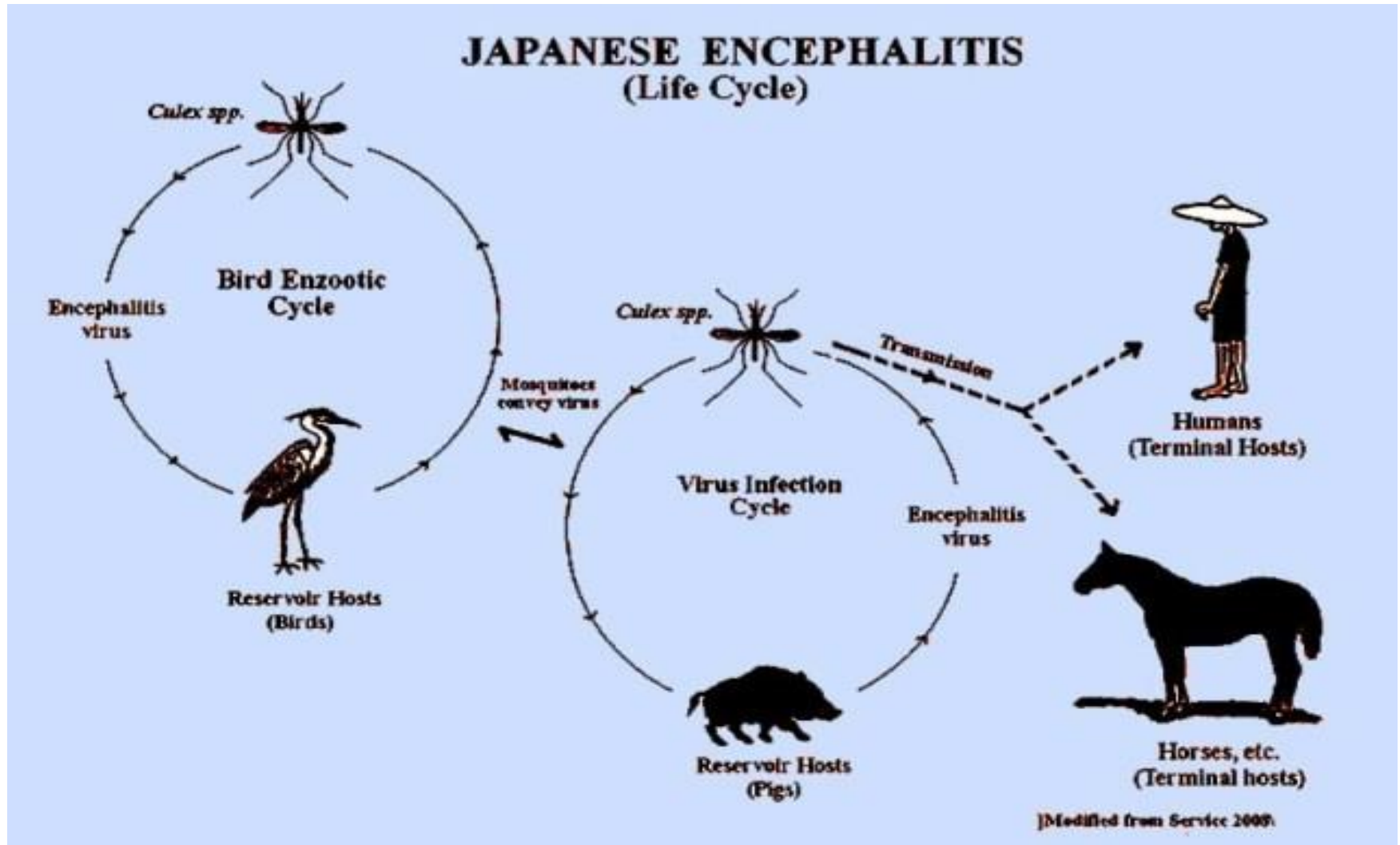


Breeding place

Habits :

- ✓ **Breeding place:** Breed in rice fields, shallow ditches and pools
- ✓ **Choice of host:** Zoophilic
- ✓ **Time of biting :** Twilight hours

Transmission cycle



Multiplication of JEV in Mosquito

Ingestion of a viraemic blood meal

Infection of the epithelial cells of posterior portion of midgut

High titer replication in the anterior section of midgut

Infection of fat body cell

Infection in the hemocoel and between thoracic muscles

Multiplication in the salivary gland

Clinical Sign

- **Human**

- ✓ In apparent to acute encephalitis
- ✓ Incubation period-7-10 days
- ✓ Illness is characterized by fever, headache, altered sensorium, abnormal movements, neck rigidity
- ✓ Convulsion occur commonly in children followed by coma and death
- ✓ CFR-30%

- **Animals**

- **Pig**

- ✓ In apparent
- ✓ Pregnant sow may give birth prematurely to infected and often dead pigs

Clinical Sign

- Horse
 - ✓ Mostly in apparent
 - ✓ Sometimes acute with fetal encephalitis
- Birds
 - ✓ High level of viraemia as well as antibodies

Diagnosis



Laboratory diagnosis

- Isolation of virus from autopsy specimen of brain tissue
 - Inoculation of suckling mouse
 - Inoculation in vertebrate cell culture or insect cell culture

- Demonstration of viral antigen in autopsy specimen of brain tissue by Fluorescent antibody (FA) techniques

- Serological Diagnosis
 - ELISA-IgM capture
 - Demonstration of four fold rise in sera by HI, CF, Mouse neutralization test

Diagnostic IgM ELISA kit for Pigs developed by ICAR-IVRI





Prevention and Control



Vector control

Immunization

- ✓ Insecticide
- ✓ Bed nets
- ✓ Thermal fogging
- ✓ Larvicidal

Vaccine	Strain	Efficacy
Inactivated mouse brain	Nakayama Beijing – 1	91%
Inactivated primary hamster kidney cells	P-3	85%
Live attenuated primary hamster kidney cells	SA 14-14-2	>95%
Inactivated Vero cell culture derived, JE vaccine (JENVAC)	Kolar strain, 821564XY	>95%

