DEPARTMENT OF MICROBIOLOGY

GENERAL PROPERTIES OF ARBOVIRUS

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ARBOVIRUSES

- Arthropod borne viruses – virus of vertebrates.
- Transmitted by insects vectors.
- Cause infections in animals & birds.
- **Transmitted to man by bite of infected mosquitoes, ticks & sand flies.**
- Worldwide, more in tropical areas than temperate.

Transmission Cycles

- Man – Arthropod – Man
- Animal – Arthropod - Man

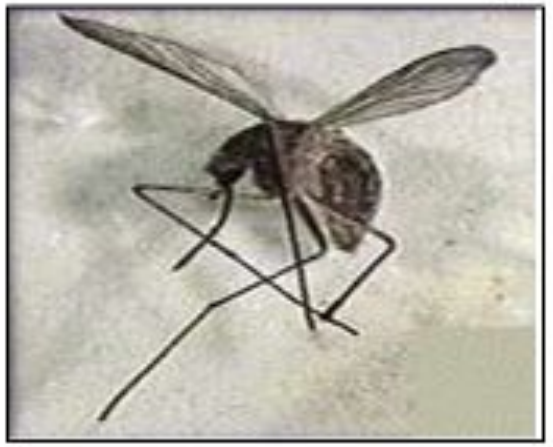
- About 500 viruses in this group.
- About 100 causes infection in man.
- About 10 in India.

- Sub groups:
  - Alpha virus (Toga viruses)
  - Flavi virus
  - Bunya virus
  - Rhabdo virus
  - Reo virus

Examples of Arthropod Vectors

Aedes Aegypti

Ticks

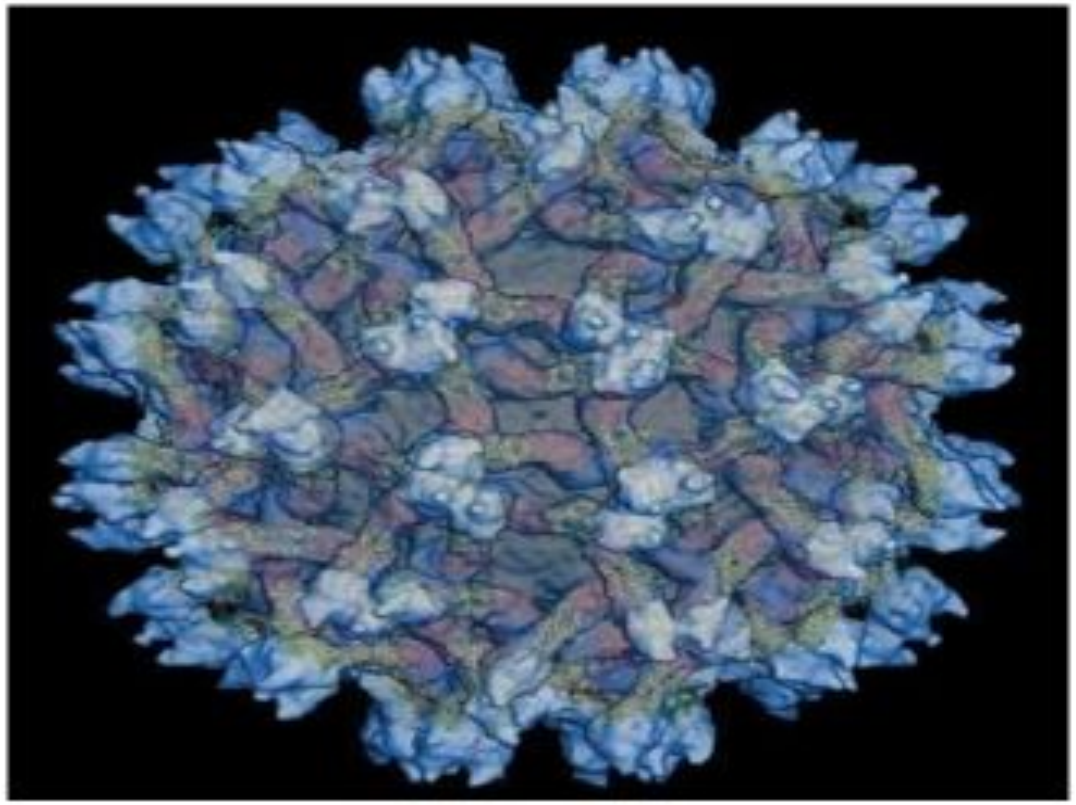


Culex Mosquito

Phlebotmine Sandfly

Morphology

- **Size :** 60-150nm
- **Symmetry:** Spherical .cubical, helical
- **Genome:** ss RNA (Reoviridae -ds RNA)



- **Distribution:** Worldwide. Many diseases given names according to location.

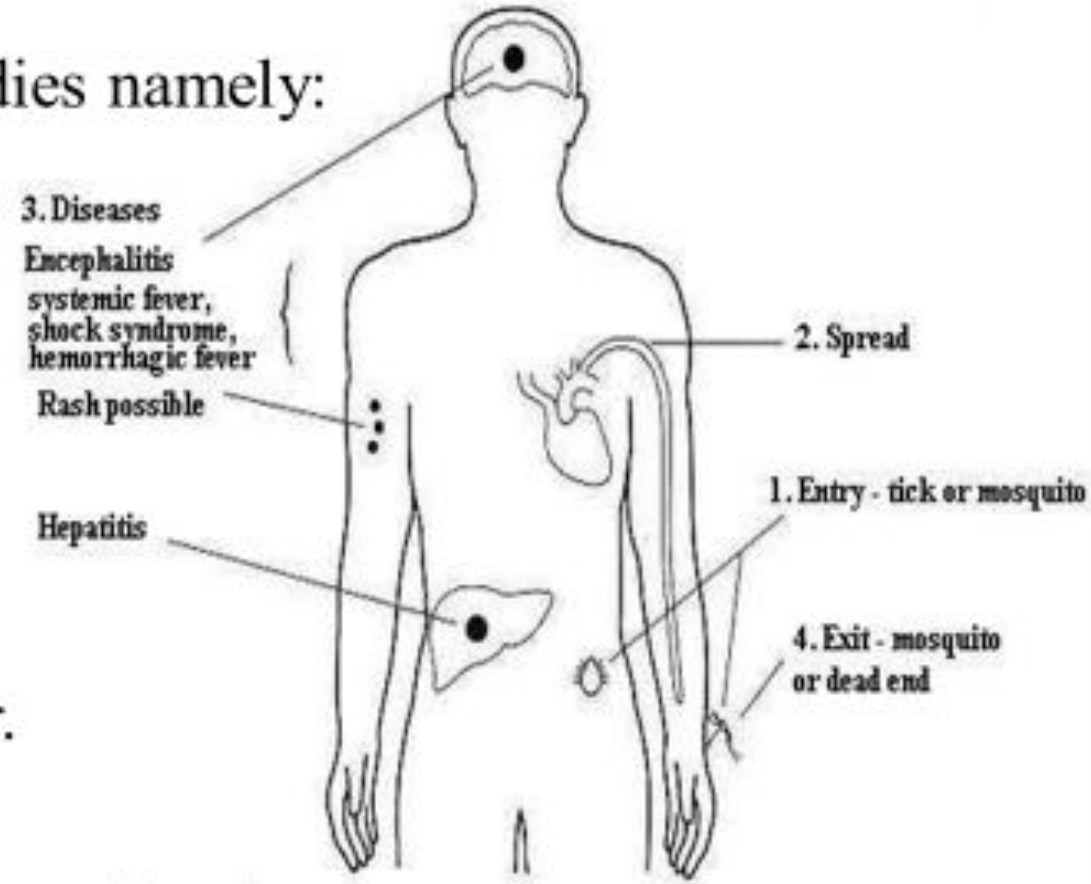
  Eg: Venzulean **E**quine **E**ncephalitis, Japanese B encephalitis. St. Louis enc. Virus, Russian spring summer Enc., California enc. etc

General Properties:

- Causes fatal **encephalitis in suckling mice** after intracerebral inoculation.
- **Possess haemagglutinin** and agglutinate erythrocytes of goose or day old chicks.
- Mosquito borne arboviruses multiply in **aedes and culex**, while tick borne multiply in **Ixodid ticks**.
- They can be grown in cell like chick embryo fibroblasts or continuous cell lines like vero or HeLa, & in cultures of appropriate insect tissues.
- May also be isolated in the yolk sack or CAM of chick embryo.
- They are **readily inactivated** at room temperature and by bile salts, ether and other lipid solvents.

Antigenic Structure:

- Three antigens are important in serological studies namely:
  a. **Haemagglutinins**
  b. **Complement fixing antigen**
  c. **Neutralizing antigen**
- Cross reactions occur among arboviruses.



Pathogenesis

- Virus enters the body through bite of the vector.
- Virus multiplies in **reticuloendothelial system** and leads to **viraemia.**
- Virus transported to target organs such as **CNS** – encephalitis;
  Capillary endothelium – haemorrhagic fevers & **Liver** – Yellow fever.

Diseases Caused

- **Febrile illness** - This is usually a non-specific illness resembling a number of other viral illnesses such as influenza, rubella, and enterovirus infections. The patients may go on to develop encephalitis or haemorrhagic fever.
  E.g. Chikungunya, Dengue.

- **Encephalitis** – Inflammation of brain.
  E.g. EEE, WEE, St Louis encephalitis, Japanese encephalitis.

- **Hemorrhagic fever** – Bleeding disorder with high fever.
  E.g. yellow fever, dengue hemorrhagic fever.

Arbovirus infections

Family & Genus	Encephalitis	Febrile illness	Haemorrhagic fever
I. Togaviridae ***Alphavirus*** (Mosquito – borne)	•WEE •EEE •VEE	•Chikungunya •O'nyong-nyong •Semliki Forest •Sindbis •Ross river virus	•Chikungunya
II. Flaviviridae ***Flavivirus***			
a. Mosquito- borne	•St. Louis Encep. •Ilheus •West Nile •Murray Valley Enc. •Japanese B Enc.	•Dengue, types 1-4	•Dengue •Yellow fever
b. Tick-borne	•Russian spring summer enceph. •Powassan		•Kyasanur forest disease •Omsk Haemorrhagic fever

Family & Genus	Encephalitis	Febrile illness	Haemorrhagic fever
III. Bunyaviridae			
a) Bunya virus (Mosquito-borne)	•California encephalitis •La Crossie	•Chittor virus	
b) Phlebovirus (Phlembotomus or mosquito-borne)		•Sandfly fever •Rift-valley fever	----
c) Nairovirus (tick-borne)		•Nairobi sheep disease •Ganjam virus	
IV. Reoviridae ***Orbivirus*** (Tick-borne)	--------	•Colorado tick borne virus	----
V. Rhabdoviridae ***Vesiculovirus*** (Mosquito-borne, sandfly-borne)	--------	•Vesicular stomatitis virus •Chandipura virus	----

Lab diagnosis of Arbovirus diseases

- **Specimen:** Blood, CSF, Brain may be used for virus isolation.
- **Virus isolation:**
  1. Intra cerebral inoculation in suckling mice. Most sensitive. Develops fetal encephalitis.
  2. Yolk sac of chick embryo
  3. Tissue culture
  4. Xenodiagnosis (a method of animal inoculation using laboratory-breed bugs and animals)

Serology:

- ELISA – Used for detection of serotype specific IgM antibody.
- Complement fixation test.
- Haemagglutination or neutralisation test.

Treatment:

- Antibiotics are not effective for treatment and no effective antiviral drugs have yet been discovered.
- Treatment is supportive, attempting to deal with problems & other treatable complications.

VACCINES:

- The only effective vaccine available is for **Yellow fever** .
- It is a live attenuated vaccine known as **17 – D strain** .
- The vaccine is administered subcutaneously in one dose , with a booster dose every 10 years .
- Recommended to travelers to endemic areas.
- Should not be given to children less than 9-months.


THANK
YOU!