Global Health Cast - Summary
Three short lessons on Dengue

Part 1: General Overview
Part 2: Clinical aspects
Part 3: Epidemiology

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Dengue is an
- acute, systemic flavivirus disease;
- caused by 4 closely related but antigenically distinct Dengue Viruses (DENV), i.e. serotypes 1, 2, 3, and 4;
- transmitted to humans primarily by *Aedes aegypti* mosquitoes (rarely *Ae. albopictus*).
- Clinically
  - ~75% of infections are asymptomatic,
  - ~20% result in mild unspecific flu-like disease (Dengue fever, DF),
  - ~5% are severe (dengue hemorrhagic fever, DHF), usually second or later infection (ADE) (case fatality rate (CFR): 2.5% globally).
- Today, half of the world’s population is at risk for infection; there are 100-400 million cases annually
- **No specific therapy** is available, vaccine prevention is of utmost importance
- Today **two vaccines** are licensed in some countries

See: Nq & Meyer (2022): Course: 54 - Denque (vaccitutor.com)
Very Brief History

- **1780**: Benjamin Rush first described “break-bone fever” (Philadelphia)
- Early decades **20th century: outbreaks** in continental United States;  
  - last large epidemics in Florida in 1934; New Orleans 1945.
- **Descriptions of hemorrhage**, shock, death in outbreaks  
  - Australia 1897, Greece 1928, Taiwan 1931.
- **1903**: Transmission by *A. aegypti* mosquitos demonstrated
- **1906**: *Viral* etiology proven
- **1944**: **Sabin**: 2 DENV strains established. 1956 Hammon: 2 more types
- After 1945: **Pandemics**, intensified transmission, multiple DENV types, SE-Asia (DHF).
- Recently: **increasing DENV transmission and BoD, including temperate climates**.
  - Fueled by population growth, urbanization, increasingly favorable ecologic and environmental habitats for *Aedes* mosquitoes compounded by poor vector control, and international travel.
Phylogenetic Map of Selected Flaviviruses

Phylogenetic Map of Selected Flaviviruses

- Dengue 1
- Dengue 2
- Dengue 3
- Dengue 4
- West Nile
- Kunjin
- Murray-Valley-Encep.
- Japanese Encep.
- Saint-Louis-Encephalitis
- Zika Fever
- Yellow Fever
- Louping III
- TBEV-European (EU) – Siberian (SIB)
- Far Eastern (FE) – Balkian (BKL)
- Himalayan (HIM) subtypes
- Omsk hemorrhagic fever
- Langat
- Kyasanur Forest Disease
- Powassan

Identical amino acid in protein E (%)

Global Distribution of 4 relevant Flaviviruses

Yellow Fever Virus

Japanese Encephalitis Virus

West Nile Virus

Tick-Borne Encephalitis Virus
## Human Diseases Caused by Selected Flaviviruses

<table>
<thead>
<tr>
<th>Virus</th>
<th>Vaccine?</th>
<th>Severe manifestations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dengue Virus</td>
<td>2 + pipeline</td>
<td>Febrile systemic disease, hemorrhagic fever</td>
</tr>
<tr>
<td>Yellow Fever Virus</td>
<td>1</td>
<td>Hepatitis</td>
</tr>
<tr>
<td>Japanese encephalitis virus</td>
<td>&gt; 7</td>
<td>CNS diseases</td>
</tr>
<tr>
<td>West Nile Virus</td>
<td></td>
<td>CNS diseases; fevers, arthralgias, rash</td>
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<tr>
<td>Alkhurma Virus</td>
<td></td>
<td>Hemorrhagic fever</td>
</tr>
<tr>
<td>Kyasanur Forest Disease Virus</td>
<td>1 (India); TBE?</td>
<td>Hemorrhagic fever</td>
</tr>
<tr>
<td>Zika-Virus</td>
<td>Pipeline</td>
<td>Fever, arthralgias, rash, congenital disease</td>
</tr>
<tr>
<td>Tick-Borne Encephalitis Virus</td>
<td>2</td>
<td>CNS diseases, ARI, others</td>
</tr>
<tr>
<td>St. Louis Encephalitis Virus</td>
<td></td>
<td>CNS diseases</td>
</tr>
<tr>
<td>Powassan Virus</td>
<td></td>
<td>CNS disease, (CFR &lt;10%), 50% of survivors suffer from long-term disability</td>
</tr>
</tbody>
</table>
Dengue Podcasts:

Global Health Cast – Dengue Vaccines – Global Health Press (id-ea.org)
