Dengue outbreak investigation

Matthias Niedrig,
Robert Koch Institut, Berlin

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Viral Threats Worldwide

Sources: WHO (outbreak list/EPR), ProMed

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Background: causes

- travellers / infectious pathogens [Dengue, Malaria, ...]
- Goods / vectors [rodents, mosquitoes, ...]
- Animal migrations
- Climate factors
- International transport
- Living conditions

Increase of population in mega-cities

Source: DIE ZEIT

© ENIVD 2010
Epidemiology: population increase in urban areas of Africa

Increase of world population from 1850 to 2050

<table>
<thead>
<tr>
<th>Year</th>
<th>1850</th>
<th>1900</th>
<th>1950</th>
<th>1998</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers in millions</td>
<td>172</td>
<td>167809</td>
<td>504</td>
<td>3585</td>
<td>5268</td>
</tr>
</tbody>
</table>
Low hygiene conditions in hospital settings

Delhi local hospital, department for treatment of Dengue patients

Dengue Infection: a disease with different clinical pictures

- Asymptomatic
- symptomatic
  - Fever
  - Dengue Fever
  - Dengue Hemorrhagic Fever
    - No shock
    - Dengue shock (DSS)

50 – 100,000,000 diseased persons

500,000 severe course of disease

22,000 deaths
Dengue in European travellers: clinical presentation:

### Dengue in European travellers

- **Clinical presentation**
  - Statement on dengue CCDR RMTC 2009, vol 35 (1-12)

#### UNUSUAL MANIFESTATIONS:
- Severe hepatitis
- Encephalitis
- Visual loss

### Dengue cases imported to Europe: Travellers are good indicators

- Travellers are good indicators
- DENV1
- DENV2
- DENV3
- DENV4

**NOTE:**
- DENV1, DENV2
- DENV3, DENV4

ENIVD-TropNet Dengue Working Group; unpublished results
Global distribution of Flaviviruses

Yellow Fever Virus

Tick-Borne Encephalitis Virus

West Nile Virus

Dengue Virus

Dengue Virus

Japan Encephalitis Virus

AFRICAN SYLVATIC CYCLE

Ae. africanus
Ae. luteocephalus
Ae. furcifer-taylori
Ae. dalzieli

Primates
e.g. forest redtail monkey

URBAN CYCLE

Ae. aegypti
Ae. albopictus

Livecycle CHIKV
Dengue transmission cycle

**Aedes aegypti**

**Aedes albopictus**

Non-Viremic Transmission


Time: 45 min.
Distance: $\geq 40$ mm

Source: S. Higgs, UTMB, USA
Imported Dengue cases into Europe: Returning travelers give useful information

ENIVD-TropNet Dengue Working Group; unpublished results
Dengue in European travelers: Epidemiological presentation

- Popularity of these countries as touristic destination
- Activity and possible variations in the virulence of dengue viruses
- Vector activity in endemic countries

**PATIENT CHARACTERISTICS**

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europeans living in EU</td>
<td>87.1%</td>
</tr>
<tr>
<td>Immigrant/refugees</td>
<td>8.1%</td>
</tr>
<tr>
<td>European expatriates</td>
<td>3.2%</td>
</tr>
<tr>
<td>Foreign visitors</td>
<td>1.6%</td>
</tr>
</tbody>
</table>


Imported Dengue cases into Europe: Travelers as „vectors“

June-Sept 2006

June-Sept 2007

DENGUE IMPORTED INFECTIONS (SPAIN)

- Acute Dengue Cases
- Negative Dengue Cases
Imported Dengue cases into Europe: Travellers are good indicators


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DengueNet registered Dengue cases

Average annual number of DF/DHF cases reported to WHO

854,452
2002-2006
African countries where Dengue (DEN2, -3) have been identified in 2008 / 2009

Reinvasion of *Aedes aegypti* into the Amerika
Dengue hemorrhagic Fever: A new form of disease

Epidemic Dengue Haemorrhagic Fever in Asia

1993-1998
1976-1979
1999

DHF reported cases in Central, South America and the Caribbean

Year
Source: PAHO

DENGUE UPDATE 2011

Source: PAHO
DENGUE UPDATE 2011

RELATIONSHIP OF DENGUE CASES BY WEEKS IN CAMBODIA 2011 (as at 06 Dec. 2011) WITH Mean AND Mean±2SD DURING 2005-2010 (Excluded 2007)

Cambodia up to 6 December 2011 (source MOH)

Source: WHO

DENGUE UPDATE 2011

Lao PDR up to 27 Dec 2011 (source MOH)

Source: WHO
DENGUE UPDATE 2011

No. of Cases

Dengue Fever/Dengue Haemorrhagic Fever

Week

2010
2011
Epidemic Threshold
Warning level

Singapore up to 31 December 2011 (source MOH)

Source: WHO

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DENGUE UPDATE 2011

Number of reported DF/UHF cases and Case Fatality Rates in the Western Pacific Region, 1991-2010

Source: WHO

© RKI 01 / 2012
DENGUE UPDATE 2011

<table>
<thead>
<tr>
<th>Trend</th>
<th>No. reported cases</th>
<th>2011</th>
<th>2019</th>
<th>2011/2019 ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>-</td>
<td>264</td>
<td>1291</td>
<td>0.6</td>
</tr>
<tr>
<td>Cambodia</td>
<td>-</td>
<td>15736</td>
<td>12266</td>
<td>1.3</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>-</td>
<td>3871</td>
<td>22912</td>
<td>0.2</td>
</tr>
<tr>
<td>Malaysia</td>
<td>-</td>
<td>19864</td>
<td>46171</td>
<td>0.4</td>
</tr>
<tr>
<td>Philippines</td>
<td>-</td>
<td>138868</td>
<td>173033</td>
<td>0.7</td>
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<tr>
<td>Singapore</td>
<td>-</td>
<td>5308</td>
<td>5330</td>
<td>1.0</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>-</td>
<td>63618</td>
<td>109304</td>
<td>0.6</td>
</tr>
</tbody>
</table>

The table is based on the number of reported cases. Dengue reporting systems vary by country and any change in the surveillance system over time is not reflected in the above figures. Number of reported cases listed for 2010 and 2011 are for the same time period for each respective year.

**Action Against Dengue: Dengue Day Campaigns Across Asia**

Dengue continues to pose a threat to public health in our region. This threat has been recognized by countries throughout the region, which have taken action to protect their populations. National leaders also have acknowledged that they must act regionally in order to protect people within their own borders.

The Association of Southeast Asian Nations (ASEAN) and the World Health Organization have formed an effective alliance to achieve a shared goal: a healthy and secure population. One clear sign of this cooperation was seen on 15 June 2011. ASEAN Health Ministers declared that day—and each subsequent 15 June—to be ASEAN Dengue Day. This important annual event allows ASEAN members, in coordination with WHO, to consolidate dengue prevention and control measures.

Source: WHO

**Increase of world tourism**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of persons travelling abroad in millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>459</td>
</tr>
<tr>
<td>1996</td>
<td>592</td>
</tr>
<tr>
<td>2000</td>
<td>702</td>
</tr>
<tr>
<td>2010</td>
<td>1018</td>
</tr>
<tr>
<td>2020</td>
<td>1600</td>
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</table>

(after 2009 forecast)

Source: WTO
Imported Dengue cases into Germany

Notified cases of Dengue virus infection*, Germany, 2001-9
(n=1670, as of 14 January 2009)

*Case definition: symptomatic infection, laboratory confirmed

Age distribution of Dengue fever patients 2005 - 2010

Destination of returning travelers with Dengue fever 2005 - 2010

Quelle: Institute of Medical Virology, Frankfurt / Main
© RKI 01 / 2012

DENGUE UPDATE 2011

Notification rates of dengue fever cases in EU and EEA/EFTA countries, by age and gender, 2008 (n = 429 confirmed) from 530

Source: ECDC, Surveillance report 2010 © RKI 01 / 2012
DENGUE UPDATE 2011

Rates of reported confirmed dengue fever cases in EU and EEA/EFTA countries, by age and gender, 2009

Source: ECDC, Surveillance report 2011

Number and rate of dengue fever cases reported in EU and EEA/EFTA countries, 2008–09

Source: ECDC, Surveillance report 2011
### Seasonal distribution of reported confirmed dengue cases in the EU and EEA/EFTA countries, 2009

![Graph showing seasonal distribution of reported confirmed dengue cases in the EU and EEA/EFTA countries, 2009.](image)

**Source:** ECDC, Surveillance report 2011

### Surveillance systems overview

<table>
<thead>
<tr>
<th>Country</th>
<th>Data Source</th>
<th>Laboratory</th>
<th>Pathology</th>
<th>Epidemiology</th>
<th>Serology</th>
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<td>Cp</td>
<td>Co</td>
<td>P</td>
<td>C</td>
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<tr>
<td>Belgium</td>
<td>BE-BELAB</td>
<td>V</td>
<td>Co</td>
<td>P A</td>
<td>Y Y N N N Y</td>
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<tr>
<td>Czech Republic</td>
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<td>C</td>
<td>Co</td>
<td>A C</td>
<td>Y Y Y N Y</td>
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<td>Estonia</td>
<td>EE-VIF</td>
<td>C</td>
<td>Co</td>
<td>P</td>
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<td>C</td>
<td>Co</td>
<td>P</td>
<td>C N N N N</td>
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<tr>
<td>France</td>
<td>FR MFR</td>
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<td>P C</td>
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<td>Germany</td>
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<td>Greece</td>
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<td>P C</td>
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<td>Co</td>
<td>A C</td>
<td>Y N Y Y Y</td>
</tr>
</tbody>
</table>

**Source:** ECDC, Surveillance report 2011
East and West distribution of Aedes albopictus in the Mediterranean area

Source: Development of Aedes albopictus risk maps, ECDC, Stockholm, March, 2008

Distribution of Aedes albopictus in Europe, January 2010

Aedes aegypti
Presence in Europe

Surveys and studies on mosquitoes were conducted during the last five years (2003-2007) and no specimen of Aedes albopictus was reported.

Aedes albopictus was reported

No information

Authochtone Dengue cases in 2010

Source: Development of Aedes albopictus risk maps, ECDC, Stockholm, March, 2008

Straetemans M. Eurosurveillance 2008, vol 13 (1-3)
Distribution of Viruses and disease vectors within Europe

- Aedes albopictus
- Ochlerotatus atropalpus
- Ochlerotatus japonicus

Source: Snow & Ramsdale, Biologist (2002) 49 (2)

Hanta virus
Tick borne encephalitis virus
Chikungunya Virus
West Nile virus
Crimean Congo hemorrhagic fever virus
Sandfly fever virus

Distribution of CHIK since 2005

- Canada
- USA
- Reunion
- Keynia
- Seychelles
- Comores
- Mauritius
- Reunion

Dates:
- 2005
- 2006
- 2007
- 2008
Chikungunya outbreak in Italy in June 2007

- 15th June – 21st Sep. 292 suspected cases of Chikungunya Fever
- 125 cases were confirmed by laboratory diagnosis
- Increase of *Aedes albopictus* in the region in recent years

Important requirements for a good diagnosis

- Good physician
- Considering all circumstances
- Kind of disease, travel history, vaccinations, etc...?
Cross reactivity between different Flaviviruses in different diagnostic assays (IFA, EIA)

- Tick Borne Encephalitis (TBEV) vaccine available
- Japanese Encephalitis (JEV) vaccine available
- Yellow Fever (YFV) vaccine available
- West Nile Fever (WNV)
- Dengue Fever 1-4 (DEN V)

Koraka et al., 2002

What comes next?

WE'VE GOT A NEW ONE!
previous Hotel Metropol in Hong Kong

Acknowledgements

Thanks for your attention!