**Aedes albopictus**-borne virus prevention and control, an European perspective.

Meeting CHIKUNGUNYA 2017: Data, Response, Actions & Critical aspects.
Dipartimento di Sanità Pubblica e Malattie Infettive Aula Celli
10 November 2017, Roma

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Overview

ECDC

Emerging and Vector-borne Diseases (EVD) Programme

Activities and challenges in relation with:

• the vector *Aedes albopictus*

• *Aedes albopictus* viral diseases

Perspectives
European Centre for Disease Prevention and Control (ECDC)

- EU agency established 2005 – Stockholm
- Covering EU 28 & 3 EEA countries
- Staff: 300 approx.
- Most EU nationalities represented
ECDC Missions

Within the field of its mission¹, the Centre shall **identify, assess and communicate current and emerging threats** to human health from communicable diseases

**Core functions:**
- Disease surveillance
- Epidemic intelligence
- Risk assessment
- Search for, collect, collate, evaluate and disseminate relevant scientific and technical data: scientific advice and guidance
- Response support
- Health communication
- Exchange information, expertise and best practices
- Preparedness and capacity strengthening
- Training

Emerging and Vector-borne Diseases Programme

Contribute to EU-wide preparedness and response capabilities. It provides Member States with access to expertise, topical assessments of disease, risk assessment and decision support tools with the latest scientific knowledge.

- *Aedes albopictus* transmitted viral diseases
- Work together with Response and Preparedness units
- Join products (risk assessments, technical meetings and reports, country visits and outbreak support, preparedness...)
- No risk management
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Source: Public Safety Canada
ECDC

Why *Aedes albopictus* remains of concern in UE?

ECDC- EVD activities
EU Vector surveillance
Vectornet, Joint initiative EFSA ECDC

- Network of medical and veterinarian entomologists and public and animal health professionals
- Entomological surveillance
- Geographical distribution of priority vectors for human and animal health
- Monitor the geographical spread
- Ad hoc surveys and support scientific advice
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EU Vector surveillance
Ecological niche modelling (2011), Suitable areas for presence of *Aedes albopictus*

Need to update regional model with expansion of geographical spread
Relevant information but there is a need for downscaling (e.g. city) and integrate seasonal vector activity and abundance

Available at [https://e3geoportal.ecdc.europa.eu/SitePages/Home.aspx](https://e3geoportal.ecdc.europa.eu/SitePages/Home.aspx)
Recent reports

Aedes albopictus - current known distribution: September 2017

Legend
- Established
- Introduced
- Absent
- No data
- Unknown

Countries/Regions not viewable in the main map extent*
- Malta
- Monaco
- San Marino
- Gibraltar
- Liechtenstein
- Azores (PT)
- Canary Islands (ES)
- Madeira (PT)
- Jan Mayen (NO)

ECDC and EFSA. Map produced on 28 Sep 2017. Data presented in this map is collected through the VectorNet project. The maps are validated by designated external experts prior to publication. Please note that the data do not represent the official view or position of the countries. * Countries/Regions are displayed at different scales to facilitate their visualization. Administrative boundaries: ©EuroGeographics; ©UN-FAO; ©Turkstat.
EU Vector surveillance
Guidance on surveillance

Long term capacity building

- Expert consultation on guidelines for the surveillance of invasive mosquitoes
  Stockholm, 2011

- Guidelines for the surveillance of invasive mosquitoes in Europe in Europe. 2012

- Guidelines for the surveillance of native mosquitoes in Europe. 2014

EU Vector surveillance
Seasonal vector activity and abundance

• Better characterise the vector activity and abundance

• Review of literature on seasonal dynamic and abundance (VectorNet, 2017)

• Assessment of long term changes in the global framework of communicable disease determinant:
  o Change activity pattern (extension, feeding habit) and vector diapause

• Development of tool, support to optimization of control strategies
Vector control

Decision support tool for the surveillance and control

*Aedes albopictus*

This project aims to develop a tool to **appraise and compare** different **vector control strategies** in order to **optimize resources allocation** and **improve cost-effectiveness of vector control**.

<table>
<thead>
<tr>
<th>Year</th>
<th>Stage</th>
<th>Details</th>
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<tbody>
<tr>
<td>2016</td>
<td>SLR</td>
<td>Modelling strategy, model parameters</td>
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<tr>
<td>2017</td>
<td>Model</td>
<td>Model vector and host and desktop interface</td>
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<td>2018</td>
<td>Test</td>
<td>Field work ≥2 countries</td>
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<tr>
<td>2019</td>
<td>Web application</td>
<td></td>
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Late-breaking report

Vector control with a focus on *Aedes aegypti* and *Aedes albopictus* mosquitoes

Literature review and analysis


- Vector population thresholds
- Evaluation
- Cost effectiveness
- Resistance
- Biological methods
- Community involvement
- Encouraging innovation and research
ECDC

Aedes albopictus-borne diseases
Descriptive epidemiology
Events of local transmission EU (2007-2017)

Chikungunya

Italy
> 200 cases
July-September
Origin India
ECSA V226

France
2 cases
September
Origin India
ECSA A 226

Croatia
Aug 1 case (DE)
15 local cases

France
Var: DEN1
1 case
DEN2
1 case

Madeira
Oct-Jan
DEN1
1 case

Portugal
Bouches du Rhône

France
11 cases
Sept-Oct
Origin Cameroon
ECSA V226

France
18 cases
July-Aug
ECSA V226

Croatia: Aug
1 case (DE)

France
2 cases
Aug-Sept

Caribbean
Americas
Dec 2013 ...

Italy
> ≈ 400 cases
July-Oct ...
ECSA A226

France
2 cases
September
Origin India
ECSA A 226

France
11 cases
Sept-Oct
Origin Cameroon
ECSA V226

France
1 case
DEN1

Dengue

Italy
>200 cases
July-September
Origin India
ECSA V226

France
2 cases
September
Origin India
ECSA A 226

France
11 cases
Sept-Oct
Origin Cameroon
ECSA V226

France
18 cases
July-Aug
ECSA V226

Italy
> ≈ 400 cases
July-Oct ...
ECSA A226

France
1 case
DEN1

France
1 case
DEN2

France
6 cases

Descriptive epidemiology
Events of local transmission EU (2007-2017)
ECDC perspective

- **Monitor** *Aedes albopictus*-borne viruses emergence and significant **outbreak**
  → ECDC Epidemic intelligence

- Assessment of the **likelihood of introduction** and potential spread
  → EU arboviruses surveillance
  → Better understand travel pattern into EU / in EU

- Assessment suitable **time and place for transmission**
  → Climatic drivers and vector population dynamic and link with vector control

- **In case of autochthonous transmission**
  - Risk assessment
  - Vector competence
  - Likelihood of spread and overall risk \( \text{Risk} = \text{Spread} \times \text{Impact} \)
  - Support to outbreak response

- **Lessons learned**: training, sharing knowledge, and identify challenges and solutions
Surveillance: Epidemic intelligence at ECDC

Aedes albopictus-borne virus

Monitor disease activities:
Emergence and significant outbreak
Summary for information for travellers

• Daily early detection of vector borne disease signals (e.g. Yellow fever)
• Worldwide monthly collection of dengue fever, Chikungunya, and Zika outbreaks

→ Weekly threats reports (CDTR)
• Monthly publication: CDC, WHO, NaTHNaC collaboration
• Customization of EI tools
Importation pattern to and within EU
Trend and number of reported chikungunya cases, EU/EEA, 2008–2016

Countries included: Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Romania, Slovakia, Slovenia, Spain, United Kingdom.

Unpublished data
Trend and number of reported dengue cases, EU/EEA, 2008–2016

Continuous importation in EU
Progressive increase on travellers volume coming for active areas
Travel pattern: Airport-level final destination of international travelers from dengue affected areas, 2010

EU at ‘front-line’ risk for importation
Significant correlation between air passenger volume from outbreak or endemic areas and number of imported case in EU

! Three large European cities (Milan, Rome, and Barcelona)

EU climatic conditions
Length of transmission season for Chikungunya (in months)

Based on Fisher et al. 2013 Int J Health Geogr. 2013; 12: 51. Length of transmission season for Chikungunya (in months), but filtered by areas, where the presence of the vector *Aedes albopictus* can be expected. Available at https://e3geoportal.ecdc.europa.eu/SitePages/Home.aspx
Risk assessment and guidance related to a public health event

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Outbreak response

**Mission 1:** Direct country support

- To assess the general coordination and planning of the response measures taken
- To propose further measures and enhanced contingency planning
  - Laboratory planning and capacities
  - Transmission risks through blood donation
  - Gaps and opportunities in implementing mosquito surveillance
  - Community involvement
  - Vector control at outbreak phase (≠ vector nuisance)
Outbreak response

Mission 2: Post outbreak mission

- In-depth outbreak analysis (GIS)
- SWOT analysis: disease and entomological surveillance, response measures activities
- Contingency plan
- Future scenarios and enhance preparedness
Preparedness

Zika virus disease epidemic: Preparedness planning guide for diseases transmitted by *Aedes aegypti* and *Aedes albopictus*

[Link]

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EU perspectives: EU projects

- **ZIKAction**: scientific and clinical research and reinforce regional preparedness for other emerging infectious diseases
- **ZIKAlliance**: clinical, fundamental, environmental and social aspects of ZIKV infection
- **ZikaPlan**: build long-term outbreak response capacity in Latin America
- **Medilab secure**: framework for collaboration to improve surveillance and monitoring of emerging vector borne viral diseases (arboviruses) in the Mediterranean and Black Sea region
- **InfraVec2**: search resources and access to key infrastructures for insect vector biology at no cost to the end-user (e.g. evaluation biocide, vector competence)
- ....
Summary

Place
- Risk of disease transmission << Presence of the vector
- Limited number of outbreaks, but high media attention and potential social burden
- Touristic areas in summer
- If outbreak expansion, can reach urban settings ...

Time
- EU edge of transmission zone = seasonal pattern
- Observed foci of transmission in later summer and fall
- But initial cases up to June and July, larger window of transmission possible
- Role of climate anomalies ?

Pathogen
- *Aedes albopictus*-borne virus. Recent emergences, next ?
Conclusions

• Global trend on human movements
  - Recent *Aedes aegypti/albopictus borne diseases* spread
  - Outbreaks in EU were expected as illustrated by 2017 outbreaks

• Risk assessment: improve assessment of an outbreak potential at early stage of detection (modelling),

• For re-/emergence: pathogen characteristics and vector competence studies quickly available

• Challenge in vector control: optimal strategy, insecticide resistance and improve integrated vector-surveillance

• Capitalize and share the lessons learned linking to training and preparedness activities
Molte grazie per la vostra attenzione
Benefits of cross-sectoral action

Illustrative Relationship between Time of Detection of Emerging Zoonotic Disease and Total Cost of Outbreak

Source: The World Bank (2012), People, pathogens and our planet: The economics of One Health
Earlier detection of risks

Early detection and control efforts reduce disease incidence in people and animals

Source: Karesh et al. (2012) UNEP