



# MEETING REPORT

**Consultation on Chikungunya  
risk assessment for Europe  
Stockholm, 30 March 2006**



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## 1. Background

The founding regulation<sup>1</sup> establishing the European Centre for Disease Prevention and Control (ECDC) gives ECDC a mandate to strengthening the capacity of the EU for the prevention and control of infectious diseases. Considering the ongoing chikungunya fever epidemic affecting several countries in the Indian Ocean, including the French island of La Réunion, as well as the extensive travel between the concerned area and Europe, ECDC called a consultation of experts in order to assess the short-term risk this epidemic represents for Europe. The one-day consultation in Stockholm involved experts in the field of infectious diseases, epidemiology, entomology and risk assessment modelling (Annex 1 & 2).

## 2. Objective of the consultation

The objective of the consultation was to assess the short-term risk of transmission of Chikungunya virus in Europe, in order to suggest recommendations for the European Member States for strengthening their preparedness.

## 3. Expert presentations

An overview of the latest knowledge on Chikungunya virus, the vector and the host was presented, as well as an update on the ongoing epidemic in the Indian Ocean. This was followed by presentations on the entomological aspects of a risk assessment for France, and factors influencing statistical and mathematical risk modelling for Europe.

The following points were raised during the discussions:

### 3.1. Chikungunya virus

- Chikungunya virus (CHIKV) is an Old World Alphavirus, and is not present in the New World.
- Contaminated persons develop very high titres in the blood (high viraemia), and infection is therefore easily identifiable. There is uncertainty with regards to the duration of the viraemia which is suspected to last for 3 to 5 days, but may extend to 10 days.
- Three different virus strains related to the Central/East African genotype were identified from imported cases in France from La Réunion.
- Serological surveillance data from the past 40 years have shown that there is arbovirus circulation in Europe, including Chikungunya virus.
- It is not known whether there is an animal reservoir and if non-viraemic transmission may occur.
- *Aedes albopictus* as vector
  - Among 240 mosquito pools collected in La Réunion in January 2006, 22 were positive for *Aedes albopictus*, indicating a high probability that *Aedes albopictus* is the vector for the current outbreak. It is estimated that several mosquito species might be involved in the transmission of CHIKV on the island, among which *Culex quinquefasciatus*. However, *Aedes albopictus* is considered the main vector.
  - The genetic differences between mosquitoes in various regions in La Réunion raise the question whether the vectorial competence may differ accordingly.
  - Eggs of *Aedes albopictus* can survive desiccation for several months depending on the time they were laid.
  - Vertical transmission of CHIKV in *Aedes albopictus* has not yet been demonstrated, although it has been confirmed for Dengue virus (flavivirus).
  - Rare data on experimental infection rates suggest that *Aedes albopictus* (25-48% infection rates), might be a better vector for CHIKV than *Aedes aegypti* (0-18%)<sup>2</sup>.
  - The vector longevity is estimated to be between 2 weeks and 1 month, and the time for virus replication in the mosquito (extrinsic cycle) about 10 days, indicating sufficient opportunities for the development of a population of infected mosquitoes.

<sup>1</sup>Regulation 853/2004 of the European Parliament and of the Council

<sup>2</sup>Turell MJ, Beaman JR, Tammariello RF. (1992) Susceptibility of selected strains of *Aedes aegypti* and *Aedes albopictus* (Diptera: Culicidae) to Chikungunya virus. *J Med Entomol*; 29:49-53.

### **3.2. Chikungunya clinical presentation**

- Questions remain related to the occurrence of cases of re-infection, while long-term immunity is expected.
- There is evidence of interference between Dengue and CHIKV infection in the immuno-response.

### **3.3. Epidemiological aspects of the outbreak in La Réunion**

- All age groups are affected, which indicates the introduction of a new infection without previous immunological protection.
- Around 20 to 25% of the population in La Réunion is estimated to have been infected at the time of the meeting.
- While it is not known how CHIKV was introduced in La Réunion, it is likely to have been through an infected person.
- The proportion of symptomatic cases in the epidemic in La Réunion is high, up to 80%.

### **3.4. Entomological aspects of a risk assessment for France**

- The vector *Aedes albopictus* has been introduced in several European countries (Albania, Belgium, Bosnia and Herzegovina, Croatia, France, Greece, Italy, The Netherlands, Serbia and Montenegro, Slovenia, Spain and Switzerland), mainly through the importation of tyres and lucky bamboo (decoration plant), and resulted in its establishment in most of Albania, Northern/Central Italy, and limited foci in other countries.<sup>3,4</sup> Probable geographical distribution of the vector is related to favourable climatic and ecological conditions (cf. urbanisation, breeding sites, etc.), which are present in most of Southern Europe. An updated risk map is needed to fully estimate this aspect.
- The level of *Aedes albopictus* surveillance differs between countries, leading to different levels of details of information available at this time.
- Vector control activities have slowed down the spreading of the species in France, but little is known from other areas with favourable ecological and climatic conditions. The continuous and widespread distribution of *Aedes albopictus* in Italy is a reason for concern.

### **3.5. Statistical and mathematical risk modelling for Europe**

- Statistical modelling matches the pattern between disease/vector occurrence and spatial (e.g. climatic) factors to develop predictive risk models; mathematical modelling uses epidemiological and environmental parameters that are involved in transmission dynamics. Both risk modelling methods are complementary.
- Detailed vector distribution data are needed in order to make the model more powerful.
- It is difficult to predict the power of a risk model applied to a disease like chikungunya with an epidemic transmission, versus a disease like malaria with a continuous/perennial transmission.

<sup>3</sup> Gratz NG. (2004) Critical review of the vector status of *Aedes albopictus*. *Med Vet Entomol*; 18: 215–27

<sup>4</sup> Schaffner F. (2006) Updated data on non-indigenous invasive mosquitoes in Europe, with special reference to France. 15<sup>th</sup> European Society for Vector Ecology meeting in Serres, Greece, 10–14 April 2006.

## 4. Risk assessment for Europe

In order to structure the discussion, an artificial distinction was made between the risks of establishment of CHIKV transmission in Europe related to the 3 key determinants: the introduction of the virus, the presence and characteristics of the vector and the interactions with the host.

### 4.1. Risk related to the introduction of the virus

- The highest likelihood for virus introduction comes from viraemic persons, considering 1) the high frequency of travel between high incidence areas in the Indian Ocean and Europe<sup>5</sup>, and 2) a high proportion of those travellers are likely to be “visiting friends and relatives” (VFR) who do not necessarily take into account all the potential preventive measures to reduce the risk of becoming infected by Chikungunya virus during their stay abroad. In addition to France, several other European countries have confirmed the occurrence of chikungunya fever in tourists returning from the Indian Ocean.
- Limited likelihood for introduction through breach of universal precautions when handling blood samples as patients present with high viraemia. Since the meeting (March 2006), one report of such transmission was described to have occurred in France.
- Limited likelihood for introduction through blood transfusion from a viraemic donor.
- Limited likelihood of introduction by infected vectors (adult mosquito or eggs) imported from areas where the disease is present, although further research on vertical transmission is needed to fully assess this probability.

### 4.2. Risk related to the presence and characteristics of the vector

- The spread of *Aedes albopictus* in Europe has been documented (cf. 3.4. Entomological aspects of a risk assessment for France), but the map would need to be updated, taking into account ecological and climatic information, and considering a more detailed administrative level.
- The vectorial capacity (host preference, longevity, density) and competence (susceptibility of local strain) for transmitting Chikungunya virus in Europe needs further investigation, in particular in highly infested areas. Results from research in France are expected mid-2006.
- Based on current knowledge, experts agreed it is certain that the species will be able to transmit the virus in Europe, in particular during humid summer months, but the efficiency of this transmission is not known.

### 4.3. Risk related to interactions with the host

- Factors influencing the host-related risk include the likelihood of being bitten, immunological susceptibility, duration and level of the viraemia, proportion of asymptomatic cases and capability to detect a case.
- One example was given, referring to the summer time at camping sites, when conditions for transmission are favourable taking into account the high density of people.

<sup>5</sup> Eurostat estimated that in 2004, a total of 1,474,218 persons travelled from Madagascar (153,766), Mauritius (657,312), Mayotte (63,372) Réunion (498,388) and Seychelles (101,380) to the European mainland.

## 5. Conclusion

Based on the expert presentations and discussions, it was concluded that there is a risk for CHIKV transmission in Europe. The magnitude of the risk cannot be precisely determined at this time. Experts agreed that the risk of transmission would be limited to the local public health level rather than to large geographical areas.

In addition, experts insisted that the risk for Europe is not limited to the current epidemic in the Indian Ocean. The virus is present in Africa, India, and South-East Asia with more than 30,000 cases currently reported from India<sup>6</sup>. In addition, experts stressed the fact that the risk does exist as well for other vector-borne diseases. The frequent importation of Dengue virus in Europe is well documented.<sup>7</sup> Therefore, the recommendations presented below could be used as the basis for broadening the scope of the discussions, to ensure that threats from imported viral diseases are addressed at European level.

## 6. Recommendations

The following recommendations were proposed by the group of experts to be brought to the attention of Member States for consideration:

### 6.1. To be considered in the short term

1. Airline companies, to provide an information sheet to all persons travelling from the affected area (i.e. international departing passengers), according to the disease incidence (to be assessed regularly). Travellers who develop symptoms consistent with Chikungunya virus infection should be recommended to consult a medical doctor for follow-up and advice on preventing mosquito bites.
2. National public health authorities, to consider making Chikungunya virus fact sheets available to physicians, as returning travellers may present with the disease (e.g. [www.ecdc.eu.int](http://www.ecdc.eu.int)).
3. National public health authorities, to remind health care staff about the need to follow universally accepted precautions when handling samples from all patients, including patients presenting with chikungunya fever.
4. In areas where *Aedes albopictus* is known to be present, and therefore with a higher risk of local transmission, for national public health authorities, to provide clinical disease information to clinicians in order to raise their awareness about chikungunya fever as a differential diagnosis.
5. The European Commission, to advise EU Member States with relation to this specific epidemiological situation, referring to Annex III, section 2.3. of Commission Directive 2004/33/EC (implementing Directive 2002/98/EC of the European Parliament and of the Council as regards certain technical requirements for blood and blood components).
6. ECDC, to assess and list the capability and capacity of laboratories in Europe for the diagnosis of chikungunya and facilitate the sharing of the necessary biological material among laboratories in order to enhance overall European laboratory testing capacity.
7. ECDC, to facilitate the exchange of information on chikungunya fever among European stakeholders.

<sup>6</sup> Promed. Chikungunya - Indian Ocean update (20); India. 1 May 2006. Accessible from [http://www.promedmail.org/pls/promed/?p=2400:1001:935905938377483191::NO::F2400\\_P1001\\_BACK\\_PAGE,F2400\\_P1001\\_PUB\\_MAIL\\_ID:1010,32824](http://www.promedmail.org/pls/promed/?p=2400:1001:935905938377483191::NO::F2400_P1001_BACK_PAGE,F2400_P1001_PUB_MAIL_ID:1010,32824)

<sup>7</sup> Wichmann O. Mühlberger N. Jelinek T. (2003) Dengue – The underestimated risk in travellers. *Dengue Bulletin*; 27: 126-37.



#### 6.2. To be considered in the longer term

8. National public health institutes, to document the *Aedes albopictus* competence and capacity as a vector in areas in Europe where it is known to be present.
9. National public health institutes, to update the identification of areas at risk for the establishment of the vector, considering climatic and ecological conditions in Europe, and national public health authorities, to implement or strengthen vector surveillance in these areas.
10. National public health authorities, to consider measures for preventing the introduction of *Aedes albopictus* through trade (used tires, lucky bamboos).

#### 6.3. Implications for ECDC

The group of experts stressed the need to broaden the risk assessment to vector-borne diseases in general as similar risks exist for West Nile fever or may develop in the future for dengue fever.

The ECDC will further discuss its involvement in monitoring such risks through its Advisory Forum.

### 7. Annex 1: Participant list

<b>Jean-Paul Boutin</b>	Institut de Médecine Tropical du Service de Santé des Armées, France
<b>Simon Brooker</b>	London School of Hygiene and Tropical Medicine, United Kingdom
<b>Henriette De Valk</b>	Institut de Veille Sanitaire, France
<b>Sebastian Dieckmann</b>	Berlin Institute of Tropical Medicine, Germany
<b>Didier Fontenille</b>	Institut de Recherche pour le Développement, France
<b>Ernest Gould</b>	Centre for Ecology and Hydrology, United Kingdom
<b>Michael Nathan</b>	World Health Organization
<b>Mikael Nilsson</b>	Swedish Institute for Infectious Disease Control, Sweden
<b>Francis Schaffner</b>	Entente Interdépartementale pour la Démoustication du Littoral Méditerranéen, France
<b>Frank von Sonnenburg</b>	University of Munich, Germany
<b>Willem Takken</b>	Wageningen University, the Netherlands

## **8. Annex 2: Programme of the consultation**

<b>09:00 – 09:10</b>	<b>Opening of the meeting</b> Denis Coulombier - ECDC
<b>09:10 – 10:00</b>	<b>Latest knowledge on chikungunya</b> The virus Ernest Gould – Centre for Ecology and Hydrology, UK  The vector Didier Fontenille – Institut de Recherche pour le Développement, France  The patient Frank von Sonnenburg – University of Munich, Germany
<b>10:00 – 11:00</b>	<b>Description of the epidemic in La Réunion</b> Henriette De Valk – Institut de Veille Sanitaire, France
<b>11:00 – 11.30</b>	<b>Coffee break</b>
<b>11:30 – 13:00</b>	<b>Risk for Europe</b> Entomological elements for appearance of the virus in France Francis Schaffner – Entente Interdépartementale pour la Démoustication du Littoral Méditerranéen, France  Modelling approaches to chikungunya risk in Europe Simon Brooker – London School of Hygiene & Tropical Medicine, UK
<b>13:00 – 14:00</b>	<b>Lunch</b>
<b>14:00 – 15:30</b>	<b>Risk for Europe and recommended measures</b>
<b>15:30 – 16:00</b>	<b>Conclusions of the meeting</b>



