Chikungunya fever is a viral disease transmitted by Aedes spp mosquitoes [1]. In recent years, several outbreaks have been reported in Kenya (2004), the Comoros Islands (2005), the island of Réunion (2005, 2006), other islands in the southwest Indian Ocean (2005) and in India (2005-2006) [2,3], during which Ae. aegypti and/or Ae. albopictus were the main vectors [1].

As viraemic and infected persons returned from epidemic areas to temperate regions, concern developed that local mosquitoes could sustain disease transmission in the European Union. In March 2006, the European Centre for Disease Prevention and Control (ECDC) concluded, based on an expert consultation, that there was a risk for chikungunya virus transmission in Europe [4]. In the summer of 2007, an outbreak of chikungunya fever in north-eastern Italy marked the first occasion of the virus being transmitted by mosquitoes on the European mainland [5]. In order to assess the possible spread of Ae. albopictus in Europe and to provide recommendations for vector surveillance, the ECDC called a consultation of entomologist experts in October 2007. The main conclusions, concerning the introduction and establishment of the vector and various aspects regarding surveillance, are presented below. The meeting report reflecting the discussion, which took place on 22 October in Paris 2007, was published by the ECDC on 14 February 2008 [6].

**How can Ae. albopictus be introduced in Europe?**

The vector Ae. albopictus has been introduced in several European countries since 1975. As of 2007, it had been observed in Albania, Bosnia and Herzegovina, Croatia, Greece, France (Côte d’Azur and Corsica), Italy, Montenegro, the Netherlands (only in glasshouses of companies importing tropical plants, although adult mosquitoes are sporadically found in their immediate surroundings), Serbia, Slovenia, Spain and Switzerland [7].

Ae. albopictus can be introduced in Europe through different routes. The eggs of Ae. albopictus can withstand desiccation, which allows them to survive long travels around the world in a variety of containers. The international trade in used tyres has played a major role in such spread because tyres make optimal breeding sites [8,9], likewise the importation of Dracaena sanderiana plants, also known as ‘Lucky Bamboo’ [10]. Furthermore, public or private transport from infested areas by highway, ferry or air can contribute to the passive dispersion of Ae. albopictus. Once the vector is established in a new area, the mosquito will disperse actively to nearby areas with suitable habitats.

**Which conditions are suitable for the establishment and spread of Ae. albopictus in Europe?**

After the vector has been introduced in a specific area, experts agreed that the establishment of Ae. albopictus would be dependent on four main environmental conditions:

- **Winter temperatures.** If winter temperature drops below a certain level the eggs will not survive. Areas with mean January temperatures ≥20°C are generally accepted as overwintering areas [11].
- **Annual rainfall.** An average yearly rainfall of at least 500mm is required to provide enough water for Ae. albopictus breeding sites.
- **Summer rainfall.** A sufficient amount of rainfall in summer is necessary to maintain breeding sites during the warm season.
- **Summer temperatures.** Temperatures influence the speed of development from the immature stage (larvae, pupae) to adult mosquitoes. The development rate is optimal when temperatures are between 25°C to 30°C.

To date, the vector has been widely established in Albania and Italy, but spreading fast in the Balkan countries, France, Greece and Spain.

**Where and how should surveillance of Ae. albopictus be conducted?**

There is currently no European standard for vector surveillance methods, which influences the comparability of data between countries. Different trapping techniques currently being used in Europe include oviposition traps (containers with water that allow female mosquitoes to lay eggs), carbon dioxide-baited counterflow traps (mosquito traps that utilise an outgoing airflow which carries chemical lures that attract mosquitoes to the trap and an incoming air flow draws mosquitoes into a collecting chamber), CDC traps (Centers for Disease Control and Prevention traps for adult mosquitoes, usually baited with carbon dioxide) and larval surveys (surveys to water collections, especially in containers to look for mosquito larvae). Furthermore, the density of the mosquito eggs in ovitraps does not necessarily reflect the density of the mosquito population in the field, as other breeding sites are available; it gives an indication of the presence or absence of the vector in a certain area.

Vector surveillance in European Union Member States is mostly conducted in regions at high risk for establishment of Ae. albopictus. Based on local data, likely geographic areas for introduction of Ae. albopictus can be mapped, e.g. storage centres for imported used tyres, main road axes, ports. Combining such maps with the risk
of establishment once the vector has been introduced provides useful guidance on where to focus vector surveillance activities on national and local levels. The experts at the meeting agreed that local characteristics and microclimates should be considered not only for the establishment of *Ae. albopictus*, but also for its likely abundance. These characteristics include: urban vegetation, human population density and housing.

Conclusions

It was agreed that an updated map of the current distribution of *Ae. albopictus* in Europe is needed, based on the available vector surveillance data. Furthermore, it was recommended to map the risk of establishment of *Ae. albopictus* in Europe, in the event of it being introduced, by studying the four main climatic factors winter temperatures, annual rainfall, summer rainfall and summer temperatures – a sensitivity analysis for each determinant would be needed, and taking into account the predicted vector abundance.

The concern on the possible introduction in Europe of the mosquito *Ae. aegypti*, another important vector for chikungunya virus as well as other arboviruses such as dengue and yellow fever, was also raised, as this vector has already been introduced in the Madeira island (Portugal), with frequent flights into mainland Europe [12].

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This article was published on 14 February 2008.

Citation style for this article: Straetemans M, on behalf of the ECDC consultation group on vector-related risk for chikungunya virus transmission in Europe. Vector-related risk mapping of the introduction and establishment of *Aedes albopictus* in Europe. Euro Surveill. 2008;13(7):pii=8040. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=8040