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Dengue outbreak in Madeira: entomological and epidemiological surveillance and the challenge of control of a vector borne-disease

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ABSTRACT

Dengue is a vector-borne disease caused by a Flavivirus with four distinct serotypes (DEN-1-4). One of the most competent mosquito's species for disease transmission is *Aedes aegypti* (Linnaeus, 1762), [1] a well-known invasive species. This mosquito species, originally from West Africa, has spread to several regions of the world. During the 15-17th centuries the species migrated to the New World and is believed that this species has invaded southern Europe, reaching Spain and Portugal also through maritime transport. Although present in the Iberian Peninsula until mid-20th century, no record

of this species has been reported in the last five decades. Its supposed disappearance is often associated to the malaria eradication campaigns carried out in the 1950s. *Aedes aegypti* has been described for the Macaronesian islands of Canarias and Cape Verde. But until recently it was absent from the archipelagos of Azores and Madeira. In 2005, it was first recorded in Funchal, the capital city of Madeira. In 2006, a mosquito surveillance network based on ovitraps was established to monitor the presence and the abundance of the vector in the island [2]. Results show that since 2007 the mosquito population has expanded to the west (Ponta do Sol and Ribeira Brava counties) and East (Machico county) of Funchal city. The vector was detected in Porto Moniz (in 2011) but its presence was not confirmed in subsequent monitoring activities. Up to date this vector has not been found on Porto Santo. [3]. On 3 October 2012, two autochthonous cases of dengue fever were laboratory confirmed in the Autonomous Region of Madeira (RAM), Portugal, following clinical suspicion of dengue, i.e. sudden onset of fever and influenza-like symptoms in patients without travel history to dengue-endemic regions [4].

In this seminar we will present the main features of entomological findings as also the epidemiological pattern of dengue outbreak that occurred on the island of Madeira from September 26, 2012 to February 3, 2013. We will highlight some of the control measures taken during the outbreak and still in course.

According with the principles of the epidemiological surveillance system the processing and analysis of data were intended to meet the trends of evolution of the outbreak concerning time, space, demographic characterization and symptoms of probable cases. From September 26, 2012 to February 3, 2013 a total of 2165 probable cases were reported. During this period 1080 cases were laboratory confirmed, corresponding to 50 % of probable cases. From the "place of residence" was possible to identify the areas with highest incidence, at civil parish level. The cumulative incidence rate on the Madeira island was 80.85 per 10000 inhabitants and the most affected municipality was Funchal with an incidence of 156.04 per 10000 inhabitants. The application of geographic information systems to the entomological and epidemiological surveillance has proved to be extremely useful, allowing implementing control measures for reduction of breeding sites and mosquito population on priority areas with the highest incidence of dengue cases.

In response to the outbreak, several control measures have been undertaken by the health authorities of Madeira. In order to prevent exportation, enhanced vector control measures have been implemented at Madeira's single airport. Currently, all aircrafts departing from the island undergo disinfection procedures. Mosquito surveillance systems at the airport and at passenger and cargo harbors have been boosted. Particular care is being

given to the passenger ship port, located in the most affected area, Funchal. Information, mainly focused on the use of personal protective measures and on the elimination of mosquito breeding sites is being disseminated by several mechanisms: (i) individual information to residents through a door-to-door campaign carried-out by environmental technicians of the IASAUDE, RAM; (ii) postings on IASAUDE website and in traditional and social media, and; (iii) community-based activities involving the educational, religious and health sectors. Advice for travelers to Madeira has been issued, containing information about methods to reduce the risk of being bitten by mosquitoes and symptoms of the disease [5]. Even with regard to vector control measures should be noted that prior to the outbreak and during the outbreak of dengue, adulticide and larvicide applications were made, as well as tests of resistance to insecticides in 2009 and 2013.

In conclusion we would highlight that timely knowledge of localisation of areas with higher ARs guided targeted control measures for reduction of breeding sites and mosquito population in the affected areas. This first sustained dengue outbreak in the European Union calls for the development of integrated response strategies for diseases transmitted by invasive mosquitos.

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