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BOOK OF ABSTRACTS

Session 10.
Medical and Veterinary Entomology

Epidemiology and Management of Insect Vectors

CO277

ANOPHELES MOSQUITOES OF THE MACULIPENNIS COMPLEX IN EMILIA-ROMAGNA AND LOMBARDY (NORTHERN ITALY)

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After the Malaria eradication in Italy, the interest in characterization the Anopheline fauna has progressively decreased, and nowadays, the knowledge of the distribution of these mosquitoes is largely fragmentary. If mosquito vectors are present, autochthonous Malaria cases are still possible the arrival of infected people, as demonstrated by the recent outbreak in Greece or the autochthonous cases in Puglia during 2017. The definition of Anopheline fauna is hampered by the presence of complex of sibling species difficult to distinguish on a morphological basis. The Maculipennis complex is one of these groups, which includes primary Malaria vectors, and other species considered secondary or irrelevant vectors. Seven species of the complex are reported in Italy: *Anopheles labranchiae*, *An. sacharovi*, *An. atroparvus*, *An. maculipennis ss*, *An. melanoon*, *An. messeae*, *An. subalpinus*. The aim of this study is to define Maculipennis complex species present in studied area. Anopheles mosquitoes were directly collected (mainly by manual aspiration in resting sites) or retrieved from the entomological surveillance programs (particularly WNV surveillance plans). To preserve the body, DNA was extracted from two legs and submitted to ITS2 and COI PCRs and the obtained products were sequenced for molecular identification. Morphometry was applied to wings, in attempt to discern the different species preserving mosquitoes, which can thus be addressed to molecular analyses after species identification. More than 10,000 Anopheles mosquitoes were sampled, mainly in 2017. 420 specimens were identified by biomolecular analysis, of which 353 from Emilia-Romagna and 67 from Lombardy. The most abundant species was *An. messeae* (333 specimens), followed by *An. maculipennis ss* (78 specimens), more abundant in the western part of the surveyed area. Moreover 9 specimens of *An. atroparvus*, a good vector of Malaria, were identified. These preliminary results demonstrate that Anopheles mosquitoes, potentially able to transmit Malaria, are still present in Northern Italy.

Keywords: Maculipennis complex, *An. messeae*, *An. maculipennis ss*, *An. atroparvus*, Malaria

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CLIMATE CHANGE AND VECTOR-BORNE DISEASES IN EUROPE

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Zika, dengue, chikungunya, malaria, Lyme disease, bluetongue, Shmallenberg are vector-borne diseases (VBD) with huge impacts on societies and they are now omnipresent in the news. These diseases are transmitted by exothermic arthropod vectors such as mosquitoes, ticks and midges which are extremely sensitive to external environmental conditions. Rainfall is an important factor as it provides breeding sites for larvae. Temperature impacts a broad range of factors such as vector development, its survival, vector biting rates and the time required for the pathogen to develop inside the arthropod vector (so called extrinsic incubation period). Consequently, future climate change is expected to greatly impact the distribution and severity of these vector-borne diseases. Different mathematical models can be used to model the dynamics of vector-borne diseases. We employ various mechanistic models for which epidemiological parameters dynamically rely on climatic variables. This presentation will present recent modelling advances about climate change impacts on animal and human vector-borne diseases, with a focus on recently reported trends in Europe. We will discuss the risk of arbovirus transmission posed by the Asian tiger mosquito *Ae. albopictus* and the risk posed by bluetongue virus to animal health in Europe. To conclude, we will present recent modelling results showing that the climate phenomenon El Niño fuelled the Zika outbreak that plagued Latin America in 2015-16.

Keywords: Climate change, epidemiological modelling

CO279

EPIDEMIOLOGY AND MANAGEMENT OF CULICOIDES AND CULICOIDES-BORNE DISEASES IN EUROPE

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Arboviruses transmitted by Culicoides biting midges have undergone an unparalleled emergence in Europe during the past two decades, involving major changes in their epidemiology. In this talk I will draw parallels with the emergence of other vector-borne diseases in Europe to examine differences in the potential for sustained transmission of arbovirus in this region. This will include examining our response to veterinary *versus* medical pathogens and how the requirements of policy shape the research we conduct. The aim is to highlight where surveillance in particular can be harmonised across vector groups and to make schemes more effective in providing the data we require. I will examine the methods used to define both spatial and temporal incidence and some of the strengths and weaknesses of datasets produced from these schemes. Then I will discuss how future advances in technology may change the ways in which we carry out surveillance, summarising emerging techniques in this area. Finally I will discuss areas of weakness in our current systems for responding to arbovirus incursions with reference to our experience with bluetongue and Schmallenberg viruses.

Keywords: Biting midges, arbovirus, surveillance, emergence

CO280

MODELLING VECTOR DYNAMIC AND ARBOVIRUS OUTBREAKS IN EUROPE

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The colonization by mosquito species such as *Aedes albopictus* of Europe represents an alarming public health threat due to their potential role as competent vectors for arboviruses. Moreover, the expanding geographic range of mosquito-borne diseases such as Dengue and Chikungunya and the re-occurrence of significant outbreaks in endemic countries have increased the risk of infected travellers reaching Europe. The combination of these factors has already had an impact. Indeed, Southern Europe experienced in the last decade events of autochthonous transmission of Dengue in France and Croatia and two Chikungunya outbreaks in Italy. Mathematical and statistical models can improve our knowledge on vector and outbreak dynamics, which in turn could help reduce the public health burden represented by mosquito-borne diseases. In fact, understanding the vector population dynamic is essential to identify under which conditions the transmission risk is higher. Moreover, estimates of the vector population dynamics and of the likelihood and impact of arbovirus transmission could help the planning of preventive and reactive interventions. Using the recent (2017) Italian outbreak of Chikungunya, the application of mathematical and statistical models will be showcased to illustrate the quantitative estimation of vector dynamics and transmission risk and their potential to understand actual outbreak dynamics and to inform control interventions.

Keywords: Outbreaks, vector dynamics, arboviruses, mathematical model, Aedes species

CO281

CURRENT DISTRIBUTION OF THE INVASIVE MOSQUITO *AEDES KOREICUS* (DIPTERA; CULICIDAE) IN ITALY

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Mosquitoes belonging to genus *Aedes* are often recorded out of their native places as invasive species. In addition, these species are proven or potential vectors of important arboviruses and are a threat for human and animal health. Several invasive Aedes species are now established in Europe and Italy is one of the most infested European countries. At present, three invasive species occur in Italy: *Aedes albopictus*, *Ae. japonicus* and *Ae. koreicus*. The latter, was first found in North-Eastern Italy in 2011. The constant monitoring of this species shows an increasing spreading trend. Aedes koreicus develops in artificial containers, sometimes sharing the breeding sites with the other invasive mosquito species and is adapted to tolerate the cold winter temperature. For this reason, it is present in mountainous and hilly areas where *Ae. albopictus* is present in low density or absent. Starting from the area of the first report, it has now spread over five Italian Regions and 123 municipalities, from West to East colonizing wide areas of Northern Italy. According to these records, northern Italy has a high probability to be invaded by *Ae. koreicus* in the next decade. The North-East Italy in particular, confirms to be one of the areas with the most frequent experience of invasive mosquito introduction in Europe. This is likely a consequence of the intensive trade of goods. The establishment of invasive mosquito species complicates the current surveillance system and requires well trained personnel for identification. A new competent vectors of pathogens may represent a challenge for the Health System.

Keywords: *Aedes koreicus*, North Italy, invasive mosquitoes

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MANAGEMENT OF INSECTICIDE RESISTANCE IN MOSQUITO VECTORS OF HUMAN DISEASE

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Malaria prevention is reliant on insecticides, used to treat bednets or for spraying houses. Coverage with these mosquito control measures has been dramatically scaled up across Africa in the 21st century and this has contributed to the reductions in malaria burden witnessed by many countries. However intense selection pressure with pyrethroid insecticides, the only class currently used to treat bednets, has resulted in high levels of resistance in African malaria vectors. Whilst the impact of resistance on indoor residual spraying is clear, and has led to changes in insecticide use, the impact of resistance on bednets is harder to quantify. The majority of studies attempting to address this have assessed the level of personal protection provided to a bednet user and concluded that bednets are still protective against malaria, even in areas where the mosquitoes are resistant to malaria. However the success of bednets in controlling mosquito populations relies on the additional community level protection afforded by the killing action of the insecticide, which reduces the longevity of the mosquito population and provides protection to both net users and non users. This community effect will be rapidly eroded by pyrethroid resistance. Data from laboratory and field studies, plus outputs from modeling studies, will be presented to outline the current status of our understanding of the impact of insecticide resistance. Alternative approaches to manage resistance, including critical knowledge gaps, which are impeding the implementation of effective resistance management strategies, will also be discussed.

Keywords: Malaria, bednet, pyrethroid, insecticide, anopheles

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MANAGEMENT OF TICK INFESTATION IN WILD ANIMALS

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