



There are over 3,000 species of mosquitoes, and some have the ability to carry many different diseases.

Partners of the project:

Coordinator: Department of Biogeography – University of Bayreuth – Bayreuth – Germany

Unit of Medical Entomology – Institute of Tropical Medicine – Antwerp – Belgium

Infectious Diseases and Vectors (MIVEGEC) – IRD/CNRS/University of Montpellier – Montpellier – France

Arbovirology – Bernhard Nocht Institute for Tropical Medicine – Hamburg – Germany

Disease ecology and One Health Unit – National Autonomous University of Mexico – Mexico City – Mexico

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DiMoC - Diversity components in Mosquito-borne diseases in face of Climate change

Context

Mosquito-borne pathogens such as chikungunya virus and West Nile virus are an increasing threat of veterinary and public health in Europe. Emerging and re-emerging transmission patterns are influenced by global transport, long-distance travel, and environmental and climatic changes, while vaccination and pharmaceutical treatment is either not available or very limited. The role of biodiversity on disease transmission is becoming evident as far as introduced invasive species and habitat degradation are concerned, but on the other hand, attenuating or promoting effects on the chain of infection remain poorly understood. At the same time, a better understanding has a high potential to advance policy actions and response on the transmission of zoonotic diseases and avoid local or regional outbreaks.

Main objectives

DiMoC will contribute to better understand the effects of biodiversity in mosquito-borne pathogen transmission. Through the analysis of different organisational (hosts, insects, viruses, human population), spatial (continental, regional, local, organism) and temporal scales (current conditions / future projections), DiMoC will test whether:

- Greater diversity in insect-specific virus hosted by mosquitoes results in a reduced relative risk of transmission of a virus through interactions within these populations;
- Mosquito diversity is influenced by interspecific interactions (e.g. competition) between species, which translates into different relative transmission risk;
- Greater host species diversity reduces the transmission risk due to the dilution effect;
- Changes in climatic conditions explain current large-scale patterns of pathogen, vector, and host diversity more than socio-economic conditions.

These results will allow to evaluate whether scenarios and models including climate, landscape diversity, and societal diversity can be used to quantify uncertainty in future trends of risks in pathogen transmission.

Main activities

DiMoC will focus on the European continent and on one overseas region and assess relative transmission risk of pathogens. Mosquitoes that can transmit pathogens (called vectors) will be caught in Belgium, Germany and Italy. The species will be studied to understand the effects of local microhabitat diversity and its influence on interspecific interactions of invasive versus native mosquitoes, which in the end translates to varying vector diversity and abundance. Cutting-edge approaches such as salivation assays of mosquitoes will help determine the differences in the vector competence for West Nile, chikungunya and Japanese encephalitis viruses. Vector impact will be assessed at regional scale: mosquito captures will allow to determine mosquito abundance, richness and diversity. Using molecular methods, DiMoC will identify vertebrate blood-meals in mosquitoes to reveal differences in host assemblages within and between studied sites.

DiMoC relates continental-scale patterns of vector diversity to current climate data and also to global scenarios and models on climate change. It will also identify the contribution of socio-economic drivers for explaining the detected patterns of vector diversity and pathogen transmission by integrating spatial information on human infrastructure, population density, land use and land cover.

DiMoC will proactively work with policy and practice. It identified key local to supra-national target organisations and policies to engage with, ranging from local authorities competent for the management of mosquito-borne diseases in Belgium, France (including overseas regions), Germany and Mexico to European institutions, authorities and associations. They will be involved in assessing the relative disease risks in local to continental settings. In particular, policy briefs will allow condensing the project results into practice-oriented conclusions for the management of biodiversity and risk mitigation in the context of mosquito-borne diseases.