

Preliminary studies for the implementation of a novel One Health surveillance of arboviruses in the Indian Ocean

Helene Guis^{a, b, c*}, Michaël L. Tantely^d, Floriane Boucher^{c, e}, Manou R. Raharinirina^d, Catherine Cêtre-Sossah^{c, e}, Yannick Grimaud^{c, e, f}, Eric Cardinale^{c, e}, Claire Garros^{c, e}, Romain Girod^d

^aCIRAD, UMR ASTRE, Antananarivo, Madagascar; ^bUnité d'Epidémiologie et recherche clinique, Institut Pasteur de Madagascar, Antananarivo, Madagascar; ^cASTRE, CIRAD, Univ Montpellier, INRA, Montpellier, France; ^dUnité d'entomologie médicale, Institut Pasteur de Madagascar, Antananarivo, Madagascar; ^eCIRAD, UMR ASTRE, Sainte-Clotilde, Réunion; ^fGroupement de Défense Sanitaire, La Plaine des Cafres, Réunion

*Corresponding author: helene.guis@cirad.fr (Helene Guis)

Introduction: Numerous arboviruses affecting both humans and animals are present in the Indian Ocean among which dengue, chikungunya, Rift Valley fever, West Nile fever, bluetongue (BT), epizootic hemorrhagic disease (EHD) viruses are considered as important health burdens. Classical arboviral surveillance approaches rely on clinical surveillance in hosts, viral or serological surveillance in hosts and/or viral surveillance in arthropods. A novel surveillance approach based on the fact that vectors expel pathogens while sugar-feeding is currently gaining ground. This approach consists in allowing trapped vectors to feed on honey-soaked nucleic-acid preservation cards which are then processed to detect arboviruses, regardless of the host or arthropod species involved.

Material and Methods: Preliminary field and laboratory experiments were designed to test optimal sugar-feeding conditions for two types of vectors, *Culicoides* biting midges in La Reunion Island (vectors of BT and EHD viruses) and Culicidae (mosquitoes) in Madagascar. These involved testing preferences regarding honey concentration, honey coloration, card position, number and duration use of honey soaked cards, duration of coloration in honey-fed arthropods, and trap configuration and within-trap optimization strategies to increase survival of insects and boost sugar feeding inside traps.

Results: The number of insects caught, sugar-feeding and survival rates were highly variable and thus important to optimize. Optimization strategies differed for *Culicoides* and mosquitoes.

Conclusion: Although teams in Australia and South and North America have already proven the utility of this innovative arbovirus surveillance strategy, its implementation in different entomological, geographical, social and economic contexts and application to other families of arthropods necessitates challenging optimizations strategies before wide-scale implementation.

Research impact highlights: A novel One Health surveillance approach relying on the detection of viral pathogens expelled by vectors during sugar-feeding has been proven useful in Australia and South and North America. Several optimization strategies for both for Culicoides biting midges and mosquitoes were tested in the Indian Ocean and showed the necessity of these preliminary steps before wide-scale implementation in new entomological, geographical, social and economic contexts.

Keywords: Vector and Vector-borne diseases - arbovirus surveillance - mosquito and Culicoides - One Health - Indian Ocean