

COST Action “Investigation and Mathematical Analysis of Avant-garde Disease Control via Mosquito Nano-Tech-Repellents” (IMAAC) CA16227 (2017—2021)

Peyman GHAFFARI, Ana Marija GRANCARIĆ

University of Zagreb, Faculty of Textile Technology, Zagreb, Croatia
pgsaid@fc.ul.pt
ana.marija.grancaric@ttf.hr

Notice



SUMMARY

The main aim and objective of the Action is to address the quantitative and mathematical investigation of the effect of employing avant-garde mosquito control measures as part of the technological processes in the textile and paint industries. The measurement of these effects in population to improve the new generation of control measures is the core of this challenge. This will be achieved through the specific objectives detailed in the Technical Annex.

The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 32 million in 2016.

The MoU will enter into force once at least five (5) COST Member Countries and/or COST Cooperating State have accepted it, and the corresponding Management Committee Members have been appointed, as described in the CSO Decision COST 134/14.

The COST Action will start from the date of the first Management Committee meeting and shall be implemented for a period of four (4) years, unless an extension is approved by the CSO following the procedure described in the CSO Decision COST 134/14.

IMAAC aims at investigation and mathematical analysis of the effect of avant-garde control measures in vector-borne diseases involving day-time active mosquitos transmitting diseases like dengue, Zika, chikungunya and yellow fever. The control measures involve new technologies in textile and paint products based on nano- and micro-particles releasing repellents or pesticides in well portioned dosage. The study will

also be expanded to scenarios using vaccines in combination with mentioned control techniques. The main focus will be on dengue fever transmitted via *Aedes aegypti* and *Aedes albopictus* mosquitoes in synergy with existing EU-projects, but the application will have also positive effects on other vector-borne diseases. Nano- and micro-particles are used in textile production for various purposes, and can be used to release chemicals like repellents and insecticides in a well-controlled rate. First attempts in this direction have been made, but no efficacy studies could be performed yet. The spectrum of combinations of nano- or micro particles, repellents, insecticides and types of textiles (or paint) has not been well studied. Especially, efficacy studies in cases using these control measures in combination with vaccines are uncharted territories and mathematical modelling has to be developed.

This Action aims to bring together experts from epidemiology, biostatistics, mathematics, biology, nano-technology, chemical and textile engineering to implement new techniques to combat mosquito transmitted vector-borne diseases. The key question remains, in how far such avant-garde measures can help to reduce the disease burden, eventually in collaboration with existing vaccines which turned out to have only limited efficacy on their own.

Areas of Expertise Relevant for the Action

- Mathematics: Statistics
- Biological sciences: Biostatistics
- Chemical engineering: Medicinal chemistry, drug synthesis
- Materials engineering: Nanophysics for materials engineering applications
- Nano-technology: Nano-materials and nano-structures

Keywords

- Epidemiology and Modelling
- Disease Control Measures
- Vector-borne Diseases
- Mosquito
- Dengue Fever

Specific Objectives

To achieve the main objective described in this MoU, the following specific objectives shall be accomplished:

Research Coordination

- Investigation of the effect of employing avant-garde mosquito control measures as part of the technological processes in the textile and paint industries. Nano- and micro-particles release repellents or pesticides in well-controlled dosage. The Action would measure these effects in population to improve the new generation of control measures.
- The development of structure, coordination, and maintenance of a long-term European Network between Industry and Research Institutes pursuing the goal of a new generation of mosquito control measures with the long-term vision of field studies and cumulating licensing of the products.
- This Action will not only have an immense impact on healthcare in relation to mosquito transmitted diseases but has economic benefits for the industry by producing new kind of textiles, paints (and other products i.e. tiles).

Capacity Building

- The core capacity objective remains, in how far based on mathematical analysis of the achieved data regarding new avant-garde technologies against mosquito- disease spreading can help to combat the vector-borne disease burden
- Expert knowledge from textile and paint research and related new material industries, from nano- and micro- technology, from repellent and insecticide industry and research in mathematical epidemiology and biology combined with state of the art knowledge in mosquitoes and vector-borne disease spreading and control.
- This Action will provide help by various activities such as collaborating with existing EU projects, organizing new events to join forces tackling problems applying New Techniques in Combating Mosquito transmitted diseases theoretically, experimentally and industrially
- Capacities to initiate some pilot field study projects in future through the gained knowledge. Already some advances have been achieved in the development of repellents or insecticides, which help us to realize the set targets with the help of mathematical tools developed by the theoreticians in this consortium.
- This Action will also help in the long run to apply for EU or National grants to fund more costly research such as field studies.



COST Action CA16227 Core group members with Mr. Rafael Santana - Fuerteventura Minister of Economy and Carlos DG Robaina - Director AFRIMAC