

**CA16227**

# Investigation and Mathematical Analysis of Avant-garde Disease Control via Mosquito Nano-Tech-Repellents



Funded by  
the European Union

March, 2022

# CHAIR OF COST ACTION



**Peyman Ghaffari**

*Chair of COST Action 16227*

*[pgsaid@fc.ul.pt](mailto:pgsaid@fc.ul.pt)*

The overall objective of COST Action CA16227 was to investigate the efficacy of state-of-the-art nano-insecticides imbedded in textiles and paints on mitigating the spread of dangerous vector-borne (mosquito-borne) diseases.

This multi-disciplinary COST Action brought together international scientists from the fields of ecology, biology, chemistry, mathematics, engineering, and environmental sciences as well as industry partners from agriculture and textile manufacturing.

# WORKING GROUP 1: DATA ANALYSIS AND STATISTICS

**Dorota Mozyrska**

*Working group manager*

*d.mozyrska@pb.edu.pl*



This working group was responsible for modeling and including control measures and invasion scenarios into new world regions like Europe.

Some highlights:

- cross between applied mathematics, statistical, and epidemiology concerning spreading of mosquito-transmitted infectious diseases on large geographical areas including the complexity and stochastic effects in disease dynamics;
- define tools to measure the efficacy gained from the real data related to disease cases, in case of discussed application of avant-garde mosquito repellents combating diseases using nano-micro-particles on textiles, paints, and other materials.

# WORKING GROUP 2:

## STRUCTURED POPULATION MODELS AND OPTIMAL CONTROL

**Cristiana Silva**

*Working group manager*

*cjoasilva@ua.pt*

This working group focused on the creation of new mathematical models for the transmission dynamics of mosquito-borne diseases.

Different mathematical tools were used and combined to better describe the reality and improve the mathematical modeling of infectious diseases.

Some highlights:

- Creation of new mathematical models using different techniques, giving a fit analysis to real data related to mosquito-borne diseases
- Interaction with multidisciplinary teams and translate the mathematical models and optimal control strategies to concrete and comprehensible public health solutions for the use of mosquito repellents and insecticides.



# WORKING GROUP 3:

## BIOLOGICAL AND EPIDEMIOLOGICAL RESEARCH ON VECTOR BORNE DISEASES

**Cleo Anastassopoulou**

*Working group manager*

*cleoa@med.uoa.gr*

The working group investigated the effect of described avant-garde mosquito control measures, bringing scientific knowledge from laboratories and field studies together.

Some highlights:

- investigation of controls using nano and micro technology
- study of the combination between control measures with imperfect vaccines due to the recent advances to the production of vaccines.





# WORKING GROUP 4:

## CONTROL MEASURES WITH TEXTILES AND PAINT

**Christian Fischer**

*Working group manager*

*chrbfischer@uni-koblenz.*

This working group consists of scientists from academia and industry, experts from the disciplines chemistry, physics, surface and material science, textile engineering, biochemistry etc. who jointly contribute and combine their experimental and theoretical expertise here and thus contribute to the groups' progress and success.

Some highlights:

- nanomaterial based solutions and existing agents for the application of synergistic formulations were produced to examine their potential as effective mosquito control repellents.
- some examples are the textile impregnation with special nanomaterials, nano-based encapsulations for potential agent carriers and the material functionalization for better adhesion properties to attach repellent compounds.
- in laboratory mosquito tests revealed good to very good efficacies. The next steps are the verification of the textile performance and durability of the repellent activity.



# WORKING GROUP 5:

## PILOT FIELD STUDIES AND THEIR MANAGEMENT

**Elton Rogozi**

*Working group manager*

*eltonrogozi@yahoo.com*

his group was focusing in the study of the species composition and presence, biting activity of different mosquito species; evaluation on the human biting rates, as well as to determine the best testing time of each mosquito species according their biting activity and gonotrophic cycles.

Some highlights:

- Three study sites were selected and tested in Albania areas: Lushnje: Divjaka Beach and Resort, coastal area, Durres urban coastal area: and Fier: Darzeze Beach and Resort, coastal area.
- Research trial on the repellency efficacy of repellent treated textiles with *Aedes aegypti* in Cape Verde
- The study of new strategies on mosquito control and keeping their biting behavior suppressed, brought the need of drawing new techniques like the use of natural repellents, impregnated in different textiles.



# WORKING GROUP 6:

## DATA COLLECTION, COMMUNICATION AND DISSEMINATION

**Markus Schwehm**

*Working group manager*

*markus.schwehm@explosys.de*

This working group was responsible to support the communication between the members of the COST action members and to make the network visible to the outside world.

Some highlights:

- Conceptualizing, implementation and design of a folded flyer and of the imaac.eu website to attract new members to this action.
- Development of a community website for safe and controlled internal communication between members of this cost action.
- Conceptualizing and production of a short movie to disseminate the basic ideas of this action to the general public.
- Investigating the requirements for a database and web application for mosquito surveillance, which has lead to the application for an COST innovators grant







Funded by  
the European Union

This publication is based upon work from COST Action CA16227 - Investigation and Mathematical Analysis of Avant-garde Disease Control via Mosquito Nano-Tech-Repellents supported by COST (European Cooperation in Science and Technology).

COST is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

[www.cost.eu](http://www.cost.eu)