



Target Malaria: Italy

Who we are?

Target Malaria is a not-for-profit research consortium working in Africa, Europe and North America that aims to co-develop and share genetic technologies to modify mosquitoes and reduce malaria transmission. In Italy, its collaboration partner is Polo d’Innovazione di Genomica, Genetica e Biologia (Polo GGB).

Our work

Target Malaria’s vision is to contribute to a world free of malaria. Our approach focuses on controlling malaria by managing mosquito populations. Using **gene drive** technology, we aim to reduce the number of malaria-carrying mosquitoes to prevent the transmission of the disease.

We are taking a step-by-step approach by working with various strains of genetically modified mosquitoes and learning over time with our partners. Our work began with **non gene drive** genetically modified strains, focusing on sterile male and male bias mosquitoes. Our goal is to develop gene drive mosquitoes that could be used to fight malaria in Africa.

Where we operate

Target Malaria comprises institutions in Africa, Europe and North America:

- Burkina Faso: *Institut de Recherche en Sciences de la Santé* (IRSS), Bobo-Dioulasso
- Italy: *Polo d’Innovazione di Genomica, Genetica e Biologia* (Polo GGB), Terni
- Uganda: Uganda Virus Research Institute, Entebbe
- United Kingdom: Imperial College London, the University of Oxford and the Liverpool School of Tropical Medicine
- USA: Centers for Disease Control Foundation, Atlanta

PoloGGB

Polo GGB has been a Target Malaria partner since 2015. Polo GGB is a highly specialized private centre, providing research and services in the fields of diagnostics, medical genetics, ecology, genomics and bioinformatics.

The Genetics and Ecology Research Centre in Terni houses a state-of-the art-insectary, for rearing and testing genetically modified mosquitoes, including large cages that mimic the natural environment in Africa.

Our activities in Italy



Insectary & laboratory

Polo GGB's insectary is certified as Arthropod Containment Level 2 (ACL-2). This biosafety level is in line with national and international guidelines to study genetically modified mosquitoes in contained environments. Additionally, the insectary has received a favourable evaluation from the Italian Institute for Environmental Protection and Research (ISPRA), confirming its compliance with containment measures and risk assessment protocols for research activities involving genetically modified mosquitoes.

The insectary features environmentally controlled climatic chambers and large cages designed to simulate the natural environmental conditions, including variations in light (day, night, sunrise and sunset), humidity and temperature. Large cages create an optimal setting for ecological research on mosquitoes, exposing them to behaviourally-challenging conditions where they have to search for food sources, shelters and egg deposition sites while also enabling males to swarm. Those large cages also allow the testing of genetically modified mosquitoes in highly controlled settings.

Polo GGB is also developing an AI-based video-tracking systems to better characterize and quantify mosquito behaviour in the large cages.

The Polo GGB laboratory serves also as a strain repository and shipment hub to and from Target Malaria's laboratory partners in Africa, the UK and the US. The laboratory operates under the internal Quality Assurance system, and it is certified ISO 9001:2015.



Regulatory science

The Polo GGB team is responsible for assessing and characterizing the genetically modified mosquito strains. Once a strain is developed and demonstrated promising results; a series of regulatory studies are initiated to assess its efficacy and safety.

- The regulatory studies involve, for instance:
- Molecular characterization of strains
- Fertility characterization
- Assessment of life history parameters in different environmental conditions
- Stress resistance: tolerance to desiccation
- Assessment of Longevity
- Mating competitiveness
- Biting and feeding measurements
- Assessment of population suppression in large cages

A critical step in the evaluation pathway for validating the efficacy under ecologically and behaviourally complex conditions is testing candidate gene drive strains in large cages to assess their potential for reducing mosquito populations¹.

¹ Hammond, Andrew, et al. "Gene-drive suppression of mosquito populations in large cages as a bridge between lab and field." *Nature Communications* 12.1 (2021): 4589.

Our activities in Italy



Discovery

In addition to conducting regulatory science studies, Polo GGB collaborates with the discovery lab at Imperial College London to contribute to the development of gene drive strains, for instance the identification of additional target genes.

The Polo GGB team is also specialized in generating new genetically modified mosquitoes with local genetic backgrounds from potential release sites. This is achieved through mosquito embryo microinjection or introgression² (the transfer of the transgene from one genetic background to another through repeated crossings).



Stakeholder Engagement

PoloGGB is actively engaged with local stakeholders in Italy to share its research and activities. Regular Open Days provide high school or university students with the opportunity to visit laboratories and learn more about ongoing projects and technology.

² Pollegioni, Paola, et al. "Introgression of a synthetic sex ratio distortion transgene into different genetic backgrounds of *Anopheles coluzzii*." *Insect Molecular Biology* 32.1 (2023): 56-68.



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Read more on our websites:

<https://targetmalaria.org/about-us/where-we-operate/italy/>
<https://pologgb.com>