TARGET MALARIA

A Vector Control Research Alliance

From lab towards field; progress in the development of gene drive mosquitoes for vector control

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Imperial College London

Target Malaria: who we are

- A not-for-profit research consortium, including:
  - Scientists: protein engineers, molecular biologists, medical entomologists, population biologists, and social scientists
  - Risk, regulatory and community engagement advisors

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A diverse international research team

1. CDC Foundation
2. University of Oxford
3. Imperial College London
4. Polo d'Innovazione di Genomica Genetica e Biologia
5. Institut de Recherche en Sciences de la Santé (IRSS in Burkina Faso)
6. University of Ghana
7. Uganda Virus Research Institute (UVRI in Uganda)

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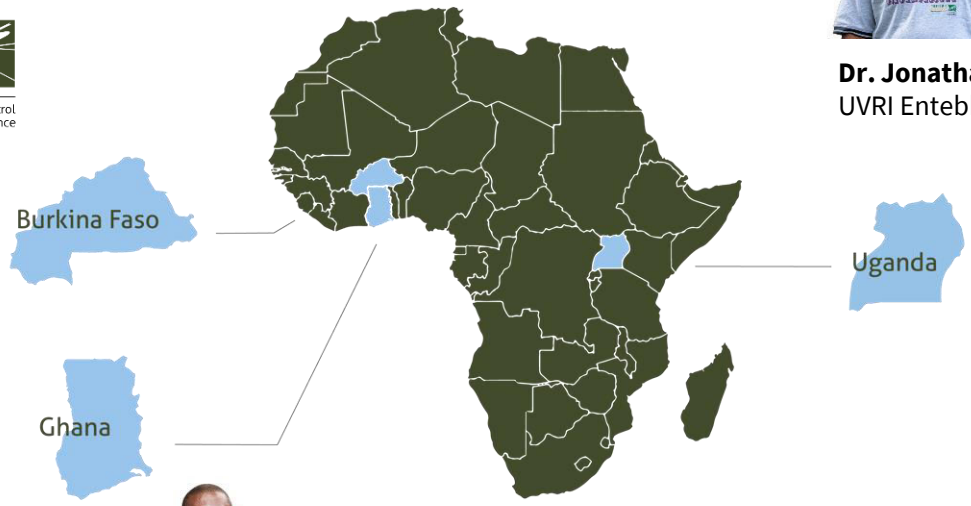
Teams in Africa

TARGET MALARIA Burkina Faso A Vector Control Research Alliance

Prof. Abdoulaye Diabaté
IRSS Bobo Dioulasso

TARGET MALARIA Uganda A Vector Control Research Alliance

Dr. Jonathan Kayondo
UVRI Entebbe



TARGET MALARIA Ghana A Vector Control Research Alliance

Dr. Fred Aboagye-Antwi
University of Ghana, Accra

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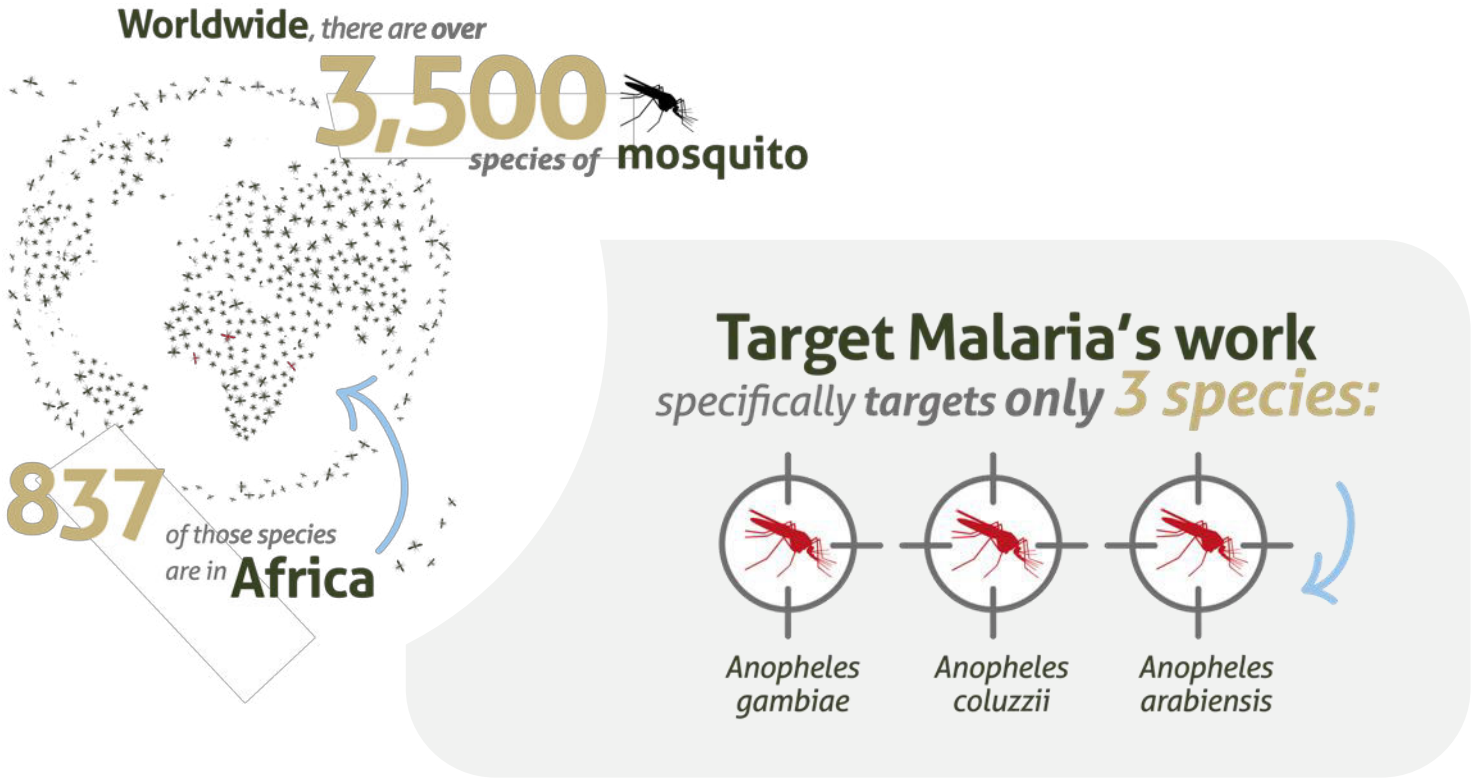
Our objectives

- **To develop and share a novel genetic technology** for vector control of *Anopheles* mosquitoes to contribute to reducing the burden of malaria in Africa
- To use an approach which is **complementary to existing methods, sustainable, long term, and cost-effective**
- To **reduce the population of the mosquitoes that transmit malaria**, and therefore reduce transmission of the malaria parasite, through genetic modification of malaria mosquitoes

A targeted approach



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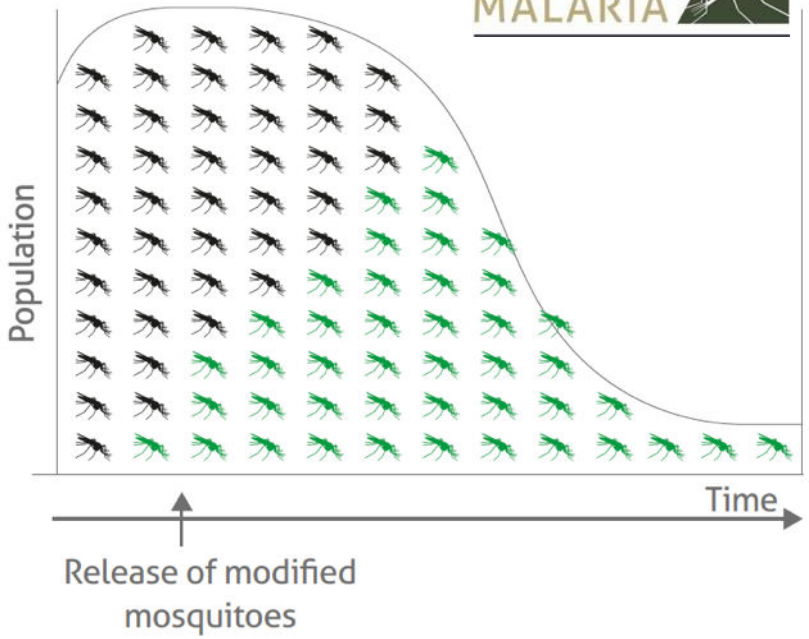
Built on three pillars

Science + **Stakeholder engagement** + **Regulatory Affairs**

Options for genetic control of mosquito-borne infectious diseases

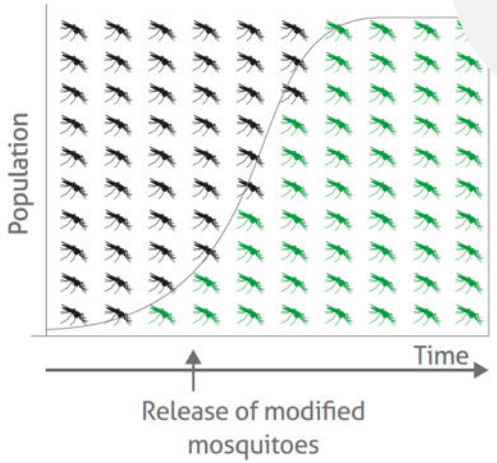
Population suppression

Releasing modified mosquitoes into the population can cause transient or permanent population suppression



Population replacement

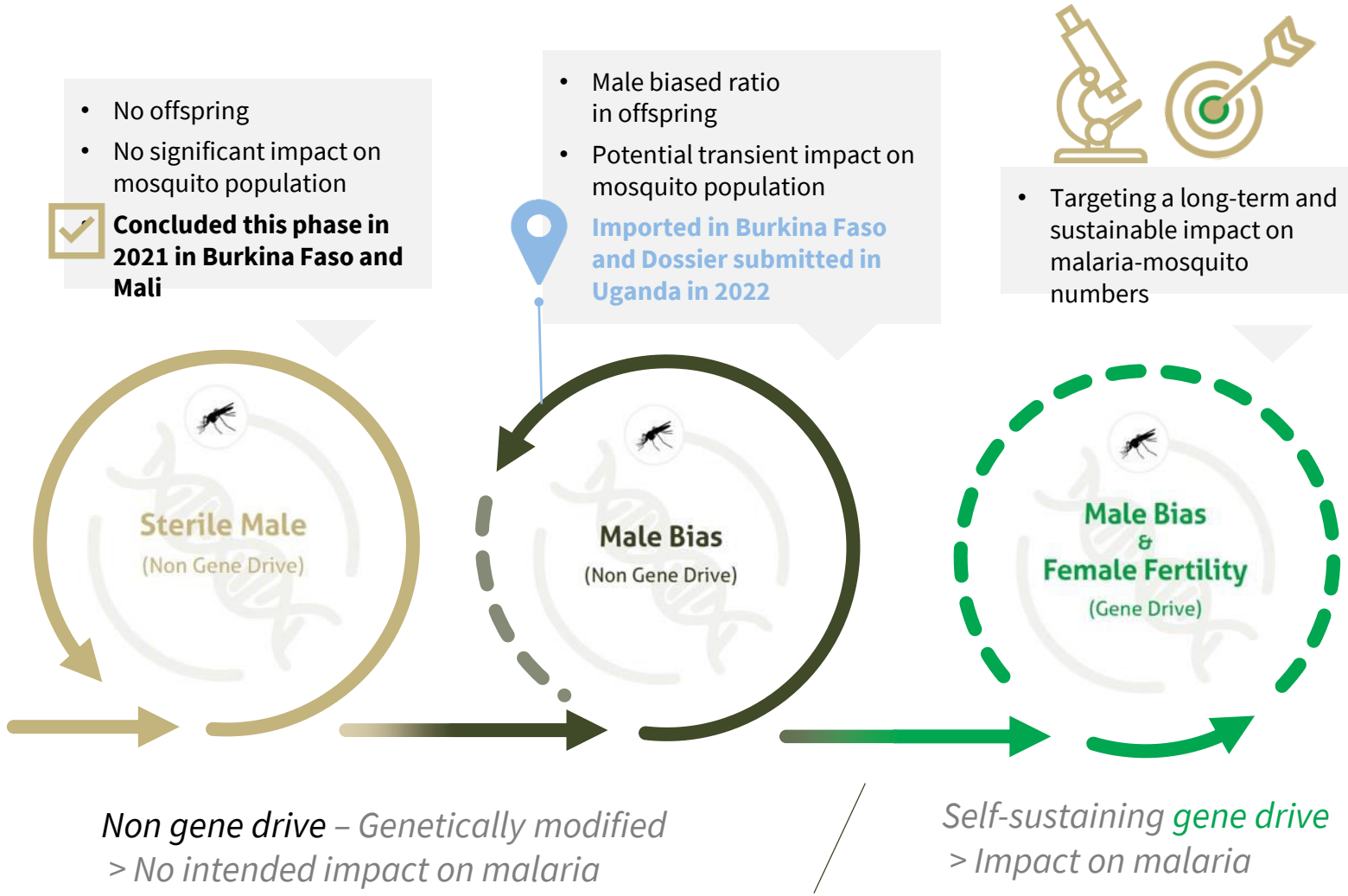
Releasing modified mosquitoes into the population can lead to the spread of a gene that blocks malaria transmission



others research projects

Gene drive can be used for **both approaches**. It allows the genetic modification to spread through a population in an efficient way.

Phased technology development



Current state of progress (2024)

Non gene drive genetically modified sterile male (**Burkina & Mali**)

- Burkina Faso imported in 2016 and concluded contained use experiments in 2018
- Burkina Faso conducted first small scale release, July 2019
- Mali imported in 2019 and concluded its contained use experiments in July 2021
- Work concluded in 2021

Non gene drive genetically modified male bias (**Burkina & Uganda**)

- Developed and ready in lab, current phase of work
- Burkina Faso has imported this strain in March 2022 for contained use experiments
- Uganda has submitted a dossier in August 2022 for contained use experiments, expecting import in 2024

Gene drive: male bias & female fertility: still in development in the lab and being tested in small and large cages.

Ecological and rearing studies (**Ghana**)

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Where is Target Malaria with **gene drive** technology?

- Target gene validated to render female mosquitoes sterile
- CRIPSR-based gene drive spreads through small and large cages of mosquitoes; successfully crashes the laboratory populations
- Gene drive female mosquito (in homozygosity) fully sterile and unable to bite
- Resistance mitigation: target gene is highly conserved, and gene drive strain has been designed to target two conserved DNA sequences within the gene to slow down resistance
- Currently validating efficacy and genetic components
- Beginning regulatory studies pathway
- Beginning to explore options for field trial designs

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Important project activities include:

- Co-development of community engagement with African communities
- Co-development of **community agreement model** for non-sterile fertile male bias GM mosquitoes
- Establishment of laboratory and insectary facilities in Africa to enable research and handling of GM mosquitoes
- Entomological and ecological surveys
- Extensive regulatory activities including:
  - Compiling dossiers for applications for importation and release of genetically modified strains (in line with the development pathway)
  - Environmental risk assessments (ERA)
  - Environmental, socioeconomic and health impact assessments (ESHIA)
  - External independent risk assessments (CSIRO)
  - Strategic Environmental Assessment scoping study (for gene drive)

- Participation in scientific conferences and international meetings to raise awareness of gene drive, and to openly disseminate our work

Acknowledgements

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BILL & MELINDA GATES foundation

Open Philanthropy Project

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