



Press Kit

Target Malaria Ghana



Introduction



Malaria, a public health risk in Ghana

Malaria is still a public health burden in Ghana. Worldwide, there are over 240 million infections and 619,000 deaths each year. It places a heavy burden on Ghana's public health and economy. 100% of Ghana's population is at risk of becoming infected with malaria.

In 2021, there were over 5,3 million cases of malaria in Ghana and there were 12,500 estimated deaths, out of the 619,000 deaths world-wide. This is according to the WHO World Malaria Report for 2022.

There have been efforts to fight the menace and these have paid off. Death from malaria world-wide has declined from 1million in 2000 to 450000 in 2015. Despite this recent progress, the efforts to confront the problem of malaria are stalling.

Existing methods to combat malaria such as insecticides treated nets, insecticides, antimalarial drugs have helped tremendously to reduce the malaria problem in Africa but unfortunately are not enough to eradicate malaria from Africa.

Various researches are carried out in order to contribute to the elimination of malaria by 2030 as advocated by WHO in its global technical strategy document for the fight against malaria 2016-2030 and Target Malaria is part of this effort.

Target Malaria

Target Malaria is a not-for-profit research consortium that aims to develop and share cost-effective and sustainable genetic technologies to modify mosquitoes and reduce malaria transmission.

When the technology is complete, it will be freely licensed for use by authorities in countries affected by malaria and where it has been approved.

The University of Ghana, Legon, is Target Malaria's partner institution in Ghana. As part of the research programme, Target Malaria has built an insectary and laboratory space to optimize infrastructure for mosquito research in a manner consistent with recognized international practices. The facility, which is located on the university campus, will be used to investigate optimal rearing conditions that enhance male mosquito fitness.

Target Malaria includes scientists, stakeholder engagement teams, regulatory affairs experts, project management teams, risk assessment specialists and communications professionals from Africa, Europe, and North America.

Key pillars of Target Malaria

There are three key pillars upon which Target Malaria's work is structured: science, stakeholder engagement and regulatory affairs. In each of those areas, we seek to attain excellence, creating a path for responsible research and development of genetic technologies. In order to succeed, our research requires the participation of the many people, as no single institution has the knowledge or research environment necessary to succeed alone. The sustainability of our research and therefore the effectiveness of our tools depend upon sharing knowledge and in investing in partnerships across disciplines and among institutions.

Biography



Dr. Aboagye-Antwi

Principal Investigator of Target Malaria Ghana and Senior Lecturer in Medical Entomology and Parasitology at the University of Ghana

Dr. Fred Aboagye-Antwi is Principal Investigator for *Target Malaria in Ghana*. He is also a Medical Entomologist at the *Department of Animal Biology & Conservation Sciences and a Senior Lecturer within the School of Biological Sciences at the University of Ghana*.

Following his undergraduate studies in Biological Sciences (Botany and Zoology) at the University of Ghana, Dr. Aboagye-Antwi pursued a Master of Philosophy (MPhil) in Zoology (Applied Parasitology) at the same university. From there, Dr. Aboagye-Antwi went on to pursue a doctoral degree (PhD) in Life Sciences (Medical Entomology) at Keele University in the UK. He also holds a postgraduate diploma in Research Methodology from Danish Bilharziasis Laboratory (DBS), Denmark.

His research interest is in water-related parasitic diseases, and a keen focus on intermediate hosts and/or vector-borne diseases. His research goal in the long haul is to describe and explain the principles underlining the wide range of complex relationships between vectors, parasites, intermediate hosts, and host.

His enthusiasm and contributions in the field of vector research, have earned Dr. Aboagye-Antwi several awards, including the Cambridge African Partnership for Research Excellence (CAPREx) postdoctoral fellowship, Roberts fund at Keele University, Ghana Education Trust Fund (GETFund) scholarship and a DANIDA Sponsorship.

With over 20 years of experience in research on parasitic infections, Dr. Aboagye-Antwi is working to pursue further knowledge in mosquito molecular genetics and genetic transformation that will enable him to make more meaningful contributions towards the control and elimination of vector borne parasitic diseases in Africa.

Since joining Target Malaria in 2018, he has been investigating the ecological consequences of reducing the population of *Anopheles* mosquitoes in malaria endemic regions. In addition, he is working on optimising protocols for rearing, transporting and releasing male *Anopheles* mosquitoes.

Recent media coverage:

<https://www.vox.com/future-perfect/23364075/future-perfect-50-target-malaria-gene-drive-mosquito>

<https://www.graphic.com.gh/features/features/why-african-scientists-are-supporting-gene-drive-research-to-fight-malaria.html>

<https://www.deutschlandfunk.de/malaria-impfstoff-gentechnik-muecke-afrika-100.html>

The University of Ghana, Legon

The University of Ghana is the first public funded university in Ghana. It is also the largest university in Ghana. It was first founded as the University College of the Gold Coast by Ordinance on August 11, 1948 for the purpose of providing and promoting university education, learning and research.

Target Malaria Ghana



The science

What is gene drive?

Gene drive is a genetic phenomenon that occurs in nature and causes a selected trait to spread rapidly through a species via sexual reproduction over several generations. Gene drive works by increasing the likelihood that a modified gene will be inherited by its offspring. Normally, genes have a 50/50 chance of being inherited, but gene drive systems could increase that chance to upwards of 99 percent. This means that over the course of several generations, a selected trait could become increasingly common within a specific species.

Researchers have been studying how to harness gene drives to solve some of society's most intractable problems for a long time. Public health and ecosystem conservation are two of the main areas where research has focused, although other uses are also possible.

What are gene drive applications in public health?

In public health, several proposals have been made which would use gene drive to limit the spread of diseases, particularly those spread by insect vectors, such as malaria, which affect several hundred million people a year. For malaria, this could be done by inserting a trait which makes the mosquitoes unable to host the malaria parasite, or one which affects the local population dynamics of the mosquitoes to reduce their numbers.

Gene drive approaches to vector control represent a potentially highly effective, long term and cost-effective tool that could, in the context of integrated approaches, help eliminate malaria.

How is Target Malaria using gene drive technology?

We aim to tackle malaria at the source. Target Malaria is using gene drive approaches to insert a modification in malaria mosquitoes that would affect the mosquito's ability to reproduce. By reducing the population of malaria mosquitoes, we aim to reduce the transmission of the disease.

Worldwide there are more than 3,500 species of mosquito, with 837 of them in Africa. Of these, a single cluster of three very closely related species are responsible for most of the malaria transmission – *Anopheles gambiae*, *Anopheles coluzzii* and *Anopheles arabiensis*.

What is the role of Target Malaria Ghana?

There are no intentions, at the moment, for Ghana to engage in any genetic or gene drive activities. Ghana's role is currently limited to two studies: to better understand the ecological role of *Anopheles gambiae* mosquitoes and to develop protocols for rearing, transporting and releasing male mosquitoes. The end goal is to support the work of Target Malaria at the global level.



Stakeholder Engagement

Stakeholder engagement is essential to Target Malaria, reflecting its core values of co-development, openness and accountability. Engagement takes various forms and has different objectives, including co-developing a better technology with stakeholders.

Part of this engagement also aims at ensuring that communities can make an informed decision about project activities and that these decisions are recorded. At each phase of our technology development, we are committed to work closely with local participating communities to ensure that no activity goes ahead without their agreement.

Why do we need communities to make informed decisions?

Target Malaria is committed to engage communities and ensure that they take part in decisions concerning our activities in their village or neighbourhood.

Ethics committees at different levels – national level, project level and partner institution level – are paying particular attention to ensure that this research is done according to ethical standards.

The institutional ethics committees review all the research protocols involving communities and individual participants, and no field activities take place without their prior approval.

What is the difference between informed consent and community agreement?

The concept of consent is well established and refers in most cases to an individual informed decision for an activity that involves a person or a household, as part of a clinical trial. When Target Malaria collects mosquitoes from individuals' bedrooms, prior informed consent is required before any activity can take place.

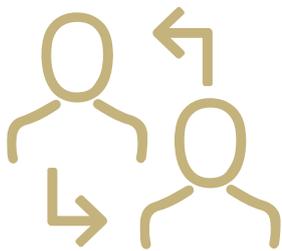
However, when considering an activity taking place at a community level, the concept of prior individual informed consent is inadequate (WHO¹, Kolopack and Lavery²). Area-wide interventions call for a different type of consultation and agreement, which is a community level informed agreement (also called authorization, Neuhaus and Caplan³).

Target Malaria seeks informed community agreement for all community level activities.

How are individuals and communities informed before they make a decision?

A process of knowledge sharing is the basis of Target Malaria's engagement strategy. This process recognises that both the project and the communities have information to share. The project provides information about the proposed activities, including potential risks and benefits, and the expectations regarding the community.

The content of this information sharing is reviewed and approved by institutional ethics committees. This process goes back and forth to ensure that all the questions and concerns from communities, as well as their own knowledge, have been taken into account and addressed by the project.



Stakeholder Engagement

How was the decision on the agreement model made?

There are many different ways of asking and recording informed community agreement. Target Malaria decided not to make the decision of what would be appropriate, but rather through engagement with communities, asked them to design what would be appropriate considering their social and cultural context. A dialogue was established early on to agree on a set of principles – transparency, inclusiveness, gender and minority representation, openness to different perspectives – and communities elaborated their agreement models. As a result, the process to reach a community decision and to record this decision varies between countries, while still following the same guiding principles.

For example, in Ghana, the communities were encouraged to establish a Community Representative Committee (CRC), representing the whole community. This CRC communicates the community's decisions to the project, after their consultation. On behalf of the community, they are in charge of signing an agreement form, accompanying the information sheet summarising the activity proposed.

In each country, the agreement model proposed is submitted to the institutional ethics committee to ensure that what is proposed is aligned with ethical principles.

On what activities do communities express their opinion?

At Target Malaria Ghana, we seek consent and/or community agreement for:

- **Entomological and ecological collections**
Target Malaria conducts a variety of entomological and ecological activities that involve collecting mosquitoes and other vertebrate and invertebrate organisms from various villages. Based on the information provided, household representatives are invited to consent for inhouse collections, and village representatives to express community agreement more broadly.
- **Mark, release and recapture activities**
At a certain stage in our research activities in Ghana, we propose to conduct small-scale releases of marked male mosquitoes. These releases take place in villages where the project has been present with field entomological collections. This mark, release and recapture is supported by the approvals received from the Ethics Committee of the College of Basic and Applied Sciences of the University of Ghana. Apart from the ethical approval from the Ethic Committee, Target Malaria also asks the communities if they approve (give community consent) the mark, release and recapture activities before they are carried out.

Factsheets



An ecological observatory to study malaria vectors

What is the ecological observatory focusing on?

The “ecological observatory” project contributes to predicting the impact of locally suppressing *Anopheles gambiae* mosquitoes, which are one of the principal vectors of malaria in Africa. The project, which started in 2018, is jointly led by the University of Ghana and the University of Oxford as part of the Target Malaria project.

The research takes place in an environment where both mosquito larvae and adult mosquitoes of the *An. gambiae* specie are present, and which is ecologically representative of the key relationships that *An. gambiae* can be expected to have in many settings.

The research studies the ecological relationships of *An.gambiae* with other species in the community including its larval competitors, adult predators and the plant species it may help pollinate. The goal is to determine the effect, if any, that the local suppression of *An. gambiae* would have on the ecological community within which it is embedded. For example, would its predators suffer from reduced food resources and might another vector of human disease occupy its ecological niche.

How do you conduct this research?

A large part of the research is about increasing our knowledge of the role and interactions that *An. gambiae* has with others in its ecological community. This requires gathering and mapping information from *An. gambiae* itself, as well as from the other species and plants it interacts with.

To do so, we collect water, insects and samples from other animals in selected sites, and we use



DNA analysis to build a careful picture of the environment in which the mosquito larvae grow, and of the species with which the adult mosquito interacts. These techniques allow us, among other things, to say for the first time exactly what predators feed on *An. gambiae*.

Using this information enables the research team to estimate what impact changing the number of *An. gambiae* would have on its ecosystem.

Why is this research important to Target Malaria?

Target Malaria is working to develop genetic technologies that is contributing to eliminate malaria in Africa, by significantly reducing the population of malaria mosquitoes that are responsible for transmitting the disease.

The project needs to understand what impact, if any, reducing the population of malaria mosquitoes would have on the environment. This is key to any decision about whether to use these genetic technologies. This is a common concern that was shared by stakeholders, from communities to regulators, and the project wants to help them make an informed decision by doing this research.

This can only be done by understanding the position of *An. gambiae* in ecological communities. This research provides information not only about possible impacts in Ghana, but also likely consequences elsewhere. It is also developing methodologies that can be replicated in other locations and applied to different control interventions.

How do you 'map' larval niches and food chains?

Typical larval breeding sites for *An. gambiae* are already known from previous work over many decades so we are able to use this information as a basis. We are complementing existing knowledge by creating a detailed profile of the species present in different sites, both microorganisms and larger organisms.

For the food web, we analyse the position of *An. gambiae* larvae in the breeding sites, but also the position of adult *An. gambiae*. For adults, current knowledge is very limited so our research will establish many new feeding relationships.

We are able to do this work thanks to new techniques for molecular identification, called 'DNA barcodes' that are specific to each species. We can identify with great precision the species present in a given community. By analysing the content of their stomach or faeces, we can also determine who eats whom.

Why is the research taking place in Ghana?

- *An. gambiae* is one of the main vector species responsible for transmitting malaria in Africa. Our research needs to be done where *An. gambiae* is present and in a setting that is as 'typical' as possible of its habitat.
- The University of Ghana has excellent expertise and track record in its faculty in vector ecology and entomology, and the ability to provide the necessary facilities for the research. In addition, there are good field sites near the University, which makes access to larvae and adults *An. gambiae* sites relatively easy.

- The outcome of the research, in particular the extensive DNA barcoding of species, provides information that can be used in other locations, allowing similar studies elsewhere in West Africa and beyond.
- The project also involves knowledge transfer and capacity building with the other teams that are part of Target Malaria. They are trained in ecological and technical skills that they can apply for research in other institutions.

Who provides oversight?

The project is subject to the oversight of the University of Ghana, including its Ethics Committee which reviews all research protocols.

In addition, we have put in place an advisory committee that provides independent guidance and advice to the project to ensure the research questions are answered to the highest standards.

Does the project affect local communities?

Target Malaria is committed to engaging with stakeholder in all project activities. A Community Liaison Officer reaches out to the populations at or near the sites to ensure that the work that takes place and that they are supportive of the research.

We do not anticipate the work of our team to directly or indirectly affect the communities working near the sites, since the activities of collection of species do not require their participation and do not modify their environment.

If the local communities oppose the work, we will not carry on our work in these communities.

This part of Target Malaria's work does not involve any genetically altered mosquitoes or other organism.



Target Malaria: Ghana

Who we are?

Target Malaria is a not-for-profit research consortium that aims to develop and share new technologies for malaria control. The University of Ghana, Legon is a collaborating partner.

Our work

Target Malaria's vision is to contribute to a world free of malaria.

Our approach is malaria control by mosquito control. By reducing the population of malaria mosquitoes, we aim to reduce the transmission of the disease.

We aim to develop a technology that can be complementary to other mosquito control methods and which offers a solution that is long term, cost-effective and sustainable.

Target Malaria includes institutions in Africa, Europe and North America. The project is currently working in three African countries:

- Ghana: University of Ghana
- Burkina Faso : Institut de Recherche en Sciences de la Santé (IRSS)
- Uganda: Uganda Virus Research Institute (UVRI)
- Researchers in the UK, US and Italy are also involved

Context

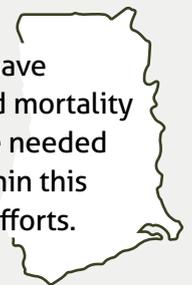
Malaria is both endemic and perennial throughout Ghana, putting the entire population at risk and placing a heavy burden on Ghana's public health system and economy.

Out of Ghana's population of 32,8 million people, 5,396,000 were infected in 2021. (WHO, World Malaria Report, 2022)



According to the WHO, out of the **619,000** people who died of malaria in 2021, **Ghana** accounted for **12,557** of them.

Current efforts to tackle malaria have reduced deaths but morbidity and mortality remains high. Additional tools are needed and Target Malaria is working within this context to complement existing efforts.



Our activities in Ghana



Insectary & laboratory

Target Malaria Ghana has built an insectary and laboratory space to enhance infrastructure for mosquito research in a manner consistent with internationally recognised practice. We will use this laboratory space to investigate optimal rearing conditions that enhance male mosquito fitness.



Stakeholder Engagement

- Inform and engage stakeholders around the insectary, in the two project communities, at the district, regional and national levels about the project activities to ensure transparency and agreement.
- Feedback to stakeholders about project progress and activities taking into account their views, opinions and concerns.
- Assuring stakeholders that their concerns are taken into consideration.



Ecological observatory

This project focuses on the community ecology surrounding *Anopheles gambiae*. It will allow the construction of quantitative ecological networks surrounding *Anopheles gambiae* and aid in making predictions regarding the impact of eliminating or reducing this species on the rest of the ecosystem. Activities include:

- Identifying and characterising niches, as well as the interactions within the niches.
- Unravelling of the role of *Anopheles gambiae* in food webs and the provision of ecological services.
- Investigating whether mosquitoes pollinate plants and which kinds of plants they pollinate.
- Using the data produced from above to predict what could happen to other life forms if malaria mosquito populations were significantly reduced.



Entomology

Mosquito Rearing and Male Fitness studies of *Anopheles gambiae* complex

This study aims to develop protocols for rearing, transporting and releasing male mosquitoes.

- Develop larval rearing conditions that maximise the survival of mass-produced *Anopheles gambiae* males.
- Test rearing protocols that boost male mating competitiveness and mate choosiness.
- Improve methods for packaging, transporting and releasing of mass-produced males to minimise negative effects on male survival and mating competitiveness.

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Read more on our webiste:

<https://targetmalaria.org/where-we-operate/ghana/>

Media



Photographies

Photographies in high resolution of Target Malaria in Ghana are available on demand. Please contact **Mr. Divine Sewornu Dzokoto**, Senior Stakeholder Engagement and Communications Officer - divinedzokoto@gmail.com



Contact us

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