

Transboundary movement

All flying insects can move across borders and frontiers, this is a natural process. Insects can travel by spontaneous flight, through winds and human assisted movements, such as in vehicles, or boats. If an insect is a pest species their entry to other countries is often regulated through the examination of cargos or commodities but spread via wind and spontaneous flight cannot be regulated in such a way. When insects cross a border they can establish populations if the right habitats and sources of food are available and if there are other insects from the same species with which they can breed. In the same manner as insects travel, the diseases they are vectors of also move across borders. This is the case for malaria. It poses great challenges for elimination.

It is the expectation that genetically modified mosquitoes would behave in exactly the same way as their non-genetically modified counterparts. International responsibilities under the Cartagena Protocol on Biosafety place an obligation on the government which authorised the release to consult other neighbouring countries to enable them to decide on appropriate responses and actions.

In July 2019, Target Malaria conducted a small-scale release of genetically modified sterile male mosquitoes (not gene drive strain) in Burkina Faso. The team then collected specimens and monitored the population of mosquitoes after the release for over 6 months. This release had a number of objectives, including investigating their short-term survival and how the mosquitoes could disperse locally from the single point of release. This localised, short-term study did not involve transboundary movement. In addition, prior to the release the project conducted Mark, Release and Recapture¹ studies to investigate local dispersal.



Long distance travel by mosquitoes

Many flying insects have been shown to move long distances on air currents, principally in the adult stages. The consequences of this movement depend on their survival during flight and on the conditions and the suitability of the environment where they land. The capacity of an insect species to establish by means of dispersal at other life stages, such as eggs or larvae, varies widely.

Certain species of mosquitoes in the *Anopheles* genus have eggs that are highly susceptible to drying, while others, such as of the *Aedes* genus, for example, have eggs which are more resistant. Genetic analysis of populations can give clues on the historical capacity of different species to establish and spread over long distances.

The capacity for long distance travel for a genetically modified mosquito is expected to be similar to that of a wild type mosquito of the same species.

¹ Video explaining Mark, Release and Recapture: <https://youtu.be/EulEbtR1Sz4>

Regulating the release of new organisms in the environment

Target Malaria is working with African national regulatory authorities to share information and request permissions at every step of the research process. Our teams are following the procedures established by national legislation related to applications for release of new organisms into the environment to ensure compliance. As well as with the national legislations, the project is working to ensure compliance with emerging recommendations from regional bodies, such as the African Union, regarding the implementation of regional policy initiatives on gene drives for malaria control.

The first point of contact on matters of biosafety relevant to gene drive mosquitoes is the national Competent Authority for Biosafety in the territory where a release of a gene drive mosquito may occur. That national Competent Authority also defines the relevant regulatory processes that a regulatory dossier will be reviewed by.

The Cartagena Protocol on Biosafety (CPB) to the Convention on Biological Diversity (CBD) manages transboundary issues

The Cartagena Protocol on Biosafety was originally conceived to deal with transboundary issues as a function of trade in genetically modified agricultural commodities. The implementation of the Protocol is of great importance in the management of risks linked to transboundary movements of "Living Modified Organisms (LMO)", such as Target Malaria's gene drive mosquitoes.

The national implementation of the provisions of the Cartagena protocol and the use of the Biosafety Clearing House, for example, represent some of the tools to ensure that risks due to transboundary movement of any LMO can be managed within a regional and international context.

Proceeding with an intentional release across borders of LMOs requires national regulatory approval in each country where the releases are meant to occur. The national Competent Authority for Biosafety in the territory where a gene drive mosquito or its offspring may be expected to disperse will define the relevant regulatory processes.

Sharing information among countries about gene drive mosquitoes

Genetically modified mosquitoes can be distinguished from wild type mosquitoes in a population because of their unique genetic composition, and can be identified by molecular analysis of DNA extracts of collected specimens or by their phenotype in a laboratory.

Regional Harmonization in Africa

The African Union High Level Panel on Emerging Technologies (APET) in May 2020 issued a report on Gene Drives for Malaria Control and Elimination in Africa² that recommends a risk-benefit approach and regional harmonisation of policy and implementation of gene drive technologies, as well as early engagement with stakeholders³.

Target Malaria encourages discussions between neighbouring countries on risk management to address the potential for harmonisation of regional tools and strategies to manage the potential transboundary movement of gene drive mosquitoes and to explore if acceptable strategies can be developed to the satisfaction of all parties.

2 www.nepad.org/publication/gene-drives-malaria-control-and-elimination-africa

3 www.cbd.int/doc/decisions/cp-mop-09/cp-mop-09-dec-13-en.pdf