

## Meeting of the external group (EG) for the assessment of new technologies to control *Aedes*, 5-6 December 2017, Washington, D.C.

### Executive report

#### Objectives and goals

With the objective of creating an external group (EG) on “new technologies to control *Aedes* mosquitos,” PAHO/WHO hosted a meeting on 5 and 6 December 2017 at the Organization’s headquarters in Washington, D.C., with a total of 25 participants. This initial meeting included PAHO/WHO personnel, producers and developers of new technologies, and representatives of non-profit organizations, universities, and research institutions in the United States, Brazil, Mexico, United Kingdom, and Colombia. The meeting reviewed the latest findings and evidence generated by pilot studies, evaluating new technologies for control of *Aedes* vectors in the Region of the Americas.

The purpose of the meeting was to exchange data and information on new technologies, and to discuss options and methods for evaluating those tools, with an emphasis on those recommended by the WHO Vector Control Advisory Group (VCAG). In open sessions, principal investigators involved in the development of new technology were invited to present evidence and information on the successes and challenges of existing innovative methods for mosquito control.

The EG is composed of internationally recognized researchers in fields such as ecology, epidemiology, and vector-borne disease control. The group was created at the recommendation of the PAHO Technical Advisory Group on Public Health Entomology and Vector Control. In the Americas, the EG complements WHO-VCAG as an independent group whose main objective is to provide support and advisory services to PAHO and its Member States for the evaluation of new and additional tools for vector control.

The expected results of this meeting were to review and discuss findings and advances in the pilot study now underway in the Americas, based on these new technologies. In order to provide technical support for the countries of the Region, a proposed methodological instrument for characterizing and monitoring implementation and evaluation of the pilot studies was also reviewed and discussed.

#### Open sessions: state of the art of these new technologies in the Region of the Americas

Four innovative approaches to *Aedes* mosquito-borne disease control were presented: the release of females or males infected with the *Wolbachia* bacterium; the use of genetically modified mosquitoes (Oxytec’s OX513A technology); the sterile insect technique (SIT); and auto-dissemination by autocidal mosquitoes, using Pyriproxyfen, an analog of the juvenile hormone.

Field studies on the release of mosquitoes infected with *Wolbachia*, at various scales and in different stages of progress, are being implemented and evaluated in Brazil, Colombia, Mexico, and the United States. Pilot studies on interventions involving replacement of the mosquito population (release of females and males infected with the *Wolbachia* bacterium) have also been in implementation since 2017 in Rio de Janeiro (Brazil) and Medellín (Colombia), in areas with populations of between 250,000 and 2.5 million. The study directed by the Brazilian Oswaldo Cruz Foundation (FIOCRUZ), under the auspices of the World Mosquito Program (previously the Eliminate Dengue Project), is one of the most advanced projects of its kind. Preliminary results point to a possible reduction of dengue cases in the areas of intervention, in comparison with the control areas. However, further analysis and evidence of this achievement is needed. Pilot studies with this approach are also in progress in Medellín, Colombia.

Other studies that release male *Aedes aegypti* mosquitoes infected with *Wolbachia* are underway in Mexico. In a collaboration between Michigan State University (MSU), in the United States, and the State University of Yucatán (UADY) and the government of the state of Yucatán, in Mexico, initial research is being conducted through baseline entomological studies. The mass release of mosquitoes will begin in 2018, once the facilities are ready.

A similar strategy is being implemented in the United States, where the release of male *Aedes albopictus* mosquitoes infected with *Wolbachia* has been approved by the Environmental Protection Agency (EPA) for commercial use in 20 states, and approval for similar work with *Aedes aegypti* is expected to be given in the next few years. Field study results in the state of Kentucky showed that weekly release of 10,000 male mosquitoes infected with *Wolbachia*, from a release point, was eliminating up to 70% of the wild-mosquito population.

The best known example of the use of genetically modified male mosquitoes is the technology developed by the British company OxYTEC with the *Aedes aegypti* OX513A strain. In a number of countries, this technology has been found to suppress the mosquito population by between 92% and 99%. Tested for the first time on Grand Cayman Island in 2007, the technology has been available since 2002. Pilot studies are currently being carried out in the United States and Brazil.

Based on experience with the sterile insect technique (SIT) for agricultural pest control, which is also of importance in the veterinary field, this technology appears to be a promising strategy for mosquito control, and important for public health. Although several improvements are in development for the mass production of mosquitoes, and for *Aedes Aegypti* in particular, the use of this technology for large-scale mosquito control is still in an early stage. Next year, with support from the International Atomic Energy Agency (IAEA), pilot studies using SIT are scheduled, in order to evaluate local strains for the control of *Aedes aegypti* in Brazil, Mexico, and Cuba.

The use of autocidal mosquitoes to transport and administer direct lethal doses of Pyriproxyfen to *Aedes albopictus* and *Aedes aegypti* breeding sites has also shown potential as yet another strategy to control these species. Small-scale field studies in the United States have shown reductions of 75% in the adult female mosquito populations of Los Angeles, California. In Brazil, this intervention showed a similar reduction in pilot areas, where the per capita number of female *Aedes* was reduced by as much as 93% to 97%.

Lastly, the meeting reviewed some regulatory aspects of the use of genetically modified mosquitoes, particularly issues related to risk assessment analysis, using the OX513A *Aedes aegypti* technology as an example.

#### **Closed sessions: members of the PAHO External Evaluation Group**

Members of the PAHO and WHO Secretariat and External Group discussed a document containing a proposed instrument for evaluating pilot studies of new technologies. The instrument was designed to guide decision-makers in the implementation of these new technologies, and in aligning and ordering the process of evaluating and monitoring their impact. Through PAHO, the instrument will be available to any country in the Region interested in implementing pilot studies; it can also be used to evaluate the sustainability of these tools in places where pilot studies are already being carried out.

The EG decided it was important to have a standardized instrument to support the process of evaluating the new technologies, and issued its technical recommendations, which are being incorporated into the final document. It also proposed work plans for 2018. In 2018, PAHO will make available to the countries the updated and revised guide, as well as providing technical support to evaluate the implementation and

monitoring of pilot studies, whether at a country's request or when PAHO believes such activity to be of benefit to the Region.

Also in this session, members of the EG shared their observations on the progress and challenges of the new technologies, elected a coordinator, and scheduled an initial (virtual) working meeting in 2018.

### Conclusions and recommendations

The following general challenges in the use of the new technologies were identified, along with corresponding recommendations for implementation:

1. *These technologies should be integrated with other mosquito control methods currently in use.* Current mosquito control methods have been proven to have satisfactory results when used properly. Technologies based on the mass release of mosquitoes, and other complementary technologies, are more effective—or only work—when there are low levels of wild mosquito populations. The combination of new technologies with other traditional control methods could make interventions less costly and more effective.
2. *Collaboration with local governments.* Although new technologies are now available and some are in advanced stages of development (with standard operating procedures, quality management systems, and even automated processes to improve the mass production and large-scale release of mosquitoes), collaboration with local governments is essential for their implementation. Training, technical and logistic support, and advice on use of these technologies are essential (along with support to governments for capacity-building) both prior to production and during implementation.
3. *Social participation.* Although the new technologies have been proven safe for human beings and the environment, and despite the fact that some countries have given technical approval for their safety in commercial and operational use, there is very little knowledge about the scope of these technologies at the community level. The average person does not understand how these new technologies work, and distinguishing between them can be confusing. As a result, it is essential to work with communities and determine how to communicate the possible benefits of these technologies before implementing them.

The meeting achieved the following specific objectives: (i) reviewing and updating the new *Aedes* control technologies that have been implemented in the Region of the Americas; (ii) reviewing the first draft of the document proposing an instrument for evaluating pilot studies of new technologies; and (iii) creating an expert group capable of providing technical support to countries interested in implementing these new technologies in the form of pilot studies.