



**Pan American  
Health  
Organization**



**World Health  
Organization**

REGIONAL OFFICE FOR THE **Americas**



**PAN AMERICAN  
HEALTH  
ORGANIZATION**



**World Health  
Organization**

REGIONAL OFFICE FOR THE **Americas**

**Haroldo Bezerra, Regional Advisor  
Public Health Entomology  
PAHO/WHO – WDC**

**Global Health Consortium GHC/ 8<sup>th</sup> Internacional Conference on Global Health**

**Arbovirus in Latin America and the Caribbean: Strategies and challenges for  
prevention and control**

**Miami - May 23, 2018**

**\*\*\*\*\***

**Integrated Vector Management/IVM: a regional  
perspective**

# Contents

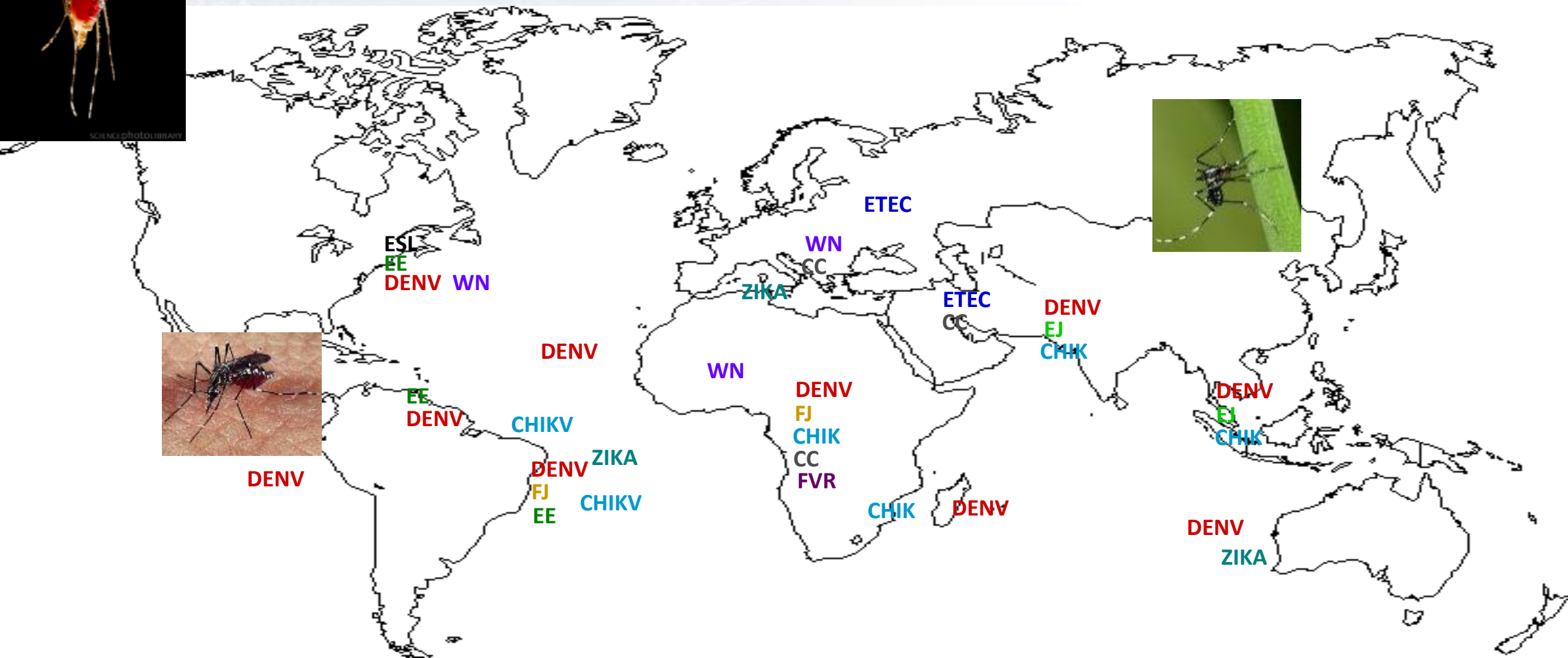
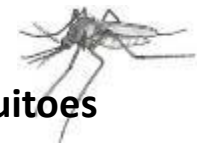
- **Background**
- **Key elements of IVM**
- **Progress and challenges in the implementation of IVM**
- **Next steps**

# Arboviruses



+500/arboviruses  
110 pathogenic to humans

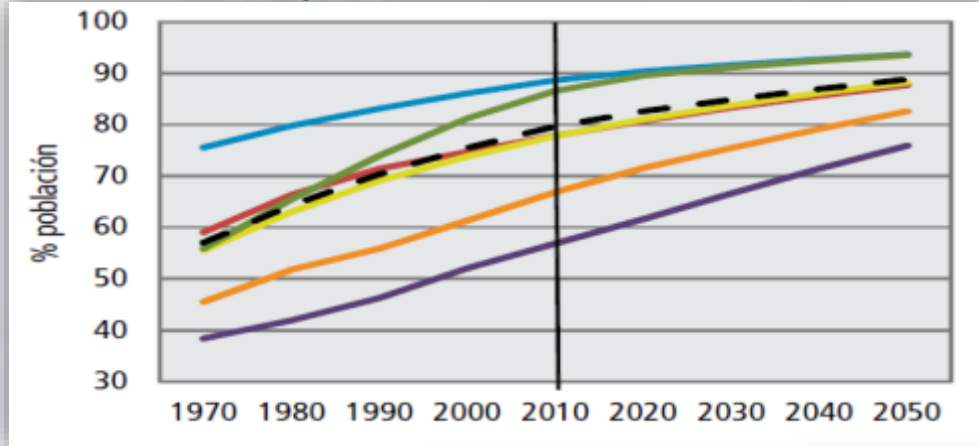
265 transmitted by mosquitoes



Adapted - Anna-Bella Failloux 2014

# Vector-Borne Diseases (VBD) in the Region of the Americas

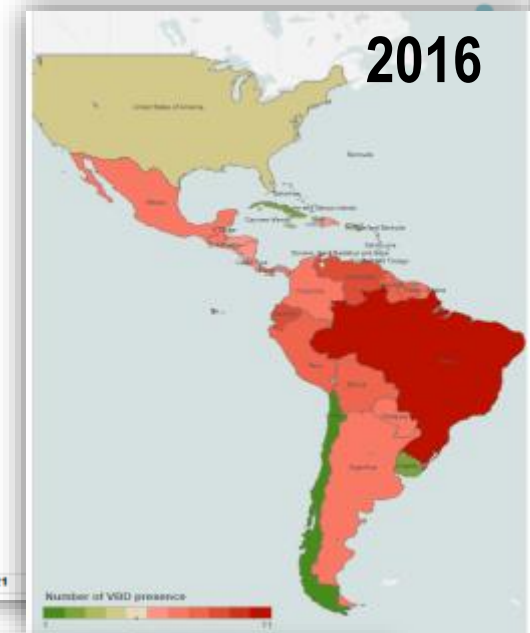
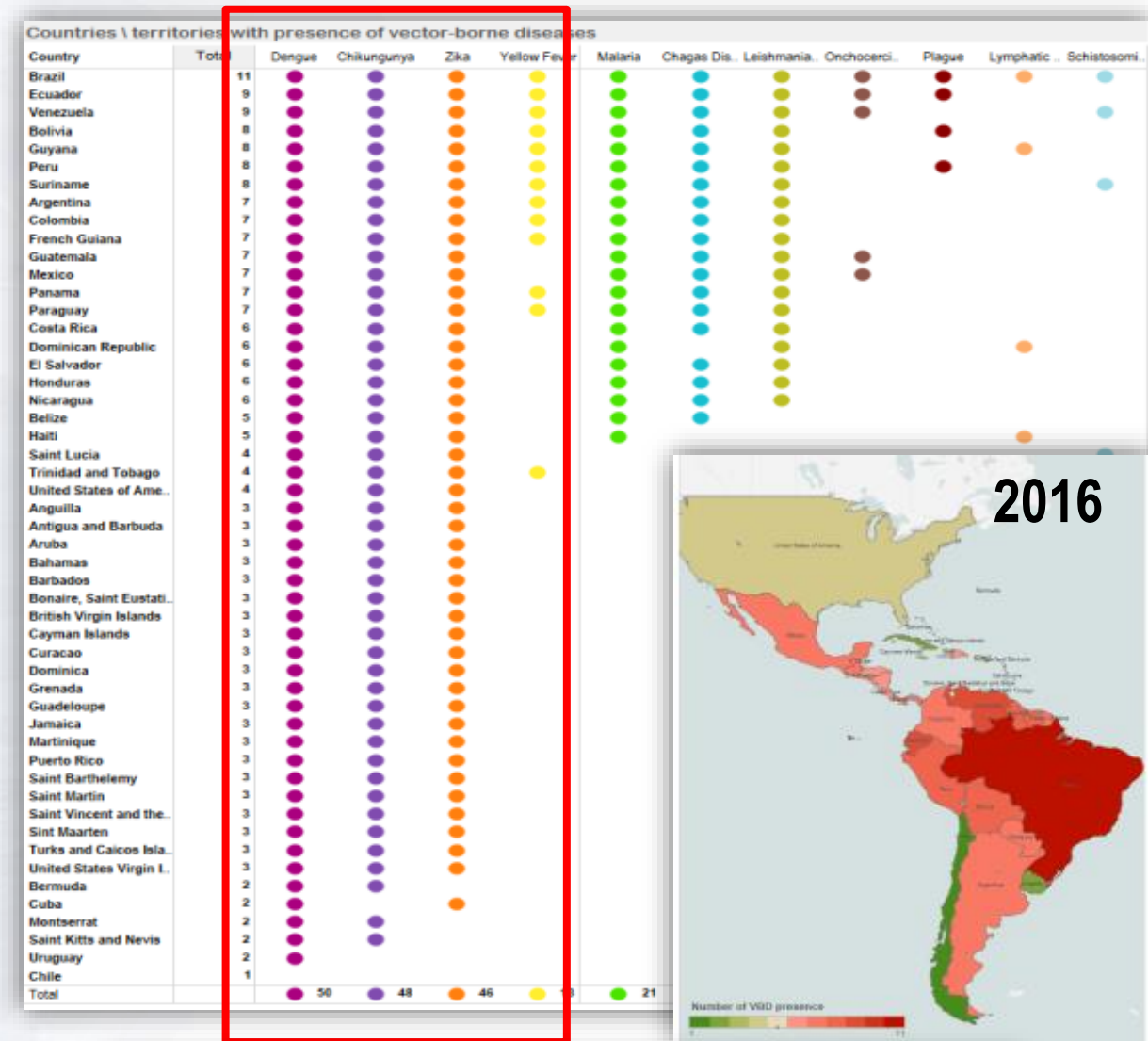
## Evolution and projection of urbanization rates 1970-2050 / Latin America and the Caribbean



Eradication of *Aedes aegypti* in the Americas as a vector for YF 1947-1970



- Lack of specialized human resources
- Lack of quality control
- Inadequate impact evaluations
- Little engagement outside of the health sector



# Vector-Borne Diseases & Integrated Vector Management

## CD55.R7 – PAHO/WHO 2016



### 55.º CONSEJO DIRECTIVO

68.ª SESIÓN DEL COMITÉ REGIONAL DE LA OMS PARA LAS AMÉRICAS

Washington, D.C., EUA, del 26 al 30 de septiembre del 2016

CD55.R7  
Original: inglés

#### RESOLUCIÓN

CD55.R7

PLAN DE ACCIÓN PARA LA ELIMINACIÓN DE LA MALARIA 2016-2020

PLAN DE ACCIÓN PARA LA ELIMINACIÓN DE LA MALARIA 2016-2020

## CD55.R9 – PAHO/WHO 2016



### 55.º CONSEJO DIRECTIVO

68.ª SESIÓN DEL COMITÉ REGIONAL DE LA OMS PARA LAS AMÉRICAS

Washington, D.C., EUA, del 26 al 30 de septiembre del 2016

CD55.R9  
Original: inglés

#### RESOLUCIÓN

CD55.R9

PLAN DE ACCIÓN PARA LA ELIMINACIÓN DE LAS EID Y LAS MEDIDAS POSTERIORES A LA ELIMINACIÓN 2016-2022

PLAN DE ACCIÓN PARA LA ELIMINACIÓN DE LAS EID Y LAS MEDIDAS POSTERIORES A LA ELIMINACIÓN 2016-2022

## CD55.R6 – PAHO/WHO 2016



### 55.º CONSEJO DIRECTIVO

68.ª SESIÓN DEL COMITÉ REGIONAL DE LA OMS PARA LAS AMÉRICAS

Washington, D.C., EUA, del 26 al 30 de septiembre del 2016

CD55.R6  
Original: español

#### RESOLUCIÓN

CD55.R6

ESTRATEGIA PARA LA PREVENCIÓN Y EL CONTROL DE LAS ENFERMEDADES ARBOVIRALES

ESTRATEGIA PARA LA PREVENCIÓN Y EL CONTROL DE LAS ENFERMEDADES ARBOVIRALES

## CD48.R8 – PAHO/WHO 2008



### 48.º CONSEJO DIRECTIVO

60.ª SESIÓN DEL COMITÉ REGIONAL

Washington, D.C., EUA, del 29 de septiembre al 3 de octubre del 2008

CD48.R8 (Esp.)  
ORIGINAL: INGLÉS

#### RESOLUCIÓN

CD48.R8

EL CONTROL INTEGRADO DE VECTORES: UNA RESPUESTA INTEGRAL A LAS ENFERMEDADES DE TRANSMISIÓN VECTORIAL

El control Integrado de vectores: Una respuesta integral a las enfermedades de transmisión vectorial

# Integrated Vector Management (IVM)



ORGANIZACIÓN PANAMERICANA DE LA SALUD  
ORGANIZACIÓN MUNDIAL DE LA SALUD



## 48.º CONSEJO DIRECTIVO 60.ª SESIÓN DEL COMITÉ REGIONAL

Washington, D.C., EUA, del 29 de septiembre al 3 de octubre del 2008

CD48.R8 (Esp.)  
ORIGINAL: INGLÉS

### RESOLUCIÓN

#### CD48.R8

#### EL CONTROL INTEGRADO DE VECTORES: UNA RESPUESTA INTEGRAL A LAS ENFERMEDADES DE TRANSMISIÓN VECTORIAL

#### EL 48.º CONSEJO DIRECTIVO,

Habiendo examinado el informe de la Directora, *El control integrado de vectores: una respuesta integral a las enfermedades de transmisión vectorial* (documento CD48/13), en el cual se propone que los Estados Miembros aborden áreas comunes de trabajo para combatir las enfermedades de transmisión vectorial mediante el fortalecimiento de la capacidad nacional para lograr la óptima utilización de los recursos destinados a esta finalidad a fin de mejorar la eficacia y la eficiencia de los programas nacionales de control de vectores;

## Key elements of IVM

1. Advocacy, social mobilization and legislation.
2. Collaboration within the health sector and with other sectors.
3. Integrated approach (non chemical and chemical).
4. Evidence- based decision making.
5. Capacity building.

# Vector Borne Diseases today: what has changed?

- Increasing the risk of **spreading vector-borne diseases (VBD)** requires strengthening international, intersectoral and interdisciplinary coordination.
- The efforts of the **Countries, PAHO, WHO and other partners** to strengthen the integrated analysis of the entomological and epidemiological information for decision making.
- The importance of the implementation of **Integrated Vector Management (IVM)** to reduce the risk of transmission of VBD.





# Regional Program of Public Health Entomology and Vector Control



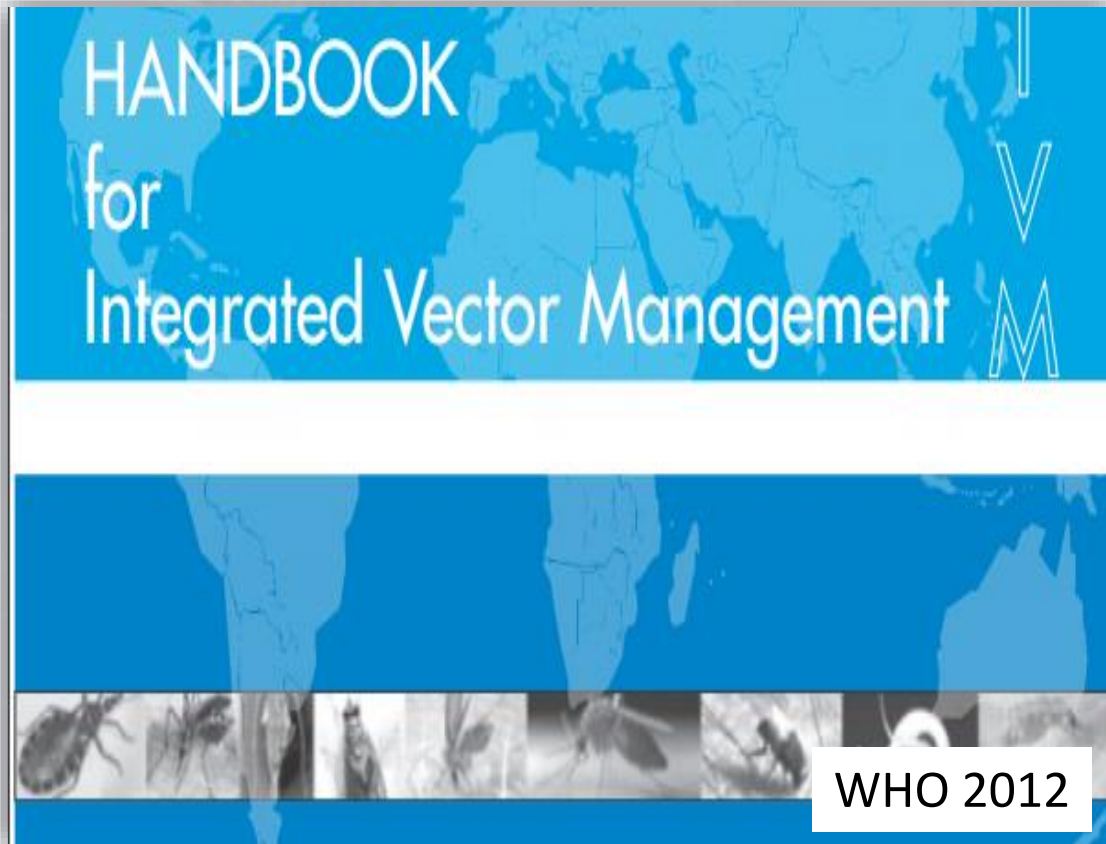
## **Priorities** of the Regional Program of Public Health Entomology and Vector Control de la PAHO/WHO

Strengthening the Practice of the Entomology in Public Health

Review, update and implement Integrated Vector Management (IVM)

Establish a surveillance and management system for insecticide resistance

## ONGOING PROGRESS (I)



- Review, update and adaptation of IVM:
  - Development of new operational guidelines adapted for the Americas
  - Validation of guidelines contents with specialists and professionals from the countries

## ONGOING PROGRESS (II)



Trained human resources and the community:

- Trained expert groups updated to provide technical support as required by countries (entomology and vector control).
- Training in the rational use of insecticides and equipment for the application of insecticides – UNESP/NECE
- Mosquito Awareness Week, 2016-2018

# Mosquito Awareness Week, 2016-2018



Google Custom

Temas | Programas | Prensa | Publicaciones | Datos | Países y Centros | Cuerpos Directivos | Acerca de OPS

## SEMANA DE ACCIÓN CONTRA LOS MOSQUITOS

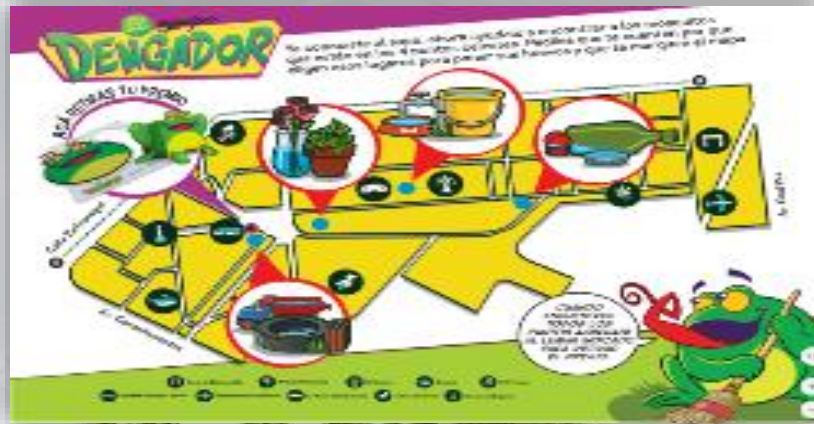
### Semana de acción contra los mosquitos

*busca promover la educación, concientización y participación comunitaria sobre el control vectorial y evitar las picaduras de mosquitos*

<https://www.paho.org/maw>



# Mosquito Awareness Week, 2016-2018



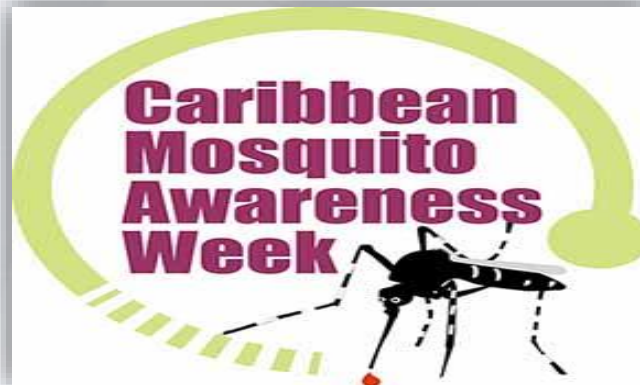
Argentina



Panamá



Bolivia



<https://www.paho.org/maw> Caribe



Chile

## ONGOING PROGRESS (III)

- Establishment of the regional network of monitoring and management of resistance to insecticides.

Participant countries:

**Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, French Guyana, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Suriname and Uruguay**

- Manual of procedures for the evaluation of resistance to Insecticides used in public health.

- Elaboration of national plans for the monitoring and management of insecticide resistance (9 countries)**

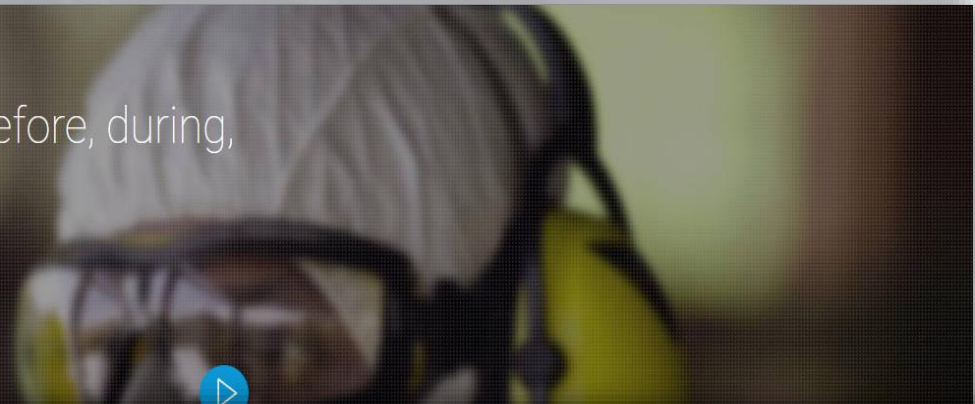


# ONGOING PROGRESS (IV)

VIDEO 1

Protection and security before, during, and after insecticide use

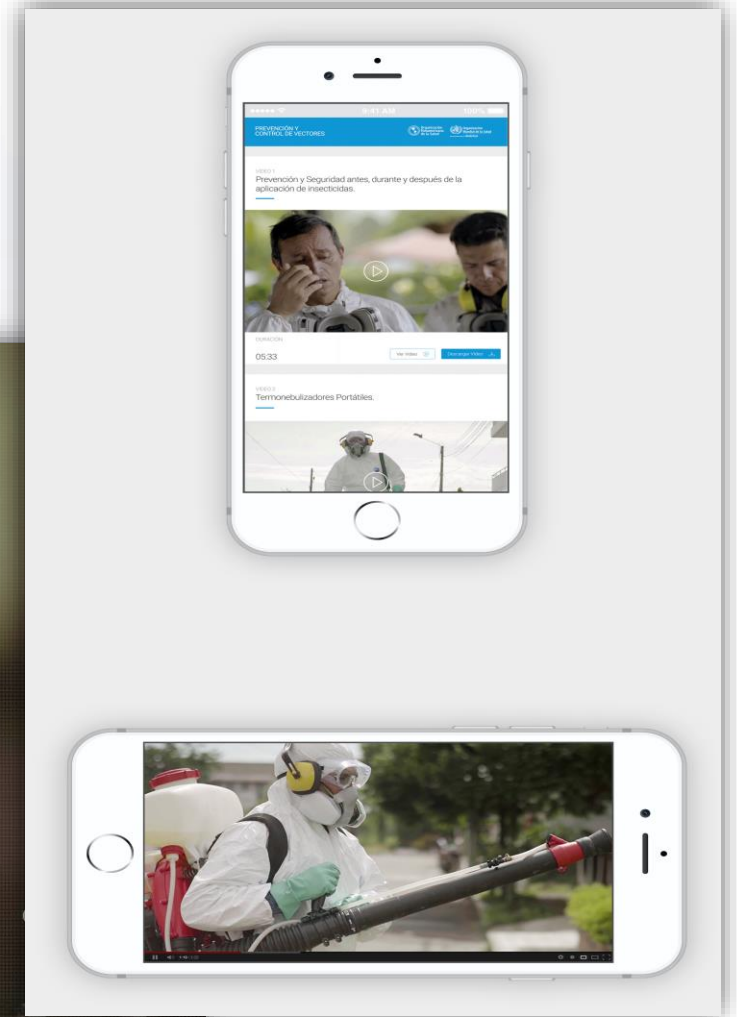
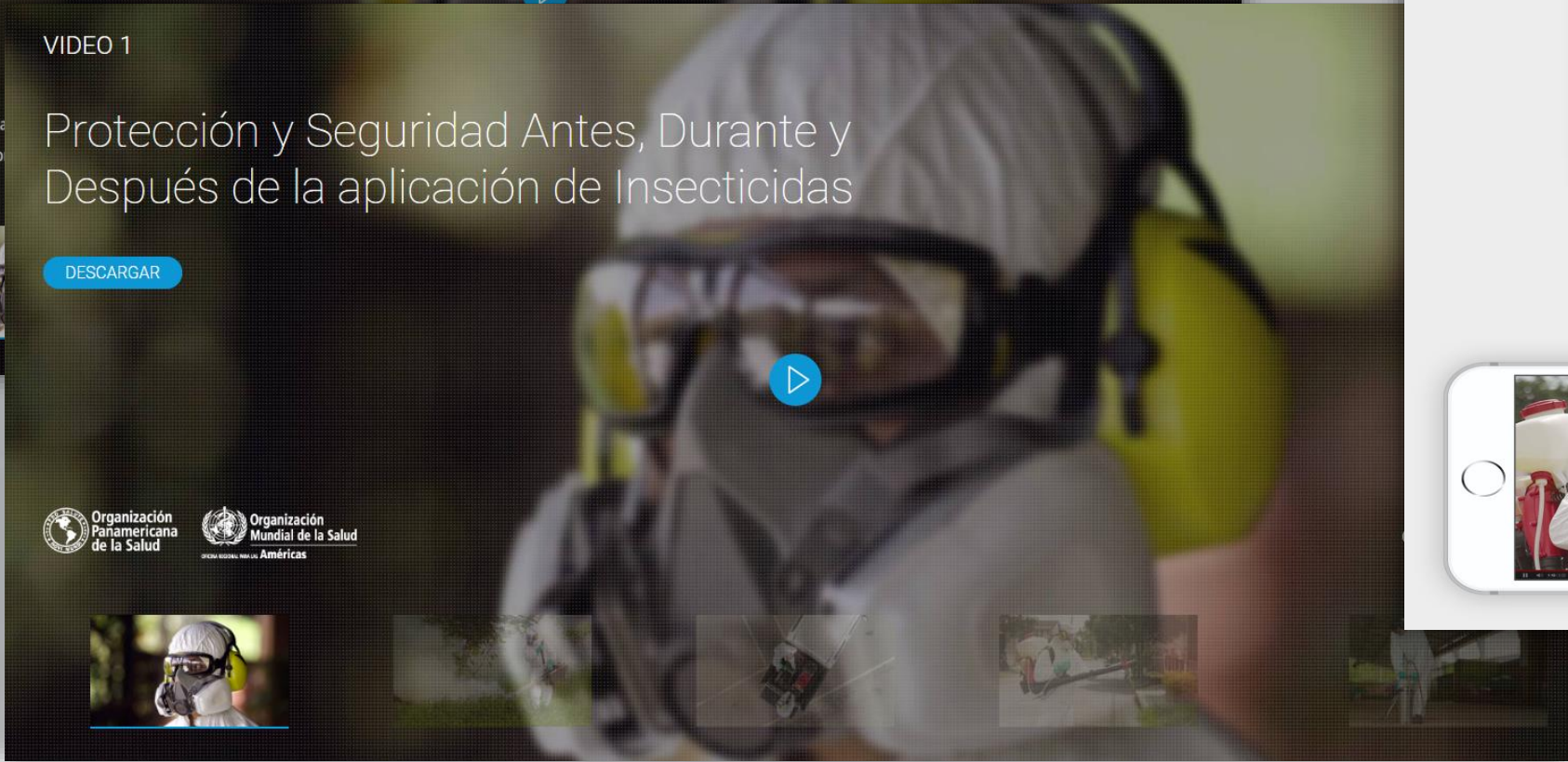
DOWNLOAD



VIDEO 1

Protección y Seguridad Antes, Durante y Después de la aplicación de Insecticidas

DESCARGAR



# ONGOING PROGRESS (V)

- Implementation of Good Laboratory Practices (GLP) using global standards through reference laboratories in the Americas, including FIOCRUZ (BRA), CIPEIN (ARG), *U. Autónoma de Yucatán* (MEX) and the Regional Center on Public Health Research/National Institute of Public Health of Tapachula, in Chiapas (MEX).
- Transfer of technology for the production of insecticide-impregnated papers in CIPEIN and FIOCRUZ. In coordination with WHO and the University of Sains in Malaysia.

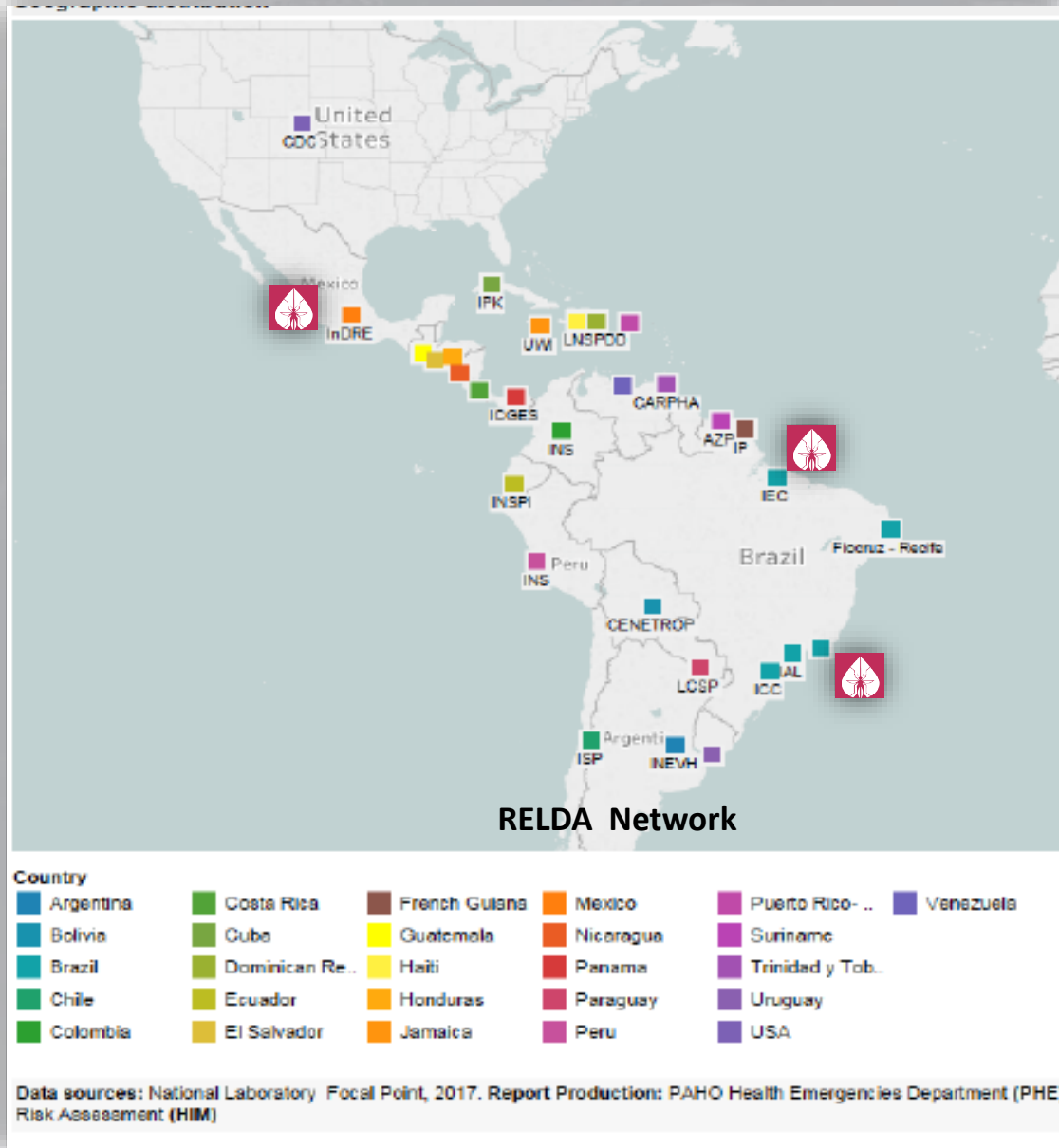
**GLP accreditation of test sites**  
(WHO & IVCC)

Region	Site	Current testing capabilities					
		Products	Phases				
<b>IVCC to lead</b>	<b>West Africa</b>	Institut Pierre Richet, Institut National de Santé Publique, Cote d'Ivoire	LLIN IRS	1	2	3	
		Institut de Recherche en Sciences de la Santé, Centre Muraz, Bukina Faso	LLIN IRS	1	2	3	
		CREC, Cotonou (in collaboration with LSHTM), Benin	LLIN IRS	1	2	3	
		Centre Suisse de Recherches Scientifiques en Cote d'Ivoire, Cote d'Ivoire	LLIN IRS	1	2	3	
<b>IVCC to lead</b>	<b>East Africa</b>	Kilimanjaro Christian Medical University College, Moshi, Tanzania	LLIN IRS	1	2	3	
		Ifakara Health Institute, Bagamayo, Tanzania	LLIN IRS	1	2	3	
		National Institute for Medical Research, Muheza, Tanzania	LLIN IRS	1	2	3	
<b>WHO to lead</b>	<b>Western Pacific</b>	Vector Control Research Unit, USM, Penang, Malaysia	SS	Larv	2	3	
		Institute for Medical Research, Kuala Lumpur, Malaysia	SS	Larv	2	3	
		Centre for Disease Control, Beijing, China	SS	Larv	2	3	
		Environmental Health Institute, Singapore					
<b>WHO to lead</b>	<b>South East Asia</b>	WHO CC - National Institute of Malaria Research, Delhi, India	LLIN IRS	Larv	1	2	3
		WHO CC - Vector Control Research Centre, Puducherry, India	LLIN IRS	Larv	2	3	
<b>WHO to lead</b>	<b>Americas</b>	Oswaldo Cruz Foundation, Fiocruz, Rio de Janeiro, Brazil					
		Centro Regional de Investigación en Salud Pública, Tapachula, Mexico					
		Universidad Autónoma de Yucatan, Merida, Yucatan, Mexico					
<b>WHO to lead</b>	<b>European</b>	Centro de Investigaciones de Plagas e Insecticidas, Buenos Aires, Argentina					
		IRD, Montpellier, France	LLIN SS IRS Larv	1			





# ONGOING PROGRESS (VI.a)



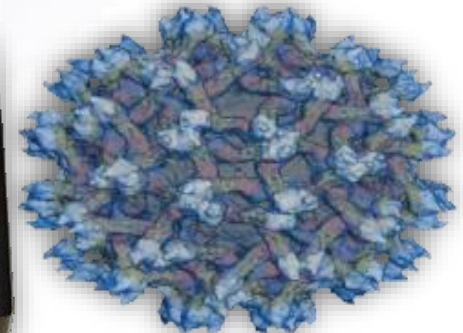
## Detection of virus in mosquitoes



References laboratories for entomo-virologic surveillance



Laboratories that had been implemented viral detection in mosquitoes



# ONGOING PROGRESS (VI.b)

## Training Workshops

### First workshop, Belen,Sep 2017

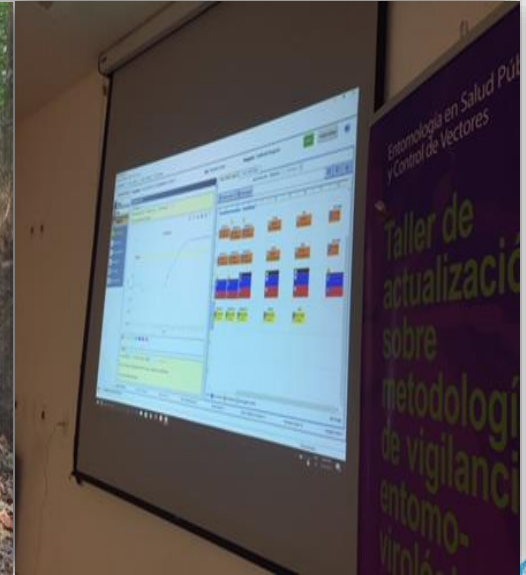
- Argentina(INEHV),
- Brasil( LACEN Bahia, Lacen FIOCRUZ Rio, IAL SP, IEC),
- Mexico ( InDRe, ISP),
- Nicaragua(CNDR),
- Panama( ICGES),
- Paraguay(SENPEA),
- Peru(INS)

### Second workshop, Mexico, InDRe

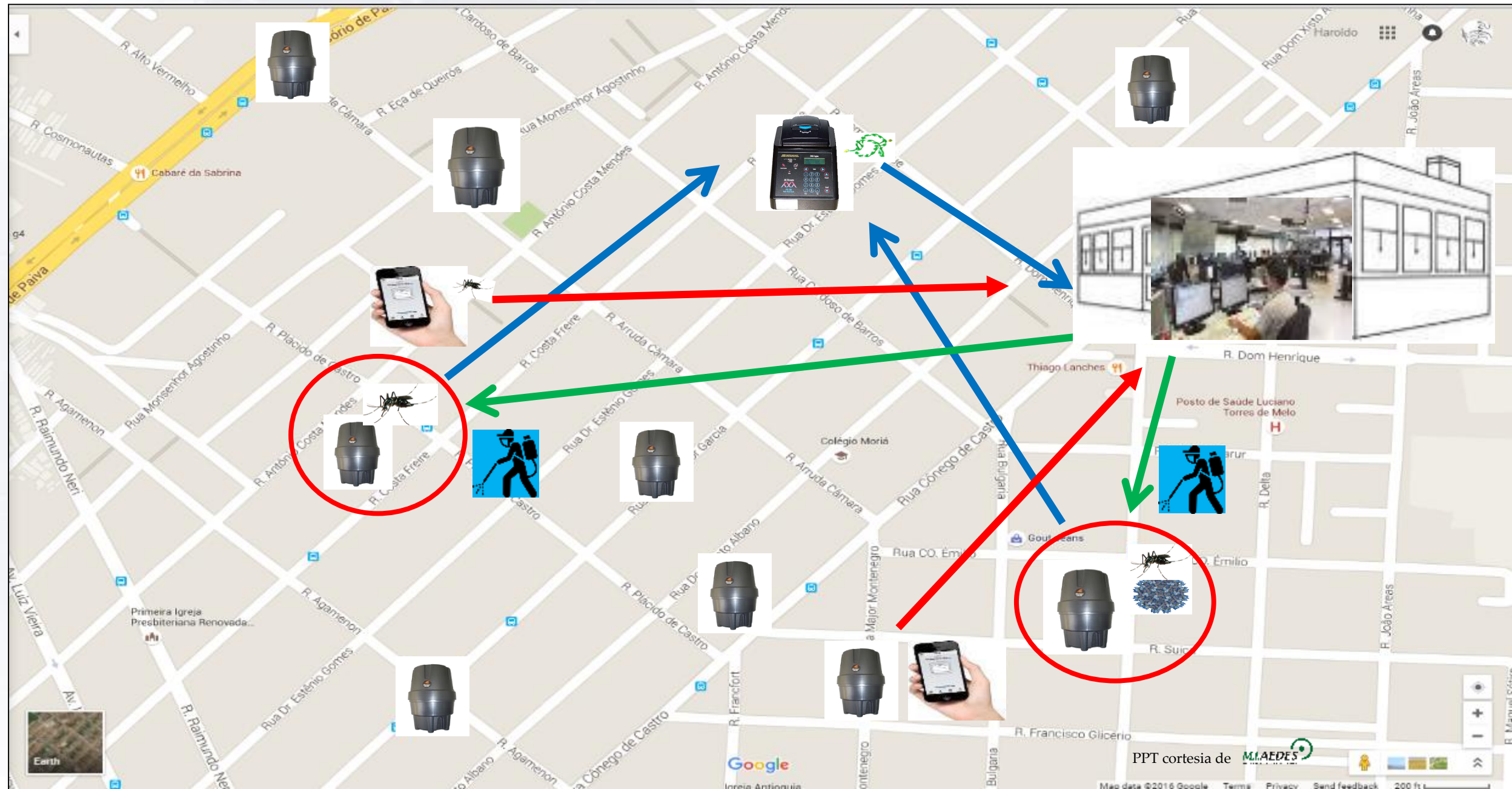
- BOL,BLZ,COL,  
CHI,CRI,CUB,DOR, SLV,  
HON,GUT,HAI.

### Third Workshop, English Caribbean

- JAM,BAR,SUR,GUY,CARPHA



# Early detection – Opportune Response



## ONGOING PROGRESS (VII)

### PAHO supports pilot deployment of new technologies for the control of *Aedes spp* in Latin America and the Caribbean

PAHO has established a Group of experts (partners) on entomology, vector control, insecticide used in public health, entomological research, monitoring and evaluation, and epidemiology. Their main task is to provide technical cooperation to countries that request help to carry out pilot studies/tests on new vector control technologies recommended by WHO.

**New technologies:** a) *Wolbachia* and b) mosquito genetic manipulation

#### Technical cooperation aims to:

- Establish the synergistic benefits of using new technologies in combination with current and traditional effective technologies for vector control.
- Better document accurate evidence in support of the use of new technologies.
- Determine the benefits and challenges faced in the use of new technologies.

# Wolbachia: World Mosquito Program



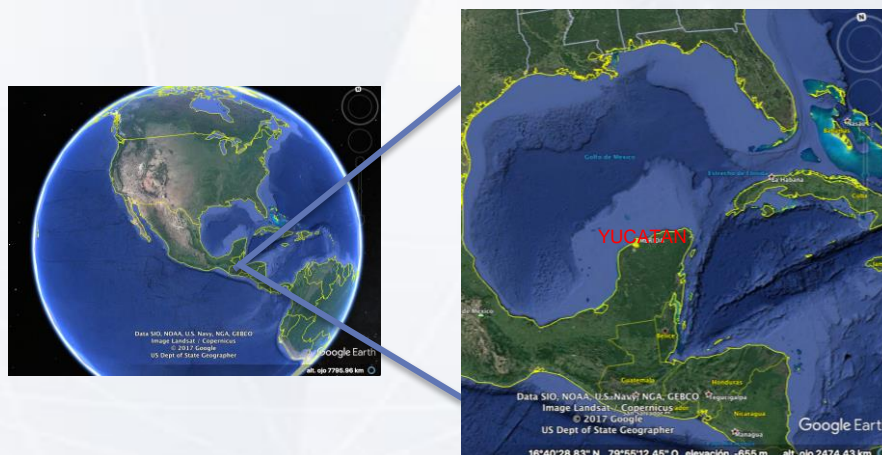
- Current project sites
- Planned project sites



## Baseline studies for the large-scale release of mosquitoes with *Wolbachia* in Yucatan / Mexico

### Main goal

- To design, build, equip and start-up a laboratory to produce *Aedes aegypti* mosquitoes with *Wolbachia* and to implement a strategy for biological control, to reduce mosquito populations and reduce the incidence of *Aedes*-borne diseases (DEN-CHIK-ZIK) in the state of Yucatan.
- Innovative method to complement the *Aedes aegypti* and ABD prevention/control programme.



Adapted from Zhiyong Xi (MSU). PAHO Evaluation Group meeting on *Aedes* 5<sup>th</sup> December 2017, Washington DC



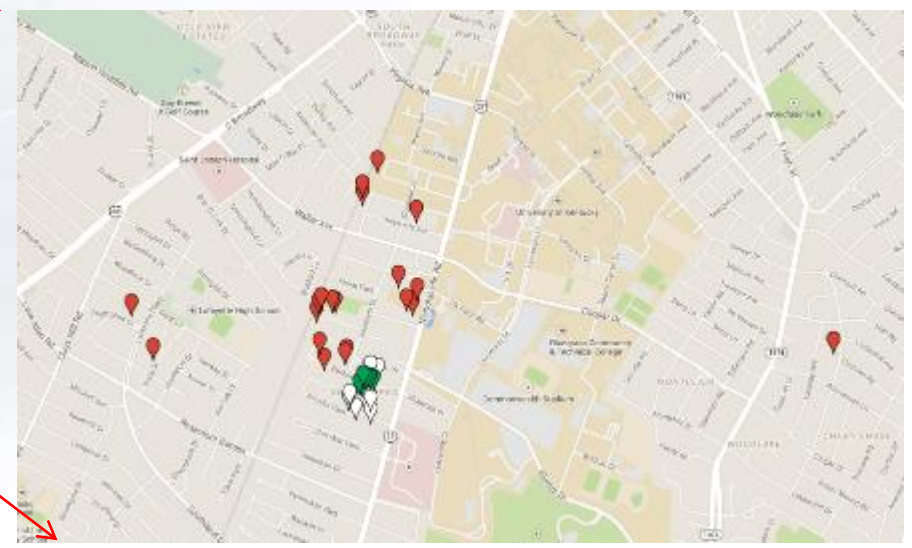


## Wolbachia in USA



### Field Sites

- Lexington, Kentucky



SCIENTIFIC REPORTS  
**Female Adult *Aedes albopictus*  
Suppression by *Wolbachia*-Infected  
Male Mosquitoes**  
James W. Mains<sup>1</sup>, Corey L. Brelsfoard<sup>1</sup>,  
Robert I. Rose<sup>2</sup> & Stephen L. Dobson<sup>1,3</sup>  
SCIENTIFIC REPORTS | 6:33846 | DOI: 10.1038/srep33846

Adapted from Stephen Dobson, Mosquito Mate.  
PAHO Evaluation Group meeting on *Aedes*  
5<sup>th</sup> December 2017, Washington DC





OXITEC

# OX513A *Ae. aegypti*

2009 -  
Grand Cayman  
trial: 96%  
suppression

2010 -  
Brazil  
Three trials:  
All >90%  
suppression

2014  
Panama trial +  
No *Ae. albopictus* niche  
replacement.  
No persistence in the  
environment

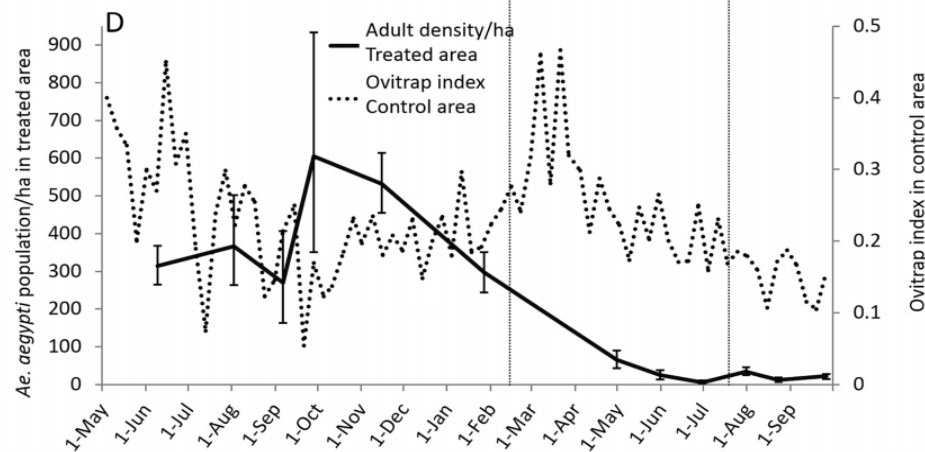
## 2014-2017

Brazil: CTNBio Approval, ANVISA  
announced they will issue a  
temporary registration

Pilot deployment under  
operational conditions  
Piracicaba project (65,000  
people)

RESEARCH ARTICLE

### Suppression of a Field Population of *Aedes aegypti* in Brazil by Sustained Release of Transgenic Male Mosquitoes



Adapted from Simon Warrner. PAHO  
Evaluation Group meeting on Aedes  
5<sup>th</sup> December 2017, Washington DC







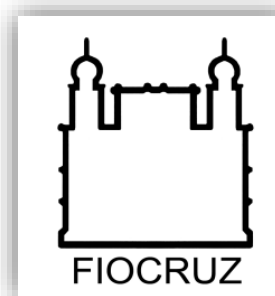
# Sterile Insect Technique (SIT): Current Projects

- **Caribbean:** Strengthening Regional Capacity in Latin America and the Caribbean for Integrated Vector Management Approaches with a Sterile Insect Technique Component, to Control *Aedes* Mosquitoes as Vectors of Human Pathogens, particularly Zika Virus.
- **Brazil:** Using the Sterile Insect Technique to Evaluate a Local Strain in the Control of *Aedes aegypti*
- **Cuba:** Demonstrating the Feasibility of the Sterile Insect Technique in the Control of Vectors and Pests
- **Mexico:** Using the Sterile Insect Technique to Control Dengue Vectors



# Mosquito-disseminated pyriproxyfen

## Brazil



### Field Sites

- Amazonian Region ( Two sites)
- Northeast, Center West and Southeast regions ( Six sites in progress)



Adapted from Sergio Luz, FIOCRUZ. PAHO Evaluation Group meeting on *Aedes*  
5<sup>th</sup> December 2017, Washington DC

## External evaluation group of new technologies



Dra Eugenia  
Grillet,  
**Central  
University of  
Venezuela**



Dra Angela  
Harris,  
**CDC, Puerto  
Rico**



Dra Linda  
Lloyd,  
**Independent  
Consultant**

Dr Fabiano  
Pimenta,  
**Belo Horizonte  
Municipality  
Health, Brazil**



Dra Amy  
Morrison,  
**University of  
California**



Dr Eduardo  
Massad,  
**Sao Paulo  
University**



Dr Gonzalo  
Prokopec,  
**Emory  
University**



### Guía para la Evaluación de las estrategias innovadoras para el control de *Aedes aegypti*: desafíos para su introducción y evaluación del impacto

Elaborada por  
Héctor Gómez Dantés

**Colaboradores:**

Mario Henry Rodríguez  
Angel Betanzos Reyes

**Grupo de expertos asesores:**

Amy Morrison,  
Gonzalo Vázquez Prokopek,  
Angi Harris,  
Maria Eugenia Grillet,  
Fabiano Pimenta,  
Linda Lloyd

### Main Objective:

- Support in the evaluation of the strengths and weaknesses of local control programs for the introduction, monitoring, impact evaluation, scaling and sustainability of new technologies.

Guía para la  
Evaluación de las estrategias innovadoras para el control  
de *Aedes aegypti*: desafíos para su introducción y  
evaluación del impacto

Elaborada por  
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Colaboradores:  
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Angi Harris,  
María Eugenia Grillet,  
Fabiano Pimenta,  
Linda Lloyd

Listado de requerimientos  
para la adopción de las  
innovaciones tecnológicas

Infraestructura y programática	Estrategias Supresión (reducir vector)	Estrategias Reemplazo (bloquear transmisión)
Antecedentes de uso de tecnologías similares para control de plagas agrícolas (TEI y otras)	Deseable	Opcional
Marco regulatorio y legislativo para el uso de biotecnologías en salud <ul style="list-style-type: none"> <li>Ambiental</li> <li>Bioseguridad</li> <li>Bioética</li> </ul>	Indispensable Indispensable Indispensable	Indispensable Indispensable Indispensable
Protocolos para la producción masiva de mosquitos manipulados	Indispensable	Indispensable
Portafolio de evidencias sobre seguridad, calidad y eficacia del producto (dossier)	Indispensable	Indispensable
Recomendación de la OPS por intermedio del Programa Regional de Entomología en salud Pública y Control de Vectores	Opcional	Opcional
Grupo Asesor de Control de Vectores (VCAG)	Indispensable (Federal)	Indispensable (Federal)
Convenios de colaboración con ministerios de salud (federal, estatal y municipal) acorde al país	Indispensable	Indispensable
Plan de implementación <ul style="list-style-type: none"> <li>Fuentes de financiamiento aseguradas</li> <li>Plan de financiamiento a largo plazo</li> <li>Logística de insumos (producción, distribución, liberación, monitoreo y evaluación)</li> </ul>	Indispensable Deseable Indispensable	Indispensable Deseable Indispensable
Infraestructura física para producción de MGM/MBW, <ul style="list-style-type: none"> <li>Insectario,</li> <li>Laboratorio (entomológico)</li> <li>Recursos materiales para monitoreo entomológico</li> <li>Personal técnico capacitado asociado al programa de control de vectores</li> </ul>	Deseable Indispensable Opcional Indispensable Indispensable	Deseable Deseable Indispensable Indispensable indispensable
Grupo Científico Multidisciplinario de apoyo a personal de control de vectores (investigación-acción)	Deseable	Deseable
Sistema de vigilancia entomológica (capacidad para monitorear cambios espaciales, temporales y de impacto)	Indispensable	Deseable
Sistema de vigilancia epidemiológica (capacidad para monitorear cambios espaciales, temporales y de impacto incluida capacidad diagnóstica: serología, PCR, aislamiento)	Deseable	Indispensable
Diagnóstico situacional basal (entomológico y epidemiológico) donde se implementarán las innovaciones	Deseable	Indispensable
Campana de sensibilización y comunicación estructurada (mensajes de impacto esperado) <ul style="list-style-type: none"> <li>tomadores de decisiones,</li> <li>personal técnicos,</li> <li>ONG's (grupos ambientales, sociedad civil)</li> <li>Medios de comunicación</li> <li>Comunidades (grupos comunitarios formales y no formales)</li> </ul>	Indispensable Si Si Si Deseable	Indispensable Si Si Deseable Deseable
Acuerdos de participación con comunidades involucradas (consentimiento informado) según país	Indispensable	Indispensable

## ONGOING PROGRESS (X)



### Meeting of the external evaluation group of New Technologies (EG) for the *Aedes spp* control

5th to 6th December 2017

Washington DC

#### Objectives :

- Update the main pilot studies under development in the Americas.
- Discuss a operational assessment guide to evaluate pilot studies.
- Elaborate a schedule of technical visits in the countries.

[www.paho.org/vectorcontrol](http://www.paho.org/vectorcontrol)

# ONGOING PROGRESS (XI)

## Control de vectores con posteridad a los desastres naturales

Guía re

Programa Regional de Entomología en Salud Pública y Control de Vectores

Organización Panamericana de la Salud  
Organización Mundial de la Salud

## Propuesta de construcción de escenarios operativos genéricos para el control del *Aedes aegypti* en la Región de las Américas.

Programa Regional de Entomología en Salud Pública y Control de Vectores

Organización Panamericana de la Salud  
Organización Mundial de la Salud

## Orientaciones para la estructuración de Laboratorios de Entomología en Salud Pública

Programa Regional de Entomología en Salud Pública y Control de Vectores

Organización Panamericana de la Salud  
Organización Mundial de la Salud

**MANUAL DE APOYO**  
PARA LA CAPACITACIÓN DEL PERSONAL DE LOS PAISES EN LA PREVENCIÓN Y CONTROL INTEGRAL DE DENGUE EN EL CONTEXTO DE LA CIRCULACIÓN DE OTRAS ARBOVIROSIS

Organización Panamericana de la Salud  
Organización Mundial de la Salud  
REGIÓN DE LAS AMÉRICAS



Propuesta de construcción de escenarios operativos genéricos para el control del *Aedes aegypti* en la Región de las Américas.

Programa Regional de Entomología en Salud Pública y Control de Vectores

Organización Panamericana de la Salud  
Organización Mundial de la Salud

New operational model for the **control** of *Aedes aegypti* in the Americas

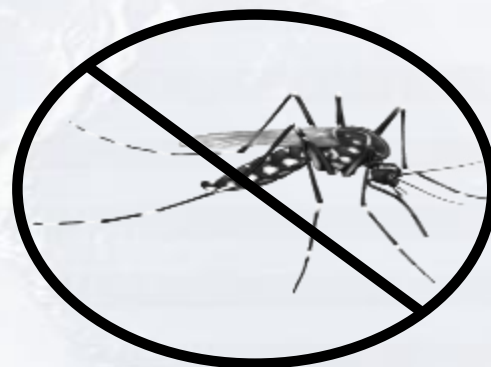
**FOUNDATION:**  
Early detection – Opportune Response

**Governance** leadership institutional development, discipline, **coordination** resources, training

**Research**  
evaluation of new technologies:  
*surveillance & vector control*

**Monitoring & evaluation**

- Surveillance
- interventions
- resistance



**DIAGNOSIS**

entomological surveillance stratification  
adult mosquito **populations** (ovitrap or adult traps) & mosquito **virus** infection (PCR)

**INTERVENTION**

according to the *setting*  
control activities  
**are not universal**

**Specialized** vector control

- selective** insecticide application
- indoor residual spraying (IRS)
  - space spray
  - other control activities options

Promotion of vector control & risk **communication**

**Institutional & family** responsibility



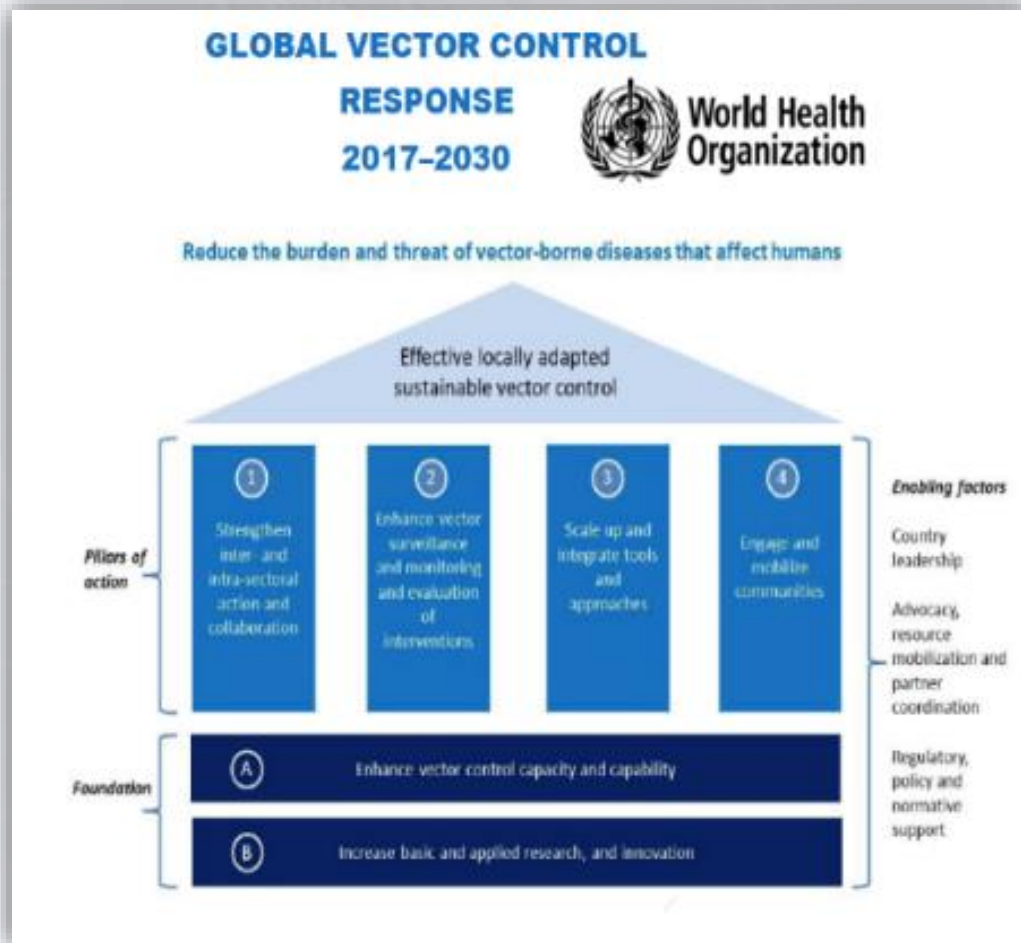
ROBUST INFORMATION SYSTEM





# Next steps

## Plan of Action on Entomology and Vector Control 2018-2023



### 162nd SESSION OF THE EXECUTIVE COMMITTEE

Washington, D.C., USA, 18-22 June 2018

Provisional Agenda Item 4.9

CE162/XX  
22 February 2018  
Original: English

### PLAN OF ACTION ON ENTOMOLOGY AND VECTOR CONTROL 2018-2023

#### Introduction

1. The objective of the Plan of Action on Entomology and Vector Control 2018-2023 is to strengthen regional and national capacity for the prevention and control of key vectors and reduce the transmission of vector-borne diseases (VBDs). The plan of action is aligned with resolutions, strategies, reports, and disease-specific plans of action of the Pan American Health Organization (PAHO) and the World Health Organization (WHO), as well as with the PAHO Strategic Plan 2014-2019 and the UN Sustainable Development Goals (1).

2. The plan of action is consistent with the structure and recommendations of the joint document on Global Vector Control Response 2017-2030 prepared by a steering

# THANK YOU AND ACKNOWLEDGEMENT TO PARTNERS AND COUNTRIES OF THE AMERICAS

## Ministries of Health of the Region



NAVY ENTOMOLOGY CENTER OF EXCELLENCE (NECE)





**Organización  
Panamericana  
de la Salud**



**Organización  
Mundial de la Salud**

OFICINA REGIONAL PARA LAS **Américas**

***Thank you!  
Muchas gracias!***



**Pan American  
Health  
Organization**



**World Health  
Organization**

REGIONAL OFFICE FOR THE **Americas**