

# Novel malaria vector control strategies and their applicability to the Americas

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# Novel malaria vector control interventions (i.e., not LLINs or IRS)

- ❑ Attractive toxic sugar baits
- ❑ Spatial repellents
- ❑ Insecticidal paint
- ❑ Durable wall liners
- ❑ Larval control
- ❑ Transgenic mosquitoes

## Attractive toxic sugar baits: Description

- ❑ Target sugar seeking female and male mosquitoes
- ❑ Use stomach toxins, so can potentially be used as part of insecticide resistance management
  - Commonly boric acid
- ❑ Delivered outdoors as sprays or indoors as hanging stations



## Attractive toxic sugar baits: Evidence

- ❑ Effective at controlling outdoor *Anopheles* in arid and semi-arid environments in the Middle East (*An. sergentii*) and Africa (*An. gambiae*) (Beier et al. 2012; Muller et al. 2010)
- ❑ Promising results indoors in an experimental hut setting against *An. arabiensis* in Tanzania (Stewart et al. 2013)
- ❑ Application in the Americas?

# Spatial repellents: Description

- Emanators of volatile repellent chemicals
  - Mosquito coils
  - Thermal emanators and candles
  - Misters
  - Hanging cards



## Spatial repellents: Evidence

- ❑ Varying degrees of effectiveness against *Aedes* mosquitoes
- ❑ Multi-country field trial against Anophelines in 4 countries (Zambia, Kenya, Tanzania and Indonesia) begins in 2014
  - 'hanging card' style
  - Latin America site may be added in 2016
  - Funded by Bill & Melinda Gates Foundation
- ❑ Application in the Americas?

# Insecticidal paint: Description

- House paint applied to walls containing insecticide and/or insect growth regulators



## Insecticidal paint: Evidence

- ❑ Good residuality; proposed as an IRS alternative
- ❑ Effective against Chagas vectors
- ❑ Experimental hut trial against *Anopheles gambiae* suggests field efficacy
- ❑ Application in the Americas?



# Durable Wall Liners: Description

- Alternative to IRS



# Durable Wall Liners: Evidence

- ❑ Demonstrated efficacy and residuality in Africa and Vietnam
- ❑ Next generation product with novel insecticide (VF)
- ❑ Application in the Americas?
  - Iquitos proof of concept trial





# Larval Control: Description

- ❑ Permanent environmental source reduction
- ❑ Long-term (self-replicating) biological agents
- ❑ Breeding site treatment with chemical or biological formulations that require repeated applications

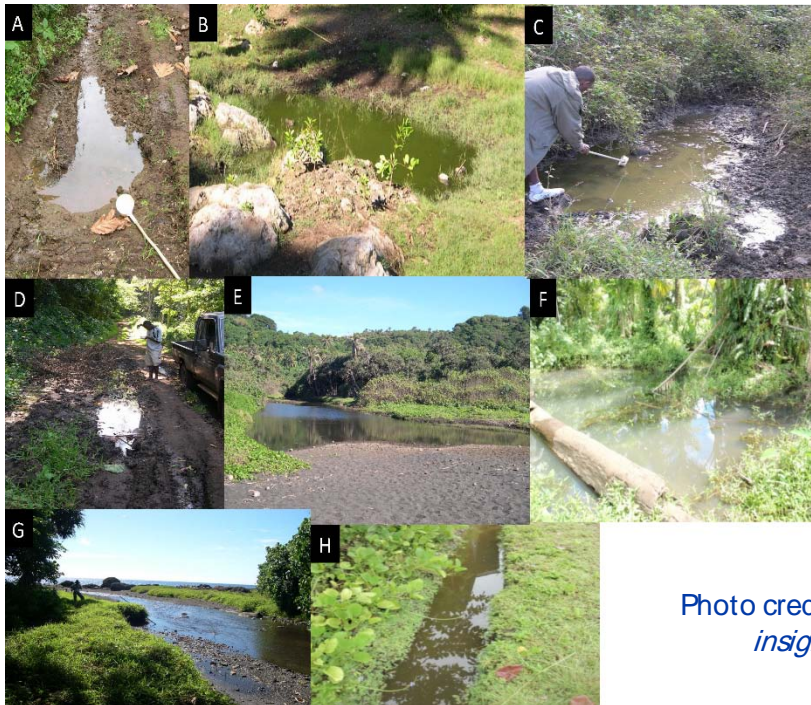


Photo credit: Beebe et al 2013 in *Anopheles mosquitoes - New insights into malaria vectors*, Sylvie Manguin, ed.

## Larval control: Evidence

- ❑ WHO recommendation: Larval control can be considered as a **supplementary** control measure where the breeding sites are **Few, Fixed, Findable**
- ❑ Application in the Americas?

# Transgenic mosquitoes

- ❑ **Population suppression**
  - Sterile Insect Technique (sterile male mosquitoes)
  - Female-specific flightless phenotypes
- ❑ **Population replacement:**
  - Transgenes to render *Anophelines* refractory to *Plasmodium* infection
  
- ❑ **Application in the Americas?**

# Conclusions

- ❑ Some of these tools may well be applicable in the Americas (and potentially more cost-effective than LLINs or IRS alone)
- ❑ The challenge lies in assessing their efficacy in a robust manner; i.e., building the evidence base for their applicability beyond the anecdotal.

