2+1: Why the combination of two passive and one active mosquito trap may well be a control tool worthy of attention

Andreas ROSE [1], Scott GORDON [1], Jennifer MCCAW [1], Alvaro EIRAS [2], Marcelo RESENDE [2], Luiz MOTA [2], Martin GEIER [1]

[1] Biogents AG, Weissenburgstr. 22, 93053 Regensburg, Germany
[2] Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

www.biogents.com
andreas.rose@biogents.com

Biogents

Outline

- Focus on *Stegomyia* (*Aedes aegypti* & *Aedes albopictus)*
- Update on the current trap technology for these species
  - Trap for host-seeking mosquitoes
  - Traps for gravid mosquitoes (lethal ovitraps)
- Recent studies published on these traps used as control tools against *Stegomyia*
- Introductiton of the 2 plus 1 concept

The BG-Sentinel catches host-seeking *Stegomyia*, but also males

BG-Sentinel 2.0

BG-Lure

BG-Sentinel: Mass trapping *Ae. (St.) aegypti* in Manaus, Brazil

Biogents

Evaluation of the Effectiveness of Mass Trapping With BG-Sentinel Traps for Dengue Vector Control: A Cluster Randomized Controlled Trial in Manaus, Brazil

C. M. DEGENER,[1,2] Á. E. EIRAS,[1] T. M. F. ÁZARA,[1] R. A. ROQUE,[3] S. RÖSNER,[4] C. T. CODEÇO,[5] A. A. NOBRE,[5] E. S. O. ROCHA,[6] E. G. KROON,[6] J. J. OHLY,[7] AND M. GEIER[8]

J. Med. Entomol. 51(2): 000–000 (2014); DOI: http://dx.doi.org/10.1603/ME13107

6 intervention areas
1 BGS per house, 60.5% coverage

6 reference areas (=“control”)

Biweekly monitoring with 4 BGS/area

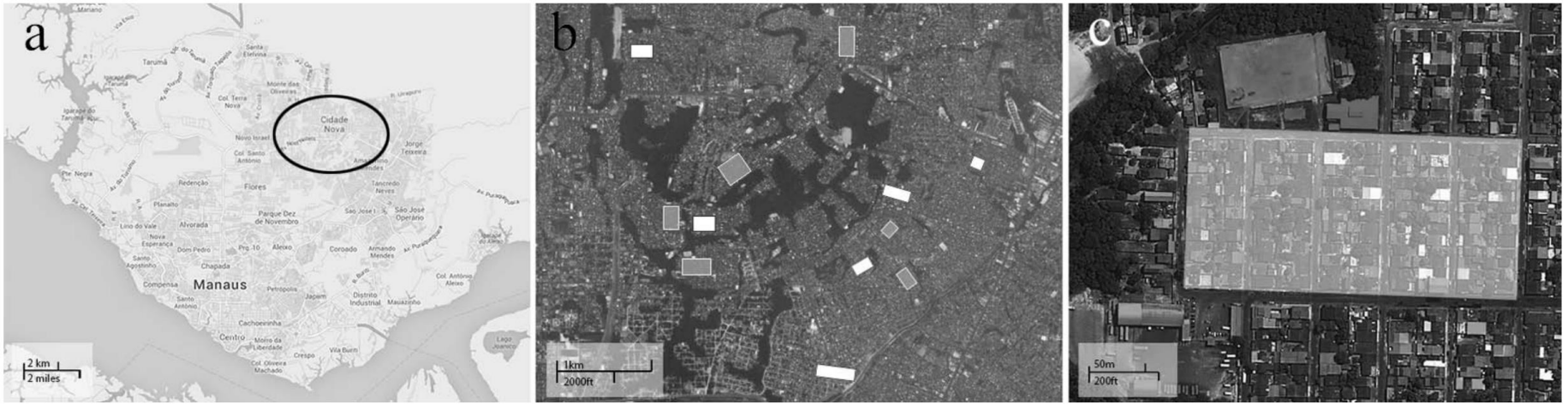


Fig. 2. Maps of (a) the study site Manaus containing a black circle that indicates the localization of the Cidade Nova neighborhood, (b) the localization of the six intervention clusters (white) and the six untreated control clusters (gray) within the study site, and (c) an example of one intervention cluster.

BG-Sentinel: Mass trapping
Ae. (St.) aegypti in Manaus, Brazil

Biogents

Table 3. Overview of the mean no. of female *Ae. aegypti* caught with BGS monitoring traps in 24 h at the baseline period and during three different periods after beginning of mass trapping

Pair	Weeks −8–0 (N = 3–4) Rainy season 1		Weeks 1–22 (N = 11) Rainy season 1		Weeks 23–42 (N = 9–10) Dry season		Weeks 43–73 (N = 16) Rainy season 2	
	Intervention	Control	Intervention	Control	Intervention	Control	Intervention	Control
1	0.13 (0.25)	0.53 (0.41)	0.37 (0.36)	0.75 (0.72)	0.28 (0.42)	0.69 (0.49)	0.34 (0.37)	1.07 (0.89)
2	0.79 (0.62)	0.69 (0.77)	0.26 (0.32)	1.66 (0.97)	0.20 (0.26)	0.50 (0.71)	0.56 (0.50)	0.34 (0.38)
3	1.00 (0.79)	0.71 (0.82)	0.48 (0.21)	2.91 (1.84)	0.23 (0.28)	1.17 (0.89)	0.21 (0.25)	2.18 (2.07)
4	1.54 (0.98)	1.19 (0.62)	1.12 (1.14)	0.94 (0.83)	1.43 (1.79)	0.38 (0.36)	0.12 (0.21)	0.94 (1.05)
5	1.79 (1.01)	1.90 (2.27)	0.86 (1.04)	0.49 (0.40)	0.85 (1.19)	0.21 (0.30)	1.12 (0.68)	0.02 (0.06)
6	2.88 (3.33)	2.31 (1.39)	0.64 (0.60)	1.13 (1.06)	0.46 (0.65)	0.40 (0.35)	0.49 (0.56)	0.26 (0.29)
Total	1.35 (1.26)	1.25 (1.29)	0.62 (0.74)	1.29 (1.28)	0.58 (1.02)	0.56 (0.62)	0.47 (0.56)	0.80 (1.24)

Presented are mean catch rates (±SD) per pair and treatment category for the baseline and the postintervention periods. The number of trapping periods (N) per cluster varied between these periods, when eventually monitoring cycles were lost; bracketed values indicate the range.

BG-Sentinel: Mass trapping
Ae. (St.) aegypti in Manaus, Brazil

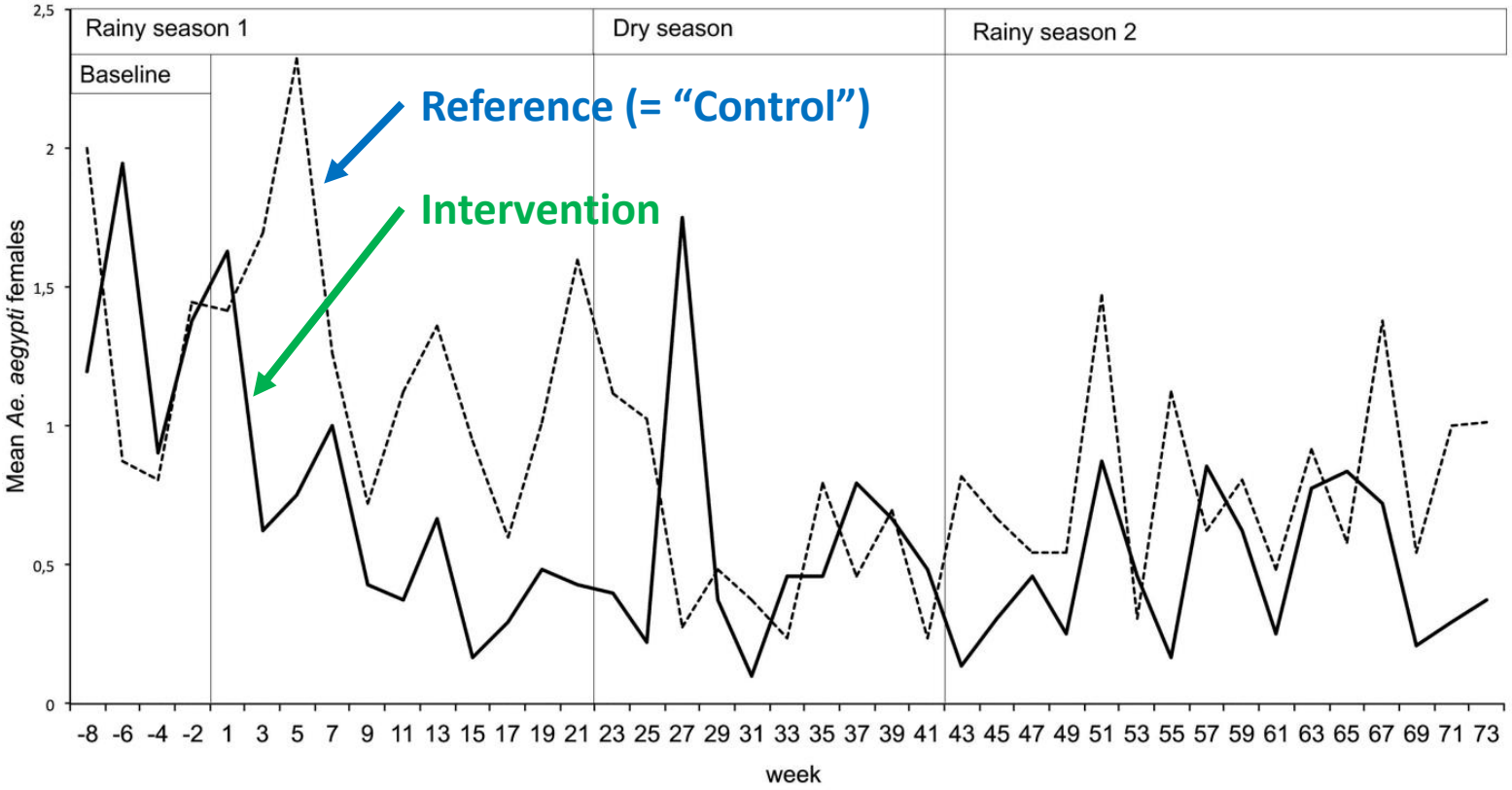


Fig. 4. Entomological monitoring with BGS traps: mean catches of female *Ae. aegypti* in mass trapping and control arm. Solid line: mean value of six intervention clusters. Dotted line: mean value of six control clusters. Vertical lines indicate the four periods of the study: baseline (Weeks −8–0), first rainy season (Weeks 1–22), dry season (Weeks 23–42), and second rainy season (Weeks 43–73).

Mass trapping of *Ae. (St.) albopictus* in Cesena, Italy

Journal of the American Mosquito Control Association, 31(1):16–25, 2015

EVALUATION OF BG-SENTINEL TRAP AS A MANAGEMENT TOOL TO REDUCE *AEDES ALBOPICTUS* NUISANCE IN AN URBAN ENVIRONMENT IN ITALY

CHRISTIAN ENGLBRECHT,[1] SCOTT GORDON,[2,4] CLAUDIO VENTURELLI,[3] ANDREAS ROSE[2] AND MARTIN GEIER[2]

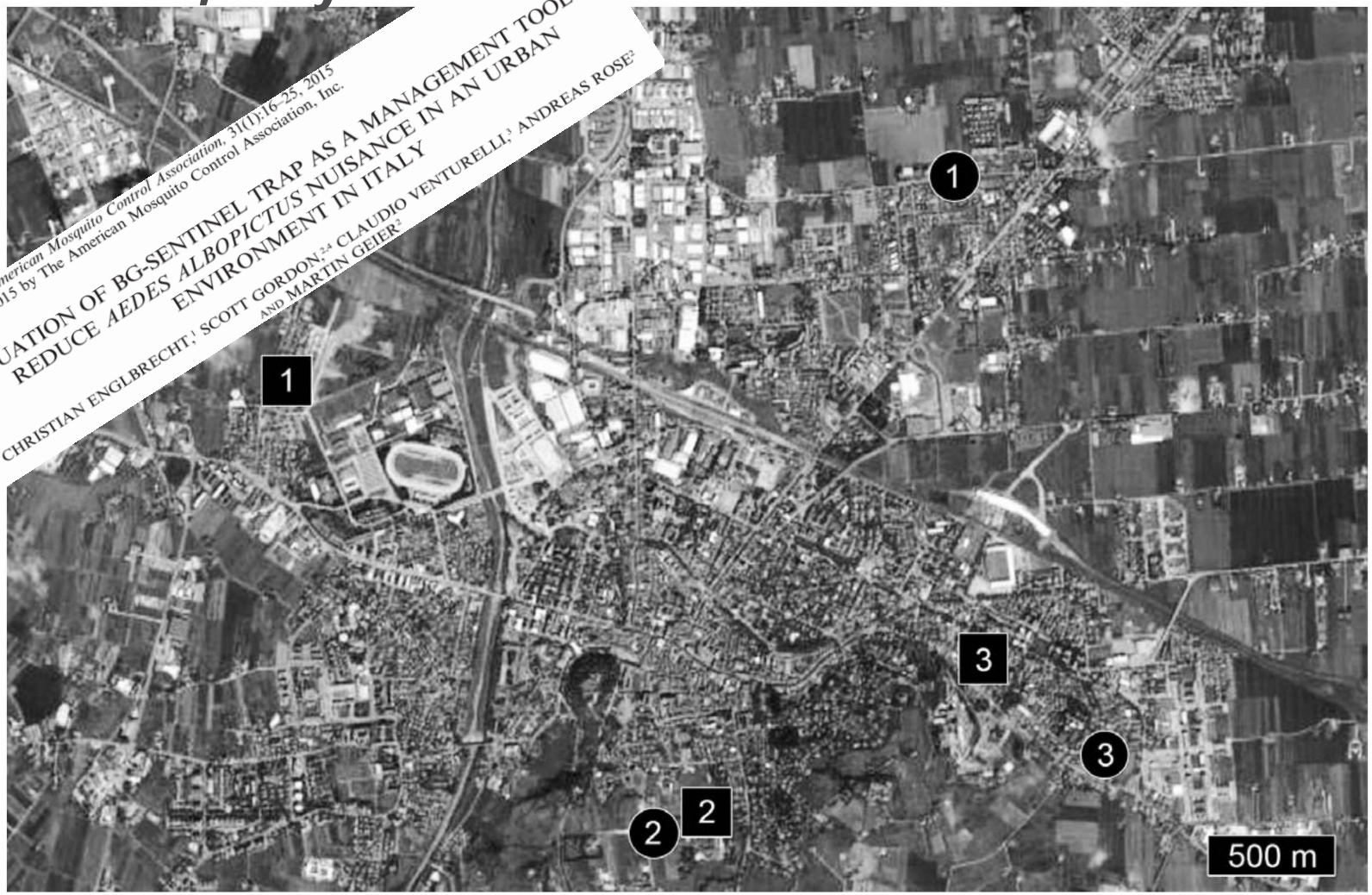


Fig. 1. Satellite image of the 3 intervention (circles) and 3 control sites (square boxes) in the city of Cesena, Emilia–Romagna, Italy.

Reduction of human landing rate of *Ae. (St.) albopictus* in intervention sites

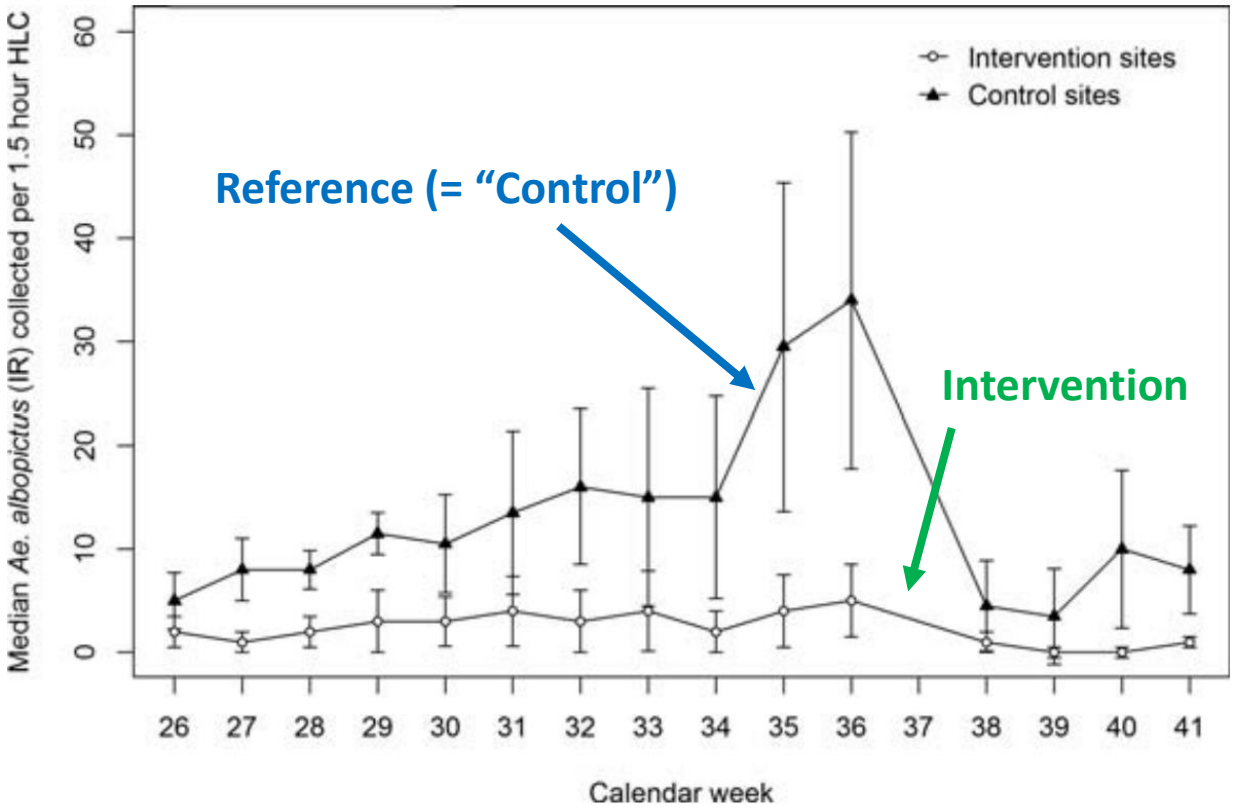


Fig. 4. Weekly median number of *Aedes albopictus* individuals collected per 1.5 h using human landing collection from intervention and control sites. Error bars represent the interquartile range.

2 private houses
2 apartment houses
2 cemetaries

3 intervention sites (7-8 BGS)
3 reference sites (="control sites")

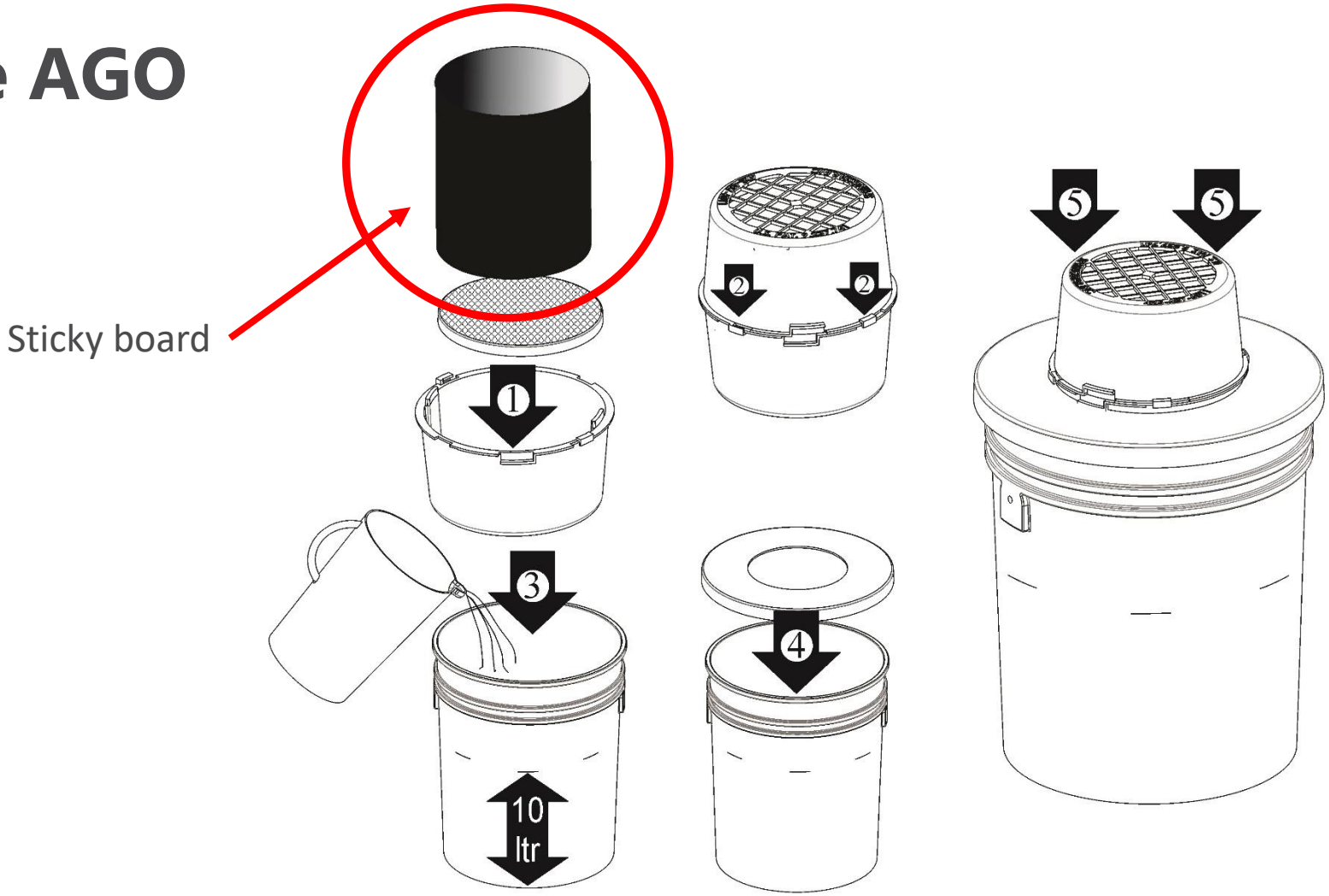
Monioring with HLR and Ovitraps11

The latest in deadly gravid traps

AGO = Autocidal Gravid Ovitrap
Mackay, Amador & Barrera (2013)

GAT = Gravid Aedes Trap
Eiras, Buhagiar & Ritchie (2014)

The AGO



https://www.springstar.net/products/ago

Use of the CDC Autocidal Gravid Ovitrap to Control and Prevent Outbreaks of *Aedes aegypti* (Diptera: Culicidae)

ROBERTO BARRERA,[1] MANUEL AMADOR, VERONICA ACEVEDO, BELKIS CABAN, GILBERTO FELIX, AND ANDREW J. MACKAY

Entomology and Ecology Activity, Dengue Branch, Centers for Disease Control and Prevention, 1324 Calle Canada, San Juan, PR 00920

J. Med. Entomol. 51(1): 145–154 (2014); DOI: http://dx.doi.org/10.1603/ME13096

1 intervention area
/w 3 to 4 AGOs per house
81% coverage

1 reference area

3 months base line, then sourcereduction, larviciding, oviciding
in both areas

Monitoring with
BGS (3 days) and
AGO (7 days)

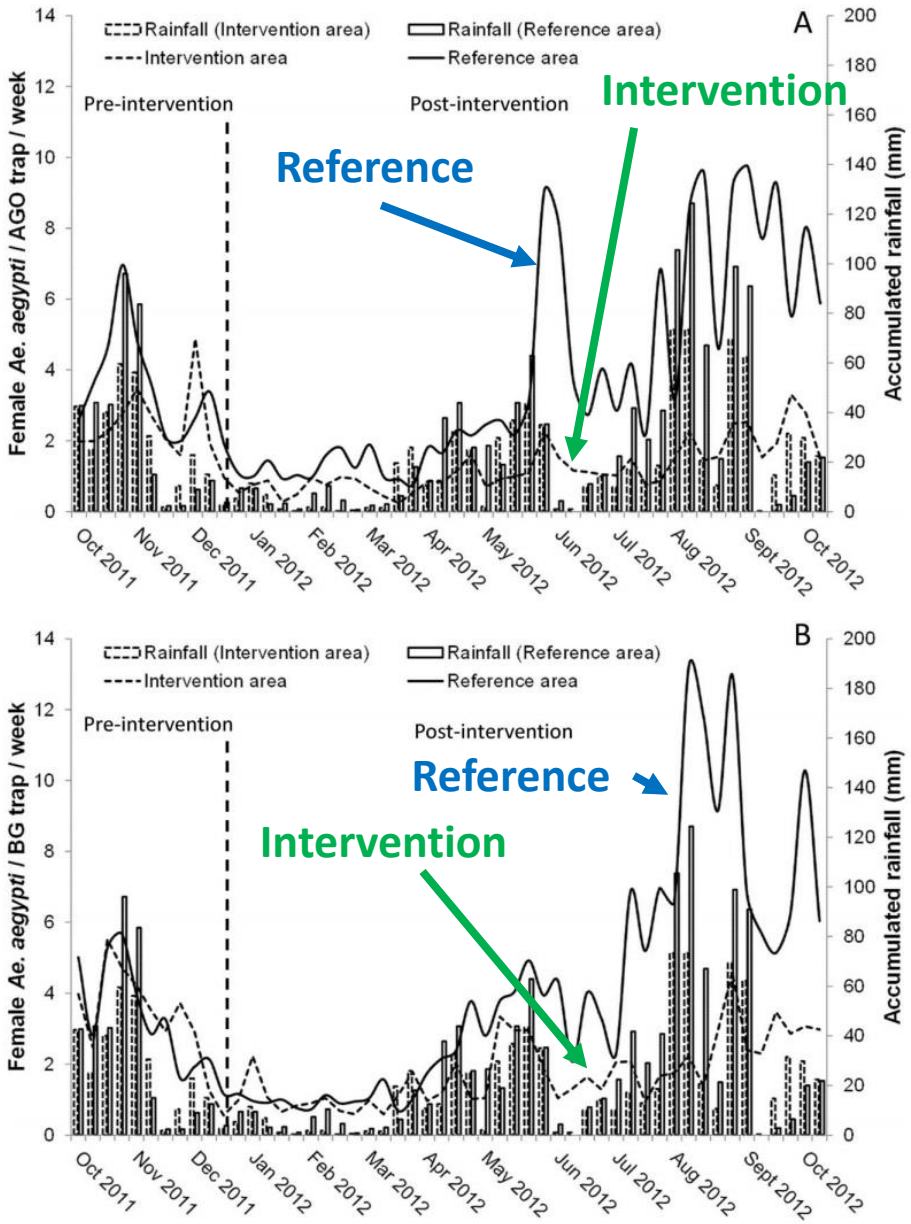


Fig. 3. (A, B) Weekly variation in the numbers of female *Ae. aegypti* captured in BG-Sentinel (sum of 3-d captures per week) and SAGO (7-d captures) traps, and accumulated rainfall (second and third weeks before sampling) in the reference (Villodas) and intervention (La Margarita) areas. Mosquitoes were monitored in both areas before applying control measures from October to December 2011 and afterwards until October 2012, following the intervention. Rainfall data are plotted with a forward lag time of 2 wk to facilitate visual association with the numbers of mosquitoes.

Am. J. Trop. Med. Hyg., 91(6), 2014, pp. 1269–1276
doi:10.4269/ajtmh.14-0426

Sustained, Area-Wide Control of *Aedes aegypti* Using CDC Autocidal Gravid Ovitraps

Roberto Barrera,* Manuel Amador, Verónica Acevedo, Ryan R. Hemme, and Gilberto Félix
Entomology and Ecology Activity, Dengue Branch, Centers for Disease Control and Prevention, Calle Canada, San Juan, Puerto Rico

2 intervention areas
/w 3 AGOs per house
85% coverage

2 reference areas

Monitoring with AGO

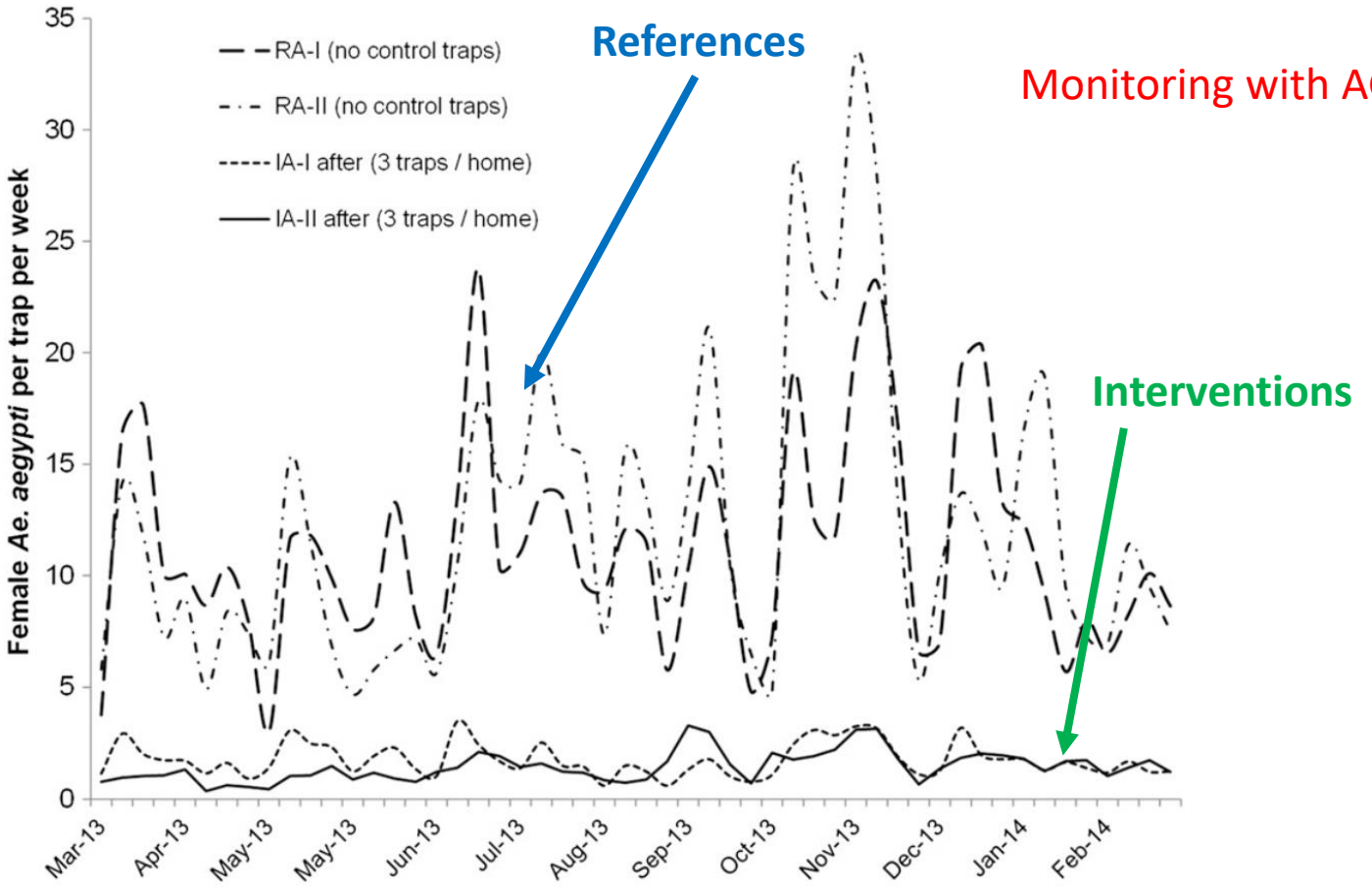


FIGURE 5. A comparison of average *Ae. aegypti* females per trap per week in two autocidal gravid ovitraps (AGO traps) intervention (IA-I, La Margarita; IA-II, Villodas) and two reference areas (RA-I, Arboleda; RA-II, Playa) in southern Puerto Rico from February 2013 to 2014.

Lorenzini OD et al. (2016) Reduced incidence of Chikungunya virus infectionin communities with ongoing *Aedes aegypti* mosquito trap intervention studies – Salinas and Guayama, Puerto Rico, November 2015 - February 2016. Morbidity and Mortality Weekly Report 65.

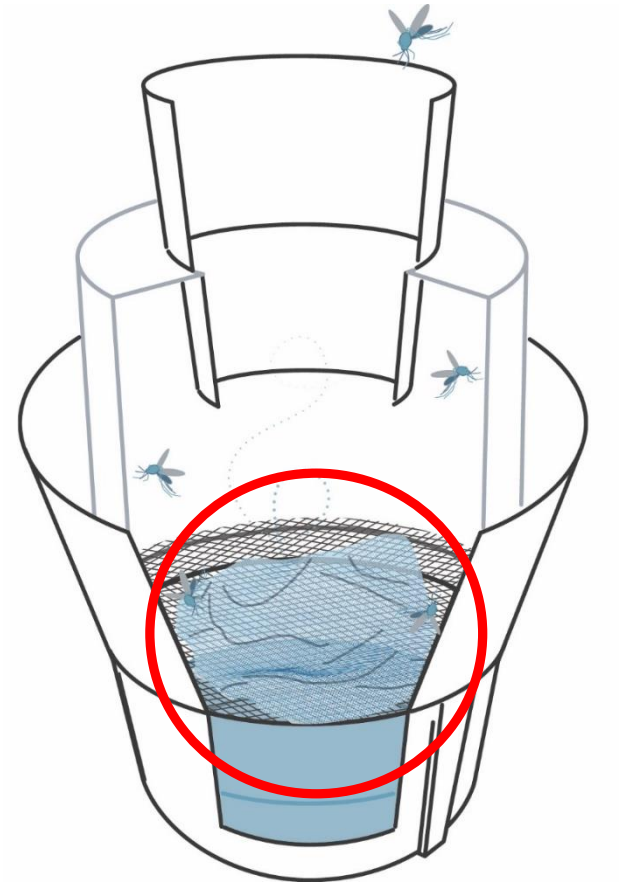
Community type	Participants	Anti-CHIKV IgG positive participants (%)
Nonintervention communities (no AGO traps)	152	69 (45.4)
Community A	103	42 (40.8)
Community B	49	27 (55.1)
Intervention communities (AGO traps present)	175	40 (22.9)
Community C	101	19 (18.8)
Community D	74	21 (28.4)

References

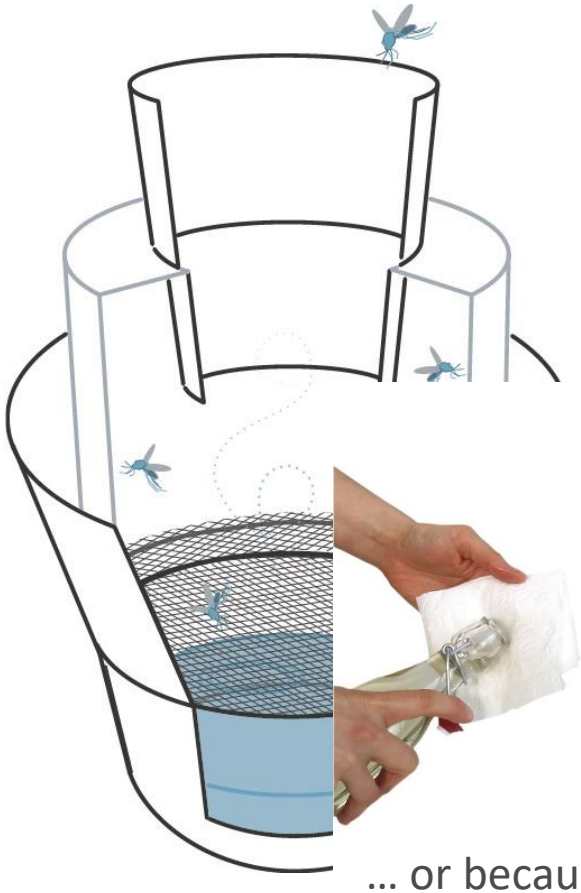
Interventions

Abbreviation: AGO = Autocidal Gravid Ovitrap; CHIKV = chikungunya virus; IgG = immunoglobulin G.

Introducing the GAT: lethal…



…because of an insecticide-treated net in the translucent chamber…



… or because of insecticide (e.g. metafluthrin) sprayed into the inside of the translucent chamber…

… or because of a thin layer of canola or perfumefree baby oil.

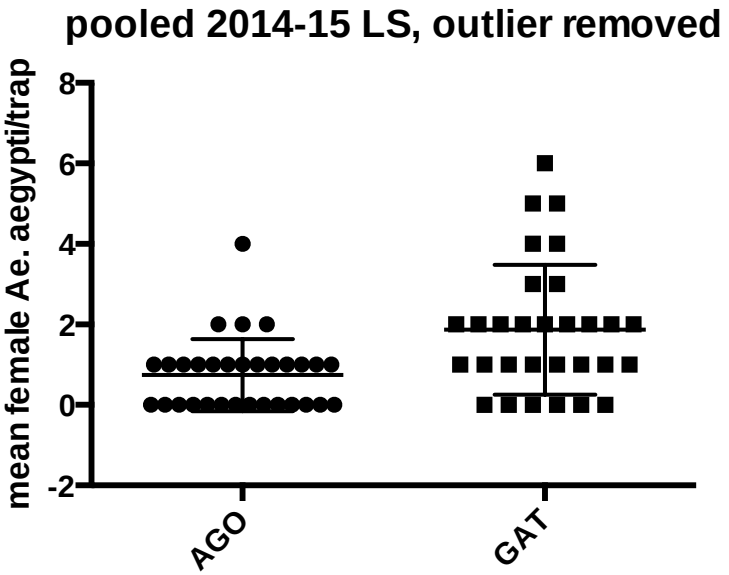
<u>But no expensive sticky boards.</u>

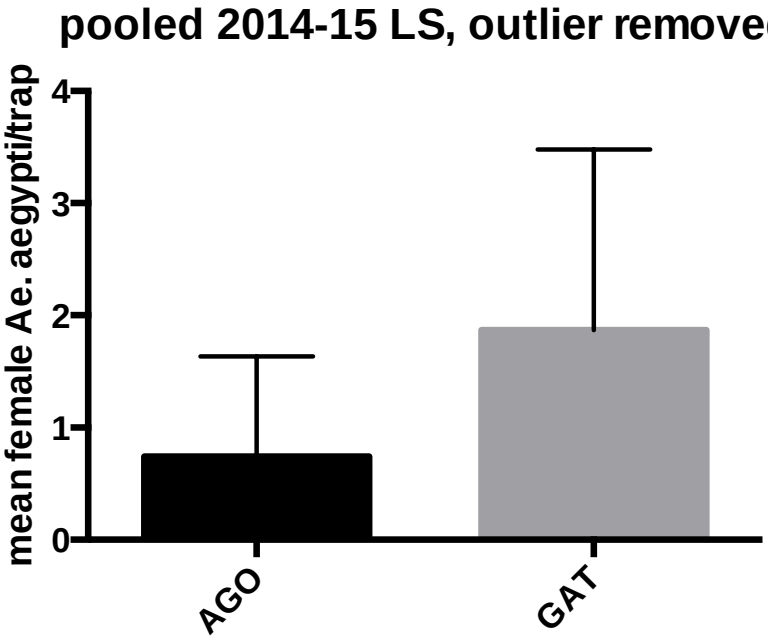
Scott Ritchie (James Cook University)
Field Latin Aqure trials in Cairns, Australia, 2014 & 2015: Comparison of Singapore Sticky Ovitrap – AGO - GAT

2014-15 Latin Square
GAT & AGO (Scott Ritchie, unpubl.)

Pooled GAT and AGO data

Removed outlier GAT collection of 26 females (30 replications)





- Recent developments have greatly improved the efficacy of traps for Dengue / Zika / Chikungunya vectors *(Aedes (Stegomyia)).*

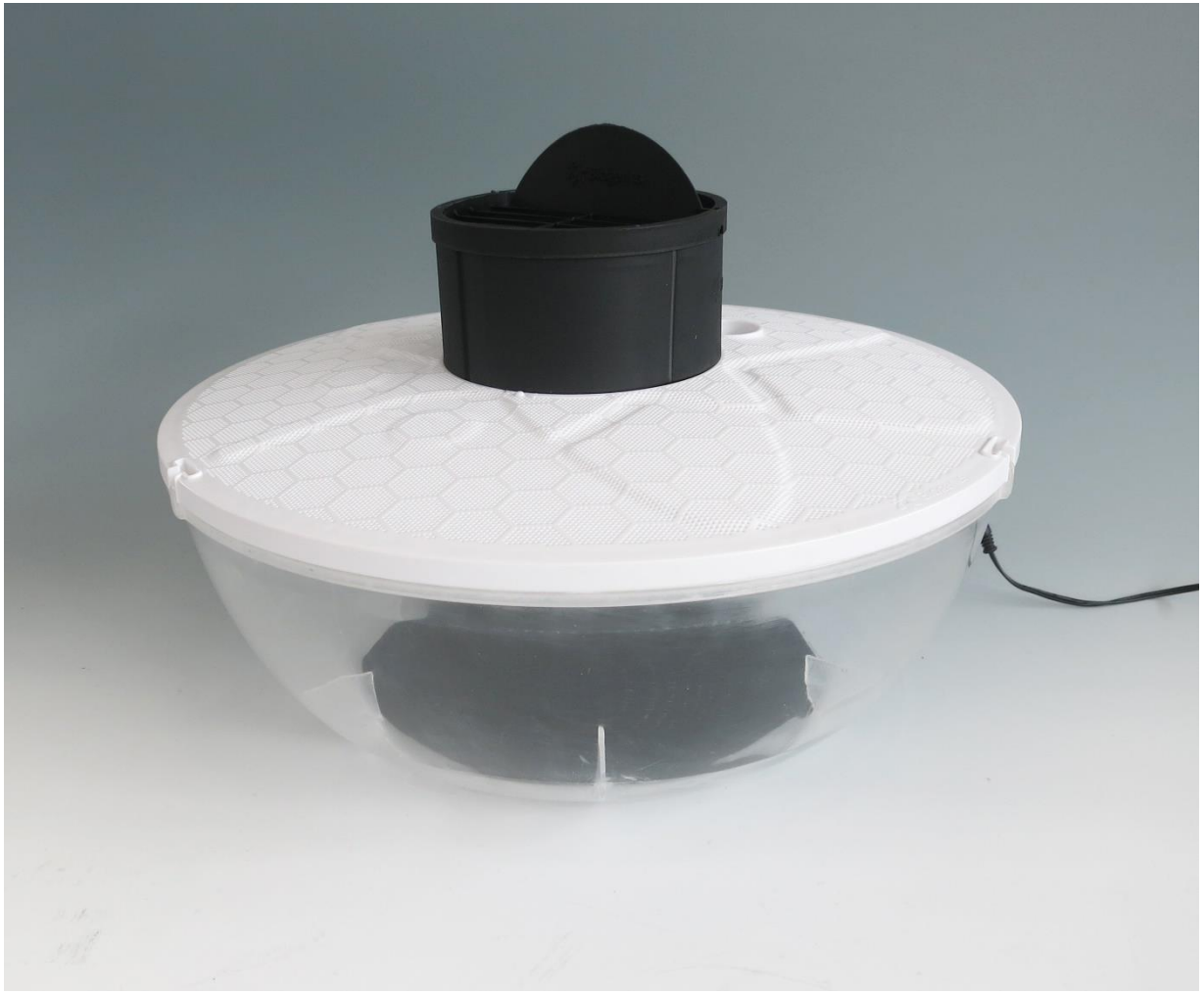
- Strong indications that traps for host-seeking mosquitoes and traps for gravid can significantly reduce *Aedes (Stegomyia)* population sizes → lower disease tramission.

- Combining both methods should widen the scope of targeted physiological mosquito stages, raising the probability of success.

- Problem so far: large scale availability and price (at least for the hostseeking trap).

Introducing the BG-Bowl

Biogents



- All plastic
- Less than 2.4 W power consumption
- No catch bag → the trap body is the collection container
- For long-term mass trapping

2 plus 1 concept: using traps to control *Aedes (Stegomyia)*

Approach

- Initial source reduction

Then, per household:

- 2 traps targeting gravid mosquitoes (BG-GAT)
- 1 trap targeting host-seeking mosquitoes (BG-Bowl)

- Costs as low as ca. 50 US$ per set, if used in area-wide projects

- Monthly servicing can also be performed by household members
- 3 years minimum product life

Thank you!

Contact us under

www.biogents.com

biogents@biogents.com

Biogents