



# Partnership To End Malaria

3 February, 2020

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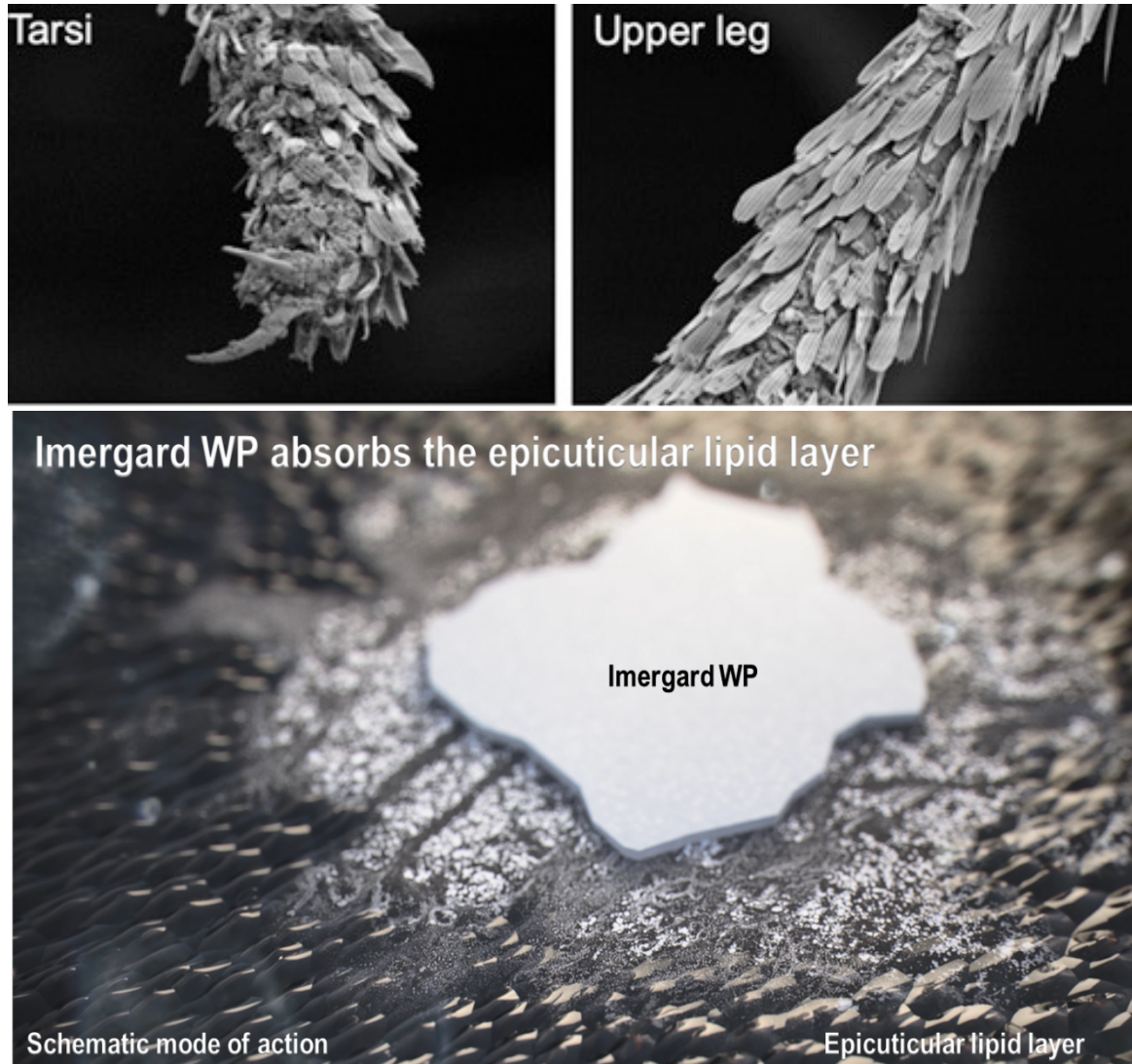
# Results from community level evaluation of Imergard wetable powder (WP) a new potential molecule for IRS.

Sarah J Moore  
Ifakara Health Institute and Swiss Tropical and Public Health Institute

If IRS is to remain an important element in an integrated vector control approach for sub-Saharan Africa, alternative insecticides, particularly ones with novel modes of action (MOA) are urgently needed

# What is a Mechanical Insecticide?

Industrial MINERAL particles that produce a mortal response on contact



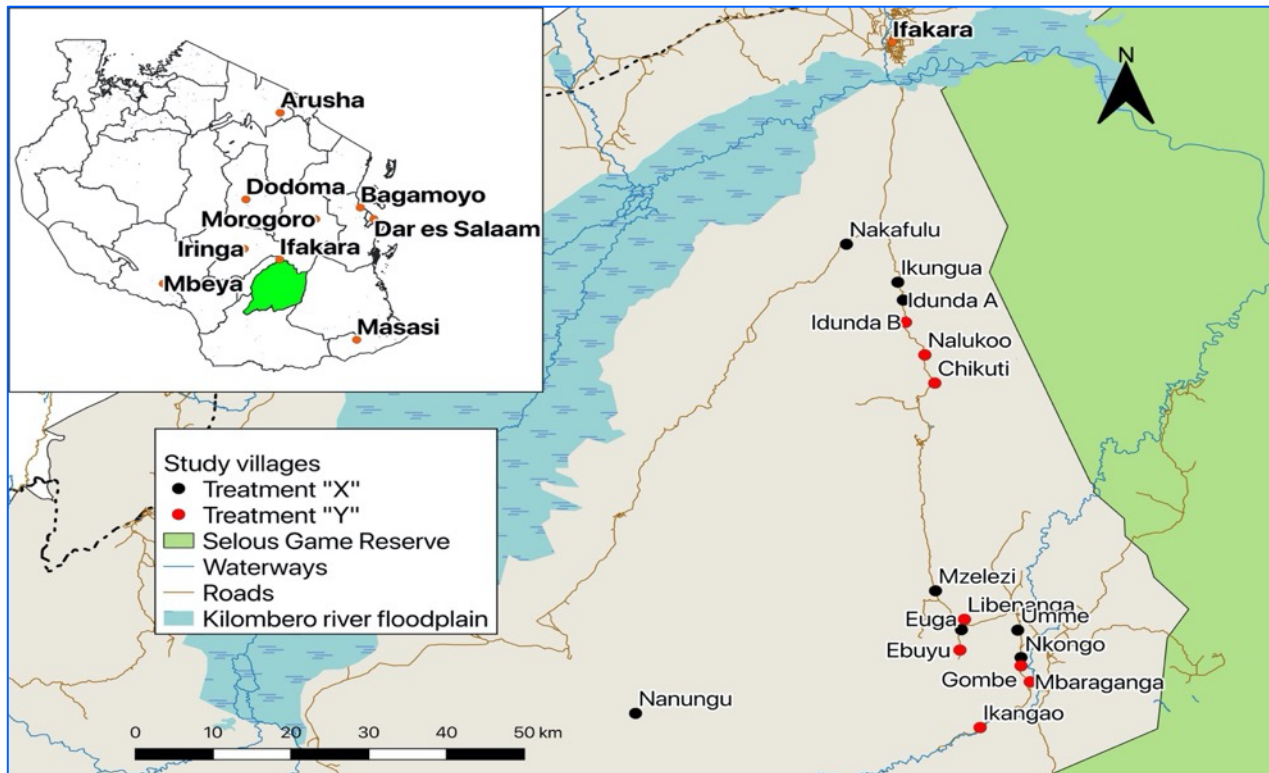
**Imergard WP is 100% perlite**

## Trial design

Single-blinded 2 arm randomized community level evaluation

- 1) Imergard™ WP applied at 6 g ai/m<sup>2</sup>; and
- 2) Positive control: Actellic 300CS applied at 1 g ai/m<sup>2</sup>.

All households had Olyset LNs from universal coverage campaign.



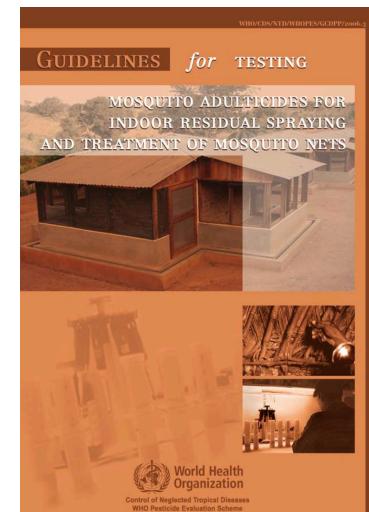
## Outcome measures

**Sporozoite rate:** the proportion of sporozoite positive mosquitoes (primary endpoint)

**Mosquito density:** nightly mosquitoes trapped by CDC light trap, human landing catch

**Residual efficacy:** the proportions of mosquitoes exposed in cone bioassay and held for up to 72 h with access to sugar solution after 48 hours

**Operational feasibility and safety**



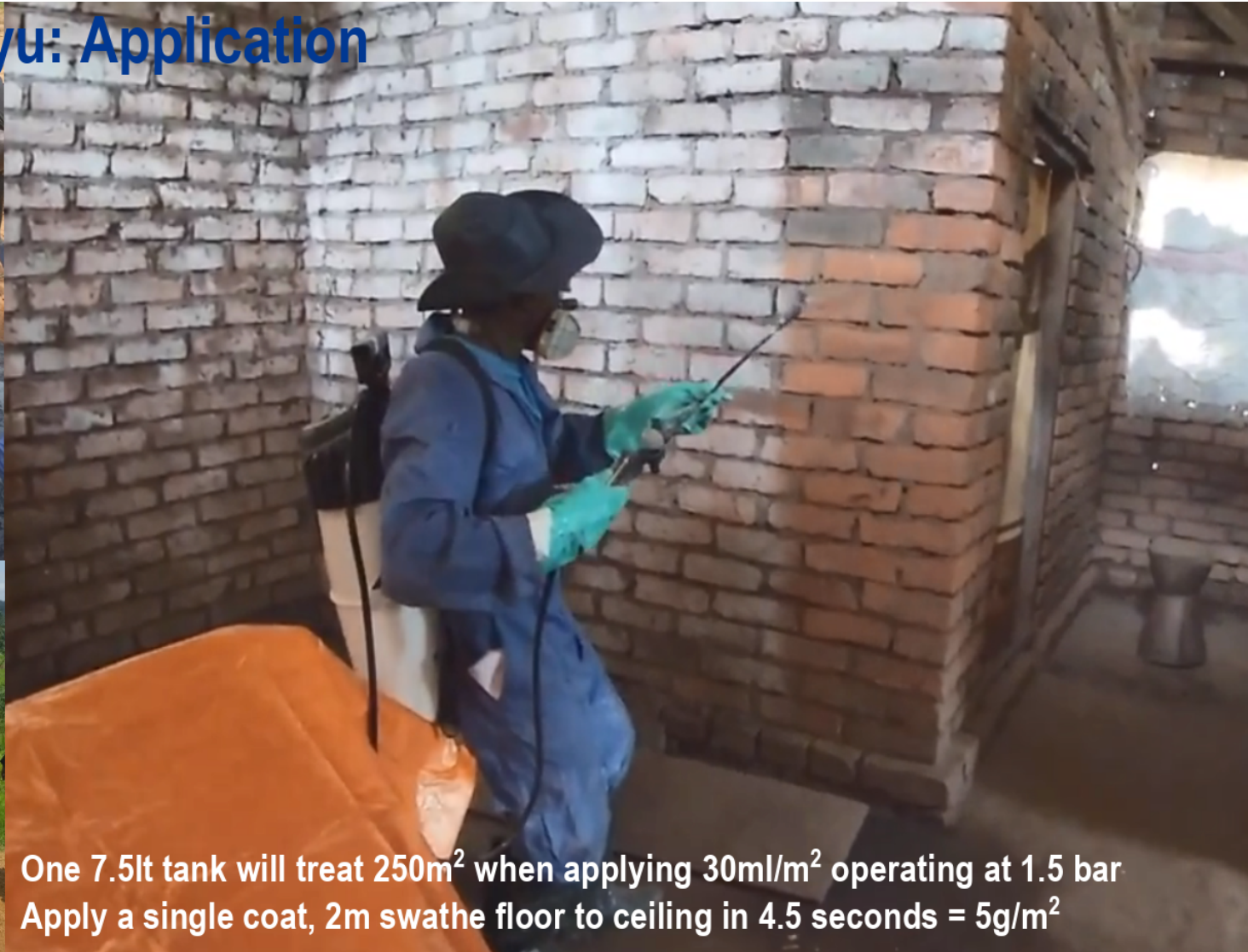


Sampling method	Outcome	Houses per cluster	Replicates per house	Frequency of sampling	Total sampling effort
Filter paper samples / gravimetric	Spray quality	5	4	1	140
WHO cone bioassays	Residual efficacy of IRS	4	5	7 days post spray + monthly for 8 months	2800
WHO tube assays	Insecticide susceptibility of target species	1	1	baseline + 8 months post spray in 4 clusters per arm	16
Indoor Prokopack collections	Vector mortality	2	1	monthly for 8 months	256
CDC LT, HDT	Vector density	80	1	4 houses each night, 20 nights a month for 8 months	6,720
	Sporozoite rate (ELISA)				
HLC	Vector density / biting rate	3	1	monthly for 8 months	236
	Sporozoite rate (ELISA)				

Factor	Imergard	Actellic 300CS	p value
Number of participants	6418	7122	
Number of households	1819	1991	
Average Cluster Size	259.86	284.43	
Household Size	3.53 (3.44-3.61)	3.58 (3.49-3.66)	0.4274
<5	0.49 (0.46-0.52)	0.52 (0.49-0.55)	0.114
5 to 18	1.17 (1.11-1.23)	1.19 (1.13-1.25)	0.6314
>18	1.87 (1.83-1.91)	1.86 (1.83-1.90)	0.821
Pregnant Women	0.04 (0.03-0.05)	0.03 (0.02-0.04)	0.1667
Walls: Mud	738 (40.57)	842 (42.29)	0.282
Walls: Bricks	1081 (59.43)	1149 (57.71)	
Roof: Grass/Leaves/Palms	906 (49.81)	1025 (51.48)	0.302
Roof: Iron Sheets	913 (50.19)	966 (48.52)	
Floor: Mud	1568 (86.20)	1757 (88.25)	0.058
Floor: Cement	251 (13.80)	234 (11.75)	
Eaves: Open	1072 (58.93)	1191 (59.82)	0.578
Eaves: Closed	747 (41.07)	800 (40.18)	
Number of Sleeping spaces	1.82 (1.78-1.86)	1.79 (1.75-1.83)	0.3057
Household density	2.04 (1.99-2.08)	2.09 (2.04-2.14)	0.0959
Nets per household	1.75 (1.70-1.80)	1.76 (1.71-1.80)	0.8101
Net coverage	0.55 (0.54-0.56)	0.56 (0.54-0.57)	0.5351



## Euga and Ebuyu: Application



## Results summary

### **Trial was conducted at acceptable quality**

No imbalance between treatment arms

Spray quality within 50% of target dose measured gravimetrically and by filter paper

The study was powered to detect a difference in sporozoite rate with 51,200 mosquitoes collected per arm. This was reached in the Imergard arm but not in the Actellic arm

### **Resistance**

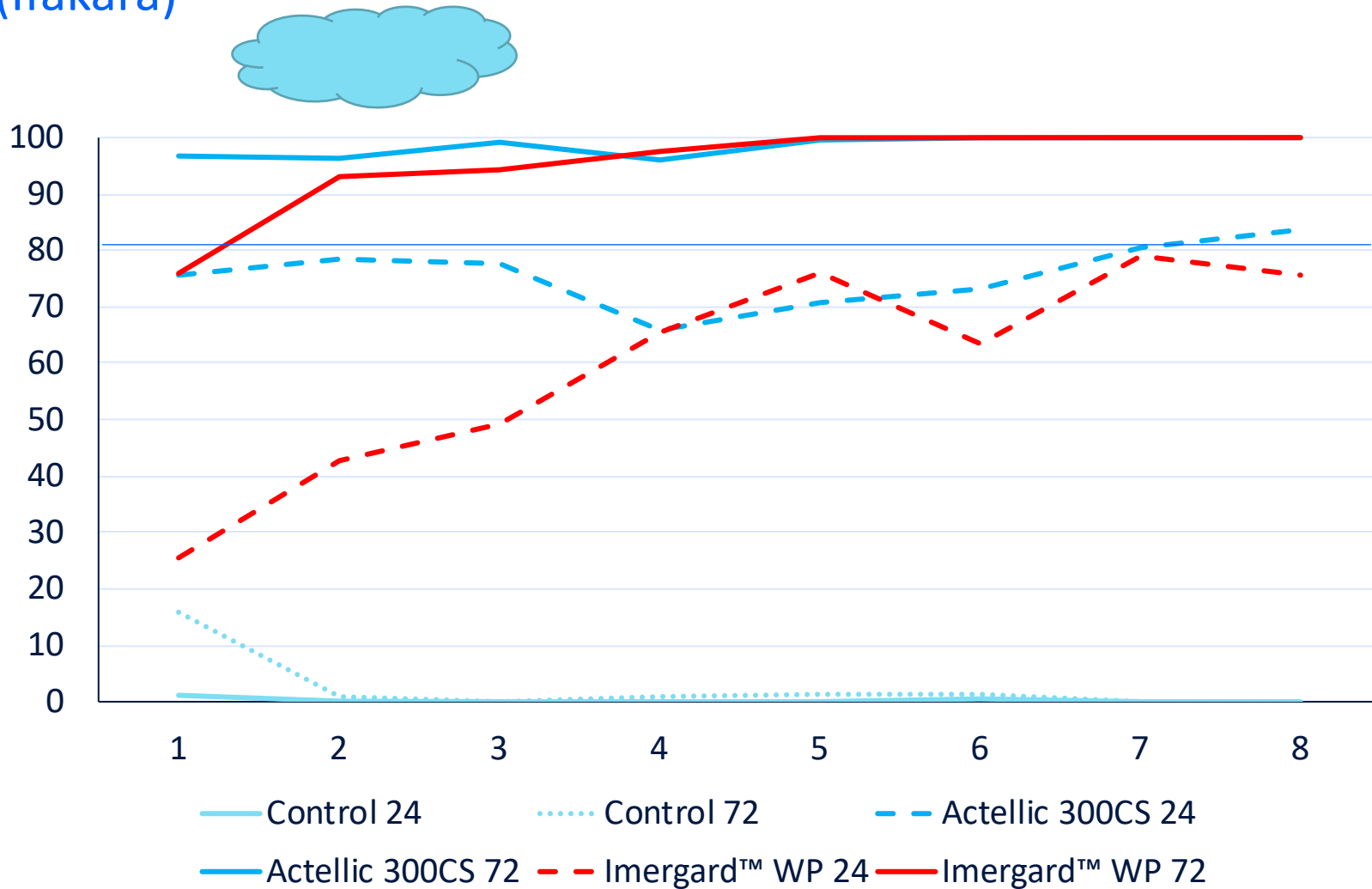
*An. funestus* and *An. arabiensis* remained susceptible to pirimiphos methyl (100% and 98% mortality).

### **Safety and acceptability**

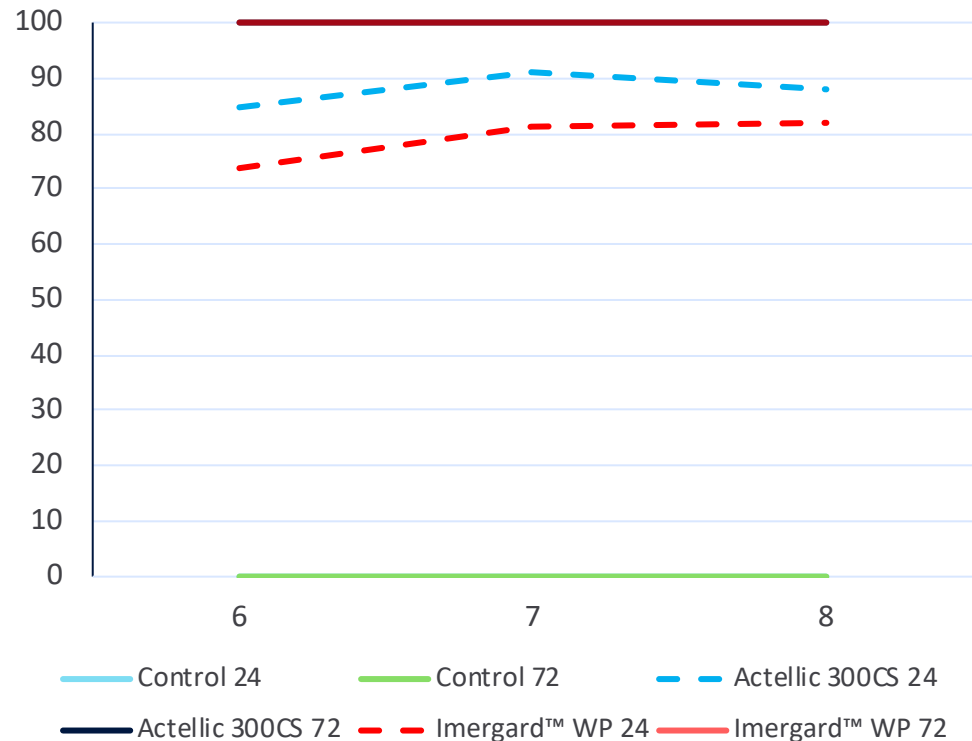
There were no serious adverse events in either treatment arm among sprayers or residents.

Both treatment arms were well received by local residents

Control corrected mortality for 8 months after spraying for Actellic and Imergard with 24 hour and 72 hour holding times measured by cone bioassay with a susceptible *Anopheles gambiae* s.s. (Ifakara)



# Control corrected mortality for 6- 8 months after spraying for Actellic and Imergard with 24 hour and 72 hour holding times measured by cone bioassay with a resistant *Anopheles arabiensis* (Ifakara)



## Residual efficacy

( $\geq 80\%$  mortality) of Imergard and Actellic with *An. gambiae* Ifakara was not met at 24 hours, however, with 72-hours holding time, residual efficacy was 8 months with susceptible and resistant strains.

## SPOROZOITE RATE – not different

Species	Actellic 300CS			Imergard			Odds Ratio with Actellic 300CS as the reference		
	Positive	Sampled	Sporozoite Rate	Positive	Sampled	Sporozoite Rate	% difference	Odds Ratio (95% CI)	p value
<i>An. arabiensis</i>	5	4,258	0.00117	12	4,226	0.00284	58.64	4.14 (0.38-45.77)	0.246
<i>An. funestus</i>	66	20,259	0.00326	274	56,556	0.00484	32.75	1.72 (0.70-4.26)	0.233
<b>Overall</b>	71	24,517	0.00290	286	60,782	0.00471	38.45	2.04 (0.83-5.01)	0.118

### Primary endpoint:

proportion of malaria infected mosquitoes (sporozoite rate) measured in 85,299 samples was not statistically different between the treatment arms for both *An. funestus* and *An. arabiensis*

Overall sporozoite rate was not significantly different between Actellic and Imergard treatment arms (0.00290 vs 0.00471; 2.04 OR (95% CI 0.83-5.01); p=0.118).

## ENTOMOLOGICAL INNOCULATION RATE

Mosquito densities different so EIR is higher in Imergard arm

Mosquito densities not different between arms adjusted for cluster

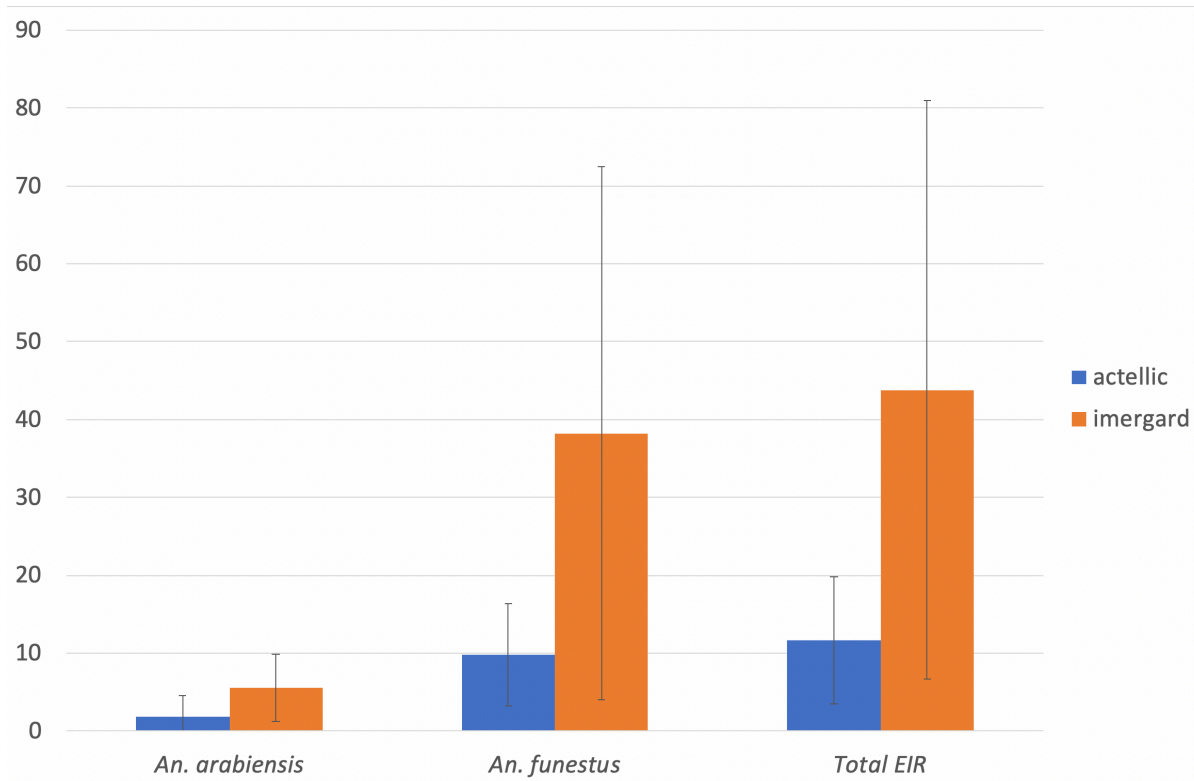
	<i>An. arabiensis</i>		<i>An. funestus</i>	
	Actellic 300CS	Imergard	Actellic 300CS	Imergard
<b>Total Number Mosquitoes collected by HLC</b>	846	1064	2205	6046
<b>Total Number of HLC Nights</b>	236	240	236	240
<b>Average Landing Rate per night by HLC</b>	4.3	4.1	6.7	14.2
<b>Total number of mosquitoes analysed for Pf CSP*</b>	4,258	4,226	20,259	56,556
<b>Total number of sporozoite positive mosquitoes</b>	5	12	66	274
<b>Sporozoite Rate</b>	0.00117	0.00283	0.00325	0.00484
<b>Proportion of all sporozoite positive mosquitoes</b>	1.40	3.36	18.49	76.75
<b>Annual EIR</b>	1.84	4.25	7.93	25.11
<b>% EIR Contribution</b>	4.71	10.86	20.27	64.17

## ENTOMOLOGICAL INNOCULATION RATE

### Secondary endpoint

*An. funestus* densities were higher in the Imergard arm but not statistically different between the two arms (adjusted by cluster).

The mean EIR by arm for *An. arabiensis* was 1.8 and 5.5 and for *An. funestus* was 9.8 and 38.2 in the Actellic and Imergard treatment arms, respectively but not statistically different between the two arms (adjusted by cluster).



Swiss TPH 

- Amanda Ross

Swiss TPH 

- Jason Moore
- Emanuel Mbuba
- Adam Saddler

# The team



ISO 9001: 2015 certified  
 **IFAKARA HEALTH INSTITUTE**  
 research | training | services

- Carly Marshal
- Hassan Ngonyani
- Rose Philipo
- Olukayode Odufuwa
- David Kaftan
- Kyeba Swai

MERCI, ASANTE SANA. THANK YOU