

I meccanismi riproduttivi delle zanzare come bersaglio per sviluppare tecniche innovative di controllo

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POLO GGB

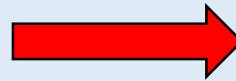


A Vector Control Research Alliance

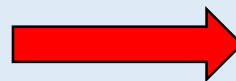
Gli attuali metodi di controllo della trasmissione

Evitare il contatto uomo-zanzara

Zanzariere impregnate e non



Repellenti (DEET, picaridina...)



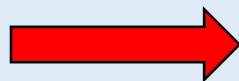
Gli attuali metodi di controllo della trasmissione

Abbassare la densità del vettore

Gestione del territorio



Insetticidi
IGR



Adulticidi



Larvicidi



Gli attuali metodi di controllo della trasmissione

I larvicidi



Auto-dissemination approach

Pyriproxyfen



[The "auto-dissemination" approach: a novel concept to fight *Aedes albopictus* in urban areas.](#)

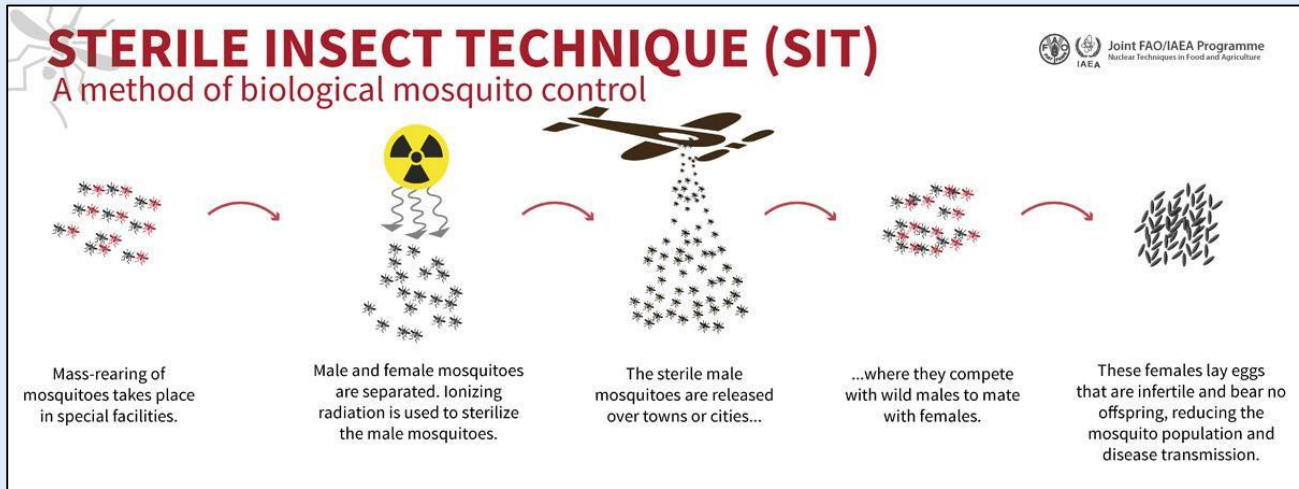
Caputo B, Ienco A, Cianci D, Pombi M, Petrarca V, Baseggio A, Devine GJ, della Torre A. PLoS Negl Trop Dis. 2012;6(8):e1793. doi: 10.1371/journal.pntd.0001793. Epub 2012 Aug 28.

PMID: 22953015 [Free PMC Article](#)

[Similar articles](#)

Ancora in fase di sviluppo

Sterile Insect Technique (SIT)



Fruit flies



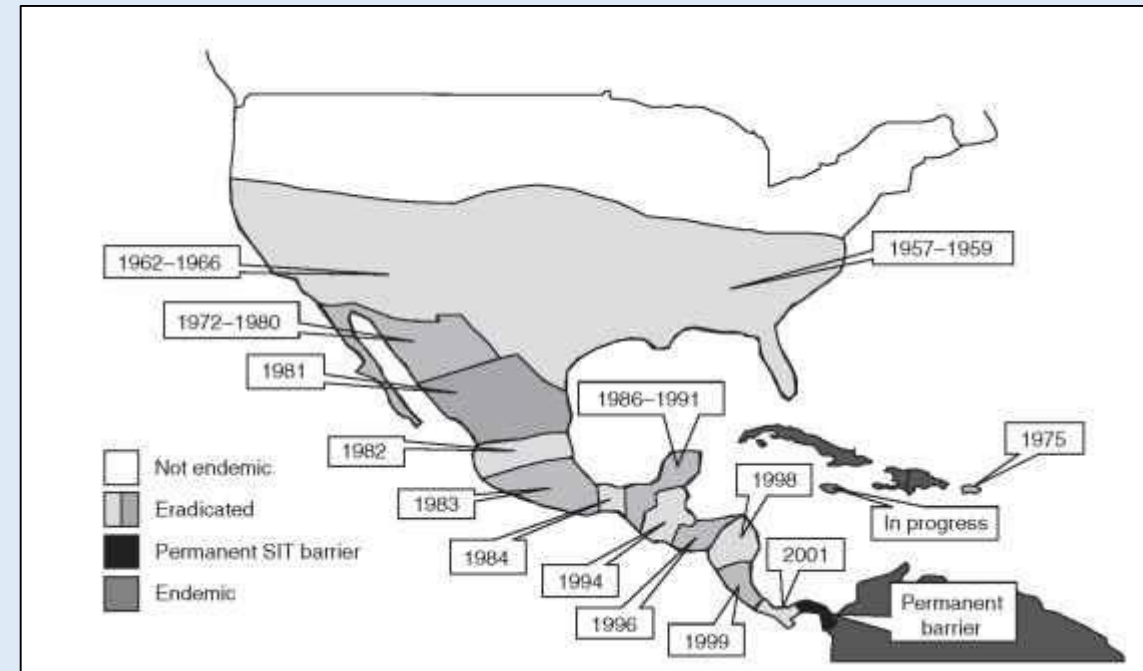
Glossina spp.



Cochliomyia hominivorax



Tecnologia trasferita sul campo



...e le zanzare?

[PLoS One](#). 2012;7(11):e49414. doi: 10.1371/journal.pone.0049414. Epub 2012 Nov 21.

The sterile insect technique for controlling populations of *Aedes albopictus* (Diptera: Culicidae) on Reunion Island: mating vigour of sterilized males.

[Oliva CF](#)¹, [Jacquet M](#), [Gilles J](#), [Lemperiere G](#), [Maquart PO](#), [Quilici S](#), [Schooneman F](#), [Vreysen MJ](#), [Boyer S](#).

[Malar J](#). 2014 Dec 11;13:484. doi: 10.1186/1475-2875-13-484.

Participation of irradiated *Anopheles arabiensis* males in swarms following field release in Sudan.

[Ageep TB](#), [Damiens D](#)¹, [Alsharif B](#), [Ahmed A](#), [Salih EH](#), [Ahmed FT](#), [Diabaté A](#), [Lees RS](#), [Gilles JR](#), [El Sayed BB](#).

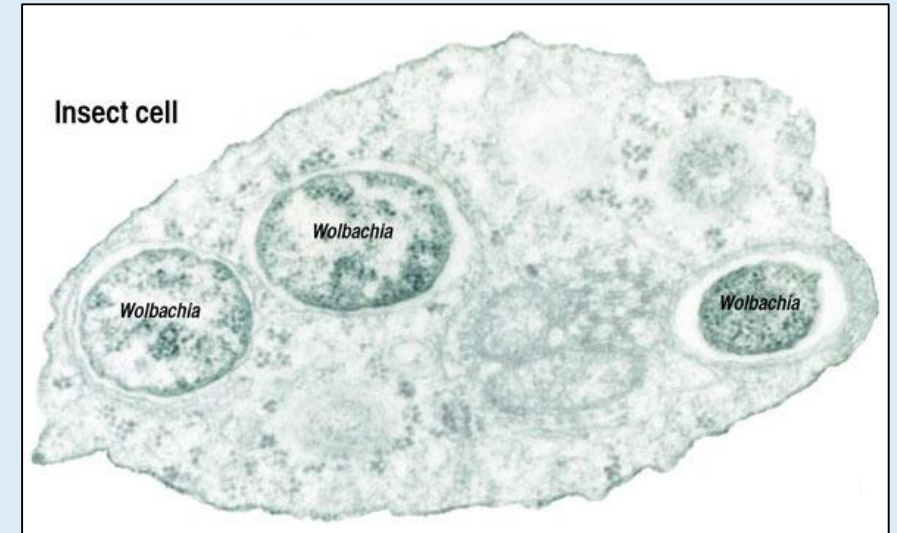
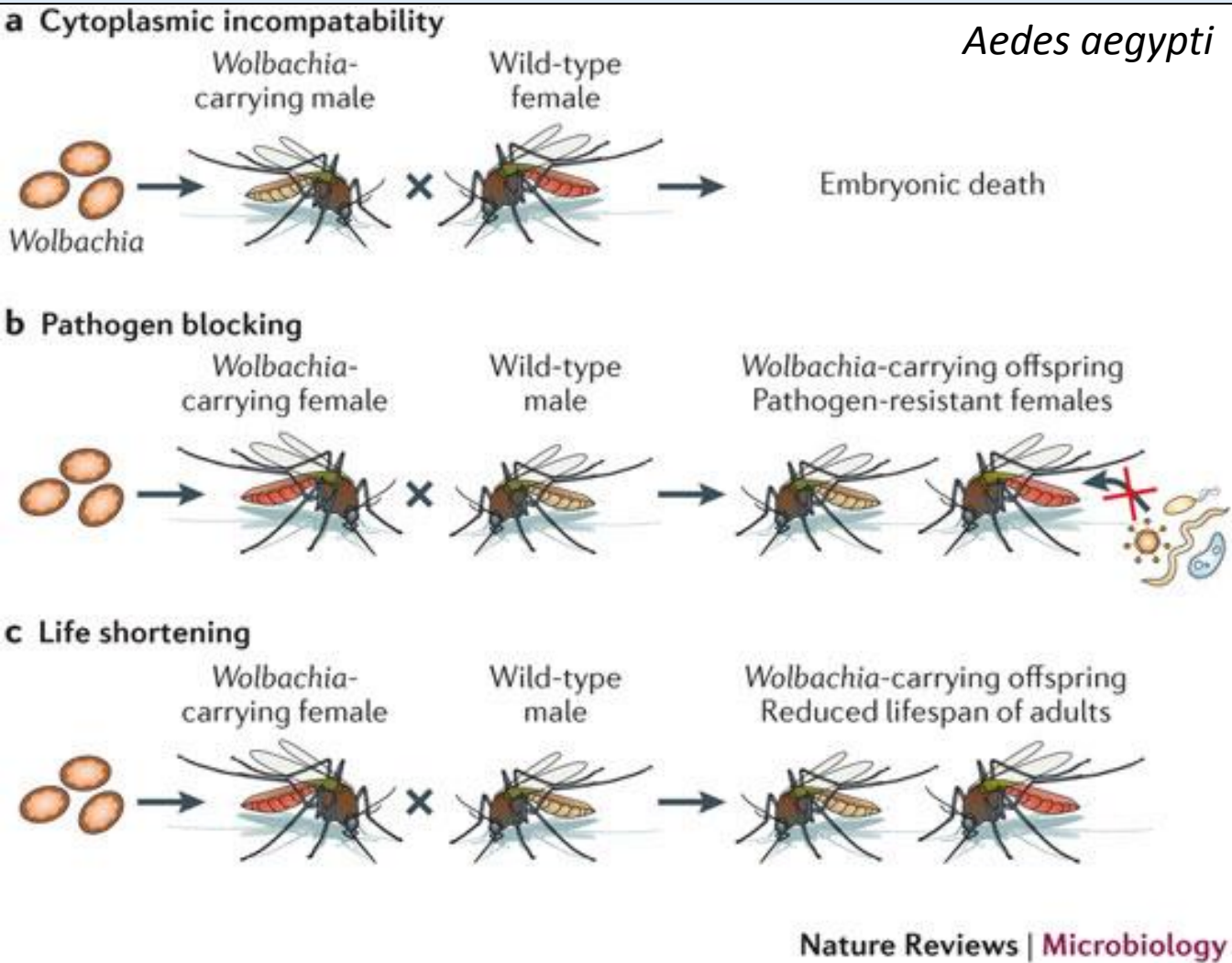
[Acta Trop](#). 2016 Mar 25;159:62-68. doi: 10.1016/j.actatropica.2016.03.032. [Epub ahead of print]

Establishment of a satellite rearing facility to support the release of sterile *Aedes albopictus* males. I. Optimization of mass rearing parameters.

[Dogan M](#)¹, [Gunay F](#)², [Puggioli A](#)³, [Balestrino F](#)³, [Oncu C](#)², [Alten B](#)², [Bellini R](#)³.

Tecnologia in trasferimento
sul campo

I batteri endosimbionti: *Wolbachia*



Nat Rev Microbiol. 2013 Mar;11(3):181-93. doi: 10.1038/nrmicro2968.

Beyond insecticides: new thinking on an ancient problem.
McGraw EA¹, O'Neill SL.

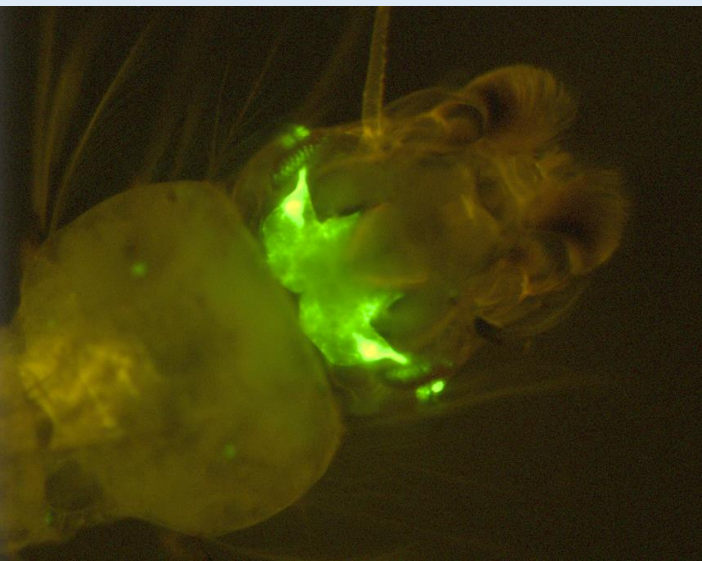
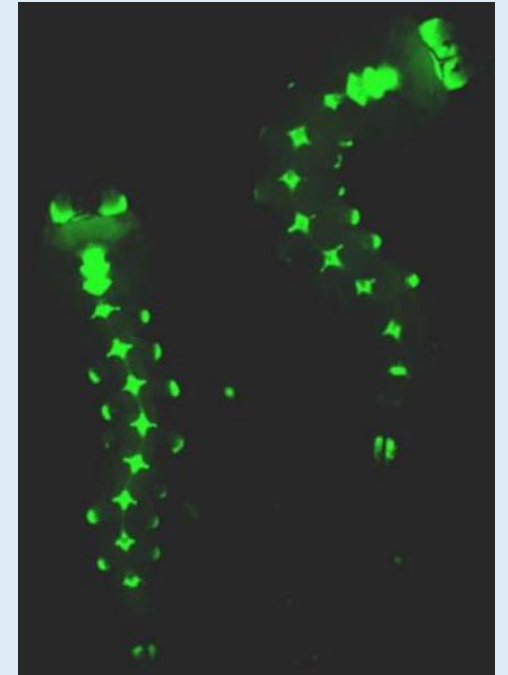
[Comparison of Irradiation and Wolbachia Based Approaches for Sterile-Male Strategies Targeting *Aedes albopictus*.](#)

Atyame CM, Labbé P, Lebon C, Weill M, Moretti R, Marini F, Gouagna LC, Calvitti M, Tortosa P.
PLoS One. 2016 Jan 14;11(1):e0146834. doi: 10.1371/journal.pone.0146834. eCollection 2016.

Tecnologia trasferita sul campo

Cos'è una zanzara transgenica?

È una zanzara nel cui genoma sono stati inseriti uno o più geni esogeni attraverso un meccanismo di modifica del DNA

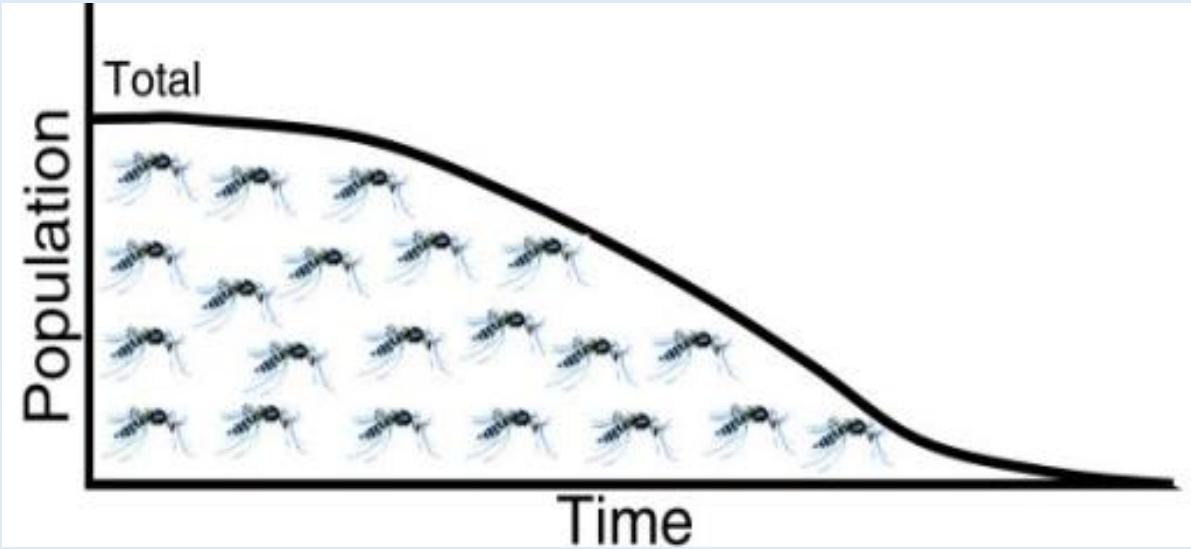


Cosa causa questa modifica genetica?

Causa l'effetto (fenotipo) desiderato

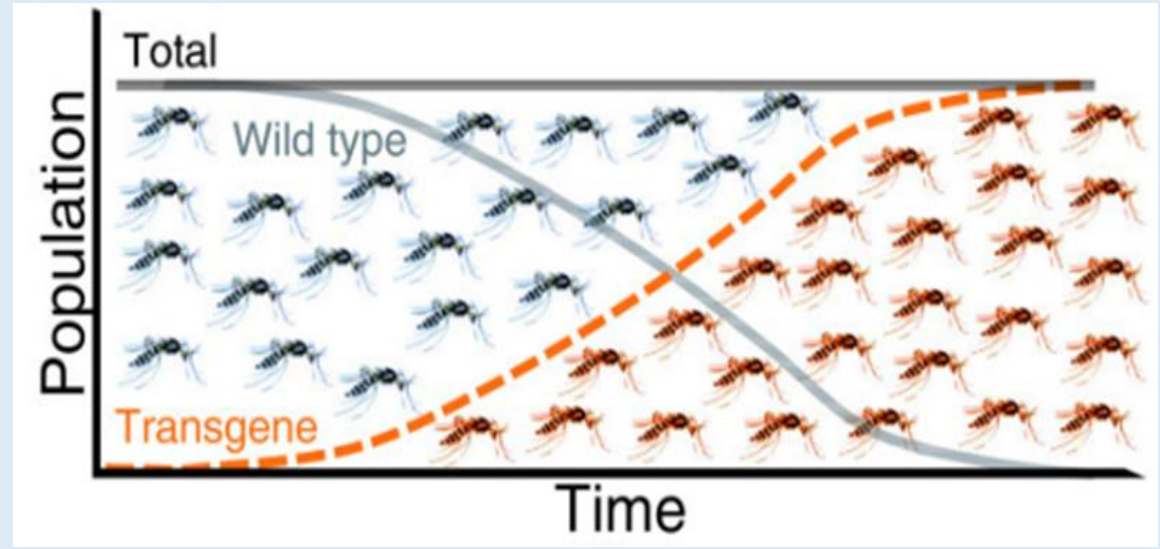
Population Suppression

Transgeni che provocano sterilità



Population Replacement

Transgeni che provocano resistenza all'infezione



Le zanzare transgeniche “sul mercato”:

- *Aedes aegypti* OX513A
OXITEC LTD
- *Aedes albopictus* OX3688
OXITEC LTD



Le zanzare transgeniche in via di sviluppo:

[Proc Natl Acad Sci U S A](#). 2015 Dec 8;112(49):E6736-43. doi: 10.1073/pnas.1521077112. Epub 2015 Nov 23.

Highly efficient Cas9-mediated gene drive for population modification of the malaria vector mosquito *Anopheles stephensi*.

[Gantz VM](#)¹, [Jasinskiene N](#)², [Tatarenkova O](#)², [Fazekas A](#)², [Macias VM](#)², [Bier E](#)³, [James AA](#)⁴.

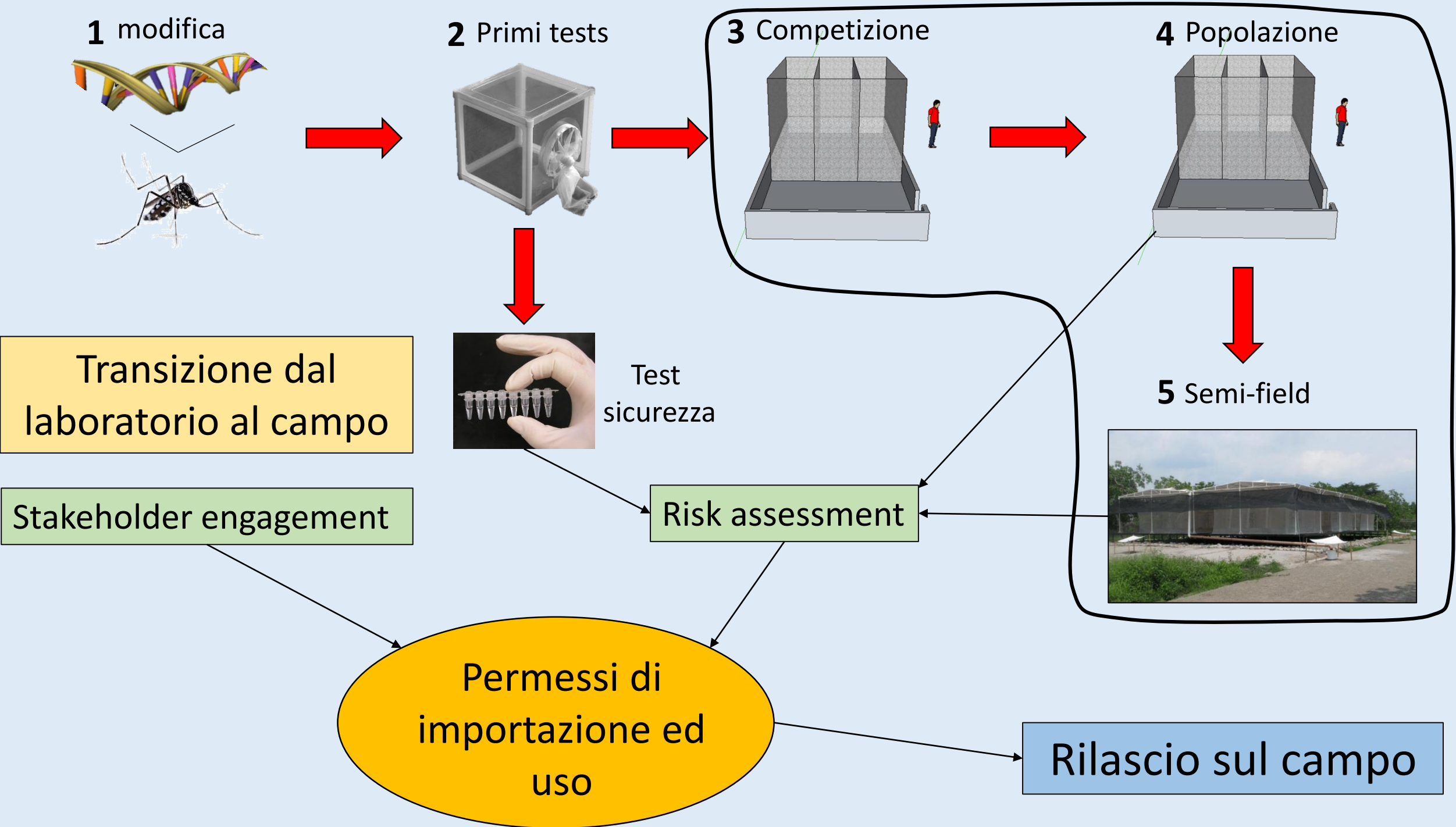


[Nat Biotechnol](#). 2016 Jan;34(1):78-83. doi: 10.1038/nbt.3439. Epub 2015 Dec 7.

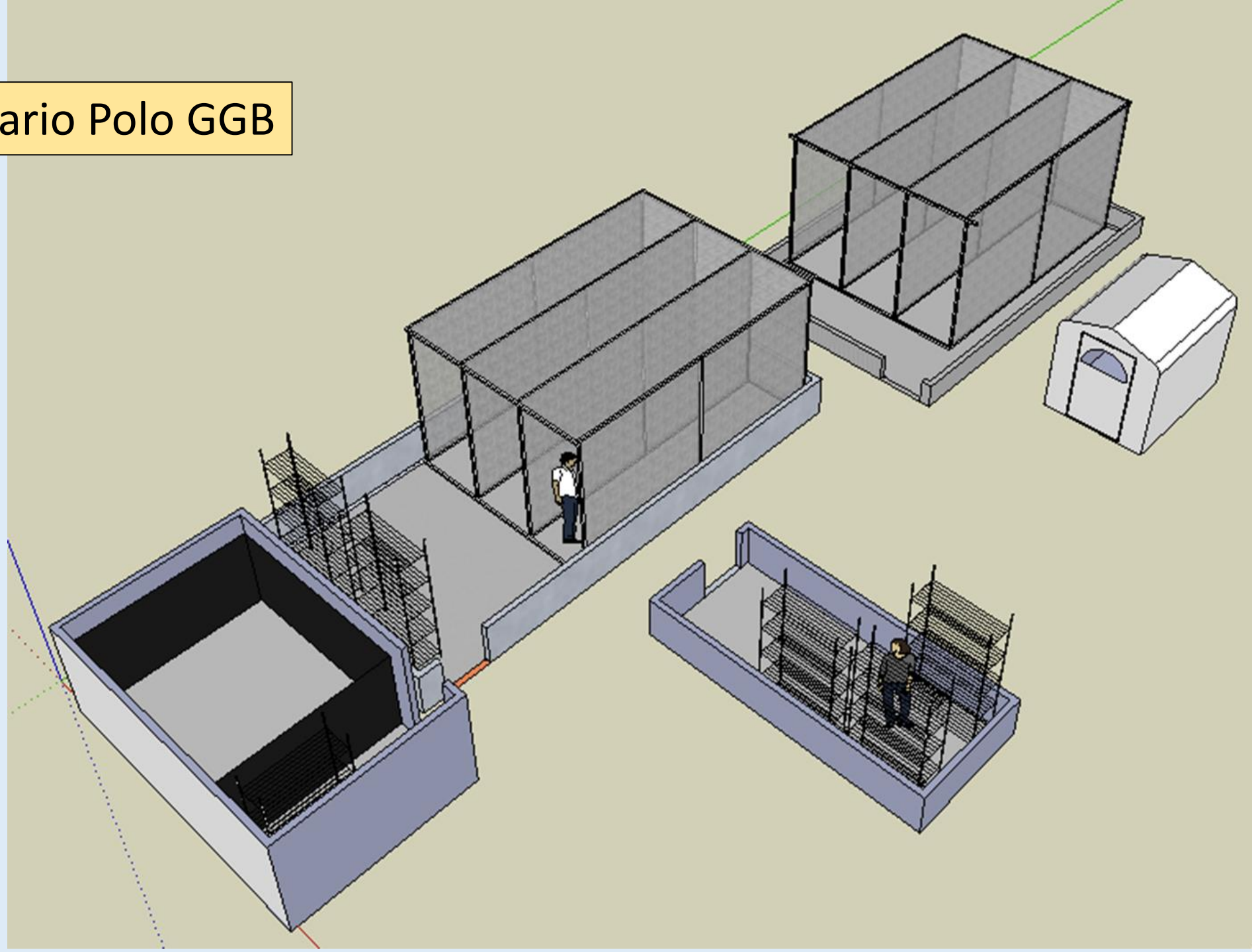
A CRISPR-Cas9 gene drive system targeting female reproduction in the malaria mosquito vector *Anopheles gambiae*.

[Hammond A](#)¹, [Galizi R](#)¹, [Kyrou K](#)¹, [Simoni A](#)¹, [Siniscalchi C](#)², [Katsanos D](#)¹, [Gribble M](#)¹, [Baker D](#)³, [Marois E](#)⁴, [Russell S](#)³, [Burt A](#)¹, [Windbichler N](#)¹, [Crisanti A](#)¹, [Nolan T](#)¹.

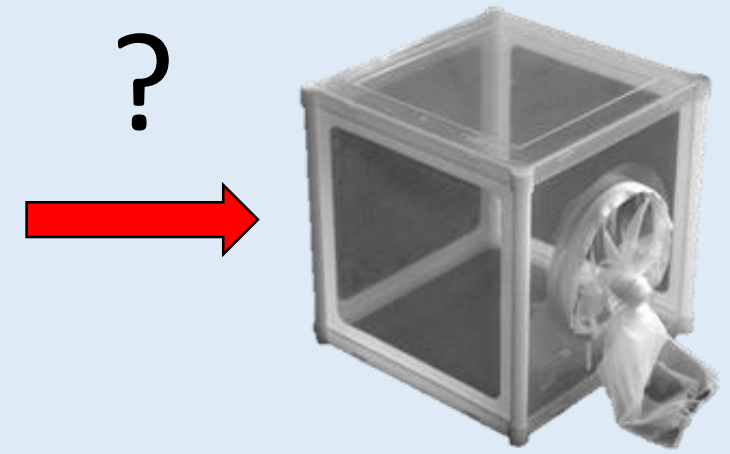


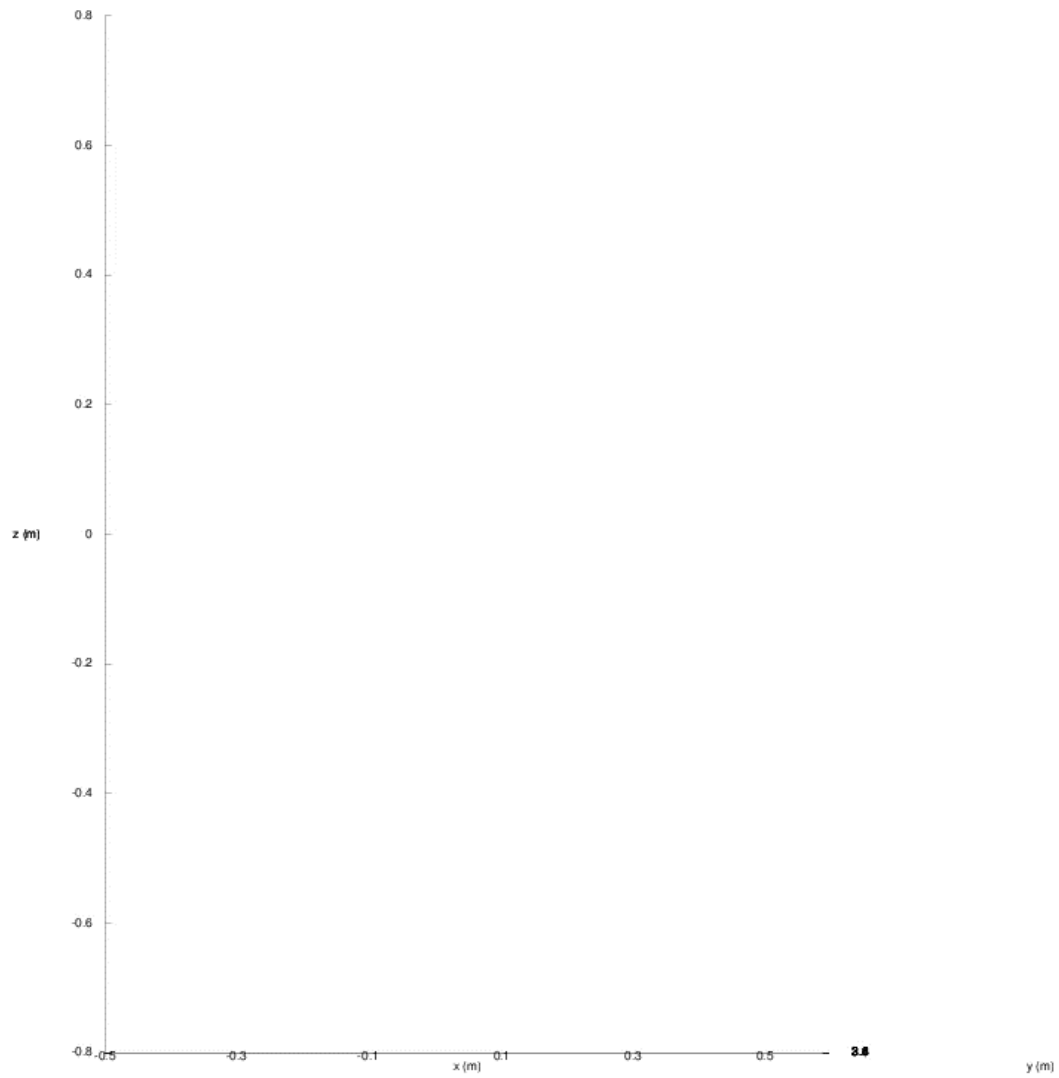


Insettario Polo GGB

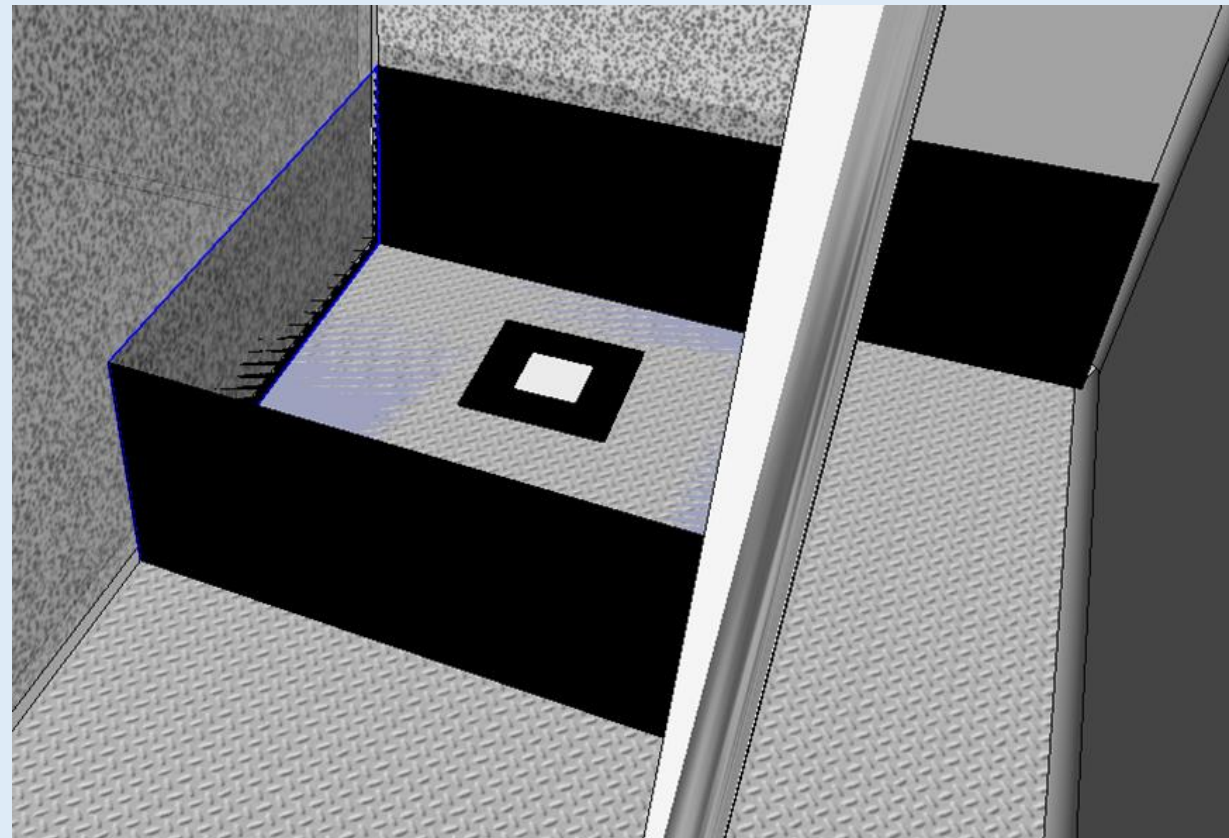


Il comportamento di accoppiamento di *Anopheles gambiae*

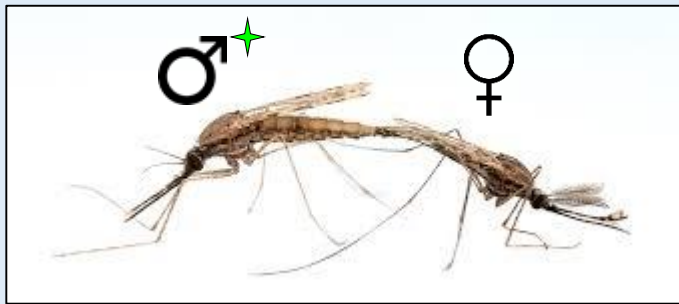




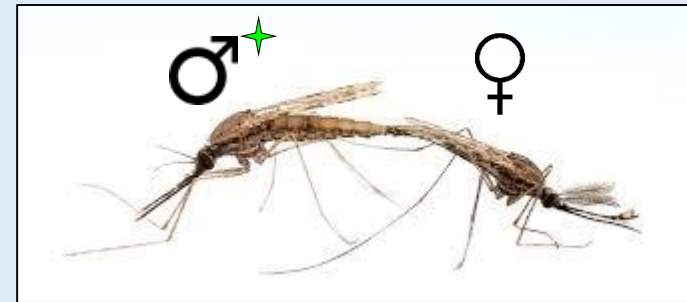
Induzione della sciamatura



Anopheles gambiae
linee sterili

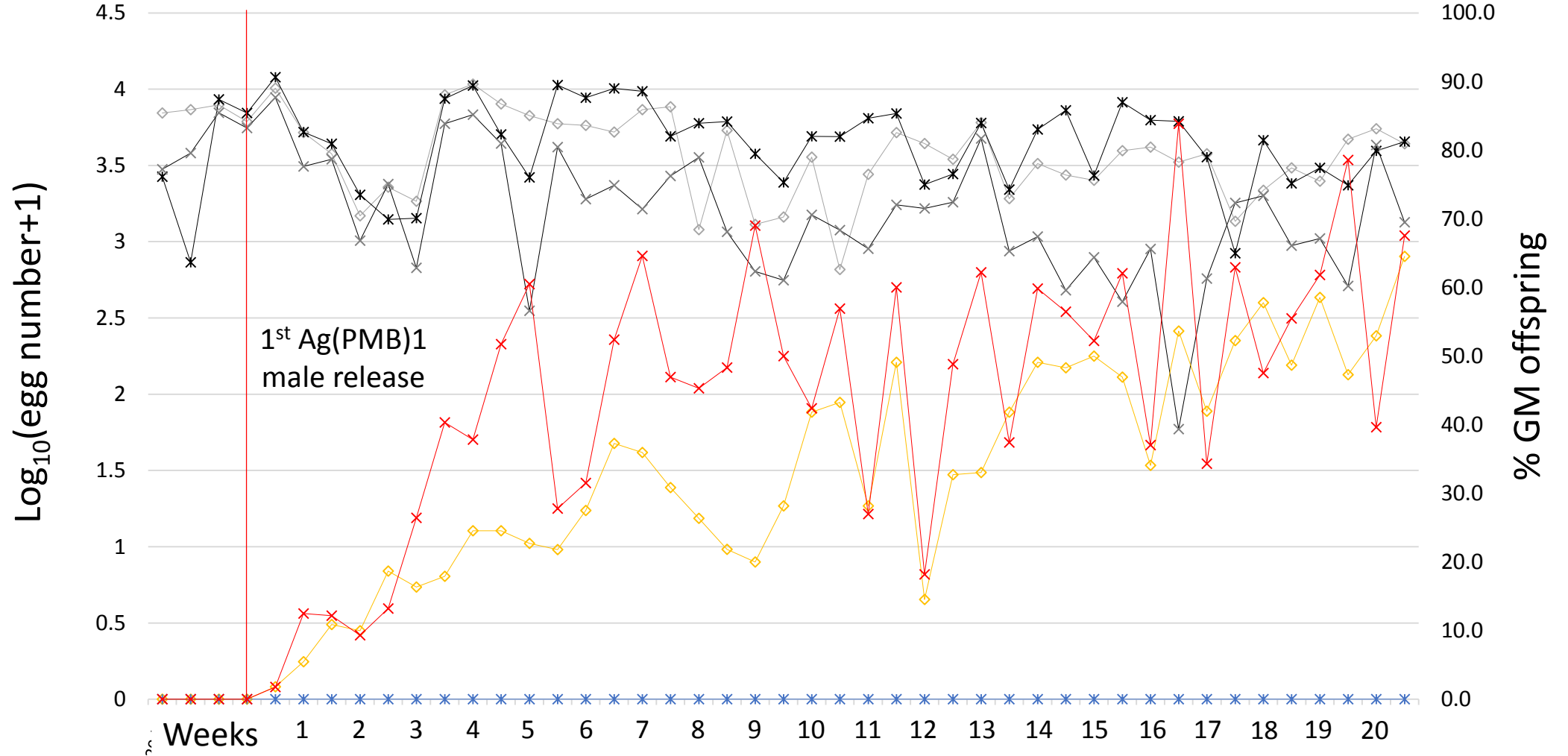


Anopheles gambiae
linee sex ratio distorter



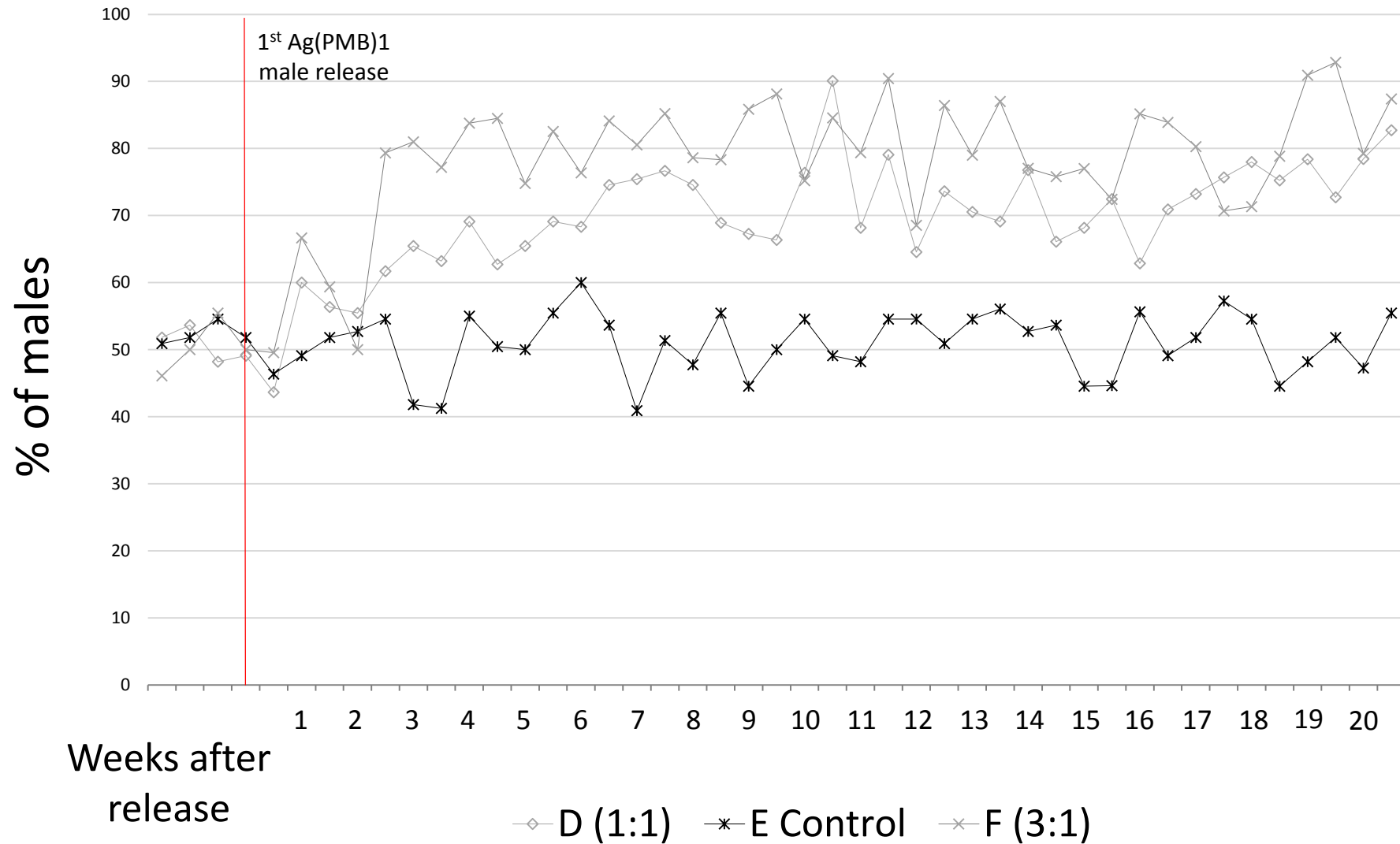
95% ♂♂

progressive evaluation of Ag(PMB)1 line Rep3



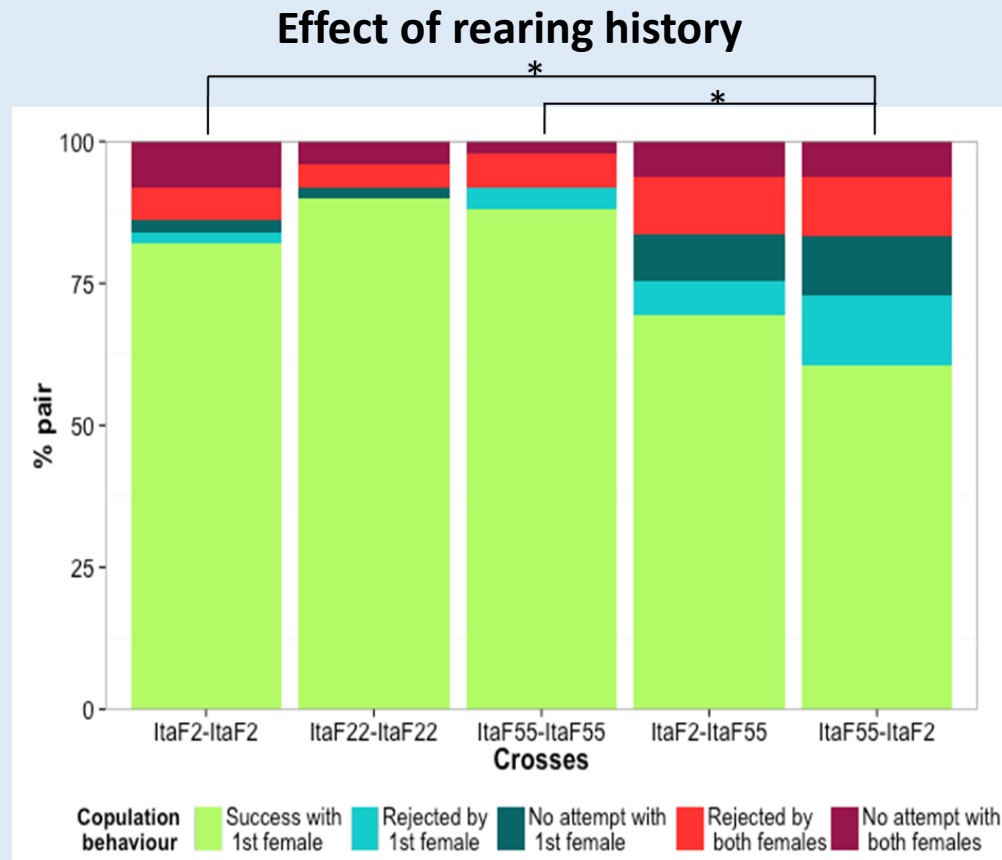
Log ₁₀ (egg number+1)	◇ D	* E	× F
% GM larvae	◇ D	* E	× F
GM:WT male ratio	1:1 D	WTE E	3:1 F

% of males in the offspring Rep3

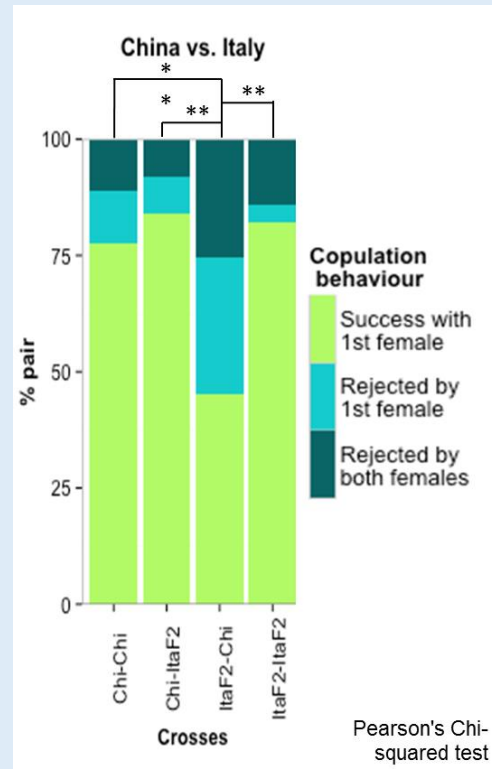


Comportamento di accoppiamento di *Aedes albopictus* per la sua implicazione nelle tecniche di controllo (SIT & GM)

Effetti della provenienza geografica e della colonizzazione: competitività, mating choice (CHC), rifiuto



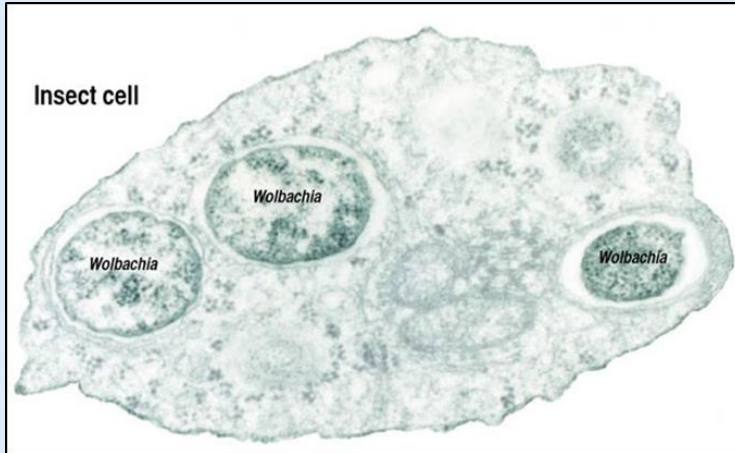
Inter-population crosses



In collaborazione con AIEA,
Dip. Chimica Università degli
studi di Perugia

Vogliamo esplorare la possibilità di adottare le nuove tecnologie in Italia?

I batteri endosimbionti



Le zanzare transgeniche



Sterile Insect Technique (SIT)



Grazie per l'attenzione

Anopheles gambiae ^{gfp}124L-2

