Fighting mosquito-borne diseases with gut symbiotic bacteria

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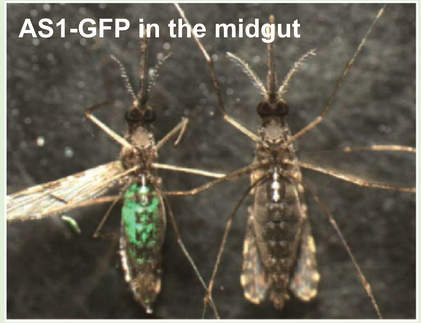
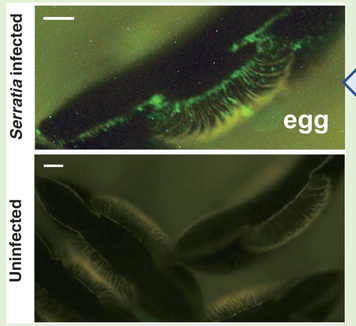
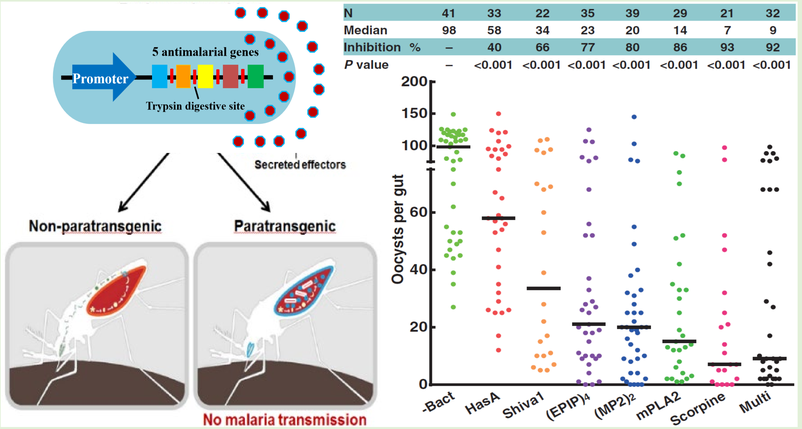
Driving mosquito refractoriness to *Plasmodium falciparum* with engineered symbiotic bacteria



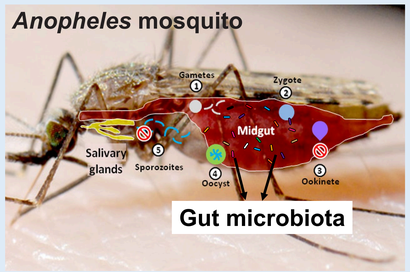


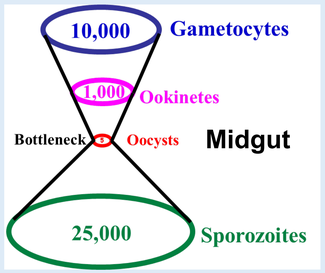


N	41	33	22	35	39	29	21	32
Median	98	58	34	23	20	14	7	9
Inhibition %	–	40	66	77	80	86	93	92
P value	–	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

- *Serratia* AS1 colonizes the midgut, female ovaries, and spreads rapidly throughout mosquito populations.
- Engineered AS1 secrets effector proteins to inhibit *Plasmodium* development in mosquitoes.

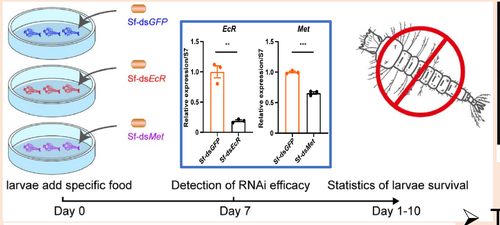
Sibao Wang*, *et al.*, ***Science*** (2017)

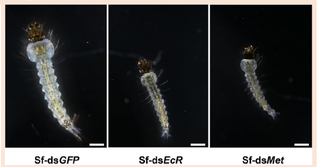


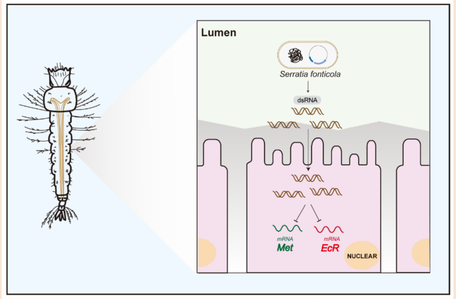


- **The mosquito microbiota and *Plasmodium* share the same compartment – the midgut.**
- ***Plasmodium* numbers undergo a severe bottleneck during development in the midgut.**
- **The gut microbiota can be explored for prevention of pathogen transmission.**

Engineered gut symbiotic bacterium-mediated RNAi for effective control of mosquito larvae



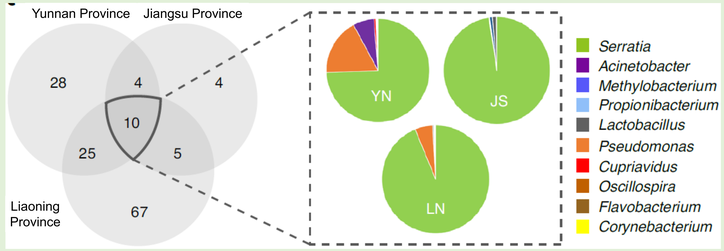


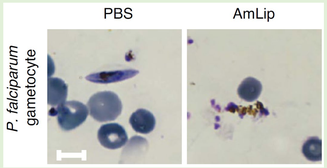


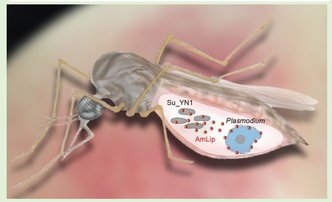
- The engineered *Serratia fonticola* can produce *dsRNA* to suppress the expression of methoprene-tolerant gene and ecdysone receptor gene.
- The strain markedly inhibit the development of *An. stephensi* larvae and leads to a high mortality.

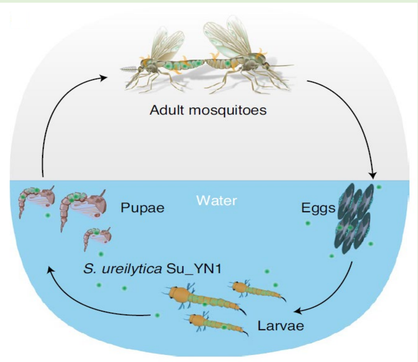
Jinjin Ding, *et al.*, Sibao Wang*, ***Microbiology Spectrum*** (2023)

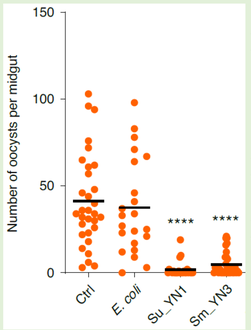
A natural symbiotic bacterium inhibits *Plasmodium* development via secretion of an antimalarial lipase











- A *Plasmodium*-blocking symbiotic bacterium *Serratia ureilytica* Su_YN1 is isolated from the midgut of wild *Anopheles sinensis* in China.
- Su_YN1 inhibits *Plasmodium* development through secretion of an antimalarial lipase.
- Su_YN1 bacteria spread efficiently through mosquito populations.

Han Gao, *et al.*, Sibao Wang*, ***Nat Microbiol*** (2021)