The endosymbiont Wolbachia modifies temperature preference in insect host species

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INTRODUCTION

Maternally transmitted *Wolbachia* bacteria infect most insect species and other arthropods. *w*Mel *Wolbachia* that naturally infect the fly *Drosophila melanogaster* block human disease transmission (e.g., dengue and Zika) when transinfected into *Aedes aegypti* mosquitoes. Researchers have transformed *Ae. aegypti* populations with *w*Mel on several continents, reducing human disease transmission. Despite the global prevalence of *Wolbachia* and its potential as a biocontrol of human disease, we still have a limited understanding of how *Wolbachia* affect the physiology and behavior of their natural *Drosophila* fly hosts. Recent work suggests that *w*Mel alters the temperature preference of *D. melanogaster*. **We tested whether *Wolbachia* affect the temperature preference of five other *Drosophila* host species, in addition to *D. melanogaster*, and how these changes to temperature preference mediate *Wolbachia*-host interactions.**

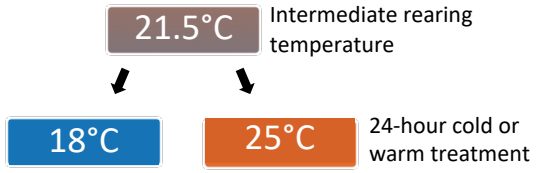
HYPOTHESIS

Wolbachia generally alter host temperature preference to promote *Wolbachia* growth.

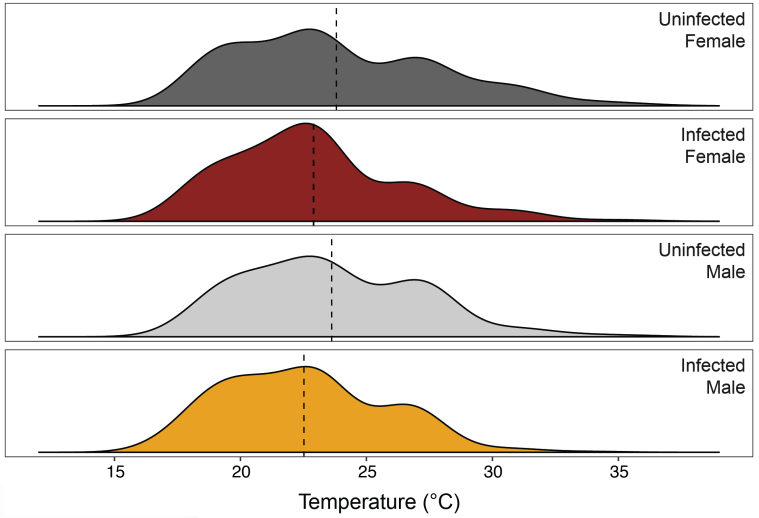
METHODS

We used a custom-built thermal gradient to test whether eight different *Wolbachia* strains alter the temperature preference of their host species in the *D. melanogaster* subgroup.

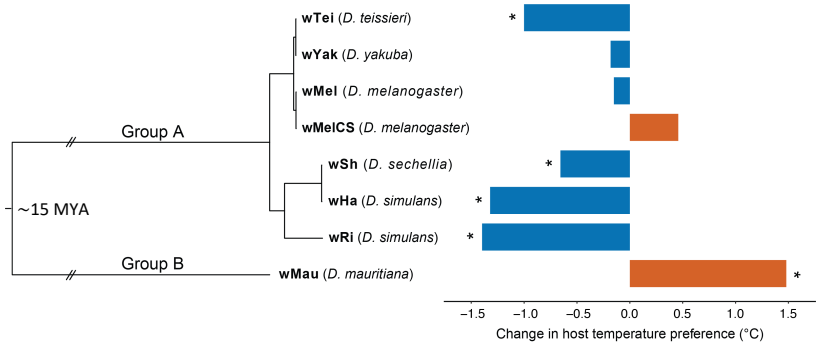
For the strains that altered host temperature preference, we then tested whether shifts toward the preferred temperature increase or decrease *Wolbachia* titer.



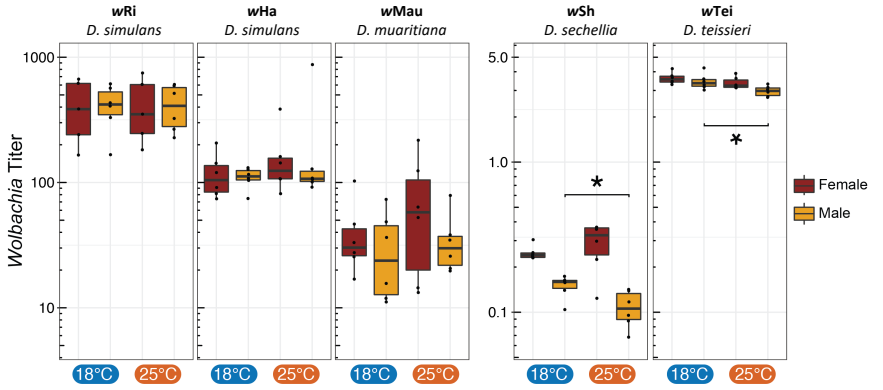
Wolbachia have widespread effects on host temperature preference that may promote growth of the bacterial endosymbiont



D. teissieri infected with the *w*Tei *Wolbachia* strain tend to **prefer colder temperatures** than uninfected flies.



We found that five *Wolbachia* strains alter host temperature preference. Host species infected with Group-A *Wolbachia* prefer colder temperatures, whereas the one species infected with a Group-B strain prefers a warmer temperature.



Infected *D. teissieri* and *D. sechellia* males have higher *Wolbachia* titer after a 24-hour shift towards preferred colder temperatures.

CONCLUSION

The widespread effects of *Wolbachia* on host temperature preference have important implications for host thermoregulation and fitness. For *w*Sh and *w*Tei, changes to host temperature preference increase *Wolbachia* titer, suggesting the endosymbiont may manipulate its host to promote bacteria growth. These experiments reveal how temperature mediates interactions between *Wolbachia* and their natural hosts, adding to our understanding of how *Wolbachia* might alter host physiology and behavior in transinfected mosquitoes used in biocontrol programs.

REFERENCES

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