Female mosquitoes get choosy quickly to offset invasions

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Certain female mosquitoes quickly evolve more selective mating behavior when faced with existential threats from other invasive mosquito species, with concurrent changes to certain genetic regions, according to new research from North Carolina State University. The findings shed light on the genetics behind insect mating behavior and could have implications for controlling mosquito pests that plague humans.

At issue is the displacement of *Aedes aegypti* (yellow fever) mosquitos by a cousin species, *Aedes albopictus* (Asian tiger), which occurred in the southeastern United States in the 1980s. In this "battle of the *Aedes*," the invading *A. albopictus* decimated *A. aegypti* populations throughout the Southeast, leaving smaller *A. aegypti* populations in Key West, Florida, Arizona and a few other southern locales. *A. aegypti* mosquitoes carry and spread many diseases that harm humans, including Zika, dengue fever and chikungunya.

Part of the takeover was attributed to how the larvae of each species grew; *A. albopictus* mosquitoes seemed to be able to outcompete the native mosquitoes. But another factor also played a huge role in the battle: When *A. aegypti* females mated with *A. albopictus* males—a genetic no-no—those females became sterile for life, a process called "satyrization." *A. albopictus* females didn't face the same fate; no offspring were produced when they mated with *A. aegypti* males, but they were later able to be fertile when mating with males of their own species.

Martha Burford Reiskind, research assistant professor in the Department of Applied Ecology at NC State and corresponding author of a paper describing the research, and colleagues wanted to understand more about how *A. aegypti* females respond to this type of threat and what happens in their genetic blueprint as their responses change.

The researchers found that *A. aegypti* females quickly—in just six generations—became more picky when selecting mates, eschewing *A. albopictus* males for males of their own species. This response occurred when *A. aegypti* females were exposed to cousin males in the lab and in the wild. Geographic location didn't seem to make a difference: The female mosquitoes in both Florida and Arizona exhibited similar genetic changes.

"We wanted to know what genes were involved in the evolution of this choosiness in female *A. aegypti* mosquitoes," Burford Reiskind said. "We can now look at certain gene regions and feel confident that they are involved in mating behavior."

Choosiness had its costs, though. Burford Reiskind said choosy female *A. aegypti* mosquitoes mated later in their brief lifespans—most live for two or three weeks—and were generally smaller.

"Invasive species are often seen as better competitors for scant resources, but that doesn't seem to be the case for these mosquitoes," Burford Reiskind said. "This study suggests other mechanisms are at play."

Burford Reiskind hopes to continue learning more about the genes involved in mating behaviors by conducting a larger-scale study, perhaps in places where *A. aegypti* and *A. albopictus* mosquitoes live in relatively equal densities.

The research appears in *Molecular Ecology*.

More information: M O Burford Reiskind et al, Rapid evolution and the genomic consequences of selection against interspecific mating, *Molecular Ecology* (2018). DOI: 10.1111/mec.14821

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