Infection with Wolbachia bacteria curbs fighting among fruit flies

July 3 2015

Male fruit flies infected with the bacterium, *Wolbachia*, are less aggressive than those not infected, according to research published in the July Applied and Environmental Microbiology, a journal of the American Society for Microbiology. This is the first time bacteria have been shown to influence aggression, said corresponding author Jeremy C. Brownlie, PhD, Deputy Head, School of Natural Sciences, Griffith University, Brisbane, Australia.

The research began with a discovery by University of Arizona student Elizabeth Bondy, an undergraduate with unusually sharp powers of observation who was working in Brownlie's lab. Male fruit flies normally fight each other, but Bondy, who was being trained to handle the insects, noticed that those infected with a particular strain of *Wolbachia* appeared to fight less aggressively than their uninfected peers. So Bondy and Chelsie E. Rohrscheib, a PhD student in Brownlie's lab, set up a home video camera to record the fighting.

The researchers used three parameters to measure aggression: length of time to initiation of fighting, total number of fights, and the average duration of a bout. The investigators then compared the infected fruit flies' fighting behavior with that of fruit flies that had never been infected, and with fruit flies that had been cured of their *Wolbachia* infections. Infected flies took three times longer than the others to initiate their first fight, and started only half as many fights. However, the infected flies' bouts lasted as long as those of uninfected counterparts. The latter point is important, because it shows the reduced

aggression was not due to sickness, said Brownlie.

The investigators also measured the neurotransmitter, octopamine, which regulates fruit fly aggression. As expected, infected flies produced less of the compound than their uninfected peers. They also showed reduced expression of two genes that encode enzymes responsible for producing octopamine. "That suggested that *Wolbachia* directly affects fruit fly gene function," said Brownlie.

Wolbachia infect at least 40 percent of all insect species, as well as other invertebrates, but they do not infect vertebrate animals. These bacteria manipulate host reproduction to transmit themselves to host offspring, and they can also alter sex selection. They have also been shown to influence host metabolic pathways, to protect hosts from pathogens, to influence life span, and even to play a role in speciation, said Brownlie.

For scientists, the fact that the bacteria affected aggression just as much as certain genetic mutations should be taken as a signal that behavioral changes should not necessarily be ascribed to genetics, said Brownlie. And while it's dangerous to extrapolate from insects to humans, new findings are hinting that gut bacteria might have similar influence on human behavior.

More information: This paper can be found online at aem.asm.org/cgi/reprint/AEM.00 … f&siteid=asmjournals

Provided by American Society for Microbiology