

EMBARGOED UNTIL MONDAY, 29 AUGUST 2016 AT 5:00 P.M. US EASTERN TIME

Editor's Note: Please hyperlink to the abstract on the AJTMH site once the embargo lifts.

Contact:
Bridget DeSimone, +1 301.280.5735, bdesimone@burness.com
Preeti Singh, +1 301.280.5722, psingh@burness.com

New Research Finds Female Mosquitoes Can Transmit Zika Virus to their Eggs and Offspring

Killing only adult mosquitoes may not end Zika outbreaks

Oakbrook Terrace, Ill. (August 29, 2016)—As the recent Miami outbreak of Zika virus, transmitted by the bite of female *Aedes aegypti* mosquitoes, prompts an all-out war on the pest, new research reveals that female mosquitoes can pass the virus on to their eggs and offspring, bolstering the need for larvicide use as an integral part of the effort to stop the spread of disease.

“The implications for viral control are clear,” said study co-author Robert Tesh, MD, at the University of Texas Medical Branch in Galveston, Texas. “It makes control harder. Spraying affects adults, but it does not usually kill the immature forms—the eggs and larvae. Spraying will reduce transmission, but it may not eliminate the virus.”

The study, “Vertical transmission of Zika virus in *Aedes aegypti* mosquitoes,” was published online today in the *American Journal of Tropical Medicine and Hygiene*.

“Since Zika virus has emerged as a global health emergency, most research has focused on the virus and its effects on humans. There is far less research on the virus in its mosquito host,” said Tesh. “But if you want to control Zika, you also have to know about the behavior of this virus in mosquitoes.”

Zika virus has been found to cause brain damage—called microcephaly—in newborns whose mothers were infected during pregnancy. The World Health Organization (WHO) has declared Zika’s spread an international health emergency, and WHO and the U.S. government have urged pregnant women and their partners not to travel to 45 countries—most of them in the Caribbean and Latin America—where Zika virus is now active.

Ae. aegypti is also known to be expanding its range northward. In the United States, it is especially abundant in Florida, the Gulf Coast, Arizona and California, with sporadic records in other Southern, Mid-Atlantic and Midwestern states.

“The study connects to two important things: one is the science: how Zika and other mosquito-borne viruses can survive in the tropics during the dry season,” said Stephen Higgs, PhD, president of the American Society of Tropical Medicine and Hygiene, and the second is the

need for a U.S. federal funding system that adequately plans for, and addresses infectious disease outbreaks.

To determine whether female mosquitoes that carry Zika virus pass it on to their offspring, researchers injected laboratory-reared *Ae. aegypti* with the virus. The mosquitoes were fed, and within the next week they were laying eggs. The researchers collected and incubated the eggs and reared the hatched larvae until adult mosquitoes emerged. Culture of these adults found Zika virus in one of every 290 mosquitoes tested.

“The ratio may sound low,” Tesh said, “but when you consider the number of *Ae. aegypti* in a tropical urban community, it is likely high enough to allow some virus to persist, even when infected adult mosquitoes are killed.”

Mosquitoes are known to pass other viruses on to their offspring, including dengue and yellow fever—both of which are also transmitted by *Ae. aegypti*. West Nile and St. Louis encephalitis viruses can also be passed on in eggs of *Culex* mosquitoes. The authors note that vertical transmission appears to provide a survival mechanism for the virus during adverse conditions: cold periods in temperate regions and hot dry seasons in tropical zones, or when many people become immune because of prior infection or vaccination.

“Now we need to show that vertical transmission occurs in nature,” Tesh said. To do that, “researchers need to collect larvae in areas where the virus is actively circulating—Latin America and the Caribbean, and now the Miami area. Finding infected larvae in an abandoned tire or water container would be evidence of vertical transmission.”

Tesh and the other researchers urge more insect studies while at the same time expanding methods to reduce the number of *Aedes* mosquitoes in and around homes to protect people from Zika virus infection. These steps include: removing standing water from containers and scrubbing them thoroughly to remove eggs and larvae; making sure that if water has to be stored in containers that they are tightly sealed to prevent mosquitoes from laying their eggs inside; and getting rid of trash such as old tires, plastic bottles and cups, and other objects in yards and vacant lots that can collect water and serve as mosquito breeding sites.

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