

Simple test detects disease-carrying mosquitoes, presence of biopesticide

August 30 2018



The tool uses a smartphone camera, a small 3D-printed box and a simple chemical test to show whether a dead mosquito belongs to the *Aedes aegypti* species. Credit: Vivian Abagiu/University of Texas at Austin

A new diagnostic tool has been developed by researchers at The

University of Texas at Austin that can easily, quickly and cheaply identify whether a mosquito belongs to the species that carries dangerous diseases such as Zika virus, dengue, chikungunya or yellow fever. It can also determine whether the bug has come into contact with a mosquito-control strategy known as *Wolbachia*.

"Many of these diseases are spreading in areas where they weren't common before," said Sanchita Bhadra, a research associate in the Department of Molecular Biosciences and first author on the paper. "Having surveillance is important in conjunction with any kind of outbreak, and this method allows a rapid [test](#) in the field."

The tool uses a smartphone camera, a small 3-D-printed box and a simple chemical test to show whether a dead mosquito belongs to the *Aedes aegypti* species. *Aedes aegypti* carries Zika and other devastating viruses that afflict an estimated 100 million people worldwide each year. The species also is closely linked to the tripling of cases of mosquito-borne diseases in the United States since 2004.

The research appears in the journal *PLOS Neglected Tropical Diseases*.

The tool developed by scientists and students at UT Austin also detects the presence of a biopesticide called *Wolbachia*, a type of bacteria that keeps mosquitoes from spreading diseases. In countries around the world and in 20 U.S. states where the *Aedes aegypti* mosquito is found, scientists working in public health agencies have started to infect mosquitoes with *Wolbachia* by introducing the bacteria into a local mosquito population to help curb transmission of viruses.



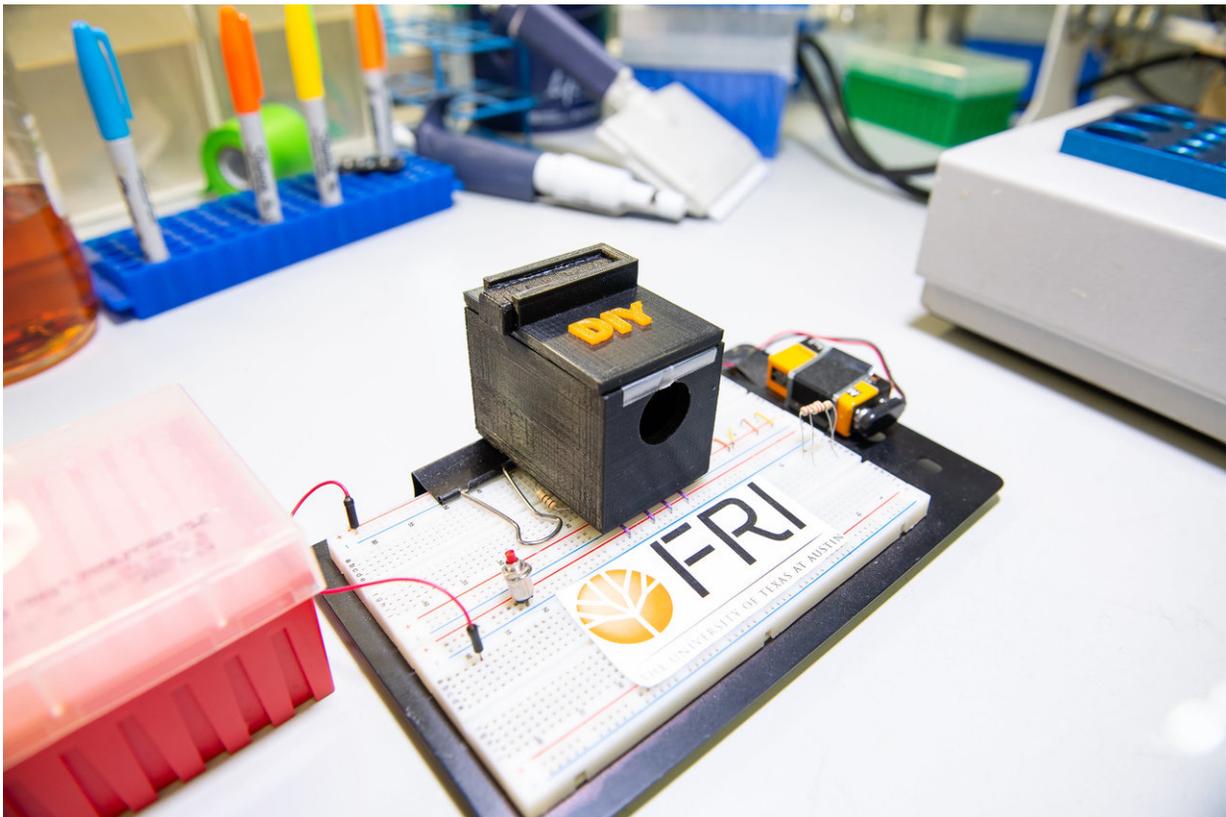
Research educator Timothy E. Riedel, research associate Sanchita Bhadra and student Nicole Pederson are part of the UT Austin team that developed a new tool for rapidly and easily determining whether a mosquito is of a species that carries dangerous diseases like Zika or yellow fever. Credit: Vivian Abagiu/University of Texas at Austin

Because mosquitoes show no outward signs of having the bacteria—and because existing diagnostic tests are hard to read, expensive and logistically cumbersome—the new tool represents a significant step forward for those hoping to monitor the effectiveness of *Wolbachia*.

"This test can happen without involving a lot of staff and equipment to make sure *Wolbachia* is effective and spreading as anticipated," Bhadra said.

Public health groups trap and kill mosquitoes routinely in conjunction with monitoring efforts, but existing technology requires a complex process to extract nucleic acid from inside mosquitoes, often after they have been dead for days and have started to decay, leading to greater expense and the possibility of more errors in lab tests than the new technology.

The new diagnostic [tool](#) uses a smartphone's camera and a simple test that can be done anywhere. It tests mosquitoes' nucleic acid without requiring a complicated process to remove it. Officially known as a loop-mediated isothermal amplification and oligonucleotide strand displacement, or LAMP OSD, the probe delivers a simple yes-or-no readout on a cellphone, with accuracy of greater than 97 percent.



The tool uses a smartphone camera, a small 3D-printed box and a simple chemical test to show whether a dead mosquito belongs to the *Aedes aegypti* species. Credit: Vivian Abagiu/University of Texas at Austin

In addition to the tests to detect mosquito species and *Wolbachia*, the team also is exploring use of the technology to easily identify whether trapped [mosquitoes](#) are carrying Zika, dengue and other pathogens.

More information: Bhadra S, Riedel TE, Saldaña MA, Hegde S, Pederson N, et al. (2018) Direct nucleic acid analysis of mosquitoes for high fidelity species identification and detection of *Wolbachia* using a cellphone. *PLOS Neglected Tropical Diseases* 12(8): e0006671. [journals.plos.org/plosntds/art ... journal.pntd.0006671](https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0006671)

Provided by University of Texas at Austin

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