Rapid, easy Zika test developed

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Aedes aegypti mosquito, which may carry the Zika virus or dengue fever. Photo courtesy CDC.

A new fast, easy and cheap "dipstick" test for the Zika and dengue viruses could revolutionize public health response to dangerous tropical

germs, a new study reports.

The test accurately diagnoses Zika and dengue and can tell the two mosquito-borne viruses apart, an area in which commercially available tests now stumble, said senior researcher Lee Gehrke, a professor with the MIT Institute for Medical Engineering and Science.

"In light of the problems with Zika virus causing microcephaly [a genetic abnormality resulting in a smaller-than-normal head] and other defects in babies born to infected mothers, it's very important a pregnant woman would know if her fever is caused by Zika virus or dengue virus," said Gehrke, who's also a professor at Harvard Medical School.

The new test resembles a pregnancy test strip, Gehrke noted. The strip contains antibodies that react to the presence of Zika or dengue virus, and gold nanoparticles that respond to the antibody reaction.

To use the test, a medical professional would dip the strip into a tube of either blood serum or whole blood.

"If it is a positive test, then we see a dot or a line on the test that results from seeing the gold nanoparticles that signal the antibodies recognizing the viral protein," Gehrke said.

The test can tell Zika from dengue, and also can distinguish among four different strains of dengue, Gehrke added.

Zika and dengue both belong to the same viral family, which are called flaviviruses.

"They are two closely related viruses spread by the same mosquito," said co-researcher Kimberly Hamad-Schifferli, an associate professor of engineering with the University of Massachusetts in Boston.

The research team, which also included members from Mount Sinai School of Medicine in New York City, developed the new test because current testing products sometimes cross-react between Zika and dengue, providing a false positive for Zika when the patient actually has the other virus, Gehrke said.

Researchers checked the accuracy of the test by testing blood serum samples taken from people in regions where Zika has hit hardest, including Brazil, Colombia, Guatemala, India, Mexico and Panama. Serious birth defects caused by Zika appeared for the first time in the western hemisphere in 2015 in northern Brazil; then the epidemic swept outward.

"We validated the test in the areas where the virus is found, using human serum from infected patients," Gehrke said. "This is not just a test we performed using materials in a laboratory. We actually traveled to the endemic areas."

The test proved 80 percent to 90 percent accurate in detecting Zika and avoiding false positives, Hamad-Schifferli said.

It will take about a year to get the test out on the market in Zika-impacted areas, since the technology is based on existing products like pregnancy tests, Hamad-Schifferli said.

The test also is expected to be very affordable. Currently, material costs are about $5 per strip, but Gehrke said costs should decline as production gets rolling.

"Our target is under $1 per strip, which we think is reasonable once the antibody production is scaled up," Gehrke said. "The gold nanoparticles are already quite inexpensive."

Infectious disease expert Dr. Amesh Adalja said the new test "will fulfill a great need and be of high value.

"The availability of rapid, sensitive and specific diagnostic tests is crucial for the identification, treatment, and control of infectious disease," said Adalja, a senior associate with the Johns Hopkins Center for Health Security in Baltimore.

He added, "That a rapid antigen test that meets this criteria is feasible for dengue and Zika—two clinically indistinguishable diseases with different prognoses—is a major step forward."

The new report appears Sept. 27 in the journal *Science Translational Medicine*.

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