Biochemist's technique rapidly detects Ebola virus

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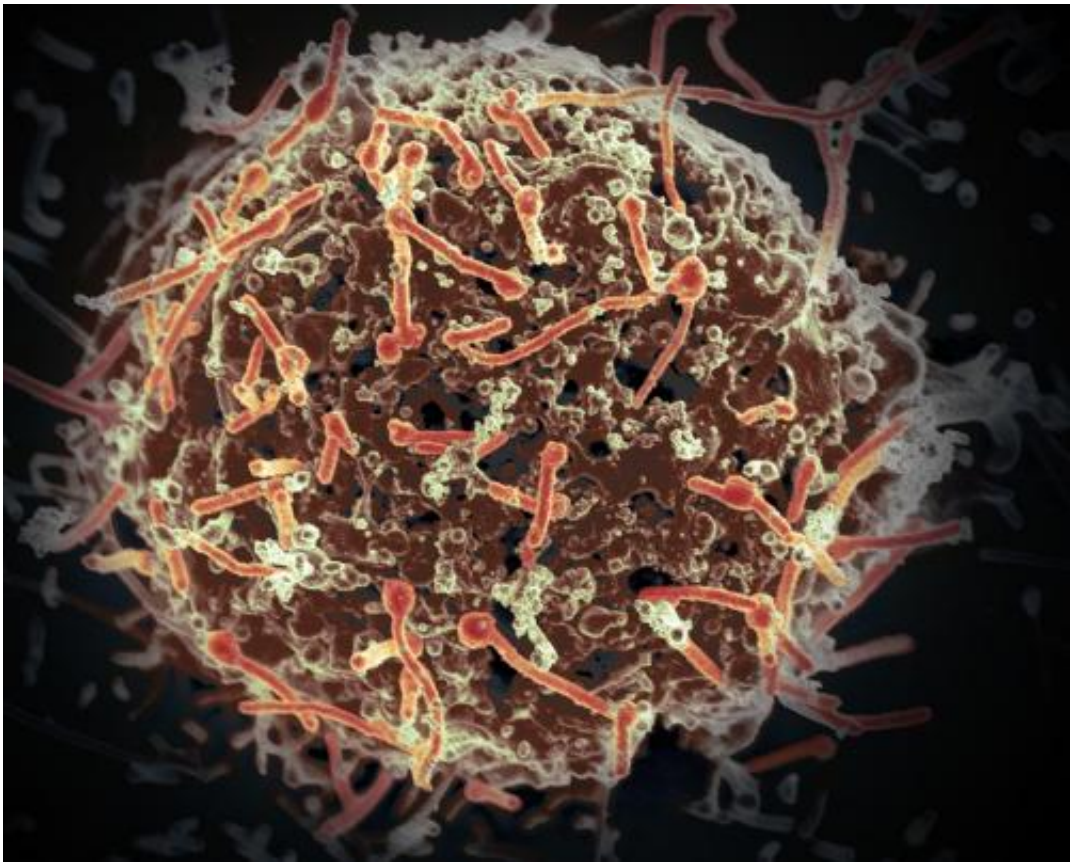

The Ebola virus, isolated in November 2014 from patient blood samples obtained in Mali. The virus was isolated on Vero cells in a BSL-4 suite at Rocky Mountain Laboratories. Credit: NIAID

In 2014, the most widespread Ebola virus outbreak in history wreaked havoc in Western Africa. The epidemic resulted in more than 28,000

reported cases and 11,315 deaths over 21 months.

Biochemist Mehmet Yigit finds those numbers unacceptable.

Yigit, an assistant chemistry professor at the University at Albany, has developed a new, cost-effective technique that can rapidly detect Ebola and other deadly illnesses. It would allow more people to be diagnosed and treated in a shorter time period.

His technique first identifies disease biomarkers that are found in human urine. Then, by using a gold nanoprobe sensor, the research team, led by UAlbany graduate students Mustafa Balcioglu and Muhit Rana, visually-detect if the associated biomarkers are present in a person's urine sample and can diagnose within minutes. The sample changes color from purple to red if infected.

To confirm the detection, Yigit's team measures the amount light absorbed by the infected sample at a given wavelength – also known as absorbance spectroscopy.

"Our goal is to assemble a small kit that can be used for rapid disease screening," said Yigit, also a member of The RNA Institute. "The current detection methods for Ebola, and other diseases, are costly, time-consuming and require sophisticated equipment. We are working to make real-time diagnosis a reality. This will narrow the population who need to be tested through conventional methods."

In total, 25 urine samples spiked with four Ebola-associated biomarkers were tested by Yigit's team. The technique provided accurate results in 24 samples, including each of the four subtypes of Ebola that infect humans. The researchers needed just one fifth of 1 milliliter of a sample to identify if it was infected.

Full results were published last month in *Advanced Healthcare Materials*.

Yigit said the Ebola results serve as only a model for the potential of his methodology. Previously, his team published findings in *Chemical Communications* on identifying biomarkers from breast cancer cells. They also released a second paper last month in Chemical Science on visual detection of mercury in different environmental and biological sources (urine, water, and soil).

The lab is currently testing for Zika virus detection.

"We are not biologists or classical biochemists. We are materials scientists developing methodologies for biomedical and environmental challenges by looking at them from a different angle," Yigit said. "Our approach can be implemented in any scenario where the associated biomarkers and their recognition elements are identified. It has a broad application spectrum."

Yigit's research is supported by internal funding from UAlbany start-up funds. He was also the recipient of the University's Presidential Initiatives Fund for Research and Scholarship, the SUNY Health Network of Excellence Award and the SUNY Network of Excellence Award in Materials and Advanced Manufacturing.

"The funding I've received from the University has enabled me to work independently and obtain everything I need for my research to be successful," Yigit said. "I am thankful to be surrounded by incredibly supportive faculty and hard-working student research assistants."

More information: Mustafa Balcioglu et al. Virus Biomarkers: Rapid Visual Screening and Programmable Subtype Classification of Ebola Virus Biomarkers (Adv. Healthcare Mater. 2/2017), *Advanced Healthcare Materials* (2017). DOI: 10.1002/adhm.201770007

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