Researchers working on simple, low-cost CRISPR-based diagnostic test for infectious diseases

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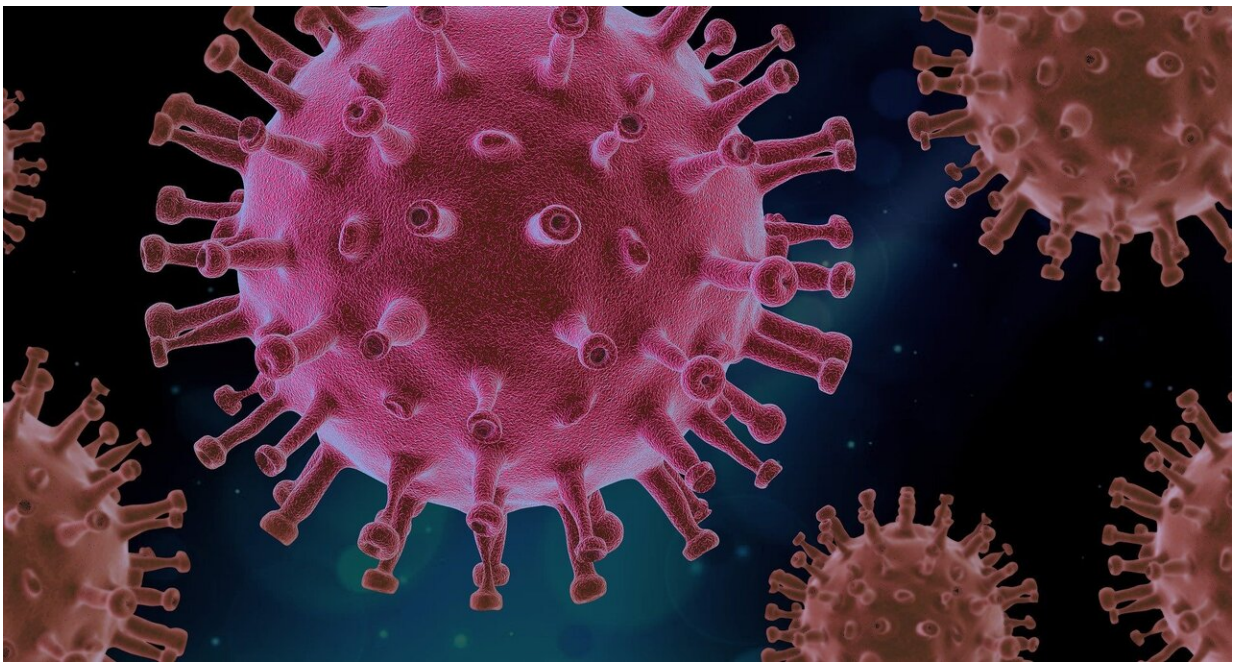

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Researchers in the Department of Biomedical Engineering— a shared department in the schools of Dental Medicine, Medicine, and Engineering—have been working to develop a new, low-cost, CRISPR-based diagnostic platform to detect infectious diseases, including the novel coronavirus (SARS-CoV-2).

With the recent outbreak of the SARS-CoV-2, the causative agent of COVID-19, Changchun Liu, associate professor, developed the "All-In-One-Dual CRISPR-Cas12a" (AIOD-CRISPR) method to enable simple, rapid, ultrasensitive, visual detection of SARS-CoV-2 and HIV viruses, intended for use at home or in small clinics.

Liu's lab has long focused on developing simple diagnostic technologies for infectious disease detection.

"The recent outbreak of novel coronavirus has spread rapidly all over the world," Liu says. "Rapid and early detection of the SARS-CoV-2 virus will facilitate early intervention and reduce disease transmission risk. Our method has a great potential for developing next-generation point-of-care molecular diagnostics."

The Polymerase chain reaction (PCR) method is currently considered the "gold standard" for disease diagnostics. However, the PCR method relies on expensive equipment and well-trained personnel. Liu's method, unlike the PCR, is isothermic (~37°C), and unlike other isothermal amplification technologies, has better sensitivity and specificity.

In Liu's lab, his AIOD-CRISPR system was successful in detecting the DNA and RNA of SARS-CoV-2 and HIV. Additionally, the method was evaluated by detecting HIV-1 RNA extracted from human plasma samples, achieving comparable results to the PCR method.

"We will further integrate the AIOD-CRISPR assay into our microfluidic diagnostic device to develop a rapid point-of-care diagnostic platform for SARS-CoV-2 detection," Liu says. "We envision that such simple, affordable, and mobile diagnostics technology can be widely used for rapid diagnostics of the SARS-CoV-2."

This isn't the first time Liu responded to an outbreak with innovative

diagnostic technology. During the 2015-2016 Zika outbreak, Liu's lab at the University of Pennsylvania developed an instrument-free point-of-care molecular diagnostic platform for Zika virus detection.

Postdoctoral researchers Xiong Ding and Kun Yin, along with Ph.D. student Ziyue Li, collaborated with Liu on this study. UConn has recently filed a patent application on this technology.

The manuscript for this study is available on the BioRxiv preprint platform.

More information: Xiong Ding et al. All-in-One Dual CRISPR-Cas12a (AIOD-CRISPR) Assay: A Case for Rapid, Ultrasensitive and Visual Detection of Novel Coronavirus SARS-CoV-2 and HIV virus, (2020). DOI: 10.1101/2020.03.19.998724

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