

## NTU team develops COVID-19 variant detection tool resembling pregnancy test kit



The team of scientists led by NTU hopes that the VaNGuard test can be deployed in settings where quickly confirming COVID-19 status of individuals is paramount. PHOTO: Nanyang Technological University

SINGAPORE — A diagnostic tool to detect variants of the COVID-19 coronavirus that looks like a pregnancy test kit.

A team of scientists led by Nanyang Technological University (NTU) has developed such a tool amid a surge in COVID-19 cases around the world due to an increasing number of coronavirus variants.

The VaNGuard (Variant Nucleotide Guard) test was integrated into a specially treated paper strip, which can be analysed with a mobile application. It utilises a gene-editing tool known as CRISPR, which is used widely in scientific research to alter DNA sequences and modify gene function in human cells under laboratory conditions.

In addition, the VaNGuard test can be used on crude patient samples in a clinical setting without the need for ribonucleic acid (RNA) purification, and yields results in 30 minutes. This is a third of the time required for a polymerase chain reaction (PCR) test, which requires purification of RNA in a lab facility.

The findings by the team were published in scientific journal *Nature Communications* on 19 March. The research team has filed a patent for the VaNGuard test.

Since the pandemic erupted more than a year ago, numerous variants of SARS-CoV-2, the virus that causes COVID-19, have emerged. Some have spread widely in the United Kingdom, India, South Africa, and Brazil.

Associate Professor Tan Meng How, who led the study, noted that the genetic sequence variations in new strains may impede the ability of some diagnostic tests to detect the virus. The team therefore spent considerable effort developing a "robust and sensitive test" that can catch the viruses even when they change their genetic sequences.

"In addition, frequent testing is essential for helping to break the transmission of viruses within populations, so we have developed our tests to be rapid and affordable, making them deployable in resource-poor settings," said Prof Tan, who is from NTU's School of Chemical and Biomedical Engineering.

### How does it work?



For ease of use, the scientists integrated the test into a paper test strip that can be analysed with a mobile application. Two bands appear on the strip in the presence of the SARS-CoV-2 virus. (PHOTO: Nanyang Technological University)

The VaNGuard test acts like a pair of 'molecular scissors', programmed to target specific segments of the SARS-CoV-2 genetic material and snip them off from the rest of its viral genome. Successfully snipping off segments is how the enzyme detects the presence of the virus.

The diagnostic platform can recognise up to two mutations within the target sites on the SARS-CoV-2 genome.

After a paper strip is dipped into a tube, it can show two strong bands in the presence of a SARS-CoV-2 virus or its variant. In the absence of the virus, only one band will appear.

The team plans to further refine their diagnostic kit, obtain regulatory approval from relevant authorities, and commercialise their test in partnership with diagnostic companies.

The VaNGuard test was developed by scientists from NTU's School of Chemical and Biomedical Engineering, School of Biological Sciences, and School of Computer Science and Engineering; National University Health System; and A\*STAR.