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Singapore scientists' 15-min saliva test as good as PCR test

The antigen rapid test can detect Omicron, and can even be done after eating

Cheryl Tan

Scientists here have developed a saliva antigen rapid test (ART) which is just as accurate as the polymerase chain reaction (PCR) test, yet takes only around 15 minutes to detect Covid-19.

The self-administered test has an accuracy rate of 97 per cent and is able to detect different Covid-19 viral variants, including Omicron.

The test kit may also be able to hit the market in as soon as three months.

The 15 minutes or so needed to obtain the results of the test, known as the Parallel Amplified Saliva rapid POint-of-caRe Test (Pasport), is similar to the shortest time needed for current ARTs. For PCR tests, it takes between a few hours and three days to get results.

The test is the result of a research collaboration between Duke-NUS Medical School, Singapore General Hospital (SGH), National Cancer Centre Singapore (NCCS) and the National University of Singapore (NUS).

Dr Danny Tng, a medical officer at the Department of Infectious Diseases in SGH, and the lead inventor behind the test, said that Duke-NUS and SingHealth have also entered into a licensing agreement with medical supply company Digital Life Line for its commercialisation.

Professor Soo Khee Chee, Benjamin Sheares Professor in Academic Medicine at the SingHealth Duke-NUS Oncology Academic Clinical Programme, said that the test, which requires the approval of the Health Sciences Authority for use here, could be available to consumers in the next three to six months. One important innovation of the new test is that it can be done at any point in time – even after food. Current saliva tests have not been considered reliable enough to roll out on a large scale, as the concentration of viral particles in saliva "drops steeply" after one eats or drinks, Dr Tng noted.

For instance, the ability of other saliva ARTs to detect the Sars-CoV-2 virus after food is around 11.7 per cent to 23.1 per cent, he said.

"Therefore, saliva antigen rapid tests are usually reliable only when they are performed first thing in the morning, after an overnight fast and before breakfast or brushing teeth.

"This makes testing of saliva samples at other times of the day less reliable," he added.

The scientists were able to remedy this using a two-stage process for the Pasport.

Like most ARTs, Pasport uses nanoparticles to bind to the virus, but with a difference – an additional amplification mechanism is built into it such that it uses more nanoparticles in its test than other ARTs, said Dr Tng.

This means the viral "signal" will be a lot stronger, allowing the Pasport to detect low viral loads, such as after a meal or drink, he added.

To capture viral variants which may otherwise evade detection through testing, the researchers have another trick up their sleeve.

Apart from using an antibody placed at the test line to capture viral proteins, just like in conventional ART kits, additional ACE2 proteins are used to capture the virus. The ACE2 protein is the entry point for the coronavirus to infect human cells.

This is because viral variants may change their targeted protein structure, and may thus evade antibody detection, said Dr Tng.

Professor Ooi Eng Eong, from the Duke-NUS emerging infectious diseases programme, said: "As the virus evolves to become more infectious, like with Delta and Omicron, the evolution has to do with its ability to infect – and the key is through ACE2. So as the virus becomes more infectious, our test will work better."

Prof Ooi said that with such a saliva test, general practitioners would be able to administer it for early diagnosis of Covid-19, without having to send a test sample to the lab for processing.

This could prevent people from developing severe Covid-19, he added, noting that many Covid-19 treatments have to be given in the early stages of infection for better results.

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Covid-19 test comparison

Type of test	How it works	Price	Accuracy
POLYMERASE CHAIN REACTION TEST	• Swab test from the nose or back of throat. • Test results available in **a few hours to three days.**	Costs **between $107 and $200** for pre-departure testing.	Sensitivity rate (ability to detect those who are positive): **Above 99.5%**
ANTIGEN RAPID TEST	• Typically involves using a nasal swab from the lower part of the nose. • Test results available in **15 to 30 minutes.**	**As low as $10.**	Sensitivity rate: **Varies.** The World Health Organisation requires ARTs to have a sensitivity rate of **above 80 per cent**.
SALIVA ANTIGEN RAPID TEST	• Involves taking saliva samples. • Test results available in **15 minutes.**	Pasport's price **to be confirmed** as it is awaiting approval for use in Singapore.	Pasport test: **97%**
SALIVA POLYMERASE CHAIN REACTION TEST	• Involves taking saliva samples. • Test results available in **a few hours to a day.**	Lucence's Safer-Clinic test: Gainhealth Clinic is charging **$145**.	Safer-Clinic: **92.5%**

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