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Hong Kong develops portable nucleic acid testing device for COVID-19

April 14, 2022 | News

The team is planning to transfer the research outcomes to society by collaborating with industry players



In 2020, an interdisciplinary research team from The Hong Kong Polytechnic University (PolyU) was awarded over HK$2.7 million by the Health and Medical Research Fund (HMRF) to commence research on a portable testing device for COVID-19 (the device). After one and a half years of extensive work, the team successfully achieved highly sensitive SARS-CoV-2 viral RNA detection based on the combination of reverse transcription–loop-mediated isothermal amplification (RT-LAMP) and gold nanoparticles (as amplification result readout reagent).

The clinical sample test results were in full agreement with the reverse transcription–polymerase chain reaction (RT-PCR) standard.

The device accommodates up to six testing samples at one time. Excluding one positive and one negative control sample, up to four samples can be tested at the same time. Once the samples have been collected, tests can be run on-site using the device, without the need to return the samples to the laboratory.

The device provides a constant temperature of 65 degrees Celsius, and the built-in optical system will monitor the precipitation or dispersion of gold nanoparticles (precipitate in positive samples, while remain dispersed in negative samples). Real-time data will be sent to a mobile app via Bluetooth, and the test results will be analysed and displayed on the screen of the phone. An increase in the optical signal between 10 and 20 minutes indicates a positive sample, and the shorter the onset time, the higher the viral load in the sample. A positive sample can be confirmed in as short as 25 minutes. The entire test can be completed in about 40 minutes, and the test results can be recognised with bare eyes.

The unit cost of testing is comparatively lower than RT-PCR. Going forward, the team is planning to transfer the research outcomes to society by collaborating with industry players so as to extend the use of such technology to the wider community