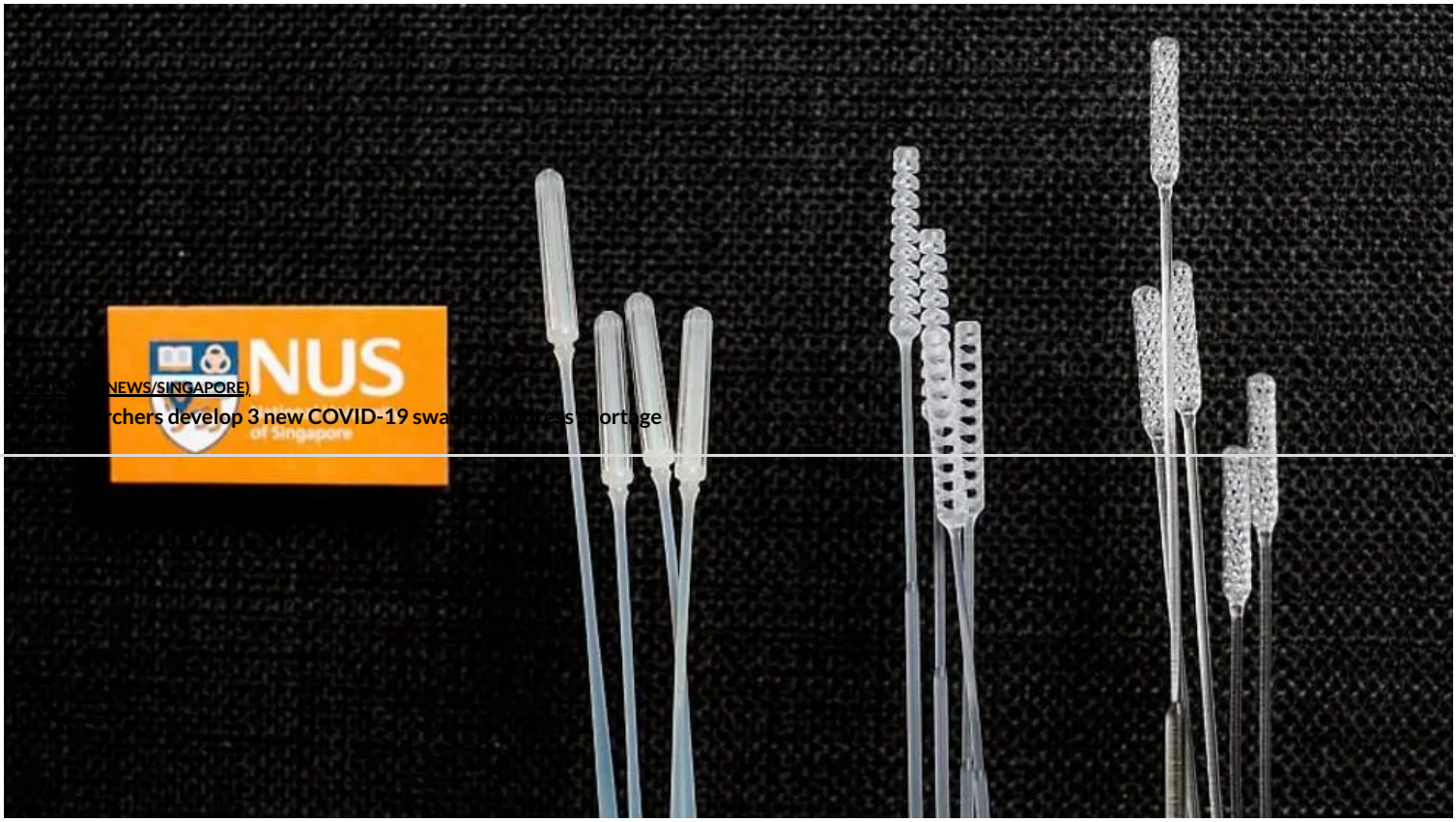
Singapore

NUS researchers develop 3 new COVID-19 swabs to address shortage



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(From left) The IM2, IM3 and Python - the three nasopharyngeal swabs NUS researchers designed for COVID-19 testing. (Photo: NUS)

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SINGAPORE: Researchers from the National University of Singapore (NUS) have developed three COVID-19 swabs to meet a surge in demand, both globally and in Singapore.

These nasopharyngeal swabs are a key element in testing for SARS-CoV-2 – the virus that causes COVID-19 – but are often out of stock due to supply chain disruptions, NUS said in a news release on Monday (Jul 13).

"As countries progressively emerge from lockdowns and reopen their economies, mass, repeated, testing is being widely adopted as a key public health strategy to prevent a resurgence of COVID-19 infections," NUS President Professor Tan Eng Chye said.

To address the shortage and ensure Singapore has a sustainable supply of these swabs, two multidisciplinary research teams from NUS developed three swab designs that are "comparable to the current 'gold standard' swabs".

The three are a 3D-printed swab named Python and two other designs, IM2 and IM3, that can be manufactured using a process called injection moulding that can produce several hundred swabs in "a few minutes", NUS said.

A SWAB WITH MINIMAL DISCOMFORT FOR PATIENT

Nasopharyngeal swabs are flexible sticks inserted through the nose to the back of the nasal cavity to collect fluid samples from an individual.

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A health worker takes a COVID-19 nasal swab test sample from an essential worker in Singapore, Jun 10, 2020. (Photo: AFP/Roslan Rahman)

These swabs have a carefully designed tip section that collects and retains sufficient nasopharyngeal fluids which are channelled into a holder for further testing, NUS explained.

“These are critical design factors as they could affect the accuracy of the test result when screening for SARS-CoV-2.”

The Python swab features a double helix structure as a swab tip, which NUS said has “excellent fluid adsorption and (causes) minimal discomfort to the patient”.

In terms of clinical efficacy, it was compared to an industry standard swab in National University Hospital (NUH), NUS said.

This was carried out in a case-controlled study of 40 patients diagnosed with COVID-19, and 10 control patients with acute respiratory illness who had tested negative for SARS-CoV-2.

“The Python swab, which was developed in less than two months, demonstrated comparable accuracy and performance, with no significant difference against the standard swab,” NUS said.

“As such, the Python swab was deemed safe and acceptable for patient use, and could help mitigate strained resources in the escalating COVID-19 pandemic.”

A patent for the swab has been filed, with two local companies – Structo and Eye-2-Eye Communications – mass-producing the swabs.

“As part of NUS’ contribution towards the nation’s fight against COVID-19, the design of the Python swab is free for use in Singapore,” said one of leaders of the team that developed the Python, Associate Professor Yen Ching-Chiuan, co-director of the Keio-NUS CUTE Center.

► **READ: COVID-19 patients can 'shed high load of virus' in first week, irrespective of symptoms: Singapore study (/news/singapore/covid-19-coronavirus-study-ncid-virus-high-first-week-aerosol-12851552?cid=h3_referral_inarticlelinks_24082018_cna)**

The team was also led by Professor John Eu-Li Wong, NUS senior vice president of health innovation and translational research, and Professor Jerry Fuh, director of the NUS Centre for Additive Manufacturing.

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The team worked with Associate Professor David Allen and Professor Wang De Yun from NUS Yong Loo Lin School of Medicine, researchers from the NUS School of Design and Environment and NUS Faculty of Engineering, as well as clinicians from NUH, on the design, pre-clinical testing and clinical validation.

Professor Freddy Boey (centre, showing the swabs), and (from left) Dr Alfred Chia, Associate Professor David Allen, and Associate Professor Yen Ching-Chiuan are part of two NUS teams that developed three nasopharyngeal swab designs for COVID-19 testing. (Photo: NUS)

CHEAPER, LOCALLY-PRODUCED SWABS

Another NUS team developed an injection moulding process and also redesigned the Python swab to make it compatible with this form of manufacturing.

The two resulting swabs are the IM2 and IM3.

"Injection moulding as a manufacturing process is inherently faster than 3D printing as multiple units of the swabs can be produced in a given cycle. Several hundred swabs can be produced in a few minutes using the moulding process," explained Professor Freddy Boey, NUS deputy president of innovation and enterprise, and leader of the second NUS team.

"This is crucial in our continued fight against the pandemic," added Professor Boey, who noted that, like the Python swab, designs of the IM2 and IM3 will also be free for use in Singapore.

Within three months, the NUS team designed and tested these injection moulded swabs, and is carrying out clinical trials in NUH and the Singapore General Hospital, the university said. Patents have also been filed for the two designs.

► READ: Singapore scientists discover 5 antibodies that can combat COVID-19, human trials to commence in coming months (/news/singapore/singapore-scientists-5-antibodies-covid19-human-trials-12844014?cid=h3_referral_inarticlelinks_24082018_cna)

The team is currently working with four companies, TNC Optics & Technologies, Meiban Group, Inzign and Forefront Medical, to mass manufacture and sterilise the injection moulded swabs.

"About 40 million pieces of the IM2 and IM3 swabs are expected to be produced over the next few months, and these locally produced swabs will be priced lower than the current commercially available imported swabs," NUS said.

The custom-designed nasopharyngeal swab designs are part of the various innovations and solutions developed by NUS researchers to tackle the COVID-19 pandemic, it added.

► READ: Singapore company to start clinical safety trials in humans for potential COVID-19 treatment (/news/singapore/covid-19-singapore-treatment-antibody-coronavirus-tychan-12822570?cid=h3_referral_inarticlelinks_24082018_cna)

The three new swabs are among several developments in Singapore related to tackling the COVID-19 pandemic.

A study published by the National Centre for Infectious Diseases (NCID) in collaboration with Duke-NUS Medical School and DSO National Laboratories revealed COVID-19 patients can shed high loads of the novel coronavirus into the air and onto surfaces in their first week of illness, irrespective of their symptoms.

A team of Singapore scientists also previously discovered five antibodies that can block COVID-19 infection and protect against key mutations.

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