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# Rapid and affordable COVID-19 test will have lasting benefits for society

Awarded to: Professor Christofer Toumazou, Imperial College London

## The President's Special Awards for Pandemic Service

Sewer epidemiology provides early warning and management of COVID-19

A new ventilator created in Cambridge will help treat patients in low- and middle-income countries

A personal respirator created for local healthcare workers could have global reach

Advanced manufacturing intensification technology



***Professor Chris Toumazou FREng FRS FMedSci of Imperial College London for developing a rapid, affordable COVID-19 test based on a lab in a cartridge technology that provides test results in just over an hour. A total of 5.8 million tests are now being deployed throughout NHS in preparation for the flu season. ©thisisjude.uk 2020***

Identifying people with COVID-19 – especially if they are asymptomatic – has been a major challenge of the pandemic. Professor Christofer Toumazou FREng FMedSci FRS and his team

to help develop a vaccine faster
Rapid and affordable COVID-19 test will have lasting benefits for society
Amazing project management skills enable the world's largest critical care facility to open quickly
Supporting the NHS by supplying oxygen, BOC installed the largest ever system of its kind
Volunteers' tech skills help launch and operate new charity dedicated to NHS workers
Environmentally friendly face shield is making virus protection greener
Incredible consortium's 13,400+ ventilators helped save the NHS from a shortage
Young engineers' enthusiasm leads to a ventilator build and test programme
New face shield and charity spearheaded by intensive care doctor helps NHS workers
A new ventilator is made in just 70 days by Babcock's team
CPAP breathing aids help patients in the UK and abroad
Rapid application of

engineered a highly accurate and lab-free COVID-19 test ("COVID Nudge") that provides results in just over an hour, harnessing the ground-breaking invention of an on-the-spot Lab-in-Cartridge genetic test. His COVID-19 test is already being used in the NHS – earlier this month, the UK government placed an order for 5.8 million COVID Nudge tests to be rolled out across the country – and its benefits will be felt for years to come.

Since his son's treatment for a genetic condition, Professor Toumazou, Regius Professor at Imperial College London, has been inspired to bring engineering innovations to medicine and to the consumer to manage chronic diseases. He is the creator of a rapid, lab-free test for specific DNA signatures, enabling identification of variants in diabetes, obesity, hypertension and genetic disorders, at an affordable price. The DnaNudge service maps people's unique DNA and nudges them towards healthier food shopping choices by indicating red or green, simply by scanning the product barcode. As COVID-19 began to spread, he recognised the urgent need for increased testing capacity – and a rapid testing solution – and successfully applied this invention to the creation of a point-of-care test for people who may have the COVID-19 virus.

Lab-based polymerase chain reaction (PCR) tests can take up to 72 hours, but Professor Toumazou's portable, lab-free RT-PCR test can return results in just over an hour, as well as differentiate between an imperfect sample and an absence of the disease, eliminating false negatives. The 'lab-in-cartridge' technology is a direct swab to result, without any laboratory or manual steps involved.

Responding to the outbreak, Professor Toumazou and team completed an initial validation of the technology in a clinical trial involving around 400 patients and, working with DHSC and with the authorisation of the MHRA, DnaNudge began deployment of the COVID Nudge test in eight London hospitals, including cancer wards, A&E and maternity departments. The test, which is MHRA-authorized for clinical use and has now obtained a CE mark, is now being rolled out nationally. An average sensitivity of the COVID Nudge test in detecting positive cases – compared against numerous NHS lab-based tests – is around 95% and specificity around 100%. A paper has been accepted for publication by a peer-reviewed journal and will be published shortly, and a pre-print is publicly available.

## Impact

industrial engineering capabilities in hospitals helps to address COVID-19

Test showing if someone is infectious could help halt pandemic spread

Bump device helps businesses promote social distancing to boost worker confidence

Leading expert on airborne ventilation provides life-saving advice to the SAGE committee

Portable 'Handy Hook' minimises surface contact to protect users

Successfully testing people who may have COVID-19 has been an enormous challenge, but Professor Toumazou's quick work meant the life-saving technology was deployed in hospitals across London and Oxford when it was most needed. The key benefit of the rapid test is that it does not require any pipettes or lab steps whatsoever.

The technology is believed to be a major contributor to the UK's recovery and has been described as a key COVID testing technology in two of the Downing Street briefings by the UK government.



The team eventually plans to make the tests available for home use, schools and numerous community settings, but for now the major demand is within the NHS with the ambition of carrying out 300,000 tests a month by September and one million a month as we lead into the flu season and new year.

By enabling widespread testing, this technology could provide confidence in bringing employees back to work and in restarting the national economy. The test also has multiplex capabilities and can check for FluA, FluB and RSV in addition to COVID-19.

Professor Toumazou, through his business DNA Electronics, is also working towards the Holy Grail of testing – to bring molecular sequencing at the point of need.

“Once the call went out from Government calling for support for testing facilities for COVID-19, Chris and his team set to work immediately, adapting his technology to detect the virus. This

test has now been CE marked and is now in widespread clinical use. In my opinion this has been a remarkable achievement," says Sir Richard B Sykes FRS, chairman of The Royal Institution of Great Britain and King Edward VII Hospital.

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