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UCT gets government funding to boost COVID-19 testing capability

The University of Cape Town's (UCT) Biopharming Research Unit (BRU), under the leadership of Professor Ed Rybicki, has received government funding to assist in the production of diagnostic reagents for COVID-19.

With South Africa yet to reach its COVID-19 infection peak, the national Department of Science and Innovation, the South African Medical Research Council and the Technology Innovation Agency, have made seven funding awards to local companies, organisations and researchers in order to ramp up the country's ability to produce locally developed reagents and test kits. Reagents are chemical substances used in laboratories to test patient swab samples and determine whether the COVID-19 result is positive or negative.

Among the eight applications for the production of reagents, the BRU – a unit within the Department of Molecular and Cell Biology at UCT – was one of only three to have received the funding award. The other four awards are set to support the development of point-of-care rapid diagnostic kits.

Earlier this month, Minister of Higher Education, Science and Technology, Dr Blade Nzimande said South Africa currently sources reagents from international companies. "Increasing global demand, fluctuating exchange rates and limited transport options are affecting the supply – resulting in an urgent need to source these components locally."

Adding to this, Rybicki said that producing reagents locally would help ease the supply bottleneck and enable faster rollout of tests that could also be significantly cheaper than imported versions. "Reducing the turnaround time on diagnosing active COVID-19 cases will also contribute to more effective contact tracing and quarantining, which could assist in stemming the rapid spread of the virus in South Africa."

"Reagents are vital as ingredients in test kits for detection of the virus and for detection of antibodies to it," said Rybicki. "Each of them has to be carefully developed so as not to cause any problems in testing, such as false positives/negatives or instability."

In order to do this, scientists require access to the genetic information of the virus, which is carried in its DNA and RNA. DNA provides the code for the cell's activities, while RNA converts that code into proteins to carry out cellular functions.

"We are developing a positive control RNA molecule to be used in nucleic acid detection kits to confirm that the specific test is working as it should," explained Rybicki. "To that end, we

need something that contains all the sequences that people are using for a variety of virus RNA detection kits."

The BRU will employ technology already being used in their laboratory, which involves enclosing a synthetic RNA molecule made in plant cells in a plant virus coat protein. "This process is enabled by using a proprietary plant virus-derived expression system that we developed to make both the RNA molecule and the coat protein – and incorporating a sequence in the RNA that is specifically recognised by the coat protein, which will allow it to bind to, make particles of, and protect the RNA," Rybicki said.

The development process involves determining the specific target sequences on the SARS-CoV-2 genome for detection of the RNA, stitching them together with the sequence necessary for coat protein binding in silico (on a computer). This sequence is then synthesised as DNA by a commercial company.

"Thereafter, we clone the DNA into one of our enhanced plant expression vectors for synthesis in plant cells as a messenger RNA molecule," explained Rybicki. "In parallel, we will optimise co-expression of the virus coat protein and show that it reliably and efficiently binds and forms particles with similar RNA targets."

Once this has been done, the reagents will be tested to prove that the technology works for protecting RNA sequences and that the product is stable and can be purified easily.

Rybicki said that the BRU aims to have an experimental product within a few weeks.

Thereafter, development will involve the optimisation of testing conditions with their partners at the Council for Scientific and Industrial Research and CapeBio Ltd, who will use the product in the kit they are developing. Another partner company Cape Bio Pharms Ltd will then manufacture several batches to the appropriate standard.

"This was the only award to UCT in this current emergency funding scheme, which throws quite a large spotlight on us – and also increases the pressure to succeed in what we promised to do," said Rybicki.

He added, however, that success in this project will also help to establish novel and exciting technology more firmly at UCT that can be leveraged for a variety of similar products, as well as for making RNA vaccines for future novel emerging viruses.

ENDS

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