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Associate Professor James Ussher and his team, from the University of Otago and Southern Community Laboratories, were at the forefront of the COVID-19 response in New Zealand. They're now working on a vaccine to prevent infection.

As early as January 2020, New Zealand declared a five-fold approach to COVID-19, aiming to "Plan for it, keep it out (through border control and self-isolation), stamp it out (through test, track and trace), manage it (through infection control, treatment and closure of institutions) and recover from it."

To date, their approach has appeared effective, with a total of 1217 cases and 22 deaths [6]. James describes the highs and lows of the last few months.

What did you focus on first?

In mid-January we knew that this novel coronavirus spreading in China was of significant international concern and that there was a very real risk it would reach New Zealand. Working with my colleagues Prof Miguel Quinones-Mateu at the University of Otago and Dr Jenny Grant at Southern Community Laboratories, we worked to set up a test for the novel coronavirus, based on the findings of a German group.

A real challenge was the lack of positive control material to develop the test (special specimens important in evaluating reliability). Therefore, Prof Quinones-Mateu's group designed and made their own artificial controls. We set the test up on an instrument that was able to analyse samples as they arrived in the laboratory, even after hours and on weekends. We were able to go live with the test on March 13, which was just in time, as this was the same day that the first positive case was detected in our region.

What were some of the challenges?

The major challenge we experienced, along with other diagnostic laboratories, was the supply of reagents and consumables required for testing due to unprecedented global demand and disruption of supply chains. We were frequently running with only three to five days of testing capacity on hand, desperately awaiting delivery of the next shipment. To try and mitigate this risk we set up a total of four different platforms to ensure our ability to continue testing.

The other major challenge was the rapid increase in testing volumes that needed to be managed in the context of a lockdown. The staff at Southern Community Laboratories were amazing in their willingness to change their way of working, splitting into two “bubbles” to ensure the laboratory could keep working if there were cases amongst staff, and working hard to clear testing volumes.

Why does New Zealand need a vaccine if there are few cases of COVID-19 in the country?

New Zealand’s economy is heavily dependent upon tourism. Currently it is not possible to reopen the country’s borders as SARS-CoV-2 will be reintroduced into an almost completely immunologically naive population, leading to new outbreaks. As SARS-CoV-2 is now endemic globally, New Zealand’s only option, if it wants to maintain its current COVID-19-free status, is to maintain the current border restrictions until an effective vaccine or antiviral drug is available.

The effectiveness of New Zealand’s public health response demonstrates that it is possible to control and even eradicate SARS-CoV-2 from the community through strictly enforced lockdowns and border controls. It should be noted though that New Zealand’s lockdown restrictions were some of the strictest in the world.

Tell us some encouragements about the New Zealand and the global race for a vaccine?

With regard to the race for a vaccine, the rate of scientific development that we have seen to date is unprecedented. There are currently more than 155 vaccines in development and 23 in clinical trials. Preclinical results (published and in preprint) suggest that several vaccine candidates can protect against disease, and some against infection. Clinical trial results available to date have demonstrated that multiple leading vaccine candidates are able to stimulate the sort of immune response that we would expect to be protective against COVID-19.

It has also been encouraging to see the amount of international cooperation through the likes of CEPI [7] (the Coalition for Epidemic Preparedness Innovations, launched in 2017 to develop vaccines to stop future epidemics) and Gavi [8] (the Vaccine Alliance), with a commitment to equitable distribution.

When might a vaccine be ready?

The quickest vaccine development process to date is four years (for the mumps vaccine). Traditionally, vaccine development takes around 15 years. Lessons learned through Ebola have allowed the vaccine development process to be compressed for SARS-CoV-2, with preclinical and clinical phase trials often occurring in parallel, and later-phase trials starting prior to the completion of earlier phase trials.

Given this, it is feasible that trials may be completed for the earliest vaccine candidates within 12 to 18 months. However, further challenges to getting vaccines into arms are manufacture, distribution, and administration. Globally, billions of doses will be required, which is a massive challenge. Even though manufacture of leading candidates has been initiated prior to clinical trial results, it may well still take a further year or longer to deliver successful vaccines. Importantly, multiple vaccines are likely to be required.

What one lesson has COVID-19 taught you?

It has highlighted the importance of rapidly responding to emerging threats. To be able to respond rapidly we need to be flexible and work collaboratively.

Links
[1] https://www.readersdigest.co.uk/health/coronavirus/heres-what-a-covid-19-scientist-has-to-say-about-a-vaccine [2] https://helencowan.co.uk/../tags/infection [3] https://helencowan.co.uk/../tags/immunity [4] https://helencowan.co.uk/../tags/COVID-19 [5] https://helencowan.co.uk/../tags/lungs [6] https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200804-covid-19-sitrep-197.pdf?sfvrsn=94f7a01d_2 [7] https://cepi.net/ [8] https://www.gavi.org/