

# COLLABORATIVE RESEARCH INFRASTRUCTURE

## National partnerships drive COVID-19 response

**The race for a COVID-19 vaccine has demonstrated how lifesaving medical research remains vulnerable to the caprices of commercial ambition, political self-interest and even international espionage. But in Australia, whether because of our compact size, strong government support or the responsibilities of an increasingly prominent biotechnology sector, the COVID-19 crisis has highlighted the unity and collaboration that distinguish our research community.**

The speed to human trials of The University of Queensland's (UQ's) vaccine candidate has demonstrated the compelling value of a partnership linking researchers, major international investment (through the Coalition for Epidemic Preparedness Innovations) and homegrown commercial prowess. Behind the scenes is a group of Australian organisations that, over the past decade, has built an incredible network of trust and responsiveness.

That network is driven by the National Collaborative Research Infrastructure Strategy (NCRIS), a Commonwealth-funded program that has united 22 of the country's research infrastructure providers in an alliance capable of responding instantly to environmental or medical emergencies. After 14 years of collaboration, NCRIS is making a major contribution to the multifaceted fight against COVID-19, supporting everything from face shields and ventilators, to diagnostic testing, clinical trials, surveillance and – of course – vaccines.

### A global response

At UQ, three NCRIS partners – Microscopy Australia, Therapeutic Innovation Australia (TIA) and Bioplatforms Australia – have been involved in the development of a vaccine using the 'molecular clamp' platform, which stabilises viral proteins, enabling them to maintain their shape for more effective vaccines. The platform, initially used to tackle a 'hypothetical pandemic', suddenly became very real with the outbreak of COVID-19, enabling a vaccine candidate to be identified and moved to human trials within six months – speeds unheard of in previous years.

'The flexibility of UQ's technology meant we were able to respond to COVID-19 as soon as the genome of the virus became available,' explains Dr Stuart Newman, CEO of TIA, which supports the key biologics facility involved in the program. 'This is a great example of how the closeness and trust within NCRIS enables us to support a major project with an urgent deadline and global implications.'

The samples were then profiled at a neighbouring facility run by Bioplatforms Australia that has 15 labs providing molecular-level analytics for some of Australia's most significant drug discovery programs. 'This is, hand on heart, the best chapter of collaboration I've seen in my 15 years in this area,' says Bioplatforms CEO Andrew Gilbert. 'Thanks to NCRIS, we were able to get behind the vaccine without a thought of what any of us would get from it individually.'

Professor Julie Cairney, CEO of Microscopy Australia, says the vaccine program received vital support from two \$5-million cryo-TEM microscopes at its UQ lab. 'The 100-nanometre-sized virus particles are covered with spike proteins, which form the basis of the UQ vaccine candidate,' says Cairney. 'Cryogenic freezing is required to maintain proteins in their natural shape as they are imaged down to the atomic level. This can only be done using the most high-powered microscopes in the world.'

### True partnership

NCRIS is a partnership in the most authentic sense of the term. When researchers from CSIRO and the QIMR Berghofer Institute, among others, separately commissioned Phenomics Australia to design mouse models for COVID-19 drug development studies, there was no talk of intellectual property rights exclusivity. Instead, says Phenomics Australia CEO Dr Michael Dobbie, they separately agreed to offer the models without charge to anyone in the COVID-19 space.

'This is the first time I've seen researchers commissioning similar mouse strains for their own research but saying they're happy to share them before they've even begun their experiments,' says



The team at Compounds Australia maintains and distributes Australia's national compound collection. Source: Compounds Australia, Griffith University

Dobbie. 'This kind of research is normally hugely competitive... but in this case, the researchers are saying they're happy for the strains to be freely shared with anyone at the point of production.'

There's no doubt that the urgency of a COVID-19 vaccine has prompted researchers everywhere to share their expertise more openly. Phenomics Australia is a founding partner of the International Mouse Phenotyping Consortium, which has put all of its COVID-19 resources on an open database. TIA is working with Compounds Australia to incorporate a 330,000-strong small molecule library built by Australia's leading chemists. Australian researchers have been punching above their weight by sharing genome-sequence data as COVID-19 strains mutate away from the original Wuhan sequence.

The NCRIS network also recognises that smaller, underfunded researchers may hold the key to the 'next big thing'. In March, TIA's Pipeline Accelerator Program, which provides access vouchers to researchers working with its 25 supported facilities, issued a special COVID-19 round – providing discounted access to 10 researchers working on small molecules and biologics to treat COVID-19.

#### Swift pivoting

The flexibility of NCRIS partners to adapt existing research infrastructure has been critical to the COVID-19 response. Before the pandemic, the Australian National Fabrication Facility (ANFF), which has 21 sites providing access to micro- and nanofabrication capabilities, was enabling the printing of solar cells at the University of Newcastle, and the bioprinting of stem cells at the University of Wollongong. As soon as the need for medical PPE emerged, these two sites used the same tools to produce clinical-grade face shields for local hospitals. In under four weeks, they'd produced

more than 9000 shields, with the Newcastle facility developing a production line capable of making 1000 shields per day.

Similarly, the National Imaging Facility (NIF) had been partnering with Melbourne-based biotechnology company 4DMedical to develop a low-cost lung imaging technology at the South Australian Health and Medical Research Institute. Now, propelled by COVID-19, the project has been fast-tracked through animal trials to produce the prototype of a 'field ventilator' that could be ready for use early next year.

'This ventilator is a world-first from our researchers,' says NIF CEO Professor Graham Galloway. 'It does not need a hospital or ICU-trained staff to operate, and could potentially save thousands of lives in developing countries.'

The longer-term pandemic response clearly weighs on the minds of all researchers. Dr Merran Smith, Head of the Population Health Research Network, which collates much of the administrative health data used for COVID-19 testing and tracing, says that this data will be equally important for future prevention efforts.

'Australia is now in a position to manage the development of a vaccine across the entire continuum – from identification of prospective drug candidates, to production, administration and monitoring across the population,' says Smith. 'Thanks to the NCRIS investment, we have the capability to support every step in the development of a vaccine for COVID-19, making the most of our world-class research facilities.' 🌱

For more information on NCRIS, visit <https://www.education.gov.au/national-collaborative-research-infrastructure-strategy-ncris>. For information on groups funded by NCRIS, visit <https://www.ncris-network.org.au/capabilities>.