

# Statement to Inquiry into the Victorian Government's response to the COVID-19 pandemic from the Peter Doherty Institute for Infection and Immunity

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## Introduction

The Peter Doherty Institute for Infection and Immunity (the Doherty Institute) is an unincorporated joint venture between the University of Melbourne and The Royal Melbourne Hospital, combining research, education and public health in infectious diseases and immunology.

Named in honour of 1996 Nobel Laureate and 1997 Australian of the year Professor Peter Doherty, the Doherty Institute incorporates research in fundamental science, clinical research and epidemiology and is home to reference laboratory services, diagnostic services and clinical care.

By integrating important functions of the University of Melbourne and the Royal Melbourne Hospital, the Doherty Institute acts as a scientific, public health and clinical centre of excellence for all aspects of infectious diseases. The institute incorporates many disciplines that are critical to a pandemic response, particularly in response to a new virus.

Relevant to this Inquiry, the Doherty Institute has played a significant role in response to COVID-19 for Victoria.

## Our Response

Beginning in December 2019, an outbreak of pneumonia presentations in Wuhan, China spread around the world and has impacted the lives of millions. The mortality and morbidity of these events have been profound, and will continue to have cascading health, economic and social implications for the foreseeable future. It has significantly altered the burden of other diseases in many countries and has shaped political decision-making and community engagement at all levels.

The Doherty Institute was prepared to rapidly respond to this emerging crisis. In many ways, this was exactly what the institute was designed to do. Within days of the announcement on January 10<sup>th</sup>, 2020 that the cause of the pneumonia in China was due to a coronavirus, a diagnostic test was developed and then shared with other public health laboratories across Australia.

On January 24<sup>th</sup>, the Doherty Institute diagnosed the first case of COVID-19 in Australia. On January 29<sup>th</sup>, our scientists had successfully grown the virus for the first-time outside China and immediately shared it with the World Health Organisation (WHO) and other laboratories nationally and internationally. The Institute acted

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immediately to mobilise a team of virologists, epidemiologists, immunologists and clinicians, initiating a comprehensive suite of biomedical and public health-related activities.

In summary, over the last six months, our public health laboratories have performed approximately 10% of the State's diagnostic tests for COVID-19, performed genomic sequencing on over 40% of Victoria's COVID-19 cases and led innovations to improve the efficiency and options for testing, including development of a saliva test, a rapid point of care test (taking 30 minutes) and strategies to increase throughput of testing 10 fold through pooling specimens. Our clinicians based at the Royal Melbourne Hospital have cared for a large proportion of Victorian COVID-19 cases and have led the largest national clinical trial for novel treatments for COVID-19. Our epidemiologists have been working closely with the State and Federal Governments, developing mathematical models to inform policy to help flatten the curve of COVID-19 cases. Our researchers have established observational studies and clinical cohorts to understand the immune response to the virus; are screening existing drugs in the laboratory to inhibit replication of the SARS CoV2 virus; and are working on multiple vaccine strategies for COVID-19.

The Doherty Institute is also home to the National Health and Medical Research Council (NHMRC) Centre for Research Excellence (CRE) Australian Partnership for Preparedness for Infectious Disease Emergencies (APPRISE) which is a national network of researchers working on pandemic responses. Through APPRISE, funding was rapidly mobilised to support multiple COVID-19-specific public health, clinical and laboratory-based research projects across the country, including in Victoria. Together this meant, that Victoria's public health, clinical and research response was rapid, co-ordinated and effective

Some specific examples of the Doherty Institute's work on COVID-19 include:

- **Mathematical modelling to inform Australian Government policymaking**

Professor Jodie McVernon leads a team of researchers contracted by Commonwealth and State Government to apply mathematical models to COVID-19 transmission to understand projected case numbers and the implications of various policy interventions, such as travel restrictions, quarantine, physical distancing, staged restrictions and mask wearing, on hospital utilisation and disease control.

This advice is based on international best practice, innovative model design and partnerships with many modelling groups national and internationally. The work has directly informed the decisions of the National Cabinet, the Australian Health Protection Principal Committee (AHPPC) and Victoria's response.

These models are iterative, being refined based on evolving data, and continue to inform government decision making at all levels of the response. This capacity in mathematical modelling is a consequence of years of research and investment in pandemic preparedness. Prior to COVID-19, this work focused primarily on

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Influenza. This stable funding base, of both Commonwealth and State funding in addition to competitive funding from the NHMRC, allowed the mathematical modellers to pivot quickly to focus on COVID-19.

- Supporting public health and diagnostics

The Doherty Institute is home to two major infectious diseases reference laboratories funded by both the Victorian and Commonwealth governments – the Victorian Infectious Diseases Reference Laboratory (VIDRL) and the Melbourne Diagnostic Unit Public Health Laboratory (MDU-PHL). Their role is to support the Department of Health and Human Services (DHHS) to track notifiable infectious diseases, such as measles, influenza, tuberculosis, and now, COVID-19. Through its state and national role, VIDRL developed the first diagnostic test for COVID-19 in Australia and diagnosed the first case of COVID-19 in Melbourne on 25 January 2020.

Since January, the Public Health labs within the Doherty Institute have shown leadership in scaling up Victoria's testing capacity and provided further surge capacity when needed. These labs have completed over 221,000 tests and provided support for the major increases in state-wide testing. Rapid scale up of testing capacity was achieved through mobilisation of staff from other departments in the institute to both VIDRL and MDU-PHL. VIDRL is frequently referred complex diagnostic cases from other laboratories (confirmatory testing) for confirmatory testing and stores isolates from every positive case diagnosed in Victoria (See Annex 1 for further details on testing numbers). It is important to note that in the second wave of COVID-19 in Victoria, the majority of COVID-19 tests are now conducted outside the Doherty Institute, in private or hospital pathology labs. The expertise in diagnostics and virology at the Institute was utilised to quickly introduce COVID-19 testing across other sites, allowing for a scale up of the State's testing program to an unprecedented level.

One of the Doherty Institute's key role is to refine, improve and innovate testing technologies. We have initiated several diagnostics innovations for PCR-based testing include pooling of samples for higher throughput and evaluating saliva as an alternative diagnostic tool. More recently we have developed and are evaluating new point-of-care testing for COVID-19 that can deliver a result within 30 minutes.

Testing for COVID-19 also includes blood testing for antibodies, called serology. This is important to determine past or possibly recent infection. It is also important to understand whether a person has developed effective antibodies, also called neutralising antibodies, which is a test for vaccine efficacy. The Doherty Institute has evaluated many commercial kits to detect antibodies and have developed a range of tests to evaluate neutralising antibodies. The Doherty Institute has a contract with the Therapeutic Goods Administration to evaluate point-of-care serology kits which informs the Commonwealth government procurement decisions,

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Following the diagnosis of Australia's initial case in January, scientists at the Doherty Institute also successfully grew the virus and shared the virus isolate with multiple diagnostic and research laboratories and repositories across the world. This step was instrumental in international efforts to develop diagnostic, therapeutic and prophylactic responses.

The responsiveness of our diagnostic capabilities represents a long-term investment by the Victorian Government. Building this capacity requires consistent development of a skilled workforce and infrastructure. Even in "peace time", this resource is always utilised as there are innovations needed for testing and treatment of existing infectious disease. The technical skills, institutional relationships and specialised equipment means these capabilities could readily adapt to a new infectious disease event.

Victoria's rapid, scalable and enduring diagnostic capabilities for COVID-19 directly highlights how long-term investment in public health is critical to support responses to relatively rare, yet devastating, events such as a pandemic.

- Using genomics as a tool of epidemiological investigation

The Doherty Institute through MDU-PHL is a global leader on the use of genomics to inform public health responses. Genetic sequencing and bioinformatics analysis enable much higher capability in disease diagnosis, outbreak detection and surveillance of outbreaks, including tracking infections. We have used this approach with great success in understanding outbreaks of other infections such as gonorrhoea, shigella or antimicrobial resistance. These same tools have proven invaluable, nationally and globally, for tracking COVID-19.

The DHHS has been an early adopter of this technology and in 2019 funded the MDU-PHL at the Doherty Institute, to increase the use of whole genome sequencing in its surveillance programs.

A dedicated SARS-CoV-2 multidisciplinary whole genome sequencing response team from the Doherty Institute and DHHS was formed to link epidemiological and genomic data of Victoria's COVID-19 cases and assess the origin and relatedness of infections (both in the community and in the healthcare setting) as well as the impact of public health restrictions. This was very effective in understanding Victoria's first wave.

The Doherty Institute has sequenced 5447 of the Victoria's COVID-19 cases, this is about 40% of current cases (as of 10 August). All COVID-19 sequences are publicly available through the Global Initiative on Sharing All Influenza Data (GISAD) website (a platform that promotes rapid sharing of influenza and COVID-19 genomic data).

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The interpretation of that data, for example to identify clusters and transmission routes, is reliant on epidemiological and case data held by DHHS. Sequencing data matched with epidemiological data is a very powerful surveillance tool.

- **Developing new treatments and a vaccine for COVID-19**

Another major focus of our work is to understand how the human immune system recognises infectious agents as well as how viruses replicate in order to develop antiviral medications. Studying replication of SARS-CoV-2 can only be done in a high containment facility, called a PC3 laboratory. The Doherty Institute has a state of the art PC3 and PC4 facility allowing for these studies. The Doherty Institute is home to many large research groups who are expert in other viruses – such as influenza and HIV. These experts have highly specialised training to work in PC3 laboratories and many rapidly pivoted their work to COVID-19.

The close linkages between public health laboratories, clinicians and researchers at the Doherty Institute resulted in pioneering studies into understanding how to block the virus from replicating using antibodies and drugs and to understand how the immune system responds to and clears COVID-19.

Through funding from the Victorian State government, the Institute has collaborated with other Victorian organisations on COVID-19 research, particularly the Burnet Institute. One key area has been to identify compounds (antivirals) which may have therapeutic benefit in the treatment of COVID-19. Another is to understand community views on public health measures, new diagnostics and how to inform effective behaviour change.

State funding has been supplemented significantly by Commonwealth and philanthropic funding which has allowed the Institute to develop several large research programs, including clinical trials investigating the pathogenesis (or progression of disease) of COVID-19, immune profiling, new treatments and vaccine development.

Two clinical trials of note are:

1. **The Sentinel Travellers and Research Preparedness Platform for Emerging Infection Disease (SETREP-ID)**

The Sentinel Travellers and Research Preparedness Platform for Emerging Infectious Disease (SETREP-ID) is a clinical research platform that has been activated within hospitals across Victoria to collect key biological samples from patients with COVID-19 to understand virus shedding (infectiousness) and the immune system response.

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This platform was developed as a response to the West Africa Ebola outbreaks in 2014-2015 and had in place pre-approved ethics and protocols in major public Victorian hospitals to immediately identify and collect patient samples relating to a new infectious disease outbreak. This platform was activated in January this year in response to COVID-19 and has been funded through the NHMRC CRE APPRISE network.

Samples from this study have been provided to over 20 research groups to support discovery research into various aspects of COVID-19.

### 2. Australasian COVID-19 Trial (ASCOT)

The Australasian COVID-19 Trial (ASCOT) is an adaptive platform trial that is designed to ascertain the effectiveness of treatments for use in hospitalised COVID-19 patients. An adaptive platform, means that therapeutics can be added or subtracted depending on new data or their observed performance. The trial will involve 2,500 patients in over 60 hospitals across Australia, New Zealand and selected international sites. The trial is recruiting patients hospitalised with COVID-19 who do not yet require intensive care support, with the aim of preventing deterioration to the point of needing a ventilator.

The Institute is also developing a range of vaccines candidates for COVID-19. Our strategy is to develop active and passive vaccination platforms. We currently are looking at three active vaccination candidates and are also developing antibodies for passive vaccination. In addition to our own vaccine program, scientists at the Doherty Institute are working with the University of Queensland and CSIRO, through The Coalition for Epidemic Preparedness Innovations (CEPI), to evaluate the University of Queensland clamped trimer vaccine.

As of 7 August 2020, the Institute had approximately 40 individual research activities investigating various aspects of COVID-19.

### Lessons Learnt

A recurring theme in the Institute's response to COVID-19 has been preparedness and our ability to pivot existing resources to support the response to COVID-19. This is demonstrated in several of the examples presented above.

The Doherty Institute was designed and initially funded to respond to outbreaks of infectious diseases, however, since its inception in 2014, support for public health in infectious disease has eroded, and in real terms, funding has been reduced.

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COVID-19 has demonstrated how important it is to have a well-funded and maintained public health and research infrastructure in place to respond with speed. This structure should encompass a full spectrum of activities, spanning from very basic or fundamental microbiology and immunology, highly skilled public health laboratory staff with access to the latest technologies, epidemiologists, public health experts and research-prepared clinicians. Across every part of this spectrum, innovation and discovery must be valued and resourced.

The response to COVID-19 has demonstrated how important it is to have various aspects of a response aligned and coordinated. For example – the close linkages to both federal and state health departments with our epidemiologists and public health labs were essential in our early rapid response and in informing policy for COVID-19. A workforce skilled in virology, specifically viruses that need high containment was available to pivot to COVID-19. Close links between clinicians and scientists allowed for clinical questions to be quickly identified and answered. Samples from patients participating in pre-approved clinical trials provided invaluable insights to the immune response to COVID-19, now informing vaccine design.

Many other states have looked to Victoria with great admiration of how we have brought together public health, clinical services and research through the Doherty Institute. The close links between the Doherty Institute and the Victorian Department of Health have also been invaluable. This served us well in our initial response to COVID-19.

There has been some public comment reflecting on the benefits of having a “one-stop shop” for infectious diseases. This is a simple concept however is much harder to enact given our federated health system. There are models used overseas which support this spectrum in addressing the threat of infectious diseases, such as a Centre for Disease Control. Another model is a National or State Centres of Research Excellence linking nodes around the nation into a cohesive, collaborative network. These are questions that we must turn our minds to as we move into recovery and learn to live with COVID-19. The purpose of such considerations would be to increase our sovereign capacity to respond to outbreaks of infection, either catastrophic, like COVID-19 or relatively small, like an outbreak of legionella or measles. An even more connected public health model locally would enhance the responsiveness of the Doherty Institute, and also harness the enormous biomedical, public health and clinical care capacity of Victoria.

Victorian policy makers and public health officers have a network of highly skilled specialists in infectious disease on whom to draw, in framing a response to COVID-19. The Doherty has been pleased to play its part as we navigate new terrain in Australian public health.

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## Annex 1: Tests for COVID-19 undertaken by Victorian Infectious Disease Reference Laboratory

