Dear Inquiry Panel,

I was excited to see Australia announce the creation of a Centre for Disease Control. COVID-19 made it clear that Australia needs an institution of this kind. I'm also glad that Australia has commissioned this Inquiry, including to inform the priorities of the CDC. There's a long-standing public health adage that "prevention is better than a cure". The same logic applies to pandemics. Pike et al in "The Origin and Prevention of Pandemics" show that the "wait-and-respond approach is not sufficient and that the development of systems to prevent pandemics *before* they are established should be considered imperative to human health."

I think this insight should be foundational to the direction of this Inquiry. My submission focuses on a select issues, but my overall view is that pandemic prevention should be a key priority of the CDC and that our institutions and leaders should never concede that pandemics are inevitable.

1. Zoonosis

Firstly, research tells us that the likelihood of zoonotic pandemics is greater than we think and on the rise. Land use change, climate change, travel and trade are known drivers of the emergence of novel pathogens. While we can't stop all of these things, the Inquiry should recommend practical interventions that reduce their risk domestically as well as international approaches that encourage others to do the same.

Land use change is a known driver of disease spillover from animals to humans. For example, urbanisation causing both nutritional stress and the fragmentation of flying fox habitats is attributed to the spillover of Hendra virus into horses and humans in Queensland.

A side effect of **travel and trade** is the spread of disease. There are concerns that activities like the movement of live animals through legal (live animal exports) and illegal (smuggling) trade may propagate spillover risks at each point. Coronaviruses carried by pangolins confiscated from the illegal wildlife trade in Vietnam have been found to originate in Yunnan and Guangxi, China. These are the provinces in which bats have been found to carry SARS-related coronavirus most similar to SARS-CoV-2.

Climate change will increase the spillover risks from anthropogenic land use. At least 10,000 virus species have the ability to infect humans but, at present, the vast majority are circulating silently in wild mammals. Changes in climate and land use will lead to opportunities for viral sharing among previously geographically isolated species. By 2070, it is expected that there will be 300,000 novel animal pair encounters globally. In other words, climate change will double the opportunities for one of the estimated 10,000 viruses in wildlife to move between species.

In all three of these cases, it's open to the Inquiry to recommend that Australia, including through national and jurisdictional biosecurity strategies, include practical interventions and programs to treat both the underlying trend and the risks it creates.

Further, while I understand that assisting foreign governments is not in the terms of reference of this Inquiry, international policies to support Australians at home are in scope. In that context, the Inquiry should consider recommendations that leverage Australian international leadership to pursue global pandemic prevention that keeps Australians safe wherever they are.

Given our special relationship with the Asia-Pacific, regional capacity building can be a key contribution to global public health. At least 4 out of 9 pandemics that have occurred since 1900 originated from Asia, due to high population density and proximity of animals to the population. Good work is already being done by the Indo-Pacific Centre for Health Security. Given the growing importance of this work, the Inquiry should consider making recommendations about how it could be appropriately expanded and focused on pandemic prevention. This might include investments into projects relevant to mitigating risks due to land use change, trade and travel, and climate change, as well as thinking about how innovative approaches to pandemic prevention recommended by this Inquiry could be spread in our region.

We can also build further our record of international leadership. Australia is a member of the International Experts Group of Biosafety and Biosecurity Regulators. Australia also advocates for chemical and biological weapons security and non-proliferation, including through the formation of the Australia Group to harmonise export controls for chemical and biological weapons. We could build on this track record and help keep Australians safe by:

- Acting on the recommendation of Global Health Security Index's 2021 report on Advancing Collective Action and Accountability Amid Global Crisis by regularly reporting to the World Organisation for Animal Health (OIE) on incidence of human cases of zoonotic disease. This is a critical global norm and we should help establish it.
- Recommending that the Foreign Minister consider including in free trade agreements that relate to animals and animal products something akin to a "national treatment" obligation that requires the other trading partner to meet or exceed the standards and practices to prevent zoonoses. Through this mechanism, Australia could adopt best practices domestically, and then encourage our trading partners to adopt similar practices - ultimately making Australia and the world safer.

2. Lab safety

Public commentary has focused on the possible origins of COVID-19, including whether it was a "lab leak". Regardless of the specifics of COVID-19 specifically, I've been shocked to learn about the high rate of safety incidents at labs handling dangerous pathogens. A publication from Manheim and Lewis found that from 1975-2016 there were 71 reported high-risk human-caused pathogen exposure events – as well as evidence of underreporting.[1] An anonymous survey on biosecurity and accidents in Belgium reported almost 100 laboratory-acquired infections in a 5 year study period.[2] A lab leak also likely began the 1977 flu pandemic.

Given pandemics can cost millions of lives and trillions of dollars, it seems clear that safety standards (or adherence to standards) fall far short of what is appropriate. While I'm firmly in favour of

[1] David Manheim and Gregory Lewis, 'High-Risk Human-Caused Pathogen Exposure Events from 1975-2016' (2022) 10 F1000Research 752.
[2] Biosafety and Biotechnology Unit, 'Laboratory-Acquired Infections in Belgium (2012-2017)'.

science, and think that science is a force for good in fighting pandemics, it has to be done responsibly.

As an outsider, there is little transparency about how physical containment facilities in Australia are regulated. The Office of the Gene Technology Regulator seems to focus mostly on GMOs and provides little information about its functions regarding physical containment facilities.

To the extent that information is available, OGTR's 2022-23 annual report is proud that it certified a record 132 physical containment facilities last year, meaning that there are now 1,874 "high-level" facilities operating in Australia. It also reports that it only conducted 49 inspections in the same period, including no inspections of the highest-level PC4 facilities.

Reviewing older reports, no PC4 facilities were inspected in 2021-22 either, and only 1 inspection occurred in 2020-21. Despite only conducting 49 inspections in 2022-23, 26 certified physical containment facilities were found to be non-compliant. In this context, the report noted that OGTR takes a "cooperative approach" to compliance and that no culpability was found in any of these cases.

In addition to seeming shortcomings in oversight, the guidelines themselves are troubling. The rules for PC4 facilities were last updated in 2007 and reference standards like AS1324.1 on air filters and AS/NZS 2243.3 on lab safety, which don't appear to have been updated since 2001 and 2002 respectively. AS1324.1 specifically has been criticised by the HVAC industry for being based on inaccurate research from the 1950s and has now been superseded by ISO 16890.

While this is a grim picture on multiple fronts, it's not necessarily a criticism of OGTR. OGTR only has 51 employees and has wide-ranging regulatory functions apart from these topics.

Overall, this snapshot paints a grim picture of the state of regulation in Australia, and one that I think falls far short of public expectations about how seriously these issues would be taken. Before reading into this, I would have guessed that PC4 facilities comply with cutting-edge global standards that account for emerging technology, and would each be inspected several times per year.

I think that this Inquiry should recommend a thorough review of biosafety – including the suitability of requirements, degree of adherence, and adequacy of oversight – for all research that involves human or animal pathogens. The review should include a risk assessment that takes into account the potentially catastrophic global consequences of errors, and ensures that our approach to mitigation is proportionate to that risk.

Overall, I think pandemics are one of the most important issues of our time, and expert assessments that the risk of pandemics is increasing are alarming. I think this inquiry should carefully consider how future pandemics could start and ensure it makes specific recommendations to reduce their likelihood. This should include the known mechanisms that have been with humans since time immemorial, such as zoonoses, as well as more recent risks, such as lab leaks, and emerging threats, such as engineered pathogens.