

Thank you for the opportunity to make a submission and share my views about the Commonwealth Government's response to COVID-19.

My key message is the overriding importance of prioritising efforts to prevent future pandemics. It seems to me that, perhaps more than any other kind of catastrophic risk, it's within our power to prevent novel pathogens from emerging and to quickly identify, contain and eliminate them if they do. Given the enormity of human and economic costs of pandemics – and that pandemics much worse than COVID-19 are possible – prevention should be our primary goal.

I think preventing pathogens from emerging and controlling them if they do should be top priorities for the new Australian Centre for Disease Control. Bernstein et al make the economic case for this in their paper "The costs and benefits of primary prevention of zoonotic pandemics". They show that, even on pessimistic assumptions and without considering the potential impact of promising emerging technologies, significant investment in pandemic prevention is overwhelmingly justified.

My comments go primarily to 'preventive health measures' in terms of reference 3.

My first concern is that advancing technology is rapidly making it possible for a large number of people to create novel pathogens that are difficult to contain.

Nature can produce pathogens that are extremely infectious like measles, with an estimated R0 of 15-20. Nature can also produce pathogens that are extremely fatal like rabies, which has an almost 100% death rate. Nature, however, is not known to produce pathogens that have both high transmissibility and high mortality.

Humans, driven by various motivations, could be on the verge of creating pathogens with both these features – risking pandemics much worse than COVID-19. The convergence of open science leading to the publication of dangerous knowledge, democratisation of synthetic biology, and AI-assisted research might mean that a small group of nefarious actors could cause catastrophic harm.

The Unabomber, Theodore Kaczynski, and the Aum Shinrikyo cult both engaged in terrorism motivated by bringing the end of civilisation. If active in the year 2023, it is conceivable that COVID-19 would have inspired them to seek to engineer a pandemic pathogen. An Aum Shinrikyo member had a virology PhD and obtained the pathogen *B. anthracis* which produces the toxin anthrax in an attempt to make it more lethal. Similarly, the Unabomber was a mathematics prodigy and professor, who had the capacity to leverage emerging technologies to further his goals.

Preventing the next pandemic requires making sure that highly skilled bad actors never have the capability to engineer a novel pathogen. However, a variety of trends are making this a realistic possibility. Open science norms – while typically essential to modern science – sometimes allow the publication of dangerous material. While the scientists who published the genomic sequences of the smallpox virus perhaps didn't foresee a future where the synthesised DNA was readily available, that information cannot be "unpublished". I recommend that the

inquiry read “Information Hazards in Biotechnology” (2018) by Lewis et al for a deeper understanding of this risk and more examples, including Mousepox and Botulinum toxin H.

Similarly, AI models are on the cusp of being able to provide substantial assistance to people doing research and filling tacit knowledge gaps. Again, if action is not taken and models with these capabilities become widely available, we may not be able to “unpublish” them.

Overall, I think the Inquiry should task the new CDC with responsibility for tracking the risk that a bad actor could create a pathogen with pandemic potential, and ensuring that safeguards remain one step ahead of that risk.

My second concern is that our poorly regulated animal agriculture industries are exposing us to intolerable levels of biosecurity risks.

In exchange for cheap meat from factory farms, people are dying of bacterial infections that were trivial to treat a few decades ago and facing escalating rates of pandemics that devastate lives and livelihoods. Simply put, factory farms are pressure cookers in which nature cooks up novel pathogens. According to the UN, there will be an estimated 10 billion people in 2050. Without paradigm shifts in industry or culture, I’m concerned that accelerating demands for meat will only increase and intensify these risks.

Intensive farming practices produce inexpensive meat due to the supposed efficiencies of increasing animal farming density. Animals are being packed closer and closer together in factory farms, breathing and defecating on top of each other. This environment is a breeding ground for novel pathogens whose evolution is accelerated by the density of homogenous hosts and the abundance of transmission routes. These practices have a negative public health externality in both antimicrobial resistance and pandemic potential viruses. The Inquiry shouldn’t stand for industries that profit by endangering people in Australia and around the world.

Antibiotics are fed to animals to reduce bacterial infections and boost growth – 70% of antibiotics produced globally are used in farmed animals, and estimates project that Australia will see a 16% increase in antibiotic usage in farming over the decade to 2030. This overuse is a driver of antibiotic-resistant infections globally. In 2020, antimicrobial resistance was attributed to 1,031 deaths, \$439 million in costs of premature death and the loss of 27,705 quality-adjusted life years in Australia (). I understand that the Australian Government has [worked with industry](#) so that its “livestock and seafood industries [have] ... little to no resistance to antimicrobials”, and these steps should be lauded. However, this same approach to ensuring intensive animal farming doesn’t risk human lives needs to be expanded to include viruses - they key cause of pandemics.

Viruses with pandemic potential often originate in wildlife but can cross the species barrier and pose a catastrophic risk to Humans. Wildlife are natural hosts for viruses that can persist without causing significant harm to the animals. Occasionally, these viruses can spill over from wildlife to farmed animals. In these farms, the viruses encounter new environments and species,

providing opportunities for genetic recombination and adaptation. This process can enhance the virus's ability to infect and transmit among different hosts, including humans. The proximity of wildlife, farmed animals, and humans in certain settings, such as live animal markets, live exports, slaughterhouses or factory farms, increases the likelihood of interspecies transmission events, potentially leading to the emergence of novel and more transmissible viruses with pandemic potential.

We now know that the 2009 H1N1 flu pandemic which caused an estimated 284,000 excess deaths originated first in swine farms in central Mexico. This quote taken from peer reviewed paper "Origins of the 2009 H1N1 influenza pandemic in swine in Mexico":

*" This highlights the critical role that animal trading plays in bringing together diverse viruses from different continents, which can then combine and generate new pandemic viruses."*

Australia needs to drastically decrease the pathogen transmission risks from high animal densities in live legal or illegal animal trade, live animal exports and factory farming. Australia's biosecurity strategies need to require the industry to take practical steps to reduce these risks. Where the risks remain too great or the prevention of pathogen transmission is too costly, Australia has a duty to end these practices to avert pandemics and our slow death from antimicrobial resistance.



I think Australia can and needs to do better than [redacted] prediction.