

I want to take this opportunity to highlight the importance of Australia focusing on efforts to prevent future pandemics – and not just preparing for them. As a young Australian, I feel like I was especially impacted by COVID-19. It impacted my education and relationships and it felt as if my demographic - for social and economic reasons - was less well-equipped than many others to handle the hardships.

While the experience has given me a range of views about the ways the government can support individuals and communities - even the best-managed pandemic will have terrible consequences. I think pandemic prevention should be given much higher priority.

It seems to me that Australia's governments invest heavily in hazard reduction for other natural disasters and are increasing their efforts because of climate change. But I'm not aware of any similar investment in reducing the likelihood of pandemics, despite the significant risks they pose to Australians. Therefore, I'd like to raise a few issues that I think are important and could help us head in the right direction.

Firstly, the point is now being reached where humans have the capability to produce novel pathogens. While nature can produce pathogens that are extremely infectious like measles, or extremely fatal like rabies, it is not known to produce pathogens that have both high transmissibility and high mortality.

Humans, driven by various motivations, could be close to creating pathogens with both these features – risking pandemics much worse than COVID-19. The combination 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.

Preventing the next pandemic requires making sure that highly skilled bad actors are prevented from having the capability to engineer a novel pathogen. However, a variety of trends are making this a genuine 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perhaps may not have foreseen a future where the synthesised DNA was readily available, that information cannot be “unpublished”.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.

Viruses that originate from wild animal reservoirs require intermediary mixing vessels to gather the right mutations that ultimately enable them to become human-adapted. The best mixing vessels are typically other mammals that have similar respiratory tracts. Therefore, the transmission of these viruses from animals to humans is more likely to occur in settings where human-animal interactions are frequent, such as in animal agriculture.

Intensive animal agriculture, in particular, is a breeding ground for pathogens. The conditions in which many hosts are cramped, coupled with the use of antibiotics, may protect against bacterial infections but not viral ones. To prevent contact with wild species that may carry zoonotic diseases, regulations must be put in place for intensive animal agriculture and meat production.

While live animal markets further down the supply chain pose a smaller risk compared to intensive animal agriculture, they are still a source of risk. Decreasing interactions between pigs in farms and wild fruit bats has resulted in a drop in incidences of influenza and Nipah virus. Likewise it has been found that when free-range turkeys were prevented from interacting with wild birds, flu incidences decreased. This suggests that wild-animal sources of infections can be controlled through proper regulation of human-animal interactions. Despite this being the case, and being acknowledged by Australia's jurisdictional biosecurity strategies, I'm not aware of any policy or programs that seek to reduce the risk.

To reduce the risk of pandemics from our food system Australia should investigate the suitability of such interventions:

- Implementing straightforward and economical measures, such as proper fencing, vaccination, or zoning, which could substantially decrease the risk of viruses from wild animals spreading to livestock and, subsequently, to humans. This is discussed in detail by Gortazar et al (2015) The wild side of disease control at the wildlife-livestock-human interface: a review. *Front. Vet. Sci.* 1:27. doi: 10.3389/fvets.2014.00027
- Improving inadequately designed ventilation systems in intensive farming which may release substances, including pathogens, into the environment, heightening their transmission from livestock to both wild and domestic animals. This is discussed in detail by Jones, et al (2013). Zoonosis emergence linked to agricultural intensification and environmental change. *Proceedings of the National Academy of Sciences*, 110(21), 8399-8404. <https://doi.org/10.1073/pnas.1208059110>
- Increasing the awareness of zoonotic spillover in producers and vets working with livestock. An assessment of Irish farmers found that more than half thought it was impossible to get an infection from sick poultry and over 90% thought it was impossible to get an infection from a healthy-looking animal. Producers and vets are at the front line of zoonotic spillover in the same way that healthcare providers are at the front line of infectious disease. As the "eyes on the ground", their awareness of zoonotic risks, and the actions they take. You can read the original research in Mahon et al , (2017). An assessment of Irish farmers' knowledge of the risk of spread of infection from animals to

humans and their transmission prevention practices. *Epidemiology & Infection*, 145(12), 2424-2435. doi:10.1017/S0950268817001418

- As in the COVID-19 pandemic, Australia could consider pioneering rapid antigen tests or other rapid diagnostics to allow producers to check their livestock routinely and monitor themselves for such illnesses. Agriculture Victoria has recently developed rapid tests for the grape industry. While this is a good step, it's another example of Australia's "biosecurity approaches" having practical measures to help the agricultural industry, but not having practical measures to prevent pandemics or otherwise take a true one health approach.
- Other peer-reviewed literature also mentions interventions that fall into 5 categories: stop clearing and degradation of tropical and subtropical forests, improve health and economic security of communities living in emerging infectious disease hotspots, enhance biosecurity in animal husbandry, shut down or strictly regulate wildlife markets and trade, and expand pathogen surveillance at interfaces between humans, domestic animals, and wildlife. The inquiry can read about these in more detail at Vora, et al (2023). Interventions to Reduce Risk for Pathogen Spillover and Early Disease Spread to Prevent Outbreaks, Epidemics, and Pandemics. *Emerging infectious diseases*, 29(3), 1–9. <https://doi.org/10.3201/eid2903.221079>

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.



## Citations

- [Emerging human infectious diseases and the links to global food production](#)
- [New portable genetic test for phylloxera | Media releases | Media centre | About | Agriculture Victoria](#)
- [Revisiting Aum Shinrikyo: New Insights into the Most Extensive Non-State Biological Weapons Program to Date](#)
- [The Words of a Killer How the Unabomber's writings helped lead investigators to his door 25 years ago](#)
- [Information Hazards in Biotechnology - Lewis - 2019 - Risk Analysis - Wiley Online Library](#)