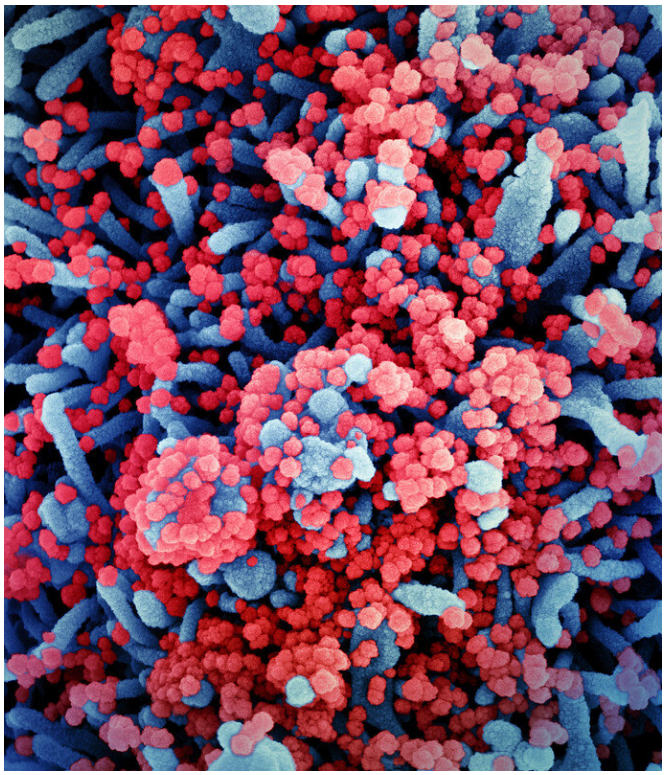
Reducing the risk of animal viruses jumping to humans

30 July 2020, by Professor Bill Sutherland and Dr Silviu Petrovan



Colorized scanning electron micrograph of a cell (blue) heavily infected with SARS-CoV-2 virus particles (red), isolated from a patient sample. Image captured at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIAID

SARS-CoV-2 is not the first deadly virus to have jumped from an animal to humans, but it is the first to have swept the globe at such speed and scale. Cambridge zoologists Bill Sutherland and Silviu Petrovan warn that we must dramatically change the way we interact with animals to reduce the risk of this happening again.

The rate at which diseases that jump from animals to humans are emerging is increasing globally. Whereas in the past almost all of these 'zoonotic' outbreaks would have been local and short lived, it is easier for them to spread today.

Degradation of the natural environment, more livestock and wild animal farming and trading, urbanisation and associated high human density, increased travel and a globalised world all lead to greater opportunities for the spread of diseases. Fingers may have been pointed at pangolins and bats for COVID-19 but it is these human-caused changes that are driving the problem.

Just as generals are warned against planning to refight the last battle, we are concerned that suggested measures are often unrealistic (ban wet markets, stop hunting), ineffective (ban trade and risk an increase in illegal trade) or might make some problems worse (banning activities prevents any oversight and could disproportionately impact indigenous local communities that depend on wild meat for protein). This complex problem requires complex solutions.

Moreover, context-specific solutions need to be put in place everywhere. Despite most of these diseases originating in wild animals, many are transmitted to humans via intermediate hosts—and this can mean pets, captive wild animals (such as civets), livestock and feral animals.

We want to improve policy and practice. The risk of another pandemic is all too real. But evidence of what works to reduce this risk is not readily available. We've found that practitioners in various areas don't tend to know about 40% of the possible options when they start making plans. When lives are at stake, that's an alarming position to be in.

And so, since the pandemic started, under the umbrella of BioRISC (Biosecurity Research Initiative at St Catharine's) in Cambridge, we brought together an international team of vets and wildlife experts in all categories of animal—wildlife, captive, feral and domestic—to look at all the major ways diseases with high potential for human-to-

human transmission can spillover from animals to humans and then spread.

The results give policymakers and individuals a wide range of options, and are intended to encourage careful consideration of how things can be changed at the national or regional level.

We use a method called Solution Scanning to look at all the evidence available and we ask experts to identify a range of options to address a problem.

The same method has been used in a previous study of ours to identify 275 ways to reduce the spread of coronavirus following lockdown. Sources of information include the scientific literature, position papers by non-governmental organisations, industry guidelines and experts in different fields.

This time, working with 23 other wildlife experts and veterinarians, we carried out a solution scan of options for preventing future zoonotic epidemics.

We estimate 60% of emerging human diseases are caused by pathogens that jump from animals, and we found seven potential routes by which another human pandemic could arise:

- direct contact with wildlife, such as wildmeat hunting
- commercial trade of wild animal products
- breeding and trade of captive wildlife
- breeding and trade of domestic animals
- antimicrobial resistance—especially in relation to intensive farming and pollution
- pathogen escape or release from laboratories, including bioterrorism
- intentional creation of life

Each of these routes is complex.

We then focused on measures that can be put in place in society at local, regional and international scales to reduce the risk of another pandemic from each of these routes.

We didn't consider the development of vaccines and other medical and veterinary medicine options—these are discussed elsewhere.

Where should we go from here?

We came up with 161 ways to reduce the risk of the next pandemic of zoonotic origin. That's a lot.

But, for a particular situation, the list of potential solutions can quickly be narrowed down based on relevance and practicality—and the most important options will depend on the local and regional context. We haven't prioritised, but nevertheless some clear front-runners can be identified:

- Urgently introduce risk-assessed plans for wildlife markets: ban the trade of some species (e.g. bats) and introduce strict hygiene checks and species separation for live animals and fresh carcasses, including during transport.
- Help various countries to improve biosecurity and reduce risks from livestock farming: provide PPE (such as gloves) and training for farm workers, control visitor and vehicle access, separate livestock from other animals with fencing, and protect food and water from contamination.
- Regulate the maximum density of animals being housed or transported: cramped conditions for animals create poor hygiene, sickness and mortality, and increase the risk of contamination.
- Enforce existing bans and regulate trade: identify animal species or products that are deemed to be high risk for pathogen transmission and work to remove and replace them or license their trade so that stricter hygiene and health checks can be implemented.
- Minimise international transport of live livestock: introduce and enforce detailed animal health status checks and limit the movements of live animals across long distances.
- Identify and protect areas with high biodiversity value but which are at risk from land use change: changes in habitat features from deforestation or mining can threaten or displace high-risk species. For example, protecting habitats such as bat roosts is important to reduce their displacement or high levels of stress and

inadvertent contact with livestock and people.
- Integrate indigenous peoples and local communities into early warning systems of disease emergence: incentivise a switch to lower-risk hunting by promoting lower-risk species alternatives and engage local communities to implement surveillance of animal and human health.
- Promote alternatives to animal products, especially for high-risk products: these might include synthetic or plant-based products instead of meat, leather, fur or traditional medicine products.

What's next?

Our aim is to present the evidence and options, as experts working in different fields, so that policymakers have comprehensive information to help them make better informed decisions. They should certainly not assume the next pandemic will arise in the same way as COVID-19. In fact we need to be acting on a much wider scale to reduce the risk.

We still don't know enough about certain risks and pathways, so increasing our understanding of pathogen hosts and potential transmission mechanisms between wildlife and livestock, captive-bred animals and humans remains particularly urgent.

Our study has shown that dealing with such a complicated mix of potential sources of infection requires widespread changes to the ways humans and animals interact. We can't completely prevent further pandemics, but we know there are a range of options that can substantially reduce the risk. Can we improve how we live with animals? Most certainly yes. And we must.

We're continuing to raise awareness of this work and exploring options for assisting policymakers with turning the list of options into policy.

More information: Post COVID-19: a solution scan of options for preventing future zoonotic epidemics: osf.io/4t3en/

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