

Zoonoses: beyond the human-animal-environment interface

World Zoonoses Day on July 6 marks the day, in 1885, when a young boy received the first vaccine against rabies—a zoonosis, a disease caused by a pathogen transmitted from animals to humans. Rarely is a World Zoonoses Day so relevant to consider these diseases and their disruption of societies.

New zoonotic diseases are emerging and re-emerging at an exponentially increasing rate. DR Congo has had 11 Ebola virus outbreaks since the 1970s, but six have occurred in the past decade. Coronavirus infections are also emerging more frequently: from SARS, to MERS, and now COVID-19. Not all zoonotic diseases become pandemics, but most pandemics are caused by zoonoses and they have become characteristic of the Anthropocene era.

Intensive livestock farming and agriculture, international trade of exotic animals, and increased human encroachment into wildlife habitats, alongside international travel networks and urbanisation, have disrupted the human-animal-environment interface. Pathogens have always spilled over from animals to humans, but exponential human population growth and exploitation of the environment makes spillover more likely, and consequential.

In 2012, a *Lancet* Series on preventing pandemic zoonoses argued the importance of pathogen discovery, surveillance, and prediction of zoonoses with pandemic potential. Today, whole-genome sequencing and diagnostics are used to analyse pathogen spread and hotspots. Surveillance for public health now relies on mobile phone app data, and early warning systems analyse big data compiled from social media, wearables, and geospatial data. Strategies are being tested to predict which viruses can infect people, and which of those viruses have pandemic potential. Efforts to develop universal vaccines could enable us to curb outbreaks early.

Global experts have long called for a One Health approach to zoonoses—a holistic approach to environmental sustainability, livestock health, and human health, recognising that a multisector approach is the best way to improve public health. Last week, an international team of wildlife and veterinary experts released an extensive list of ways to change our relationship with animals and reduce the risk of another pandemic like COVID-19. Laws to prevent different animal species mixing, improving

animal health on farms by limiting stocking densities, ensuring high standards of veterinary care, and shifting to plant-based foods are among the many feasible options to consider further.

Even a conventional One Health approach might not have the breadth to address the full complexities of zoonoses. For example, take the closure of live markets, which has been suggested to prevent the emergence of zoonotic diseases. Although reasonable from a global health security perspective, does it consider economics, culture, and society? Communities depend on animal markets for food, social cohesion, and income. Market closure might drive trade underground, and loss of regulation and monitoring will compromise sanitation, hygiene, and animal welfare. This could exacerbate risk, rather than lessen it. Safe, practical, and sustainable solutions will come from cross-specialty, interdisciplinary, and international collaboration, not from the health and environmental sectors alone.

A tripartite collaboration between WHO, the World Organisation of Animal Health, and the UN Food and Agriculture Organization was formed to help countries implement the One Health approach. Addition of the UN Environmental Programme would strengthen this governance mechanism further. But operationalising a true One Health approach to prevent zoonotic diseases emerging, spreading, and harming society goes far beyond health and environmentalism. Social and political scientists, anthropologists, economists, and others must join conversations about surveillance, capacity building, and risk reduction. Industry, travel, and tourism representatives all need to be involved in changing the trajectory.

Sounding the alarm about the risk of zoonotic pandemics has largely been the preserve of a handful of scientists and global health experts. Until now. COVID-19 has coalesced the research community around calls for establishing broad transformational change. This pandemic is a sobering warning against exploiting the natural world without pause, and that zoonoses affect not only health but the whole fabric of society. COVID-19 will not be the last, and perhaps not the worst, zoonotic pandemic. Climate change has shown how an existential threat to human civilisation can galvanise a sense of urgency in a whole-of-society response. Tackling zoonoses needs exactly the same. ■ *The Lancet*



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For the *Lancet* Series on zoonoses see <https://www.thelancet.com/series/zoonoses#:~:text=In%20a%20new%20Lancet%20Series,cost%20of%20such%20an%20outbreak>

For more on the *Lancet* One Health Commission see *Comment* *Lancet* 2020; 395: 1469–71

For post COVID-19: a solution scan of options for preventing future zoonotic epidemics see <https://osf.io/4t3en/>