# COVID, bird flu, mpox: A virologist on why we're seeing so many viruses emerge

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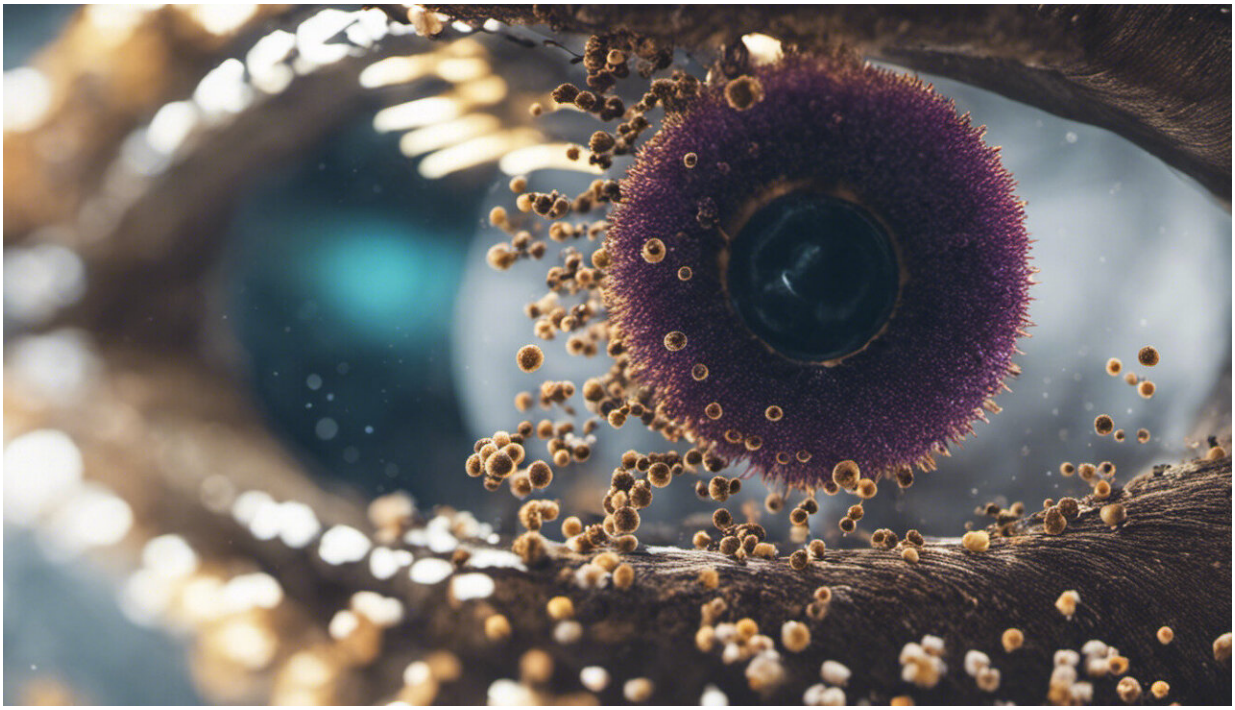

Credit: AI-generated image (disclaimer)

From the widespread outbreak of mpox (formerly called monkeypox) in 2022, to the evolving bird flu situation, to recent cases of Marburg virus in Equatorial Guinea, COVID isn't dominating the headlines as much as it used to. Instead, we've been regularly hearing about outbreaks of newly emerging or re-emerging viruses.

So, is the incidence of virus outbreaks increasing? Or, have we just become better at detecting outbreaks thanks to improved technology developed during the COVID pandemic? The answer may be a bit of both.

There are an estimated 1.67 million viruses yet to be identified that currently infect mammals and birds. Of these, it is thought that up to 827,000 have the potential to infect humans.

To understand how viruses emerge, we need to go back to the beginning of life on Earth. There are several theories about how the first viruses came into existence, but they all agree that viruses have been around for billions of years, evolving alongside living things. When there's disruption to this stable co-evolution, that's when we can run into trouble.

The main drivers of viral emergence in the human population are humans and their actions. Agriculture became a common practice more than 10,000 years ago, and with it humans started having close contact with animals. This presented the opportunity for viruses that naturally infected these animals to "species jump" into humans. This is called zoonosis. Around 75% of newly emerging infectious diseases are due to zoonosis.

As human civilization and technology advanced, the destruction of animal habitats forced animals into new areas in search of food sources. Different species that wouldn't usually have been in contact were now sharing the same environment. Add humans into this equation and you have the perfect recipe for a new virus to emerge.

Urbanization leads to high population density, creating an ideal environment for viruses to spread. The rapid development of towns and cities often outpaces adequate infrastructure such as sanitation and

healthcare, further increasing the likelihood of virus outbreaks.

Climate change is also contributing to the spread of viruses. For example, arboviruses (viruses spread by arthropods like mosquitoes) are being detected in new areas because the range of countries mosquitoes can survive in is increasing.

We've known about these factors for a long time. The emergence of SARS-CoV-2 (the virus that causes COVID) did not surprise any virologist or epidemiologist. It was a matter of when—not if—a pandemic would occur. What was unexpected has been the scale of the COVID pandemic, and the difficulty of effectively limiting the spread of the virus.

We also couldn't have predicted the impact that misinformation would have on other areas of public health. Anti-vaccination sentiment in particular has become more commonplace on social media over the past few years, and we're seeing increased rates of vaccine hesitancy.

There has also been disruption to routine childhood immunization programs, increasing the risk of outbreaks of vaccine-preventable diseases such as measles.

## Lessons in surveillance

Science has moved at an unprecedented rate during the COVID pandemic, resulting in the development of new and improved virus detection methods to monitor outbreaks and the evolution of the virus. Now, many of the scientists involved in tracking SARS-CoV-2 are turning their attention to monitoring other viruses as well.

For example, wastewater monitoring has been used extensively to detect SARS-CoV-2 during the pandemic, and could similarly help track other

viruses that pose a threat to human health.

When a person is infected with a virus, some of the genetic material of that virus is usually flushed down the loo. Wastewater has the power to show if the number of infections in an area is increasing, usually before case numbers start to increase in hospitals.

Adapting this technology to look for other viruses such as influenza, measles or even polio could provide us with valuable data on the timing of virus outbreaks. This is already happening to some degree—poliovirus was detected in wastewater in London during 2022, for example.

This increase in viral surveillance will naturally result in more virus outbreaks being reported. While some people may regard this as fearmongering, information like this could be the key to containing any future pandemics. If an outbreak were to occur in an area that doesn't have adequate virus surveillance, the infection is more likely to spread too far to be easily contained.

That said, surveillance is only one part of pandemic preparedness. Governments and health and science agencies around the world need to have (regularly updated) virus emergence and pandemic protocols in place, so that we are not scrambling to understand a situation when it may already be too late.

COVID is unlikely to be the last pandemic that many people alive today will witness. Let's hope we are better prepared next time.



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