

Outbreak of avian flu has killed more than 100 million birds and poses a serious threat of becoming a human pandemic

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The COVID-19 pandemic, which has killed more than 21 million people, has elevated an existential question into concrete immediacy. Following COVID-19, when will the next pandemic of a highly lethal nature strike again?

The first ever extensive global monkeypox outbreak affected multiple countries across nearly every continent. It felt like the world had dodged a bullet when cases began to subside. As well, the outbreak of the extremely deadly Ebola Sudan virus in Uganda threatened the region and beyond as it spread into the densely populated capital of Kampala. Such potential crises are appearing far more frequently in recent years, making new pandemics a risk to the world's population which cannot be ignored.

The first new pandemic after COVID-19, which is still continuing to infect billions of people, may well be already in plain sight, but overlooked or dismissed for the most part by most news outlets and given no political attention.

The largest recorded outbreak of a highly pathogenic avian influenza (HPAI) has been killing millions of birds since October 2021. From disease and related culling, in all more than 140 million poultry, including 60 million in North America and 48 million in Europe, have been killed, according to the World Organization for Animal Health (WOAH).

A genetic analysis of the H5N1 influenza virus in the current avian pandemic has located it in a clade (virus family) circulating among poultry and wild birds across multiple continents, but most closely related to strains among European seabirds.

The first cases in North America were detected in December 2021 in Newfoundland and Labrador, Canada, on a bird farm. In February 2022, Florida's Fish and Wildlife Conservation Commission reported that the death of black vultures at the state's Hontoon Island State Park was caused by the same virus.

Over the next several months, the virus had spread into numerous wild bird species, commercial poultry, as well as

mammals, including grizzly bears, red foxes, coyotes, seals and dolphins, as well as a human case confirmed on April 27 by the US Centers for Disease Control and Prevention (CDC) in an incarcerated individual in Colorado who had been involved in culling infected poultry.

In February 2022, the *Wall Street Journal* noted that the avian flu had affected a chicken farm in Fulton, Kentucky, and a Tyson Foods chicken processing farmhouse, raising concerns about a repeat of the last major bird flu calamity in 2015.

Egg prices have risen almost 60 percent by December, compared to the previous year, with egg inventories down 29 percent. At present, Nebraska has seen 6.7 million poultry deaths, up from 4.8 million in the 2015 outbreak. According to the *Journal*, Colorado has lost 90 percent of its egg-laying hens.

As disastrous as the outbreak has been to the bird population, the fear remains that the virus will learn to efficiently use a human host to transmit itself. Until now, according to the World Health Organization (WHO), between 2003 and March 2022, there have been only 864 cases of H5N1 in humans across 18 countries worldwide. The infection in the US was the first time for this country.

The fatality rate, however, is dangerously high with 456 deaths among the 864 cases, giving a 53 percent chance of dying if infected. Thus far, cases have remained sporadic, in small clusters, involving exposure to infected poultry or contaminated environments.

But there is growing concern among scientists that a more virulently infective form of the virus could suddenly evolve and spread rapidly into the human population as a lethal airborne pathogen. Wend Blay Puryear, a molecular virologist at Tufts University, told the *Guardian*, "There is concern about it having pandemic potential. Before COVID was on anybody's radar, this was the one that we were all watching closely."

As a recent report in *Think Global Health* noted, "Each

time one species transmits the virus to another, it constitutes a spillover event. These myriad spillovers—among wild bird species, from wild birds to domestic birds, across birds to mammals, and from animals to humans—raise serious concerns about the potential for further adaptation and evolution of this influenza lineage and the continued risk associated with avian migration. Understanding which species among these many hosts may be helping the virus adapt is crucial for targeted surveillance and mitigation efforts.”

The last pandemic to cause such a significant devastation among birds began in December 2014, when more than 50 million birds died, costing farmers over \$1.6 billion. However, by the summer of 2015, the virus suddenly vanished as quickly as it had appeared. Migratory birds returning to Canada were found to be virus-free.

However, in the present instance, the outbreak was sustained throughout the summer and has surged again this winter. Active surveillance has identified more than 3,300 infected birds across 100 species, an immense scale of transmission compared to the outbreak in 2014–2015 when fewer than 100 wild birds tested positive for H5N1.

A veterinarian with Colorado’s agricultural department, Maggie Baldwin, told the *Journal*, “One of the challenges is that we don’t know why it [the virus] has been able to thrive so long. We’re almost a full year into this outbreak and it is ongoing.”

Mike Tincher, rehabilitation coordinator for Colorado’s Rocky Mountain Raptor Program, said, “There is no historical context for this. It’s like when COVID hit for humans ... We’ve never seen this before. And it’s just not slowing down.”

As the US Department of Agriculture recently noted, “Wild birds can be infected with HPAI and show no signs of illness. They can carry the disease to new areas when migrating, potentially exposing domesticated poultry to the virus.” Such *asymptomatic* spread of the virus poses an exceptional challenge for the international community unless surveillance systems are bolstered across animal and human sectors.

A recent report by *Eurosurveillance* has garnered much attention on social media. It describes the outbreak of HPAI H5N1 among intensively farmed minks in the Galicia region in northwest Spain in October 2022. Oxford University professor of evolution and genomics Aris Katzourakis tweeted, “[I] don’t understand how mink farming can be defended. Viruses move easily between mink and humans, and this could play a big role in the emergence of future pandemics.”

When the initial outbreak occurred, veterinarians had assumed that the disease was caused by SARS-CoV-2, as it

had previously struck mink farms in Denmark in November 2020. However, laboratory testing revealed the culprit was the HPAI H5N1. More than 52,000 minks at the farm had to be culled.

As the *Eurosurveillance* report noted, the minks were kept in open barns and fed raw fish and poultry byproducts sourced from the same region. Their detailed analysis found the virus was similar to the virus circulating among birds across multiple continents.

A *Science* article published this week on the bird flu outbreak at the Spanish mink farm states, “The virus is not known to spread well between mammals; people almost always catch it from infected birds, not one another. But now, H5N1 appears to have spread through a densely packed mammalian population and gained at least one mutation that favors mammal-to-mammal spread. Virologists warn that H5N1, now rampaging through birds around the world, could invade other mink farms and become still more transmissible.”

Tom Peacock, a virologist at Imperial College of London, warned, “This is incredibly concerning. This is a clear mechanism for an H5 pandemic to start.”

The mutation in question is uncommon and only seen once before, in a European polecat, according to CIDRAP. The mutation could have spontaneously evolved among mink in a convergent evolutionary pathway. The new variant, labeled 2.3.4.4b, emerged in Europe in late 2020 and became predominant in wild birds. It is believed to have originated in Korea through a process of reassortment between the H5N1 and the clade 2.3.4.4b H5N8.

Although it appears the mutation may be less pathogenic for humans, about six people have thus far caught the virus and one has died. It also appears to be more adapted to all birds as Richard Webby, an influenza researcher, noted. It is worrisome that in this reappearance of H5N1, numerous mammalian species have become infected.

Thomas Mettenleiter, head of the Friedrich Loeffler Institute, speaking to *Science* on the lower pathogenicity (lethality) of the new strain in humans, explained, “Of course that can be bad news, too, because it might make it easier for the virus to start spreading under the radar, giving it more opportunity to evolve.”



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