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What the mink COVID-19 outbreaks taught us about pandemics

Spread of the coronavirus has exposed troubling problems at fur farms and how we respond to outbreaks there.

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Anne Sofie Hammer was searching for sick mink. The Danish government had hired the University of Copenhagen veterinary pathologist in June 2020 to investigate if farmers were infecting mink with the novel coronavirus. This meant going from farm to farm, looking for animals that weren't eating or had a cough and taking blood samples and mouth swabs.

The virus, SARS-CoV-2, had been spreading rapidly among mink farmers, and officials were worried that it would not only infect the country's roughly 17 million farmed mink but also jump back to humans. That leap had already been documented in the Netherlands.

Gasping for breath, chests heaving, some older mink especially were struggling to survive, she found. As their immune systems raced into overdrive, their lungs filled with fluid. They were drowning, she says. When she picked up some of the dead animals, "fluid would run out of their noses."

Something else troubled her too. At several farms, many seemingly healthy mink tested positive or had antibodies against the virus. That the infections occurred with little sign of disease or increased mink deaths makes it difficult to detect the spread of infection, she wrote in February 2021 in the journal *Emerging Infectious Diseases*.

Consequently, mink farms may represent a "serious, unrecognized animal reservoir" of the coronavirus, warned Hammer, who does research on behalf of the Danish government and the fur industry. Unidentified infections in animals, on farms, or in the wild could undermine our collective efforts to beat back the pandemic.

“Even if you have an efficient vaccine program and eradicate [the coronavirus] in humans, which is difficult enough, if it’s continuing in wildlife that will be a problem,” says W. Ian Lipkin, the director of Columbia University’s Center for Infection and Immunity. “We must avoid an animal reservoir of the disease,” he says. The virus, circulating among a population of animals, may continue to evolve and perhaps jump back and forth between humans and that species, potentially becoming more transmissible or deadly as it replicates, he says.

PJ Smith, director of fashion policy at Humane Society International, is one of many animal welfare advocates who say the pervasiveness of the disease at mink farms underscores how dangerous and inhumane the industry is. They say now is the moment to shut it down because farms' mink numbers are low. Mink are slaughtered in late autumn when their pelts are at their thickest and most lustrous, and breeding doesn’t begin again until around the following March.

But groups such as the International Fur Federation, which represents fur trade groups and farmers, argue that the industry can contain infectious diseases and that mink farming is an important part of the $22 billion global fur industry. “A lot of these farmers have been doing this for two, three, four generations,” says Mike Brown, a U.S. spokesperson for the federation. “This is their livelihood.”

Regardless, coronavirus outbreaks at mink farms have exposed problems that include inadequate monitoring for disease, weak or nonexistent regulations, and haphazard coordination around a virus that can be passed between humans and animals.

More than half of all diseases that sicken humans can be spread by animals, according to the U.S. Centers for Disease Control and Prevention (CDC). They run the gamut from rabies, salmonella, and Nipah virus (a deadly bat-borne virus that kills pigs and people) to Middle East Respiratory Virus (MERS) and SARS-CoV-2. The threat also goes the other way, which is known as reverse zoonosis. Humans can give mink the flu, for example.

Acknowledging the need to take more aggressive steps, last week the European Food Safety Authority and the European Centre for Disease Prevention and Control recommended changes such as taking weekly surveys of mink farms for coronavirus, testing farm workers frequently, and conducting random testing of both sick and apparently healthy mink. Such precautions aren’t the norm in the United States, where testing typically isn’t done unless animals are obviously ill.

Desperate measures

Breeding mink for their pelts is widespread in northern Europe, North America, Russia, and China, often on farms with thousands of the animals kept in adjoining wire cages. In such close quarters, pathogens can easily pass from mink to worker, or vice versa, as they inhale infectious droplets or touch contaminated surfaces.

Indeed, since the spring of 2020, the coronavirus has hopscotched across more than 400 farms in Europe, emerging most recently, this month, in Poland, a leading producer. Before that, it was detected in North America, in Canada, in December. Around that time, the Netherlands, another major mink breeder, finished killing its several million animals to prevent further outbreaks and

moved up its timeline for shutting down the industry from 2024 to 2021. And late last year, authorities in Denmark ordered all farmed mink to be killed after a mink-related virus variant was detected in people. Denmark and Sweden canceled their 2021 breeding seasons.

In the United States, the first farmed mink with the coronavirus were identified in Utah in August 2020, and outbreaks have since occurred at 16 mink farms, according to the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service. The International Fur Federation's Mike Brown says more than 12,000 of the country's roughly three million farmed mink had died from COVID-19 before the annual slaughter for their pelts, in December.

It's still unclear, half a year after the first American outbreak, whether mink have spread the disease to people in the U.S., as was confirmed in the Netherlands and Denmark.

The USDA hasn't recommended culling mink but has issued guidelines calling for infected farms to be quarantined, for workers to wear protective face masks, and to stay home if sick with COVID-19. Yet ultimately in the U.S., it's left to state governments to lead the response to outbreaks on mink farms.

Allowing breeding to begin in the U.S. this year would be "shockingly reckless," said the nonprofit Utah Animal Rights Coalition in recent letters to the CDC and USDA. "Swift action is necessary to effectively combat the COVID-19 pandemic, prevent the loss of human life, and the spread of the disease to wild animal populations," they wrote, calling for a halt to mink production.

U.S. mink mysteries

Coronavirus infections in mink haven't been restricted to farms. Last autumn, investigators in Utah found an infected wild mink in the "immediate vicinity" of a farm harboring the disease. The news, which wasn't made public by the USDA until mid-December, has compounded fears of mink sickening both humans and wild animals. Also in December, biologists sampling wild animals around infected farms in Oregon found two mink believed to have escaped from a nearby farm that were carrying the virus.

In Utah, where 12 of the 16 mink farm outbreaks have occurred, dogs and feral cats have also tested positive on the farms, raising questions about how that wild mink may have contracted the virus. Utah state veterinarian Dean Taylor says one possibility is that a feral cat was the source. Another is that the mink caught it from another wild mink, which would suggest that the virus is already more widespread than scientists realize. Or perhaps the mink found its way into the mink barn on the farm, got infected there, and went back out.

In the wild, mink are solitary animals, which reduces the likelihood of disease spread among wild mink, according to Hammer. But whether the coronavirus passes from mink to other wildlife species "also depends on how mink populations interact with others," says Lane Warmbrod, a senior analyst at Johns Hopkins Center for Health Security. "I can say it is entirely

plausible that a virus jumps between two mammalian species, as we've already seen it do from humans to mink and back."

So far, none of the small sampling of wild animals trapped and tested around mink farms in the U.S. (and Europe), beyond the wild mink, have been found with coronavirus.

But on farms in the U.S., public health and wildlife protection advocates say, there's a worrying lack of transparency about coronavirus outbreaks. The Utah Animal Rights Coalition has urged the Biden administration to take a more proactive role in tracking outbreaks, assessing the risks from them, with steps including rapid genome sequencing of the virus on the farms, and publicizing findings.

Genome sequencing of the coronavirus in mink and humans, the technique used in the Netherlands and Denmark to rapidly help confirm whether the virus jumped between species is still ongoing in the U.S., according to the CDC. In the Netherlands, such work was conducted within weeks of its first outbreak. The CDC has declined multiple requests for interviews about the slow progress.

Warmbrod says many health departments lack the expertise and tools to do genomic analysis and must outsource the work to academic and national laboratories, which can cause delays.

The CDC told National Geographic in a statement that it's working with the USDA to sequence samples from people and animals on mink farms and the surrounding areas to understand transmission pathways better and identify genetic variants of the virus. Such work takes time, the CDC says, but "currently, there is no evidence of mink-to-human spread in the United States."

Ahead of the breeding season, Wisconsin is now administering coronavirus vaccines to mink farm workers, ranking them as essential workers with higher risk and priority than many other occupations, such as teachers.

States have been tight-lipped about coronavirus on mink farms. In addition to Utah and Oregon, Michigan and Wisconsin have had outbreaks. Michigan's Department of Agriculture and Rural Development refused to provide details, telling National Geographic that this information is protected under the state's privacy law and that farms are not specifically licensed or regulated by the state. And Oregon officials have also declined to provide information, including the general location of its outbreak, citing medical privacy.

"The secrecy of the industry and the fact that regulators are refusing to release basic information makes it hard to know what they have done and what has and hasn't worked," says Lori Ann Burd, executive director for the Arizona-based nonprofit Center for Biological Diversity. Farms are largely unregulated, she says, "except for some clean water-related regulations that apply to the largest mink factory farms." It's important to know how often mink are escaping from farms because of potential risks to the public and wild animals, she says. "There is obviously a huge need for more transparency."

Burd's group has urged lawmakers to close U.S. mink farms—or at the least to increase regulatory oversight of them.

Better detection and testing needed

At the Danish mink farms Hammer visited, she reported finding coronavirus genetic material in the air around mink, on their fur, on flies, and in gutter water. At one farm, she found it on a seagull's foot. But the testing method she used can't distinguish if that material could cause disease or was just viral residue.

Hammer doesn't think birds get infected with coronavirus—there's no evidence of that—but it would be helpful to know if birds can carry the virus from one mink farm to another, she says. In Denmark, seagulls often foraged for food under cages, and small birds sneaked in and pecked at food stored on top.

No animals, including people, live in complete isolation. "We know we need to take extra precautions and be more proactive at monitoring the animal-human interface," Warmbrod says. She advises developing standardized disease-monitoring protocols for mink farms and better integrating COVID-19 genome sequence results sampled from animals and humans to better track the disease's evolution and detect any concerning variants. Even asymptomatic animals should be tested regularly, she says.

Tracey McNamara, a former chief pathologist at the Bronx Zoo, in New York, says scientists should have done immunological studies on samples in zoos' blood banks a year ago to identify the possible range of species prone to SARS-CoV-2. She urged U.S. officials at the time to do such testing. Armed with better information, she says, officials could have promulgated different policies and precautions and undertaken more targeted surveillance.

Columbia University's Lipkin says it makes sense to check zoos' available blood samples against not just the coronavirus but other emerging diseases too. "A lot of people have talked about [McNamara's idea] but there's never any real investments there," he says.

McNamara, who helped establish in the late 1990s that West Nile virus is spread by birds, attributes this reluctance to not wanting to think about zoo animals being susceptible to alarming diseases that sicken people. Lipkin agrees. It's plausible, he says, that "if you start talking about infections in zoological collections people will stop going to zoos."

How mink are killed

Generally, farmed mink are killed for their pelts with carbon monoxide released from commercially sold canisters.

Farmers in the U.S. can refer to guidelines from the American Veterinary Medical Association on how to kill animals humanely, says Mike Brown, of the International Fur Federation. The carbon monoxide mink poisoning study cited in that document states that under the right

conditions the gas can halt a mink's breathing in two minutes and cause cardiac arrest in less than 10. (The veterinary association declined to comment.)

But in 2016 at least two mink at a large farm in Wisconsin survived initial gassing. One took 20 minutes to succumb, according to an undercover investigation by People for the Ethical Treatment of Animals. Another that didn't die eventually had its neck broken by the farmer, the investigators found. Local law enforcement, however, concluded that there was no animal abuse.

"Raising mink in filthy confinement and then killing them by gassing, suffocation, or electrocution is already inherently cruel," says Delcianna Winders, director of the Animal Law Litigation Clinic at Lewis and Clark Law School, in Portland, Oregon. But mass killings during a pandemic "elevate this cruelty to a whole new level," she says. "When thousands of mink are crammed into gas chambers at once, the likelihood of prolonged suffering and excruciating deaths increases significantly."

The pandemic has highlighted instances where mink aren't killed immediately. A video posted to social media late last year by a Danish farm worker shows a live mink squirming among the dead as it seems to be trying to breathe clean air through an opening in the "kill box"—the container filled with gas. Other footage of pandemic-related killing in the Netherlands, filmed secretly by the Dutch animal welfare group Animal Rights, shows live mink being tossed into mobile gas chambers.

Industry defenders blame inexperienced workers and the extreme circumstances of the pandemic for some botched mass killings.

What does the future hold?

Despite the financial loss caused by mink farm shutdowns during the pandemic, and the increasing outcry from animal welfare groups that say mink farming is inhumane, sales of pelts have been booming.

Mark Oaten, CEO of the London-based International Fur Federation, says pelt prices in early 2021 have risen more than 40 percent since September 2020. He ascribes this to companies' fears of future scarcity, coupled with consistently strong demand from China and Korea. "We don't expect much change in the year ahead," he says.

Mink farmers and fur industry groups say they're optimistic about the future. Although the world's largest mink auction house, Denmark's Kopenhagen Fur, has announced plans to close, other auction houses can fill the gap, Oaten says. And, he adds, other countries will likely increase production to compensate for losses of pelts from the Netherlands and Denmark.

The future of the mink industry will hinge in part on China, which produced more than 11 million pelts in 2019, according to the China Leather Industry Association. The International Fur Federation's China office reports that no coronavirus infections have yet occurred at any Chinese mink farm. Information about the country's mink industry is scant, however, including whether the animals are tested for the virus.

Hobbled by farm closures, some Danish and Dutch mink farmers may decide to move their operations to other countries in the EU, says Mick Madsen, the head of communications for Fur Europe, a Brussels-based industry group. “I don’t have indications of large numbers planning to relocate, but some certainly will,” he says.

Meanwhile, several research efforts aim to develop a vaccine against the coronavirus in mink, buoying farmers’ hopes. Virologists at the University of Helsinki, financed by the Finnish fur industry, are testing a vaccine that would be delivered by injection or through the nose, says Jussi Peura, research director for the Finnish Fur Breeders Association.

Humane Society International’s PJ Smith doesn’t see a bright future for the industry, however. “Because of the pandemic, we’re expecting more production bans, which will decrease supply, paired with more fur import and sales bans, which will decrease demand.” Eventually, mink farming won’t be economically viable, he says.

Even before the pandemic, a growing number of fashion brands, including Coach, Ralph Lauren, and Burberry, had announced that they’d no longer use mink and other animal furs. And a number of European countries—the U.K., Slovakia, Austria, and Belgium, among others—had barred production of mink and other fur animals.

In September, France announced plans, still under debate by legislators, to shut down the country’s last four mink farms. Two months later, mink at one farm tested positive for the virus. Officials ordered all thousand animals on the farm killed, to protect public health.

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