



Animal and Plant Health Inspection Service  
U.S. DEPARTMENT OF AGRICULTURE



# **Guidance to Prevent Respiratory Viruses like SARS-CoV-2 and Influenza on Mink Farms**

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This guidance was developed collaboratively by the U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS), Centers for Disease Control and Prevention (CDC), and state animal and public health partners using a [One Health](#) approach. This document provides information about SARS-CoV-2, the virus that causes COVID-19, and influenza (flu) viruses in people and animals as well as guidance for preventing and controlling these viruses on mink farms. The strategies outlined may be used by mink producers, private veterinarians in the mink industry, and public and animal health officials.

## Background about Mink

Mink are carnivorous (meat-eating) mammals of the genus *Neogale*, which belongs to the family *Mustelidae*. The *Mustelidae* family also includes ferrets, otters, martens, badgers, and many other small mammals. American mink, also known as *Neogale vison* (formerly *Neovison vison*), are native to North America but have been introduced to parts of Europe, where they are considered an invasive species. Mink are farmed for their fur and other products in many countries, including the United States.

## Mink and SARS-CoV-2

SARS-CoV-2 infection has been reported in farmed mink, other animals, and people on mink farms by multiple countries. In the United States, respiratory disease among mink and increases in mink deaths were seen on most mink farms confirmed with SARS-CoV-2 infection. Some mink also appeared healthy despite testing positive for SARS-CoV-2. Infected workers likely [introduced SARS-CoV-2 to mink on the farms](#). Once the virus is introduced on a farm, it can spread rapidly between mink, as well as from mink to other animals (domestic and wild) on or near the farm, and potentially from mink to people. In late 2020, animals associated with mink farms were found to be infected with SARS-CoV-2, including resident dogs and cats, a small number of escaped farmed mink, and one wild mink trapped near a farm in Utah.

## Risk of Mink Spreading SARS-CoV-2 to People

Currently, there is no evidence that mink play a significant role in the spread of SARS-CoV-2 to people. However, there is a possibility of mink spreading SARS-CoV-2 to people and other animals on mink farms. Mink-to-human spread of SARS-CoV-2 has been reported in the Netherlands, Denmark, and Poland. An investigation on one farm in the United States suggested mink-to-human transmission was possible, but the link could not be confirmed. These results highlight the importance of routinely studying SARS-CoV-2 in susceptible animal populations, like farmed mink, as well as in people.

See [CDC's website](#) for general information on preventing COVID-19 in humans.

## Influenza (Flu) Viruses Affecting Birds and Mammals Including Mink

[Avian influenza \(AI\)](#), or bird flu, is caused by an influenza type A virus that infects poultry (such as chickens, turkeys, pheasants, quail, domestic ducks, geese, and guinea fowl) and wild birds (especially waterfowl). [Highly pathogenic avian influenza \(HPAI\)](#) virus strains are extremely infectious to domestic poultry, often fatal to chickens and turkeys, and can spread rapidly from flock-to-flock. [Low pathogenicity avian influenza \(LPAI\)](#) virus strains occur naturally in wild waterfowl and shorebirds without causing illness. LPAI can infect domestic poultry, causing little or no signs of illness.

Although bird flu viruses mainly infect and spread among wild migratory water birds and domestic poultry, some viruses can spread to other animals, including domestic animals like cats, dogs, farmed animals like poultry, wild mammals, and animals in human care, including [seals](#), [tigers](#), and [leopards](#).

Since October 2021, there have been a [number of reported bird flu infections in wild mammals](#), including [sea lions and an otter in Chile](#), [a red fox in France](#), and multiple species in [Canada](#) and the [United States](#). See the USDA APHIS page for more information about [2022-2023 Detections of Highly Pathogenic Avian Influenza in Mammals](#).

## Mink and Flu

In October 2022, HPAI A(H5N1) virus caused infections and deaths [among mink on a farm in Spain](#). The source of the bird flu outbreak was not identified, but mink may have been exposed to infected wild waterfowl. Investigators report that mink-to-mink transmission of the virus may have occurred. More information is available on CDC's [Ask the Expert](#) webpage.

[Infections with influenza A viruses](#), including strains that originated in birds and swine, have been previously reported in mink. Since the early 1980's, several influenza A virus subtypes, such as A(H10N4), A(H3N2), swH3N2/pH1N1 reassortant, A(H1N2) and A(H9N2), have been shown to spread in mink. During October of 1984, an [outbreak of LPAI H10N4](#) occurred at 33 mink farms in the coastal region of South Sweden. The outbreak was associated with widespread illness among 100,000 mink, including 3,000 deaths. In 2019, [influenza A virus infections were reported in mink kits at a Utah mink farm](#). The source of the flu infections was not established, but it is believed the mink became infected through exposure to sick people.

## Risk of Mink Spreading Flu Viruses to People

The detection of the current predominant A(H5N1) HPAI virus in mammals, including farmed mink, does not change the human health risk for the general public, which CDC considers to be low. Since the October 2022 report of HPAI A(H5N1) virus in farmed mink, CDC, USDA, and other partner agencies studied the A(H5N1) viruses from farmed mink in Spain and have not found any indications that would point to the virus having increased ability to infect people. A(H5N1) viruses cannot easily infect the human upper respiratory tract. Mink have two different kinds of cell receptors in their respiratory tracts, one which allows for easier infection with A(H5N1) viruses than in people. As a result, mink are more susceptible to infection with A(H5N1) viruses than people; this also means that limited mink-to-mink spread of A(H5N1) virus can occur, especially in an environment where animals have close contact.

See [CDC's website](#) for general information on preventing flu as a backyard poultry owner.

## Recommendations to Reduce the Risk of Introducing Respiratory Viruses to Farmed Mink

Mink can be infected with respiratory viruses through close contact with infected people, other mink, or other infected animals, including wildlife. The potential source of a respiratory virus and the likely transmission pathway can depend on many factors. While mink are most likely to be exposed to SARS-CoV-2 by an infected person, depending on the type of flu virus, they could be exposed by an infected person, an infected animal, or a contaminated surface. Mink can also be infected with flu viruses by eating contaminated feed from uncooked poultry and pork. Nonetheless, these husbandry and biosecurity practices are effective at reducing the risk of exposing mink to a range of respiratory viruses.

- Do not use uncooked poultry or pork to feed mink.
- Cook feed to kill pathogens potentially harmful to mink and people.
- Remove spilled or uneaten feed right away, and make sure feed storage units are secure and free of holes. Keep a broom and lidded garbage container nearby and frequently inspect and clean up spilled feed. Even a tiny amount of feed is a meal for a wild bird or rodent.
- Use a closed system for watering source. Closed watering systems are not open to the environment and deliver water directly to individual cages. Recirculating water systems should incorporate some type of water sanitizing system: chemical (chloride, hydrogen peroxide, oxine or pH control), ozone, or ultraviolet light.

## Recommendations to Protect Animals and People from SARS-CoV-2 and Flu on a Mink Farm

[Biosecurity](#) is a series of management practices designed to reduce the risk of disease agents being introduced and spread on the farm. In broad terms, it refers to anything designed to prevent the transfer of disease-causing pathogens. Biosecurity is crucial in controlling and containing diseases such as COVID-19 and flu, as well as in the daily management practices protecting the health of farm workers and animals. To be effective, biosecurity measures need to be disease-specific and site-specific.

To ensure the health and safety of animals and people on your farm, follow state and industry biosecurity and safety guidance.

## Recommended Biosecurity Measures on the Farm

- Use fences, gates, and other barriers to control access to animal housing.
  - Limit access to the premises and buildings where production animals are kept to essential personnel only.
- To prevent direct exposure to infected animals, raise mink in locations separated by both physical barriers and distance from other farmed animals, including poultry and swine.
  - Mink should be housed in a manner that excludes wildlife, including wild birds, rodents, and domestic animals like cats and dogs from the mink sheds and feed storage.
- [Protect against exposure to wild birds or water or ground contaminated by wild birds:](#)
  - Reduce wildlife attractants;
  - Prevent wildlife access; and
  - Add wildlife deterrents.
- Provide employees with clean clothing, including coveralls and rubber boots, and disinfection facilities, including footbaths and showers, and directions for their use.
- Thoroughly clean and disinfect equipment and vehicles (including tires and undercarriage) when entering or leaving the farm.
- Do not borrow or lend equipment or vehicles.

- If equipment or a vehicle must be shared between farms, it should be cleaned and disinfected thoroughly prior to arriving at each mink farm.
- Prohibit visits to poultry and swine farms, exhibitions, fairs, and sales or swap meets; if visits must occur, direct workers to change footwear and clothing on their return.
- Separate and monitor new mink for signs of illness for at least 21 days to avoid introducing disease to the herd.
- Require visitors to park their vehicles in designated areas away from animal housing.
- Use signage to advise visitors to remain in their vehicles until farm personnel assist them and provide a phone number visitors can call for entry instructions.
- Maintain a log of all personnel who enter the property (including family, workers, visitors, vendors, and others) that records the date, the person's contact information, the nature of their visit, and their recent travel history, including whether they have been around other animals.
- Provide and wear appropriate [personal protective equipment](#) (PPE) depending on the activity being performed. This includes coveralls and rubber boots, as noted above, and increased PPE for people working closely with animals.
  - Wearing PPE and certain clothing can often increase your risk for heat-related illnesses. See [CDC information for heat stress prevention](#) for [employers](#) and [employees](#).
- **Prevent ill workers and visitors from accessing the farm:** Regardless of their vaccination and booster status, exclude staff members from work if they have [symptoms of COVID-19](#) or [flu](#), test positive for SARS-CoV-2 or flu, or have been potentially exposed to or identified as a close contact of someone with COVID-19 or flu.

## Clinical Signs of Respiratory Virus Infection in Mink

### Clinical signs of SARS-CoV-2

[Published research](#) shows that healthy mink experimentally infected with SARS-CoV-2 can exhibit a range of clinical signs from illness consistent with severe COVID-19 in people to mild or no clinical signs. Farmed mink that show signs of illness might display a range of signs from mild to severe respiratory signs (coughing, sneezing, eye and nose discharge, difficulty breathing) and gastrointestinal signs (diarrhea). Illness spreads rapidly among mink, but clinical signs and death rates can vary among herds.

### Clinical signs of flu

Reported clinical signs of flu in farmed mink include loss of appetite, hypersalivation, depression, bloody nose, coughing, sneezing, and neurological signs such as difficulty walking or standing and tremors. Farmed mink infected with flu can also show mild to no clinical signs.

## Testing for Respiratory Viruses in Mink

Infected animals might not show any signs of illness. By testing animals, even those without signs of illness, scientists can determine if the virus is present and look for changes in the virus that could make it more deadly, spread more easily, and more difficult to control. By studying each change, scientists can monitor, and often predict, whether a change makes the virus more dangerous than others. Scientists can also use this information to track the spread of changes.

There is a risk of new SARS-CoV-2 [variants](#) developing in animals, including mink. Therefore, it is important to monitor and to test mink, other animals, and people for SARS-CoV-2 to continue to learn about this virus to protect both human and animal health.

Most flu viruses that caused [pandemics](#) emerged from a combination of human and animal flu viruses. There are many kinds of flu viruses that affect animals like poultry and swine that have sporadically infected people worldwide. Therefore, constant vigilance for new flu viruses worldwide is needed in people and animals.

## Recommendations for Mink Producers and Workers Who Suspect Mink are Infected

Any producer, worker, or veterinarian, who suspects mink (or other animals) to be infected with a respiratory virus like SARS-CoV-2 or flu should contact their [State Animal Health Official \(SAHO\)](#) immediately. The SAHO will likely engage the [State Public Health Veterinarian](#) (SPHV) and appropriate federal partners including the APHIS' Area Veterinarian in Charge and CDC's One Health Office.

State and federal officials will coordinate with producers and use a One Health approach to determine testing protocols for farmed mink for respiratory viruses. Protocols may account for animals that display clinical signs consistent with a viral respiratory infection and for animals that do not show any signs of illness, especially if they were exposed to infected people or animals.

The One Health investigation should start upon notification of suspected infections and not wait for test results. Under applicable state animal and public health regulations, state animal health and public health officials, along with federal partners, will initiate appropriate One Health animal disease response activities. State and federal partners will also collaborate with the mink farm workers to conduct epidemiologic investigations into respiratory infections in animals and people to protect both human and animal health.

## Sample Collection and Testing of Mink for SARS-CoV-2 or Flu

The SAHO will lead investigations on farms in their state, including coordinating collecting specimens for laboratory testing. The samples to collect are typically oropharyngeal or rectal swabs, or another sample as determined by a veterinarian. Blood samples might also be collected. Regardless of the sample type, all samples should be collected by a veterinarian or other animal health professional. A National Animal Health Laboratory Network (NAHLN) lab will conduct initial RT-PCR testing for evidence of viral RNA. Any samples that test non-negative at the NAHLN lab will immediately be forwarded to USDA's National Veterinary Services Laboratories (NVSL) for confirmatory testing.

## Next Steps If SARS-CoV-2 or Flu Is Detected in a Mink Herd

If SARS-CoV-2 or flu is confirmed in a mink herd, officials will follow state regulations and federal guidelines to implement a One Health approach to infection prevention and response and recovery plans with producers and their veterinarians. In general, plans are designed to isolate the herd from unnecessary contact and provide care for all animals until the threat of further virus transmission in the herd and on the farm has passed.

## Recommendations for Protecting Mink Producers and Workers around Healthy Animals

Follow CDC's guidelines to stay [up to date on COVID-19 vaccines including boosters](#). CDC also recommends that everyone 6 months and older get a seasonal flu vaccine every year. Additional information: [Prevention and Antiviral Treatment of Bird Flu Viruses in People | Avian Influenza \(Flu\)](#).

Even if you stay up to date on COVID-19 and flu vaccines, taking additional prevention steps can provide complementary layers of protection for animals like farmed mink that are highly susceptible to respiratory viruses.

- Wear a well-fitting, high quality [mask or respirator](#). Properly fitting respirators provide the highest level of protection.
- When indoors, try to [improve ventilation](#) as much as possible.
- [Wash your hands](#) often with soap and water or use a hand sanitizer that contains at least 60% alcohol.

## Recommendations for Protecting Mink Producers and Workers around Sick Animals

The risk of animals spreading SARS-CoV-2 or flu to people is thought to be low; however, there is a higher risk for people working on mink farms. Therefore, precautions including the use of [personal protective equipment](#) (PPE) are recommended to protect both people and mink:

- **Stay up to date on vaccines.** People that work with or around mink should follow CDC's recommendation to stay [up to date on COVID-19 vaccines including boosters](#) and on the [flu vaccine](#).
- **Minimize contact with sick or dead animals.** If animals are suspected to have or test positive for a respiratory virus, the number of people interacting with these animals should be kept to a minimum. Staff at [high risk](#) of getting very sick from respiratory viruses should not work with animals suspected or confirmed to be infected with a respiratory virus.
- **Always immediately [wash your hands](#)** with soap and water for at least 20 seconds after:
  - Directly contacting animals, their food, supplies, pens, or waste/feces.
  - Cleaning up after animals, including any body fluids or waste.
  - Leaving areas where animals are housed, even if you did not touch an animal.
  - Removing PPE or mask.
- **Use a NIOSH Approved<sup>®</sup> particulate respirator with N95<sup>®</sup> filters or higher, gown, gloves, eye protection (e.g., goggles or face shield), and shoe or boot covers around sick animals.** Follow recommendations for [putting on and safely removing PPE](#). Do not use compressed air or water under pressure for cleaning, or any other methods that might aerosolize (spray into the air) infectious material. Using cleaning and disinfectants may pose a chemical hazard. Additional PPE may be needed to protect workers from exposure to the chemicals in addition to respiratory viruses; follow the cleaning or disinfectant product manufacturer's instructions for use.
  - Wearing PPE and certain clothing can often increase your risk for heat-related illnesses. See [CDC information for heat stress prevention](#) for [employers](#) and [employees](#).

- **If there is a breach in PPE or other accidental direct contact with a sick animal or its urine, feces, blood, saliva, or vomit on exposed skin**, immediately notify a supervisor, and immediately wash the exposed area with soap and warm water for at least 20 seconds. If soap and water are not immediately available, use an alcohol-based hand sanitizer (at least 60% alcohol content) on skin. If hands are visibly dirty, always wash hands with soap and water before using alcohol-based hand sanitizer. If an employee has an exposure to their mucous membranes (e.g., eyes, inside of nose, or mouth), the area that was exposed should be flushed with only water. Do not use soap or hand sanitizer to wash the eyes, inside of nose, or mouth.
- **If a worker receives a bite, scratch, or abrasion** from an animal, animal product, or an object contaminated by an animal: wash the exposed area of skin immediately with soap and warm water for at least 20 seconds, immediately alert the supervisor, and contact a health care provider and let them know about this exposure.
- **For people who are exposed to sick animals or sick people:**
  - If someone was exposed to animals with the flu, they should follow CDC's guidelines for what to do when exposed to [birds infected with avian influenza viruses](#).
  - If someone was exposed to a person with the flu, they should follow CDC's [recommendations for preventing flu](#).
  - If someone was exposed to a person with COVID-19, they should follow CDC's [recommendations on what to do if you were exposed to COVID-19](#).
    - If someone tests positive for COVID-19, they should follow CDC's guidelines for [Isolation and Precautions for People with COVID-19](#).
    - If someone tests negative for COVID-19, they should self-monitor for symptoms of illness for 10 days after the last day of exposure to potentially infected animals or contaminated materials.
- **For someone who tests positive for COVID-19 or has been exposed to sick or dead animals but cannot isolate due to animal welfare concerns:**

They should:

- [Wear a high-quality mask or respirator](#) if they must be around mink or others at home and in public.
- Stay home and separate from others as much as possible.
- Use a dedicated bathroom, if possible.
- Take steps to improve ventilation at [home](#) and in [animal areas](#), if possible.
- Monitor their [symptoms](#). If they have an [emergency warning sign](#) (like trouble breathing), they should seek emergency medical care immediately.

They should not:

- Go to places where you are unable to wear a mask.
- [Travel](#).
- Share personal household items, like cups, towels, and utensils.

Visit this site to learn more about [what to do if you have COVID-19](#).



## Recommendations to Educate and Train Workers to Reduce the spread of COVID-19 and Flu

Supplement workers' normal and required job training with the Occupational Safety and Health Administration (OSHA) standards, which provide additional training and information about COVID-19, including recognizing signs and symptoms of infection and ways to prevent exposure to the virus. Training should include information about how to put in place the various infection prevention and control measures recommended here, and they should be included in any infection prevention and control or COVID-19 response plan that an employer develops. OSHA provides additional information about training on its webpages for [COVID-19](#) and [flu](#). Visit [Information for Specific Groups | Avian Influenza \(Flu\) \(cdc.gov\)](#) for more information about people who might be at risk for occupational exposure to bird flu. OSHA also provides quick reference cards in [English](#) and [Spanish](#) about bird flu that contain helpful guidance about the signs and symptoms of bird flu in people as well as additional guidance. While this guidance was developed for poultry workers, this information applies to people working with any animals susceptible to bird flu.

All communication and training should be easy to understand and should be provided in languages appropriate to the preferred languages spoken or read by the workers, if possible; be at the appropriate literacy level; and include accurate and timely information about:

- Signs and symptoms of COVID-19 and flu, how they spread, risks for workplace exposures, and how workers can protect themselves;
- Proper handwashing practices and use of hand sanitizer stations;
- Cough and sneeze etiquette; and
- Other routine infection control precautions (e.g., safe practices for how to put on [don] and take off [doff] PPE, and high-quality masks.)

Employers should place simple posters in appropriate languages for their employees that encourage staying home when sick, cough and sneeze etiquette, and proper hand hygiene practices. They should place these posters at the entrance to the workplace and in break areas, locker rooms, and other workplace areas where they are likely to be seen.

## Recommendations for Mink Farm Producers and Worker Protection around Carcasses and Pelts

People who work around mink on farms with infected animals and remove and process pelts from infected mink are at higher risk for respiratory virus infection than people who do not work with infected animals or animal products. Mink can be infected with respiratory viruses but appear healthy, and these infections may go undetected in the absence of active surveillance; therefore, steps should be taken to reduce respiratory virus transmission.

- When handling carcasses and mink pelts during pelting or processing, use eye protection (e.g., goggles or face shield), a fit-tested NIOSH Approved<sup>®</sup> particulate respirator with N95<sup>®</sup> filters or higher level, gown, and gloves whenever splashes or sprays are likely to occur.
  - For all PPE, follow the manufacturer directions on use, cleaning, storage, and disposal.
  - PPE such as gloves, face and eye protection, and other types of PPE are needed when cleaning and disinfecting tools, surfaces, and equipment as splashing may occur. Using cleaning and

disinfectants may pose a chemical hazard. Additional PPE may be needed to protect workers from exposure to the chemicals in addition to respiratory viruses; follow the cleaning or disinfectant product manufacturer's instructions for use.

- When participating in aerosol-generating procedures (e.g., whelping, pelting, processing, rendering), wear a face shield or goggles, gloves, protective outerwear, and a NIOSH Approved® particulate respirator with N95® filters or higher.
  - Respirator use should be in the context of a complete respiratory protection program in accordance with the Occupational Safety and Health Administration (OSHA) Respiratory Protection standard ([29 CFR 1910.134](#)), which includes medical evaluations, training, and fit testing.
- Wear gloves and other protective outerwear as needed to avoid contact with animal carcasses, organs, bodily fluids, and pelts.
- Always immediately wash your hands with soap and water for at least 20 seconds after:
  - Direct contact with animal carcasses, organs, or pelts;
  - Cleaning up after animals, including any bodily fluids or waste; and
  - Removing PPE or high-quality mask
- Wearing PPE and certain clothing can often increase your risk for heat-related illnesses. See [CDC information for heat stress prevention](#) for [employers](#) and [employees](#).

If possible, pelting should be delayed at least 14 days after the last clinical signs of disease in the affected housing unit. This delay is particularly important if mink need to be transported off-site for pelting. Movement could require authorization by the SAHO through a permitted agreement.

## Information on Carcass Disposal

Carcasses should be disposed of in compliance with all federal, state, and local regulations, especially those from animals that test positive for a respiratory virus, are suspected to be infected with a respiratory virus, or are exposed to infected animals or people. Additional information about state requirements for carcass disposal is available on the [Veterinary Compliance Assistance website](#). APHIS, upon request, can provide technical support and guidance to assist in identifying and implementing a local disposal plan.

- Carcasses must be carefully transported to the approved disposal site to prevent contaminated material from escaping the transport vehicles. All vehicles should be cleaned and disinfected after each use.
- Onsite composting, onsite burial, incineration, landfill, and rendering, or a combination of these methods are generally the most suitable options. For more information, visit the [APHIS Carcass Management Dashboard](#).

## Additional Resources

- USDA in-depth discussion of [PPE use in animal disease incidents](#)
- Response and Containment Guidelines: [Interim Guidance for Animal Health and Public Health Officials Managing Farmed Mink and other Farmed Mustelids with SARS-CoV-2](#)
- USDA APHIS main page for [2022-2023 Detections of Highly Pathogenic Avian Influenza](#)
- CDC: [COVID-19 and Animals](#)
- CDC: [Avian Influenza Current Situation](#)
- [Frequently Asked Questions about Avian Influenza \(Bird Flu\) | Avian Influenza \(Flu\) \(cdc.gov\)](#)
- [Ask the Expert: Highly Pathogenic Avian Influenza A\(H5N1\) Viruses \(cdc.gov\)](#)
- [Protecting Poultry Workers from Avian Influenza \(Bird Flu\)](#)
- [Information on Swine/Variant Influenza | CDC](#)

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## References:

Adney DR, Lovaglio J, Schulz JE, Yinda CK, Avanzato VA, Haddock E, Port JR, Holbrook MG, Hanley PW, Saturday G, Scott D, Shaia C, Nelson AM, Spengler JR, Tansey C, Cossaboom CM, Wendling NM, Martens C, Easley J, Yap SW, Seifert SN, Munster VJ. Severe acute respiratory disease in American mink experimentally infected with SARS-CoV-2. *JCI Insight*. 2022 Nov 22;7(22):e159573. PMID: 36509288; PMCID: PMC9746805. <https://doi.org/10.1172/jci.insight.159573>

Agüero M, Monne I, Sánchez A, Zecchin B, Fusaro A, Ruano MJ, Del Valle Arrojo M, Fernández-Antonio R, Souto AM, Tordable P, Cañas J, Bonfante F, Giussani E, Terregino C, Orejas JJ. Highly pathogenic avian influenza A(H5N1) virus infection in farmed minks, Spain, October 2022. *Euro Surveill*. 2023 Jan;28(3):2300001. PMID: 36695488; PMCID: PMC9853945. <https://doi.org/10.2807/1560-7917.es.2023.28.3.2300001>

Clayton MJ, Kelly EJ, Mainenti M, et al. Pandemic lineage 2009 H1N1 influenza A virus infection in farmed mink in Utah. *Journal of Veterinary Diagnostic Investigation*. 2022;34(1):82-85. <https://doi.org/10.1177/10406387211052966>

Cossaboom CM, Wendling NM, Lewis NM, Rettler H, Harvey RR, Amman BR, Towner JS, Spengler JR, Erickson R, Burnett C, Young EL, Oakeson K, Carpenter A, Kainulainen MH, Chatterjee P, Flint M, Uehara A, Li Y, Zhang J, Kelleher A, Lynch B, Retchless AC, Tong S, Ahmad A, Bunkley P, Godino C, Herzegh O, Drobeniuc J, Rooney J, Taylor D, Barton Behravesh C. One Health Investigation of SARS-CoV-2 in People and Animals on Multiple Mink Farms in Utah. *Viruses*. 2023; 15(1):96. <https://doi.org/10.3390/v15010096>

Honglei Sun, Fangtao Li, Qingzhi Liu, Jianyong Du, Litao Liu, Haoran Sun, Chong Li, Jiyu Liu, Xin Zhang, Jizhe Yang, Yuhong Duan, Yuhai Bi, Juan Pu, Yipeng Sun, Qi Tong, Yongqiang Wang, Xiangjun Du, Yuelong Shu, Kin-Chow Chang & Jinhua Liu (2021) Mink is a highly susceptible host species to circulating human and avian influenza viruses, *Emerging Microbes & Infections*, 10:1, 472-480. <https://doi.org/10.1080/22221751.2021.1899058>

- Hu, T., Zhao, H., Zhang, Y. et al. Fatal influenza A (H5N1) virus Infection in zoo-housed Tigers in Yunnan Province, China. *Sci Rep* 6, 25845 (2016). <https://doi.org/10.1038/srep25845>
- Keawcharoen J, Oraveerakul K, Kuiken T, Fouchier R, Amonsin A, Payungporn S, et al. Avian Influenza H5N1 in Tigers and Leopards. *Emerg Infect Dis*. 2004;10(12):2189-2191. <https://doi.org/10.3201/eid1012.040759>
- Li Peng, Chen Chen, Han Kai-yi, Zhang Feng-xia, Zhu Yan-li, Ling Zong-shuai, Zhang Xing-xiao, Jiang Shi-jin, Xie Zhi-jing. Molecular characterization of H9N2 influenza virus isolated from mink and its pathogenesis in mink, *Veterinary Microbiology*, Volume 176, Issues 1–2, 2015, Pages 88-96, ISSN 0378-1135, <https://doi.org/10.1016/j.vetmic.2015.01.009>
- Molenaar RJ, Vreman S, Hakze-van der Honing RW, et al. Clinical and Pathological Findings in SARS-CoV-2 Disease Outbreaks in Farmed Mink (*Neovison vison*). *Veterinary Pathology*. 2020;57(5):653-657. <https://doi.org/10.1177/0300985820943535>
- Oreshkova N, Molenaar RJ, Vreman S, Harders F, Oude Munnink BB, Hakze-van der Honing RW, Gerhards N, Tolsma P, Bouwstra R, Sikkema RS, Tacke MG, de Rooij MM, Weesendorp E, Engelsma MY, Brusckhe CJ, Smit LA, Koopmans M, van der Poel WH, Stegeman A. SARS-CoV-2 infection in farmed minks, the Netherlands, April and May 2020. *Euro Surveill*. 2020 Jun;25(23):2001005. Erratum in: *Euro Surveill*. 2021 Mar;26(12): PMID: 32553059; PMCID: PMC7403642. <https://doi.org/10.2807/1560-7917.es.2020.25.23.2001005>
- Ritter JM, Wilson TM, Gary JM, et al. Histopathology and localization of SARS-CoV-2 and its host cell entry receptor ACE2 in tissues from naturally infected US-farmed mink (*Neovison vison*). *Veterinary Pathology*. 2022;59(4):681-695. <https://doi.org/10.1177/03009858221079665>
- Yoon K-J, Schwartz K, Sun D, Zhang J, Hildebrandt H. Naturally occurring Influenza A virus subtype H1N2 infection in a Midwest United States mink (*Mustela vison*) ranch. *Journal of Veterinary Diagnostic Investigation*. 2012;24(2):388-391. <https://doi.org/10.1177/1040638711428349>