Date: April 2, 2021

To: Senator Jeff Golden, Chair and the Oregon Senate Committee on Natural Resources and Wildfire Recovery

From: Jim Keen, DVM, PhD, veterinary epidemiologist, Letcher, South Dakota

Topic: Support for SB 832 to phase out mink farming to help stop the COVID-19 pandemic

Dear Chair Golden and Committee members:

Thank you for this opportunity to testify in support of SB 832 as a concerned private US citizen with longtime experience and knowledge of zoonotic diseases and their public health impact. I am a research and academic veterinarian currently living on my family's farm in South Dakota. In addition to my veterinary degree (Illinois, 1988), I earned a PhD in veterinary epidemiology (Illinois, 1994).

I have more than three decades of experience as a veterinary infectious disease epidemiologist and researcher including 15 years with the USDA Agricultural Research Service in Nebraska and 13 years with the University of Nebraska School of Veterinary Medicine. In Fall 2019, I was a Visiting Fellow in the Animal Law and Policy Program at Harvard Law School. My 73 peer-reviewed publications are citied more than 5,400 times and cover a variety of animal disease, human and veterinary public health and food safety issues. My specialty is emerging zoonotic diseases of farmed animals. I have worked in the field on many zoonotic and livestock disease outbreaks in the US and abroad including Foot and Mouth disease in the UK and African Swine Fever in the Caucasus.

I am not an expert on mink farming or mink diseases or SARS-CoV-2, the virus causing the COVID-19 pandemic. However, I know a great deal about emerging zoonotic infectious diseases and intensive animal agriculture. I understand the risk and roles that animals play in public health.

I have lived in rural Illinois, Nebraska and South Dakota for most of the past 33 years. My extended family has farmed and ranched on the same land where I currently live for the past 140 years. I have great empathy for the well-being of rural communities and great respect for farmers and ranchers. But I am also very concerned about the public health risk from COVID-19 of farmed mink.

To summarize my detailed written testimony which follows, there are six major reasons why farmed mink place the public health at risk from SARS-CoV-2.

(1) Mink are **the only animals beside people** that transmit, sicken and die in large numbers from COVID-19.

(2) Mink are **the only animals** that spill the COVID-19 virus back to people often in mutated form. Mink farmers, their families and their communities are at greatest risk.

(3) Mink are **the only animal** with a large potential wild animal reservoir for COVID ie the millions of wild or feral mink across the entire Northern hemisphere that could be and have been infected

(4) Mink are **a top candidate as the "missing link"** between bats and people according to the WHO.

(5) Mink are a **proven source** of multiple novel virus variants that may compromise human vaccine effectiveness or increase human virus virulence or transmissibility.

(6) The soon to be released US mink veterinary vaccines against COVID-19 **are not a panacea** and may even be detrimental to control of the COVID-19 pandemic.

My detailed comments below are meant to convey the serious ongoing public health risks from farmed mink in the short and long term *even if* farmed mink receive a COVID-19 vaccine.

1 - Mink are uniquely hyper-susceptible to SARS-CoV-2 infection, disease and death.

Mink are the only animal and the only intensely-reared farmed species that become severely ill and die from SARS-CoV-2. There were about 60 million farmed mink globally at the start of 2020. There are about 20 million less today due to SARS-CoV-2. Half of the 40 million farmed mink outside of China either died from SARS-CoV-2 or were euthanized due to outbreaks. For reasons unknown, only people and mink are predisposed to serious clinical SARS-CoV-2 infections and death. In fact, farmed mink are more vulnerable to the virus infection and death than people.

As of January 2021, about 14% of the US populations had been infected by SARS-CoV-2. US COVID-19 mortality is about 1.7% with most deaths among people above age 70. As of February 2021, there were 416 COVID-19 mink fur farm outbreaks in 11 countries including 17 farms in the US and one 12,000 head mink farm in Oregon. During farmed mink outbreaks, 80% or more of mink are infected, a large proportion become clinically ill and about 5% die. Most sick and dead mink are young, non-breeding animals as mink are harvested for their pelts at about 6 months of age. The US produces about 3 million mink pelts per year on ~275 farms in 23 states, averaging about 10,000 mink per farm. Large farms with multiple mink crowded together in small pens make preventive "social distancing" impossible and facilitates virus spread. In summary, compared to people, SARS-CoV-2 infects and kills more mink and at younger ages due to innate mink susceptibility and inbred genetics coupled with intensive farmed mink practices.

2 - Farmed mink catch SARS-CoV-2 from people (spillover), then return the favor (spillback).

Mink are the only animal known to be infected by people and then pass the virus back to people … sometimes in a mutated form. Farmed mink are densely housed in rows of cages like people in a crowded subway car. Given daily contact with caretakers and their natural susceptibility, it is not surprising that the SARS-CoV-2 jumped from humans to mink ("spillover"). It was not expected, however, that mink would return the favor and send the virus back to infect people ("spillback"). Farmed mink efficiently infect people with SARS-CoV-2. For example, on 16 mink outbreak farms in the Netherlands, 66 of 97 (68%) owners, workers and their close contacts were infected by mink [1]. On 5 November 2020, Denmark reported 214 human COVID-19 cases infected with SARS-CoV-2 virus variants related to mink, as well as infected mink at more than 200 mink farms [2]. More than 1,000 human cases of COVID of mink origin occurred in Europe between January and June 2020 according to the European CDC.

As an RNA virus, SARS-CoV-2 is mutation prone as a survival mechanism to stay one step ahead of an ever-adapting host immune (or vaccine) response against it. In addition, whenever a virus gains entry into a new host species, it must adapt (mutate) rapidly so as to survive and replicate in the new host environment. These new mink strains may be more virulent or transmissible to people than strains that do not cycle through mink. Each time the virus jumps between humans and mink, in either direction, the chance of a dangerous mutation increases. When thousands of minks on fur farms are infected, many clinically ill with high viral loads, opportunities for virus mutations are enormous and likely. For example, a SARS-CoV-2 mink farm variant with a mutated spike protein called "Cluster 5" was reported in Denmark in November 2020 in many people. The Y453F mutation of the virus spike protein, first found in mink in both Denmark and the

Netherlands, was detected sporadically in Russian, South African, Swiss and US viral sequences with no link to Denmark and the Netherlands [3]. Mutated mink viruses like to travel.

As the European Centre for Disease Control stated regarding COVID-19 spike mutations in mink, "… the evolution of viruses with increasing changes in functional domains of the S (spike) protein could affect treatment, certain diagnostic tests and virus antigenicity. It could also have an impact on the effectiveness of developed vaccine candidates, and possibly require them to be updated". [2] In other words, the SARS-COV-2 mutates in mink and people to create new virus variants which may displace, due to evolutionary pressure, previously circulating viruses resulting in loss of vaccine protection, greater transmission, or more severe human illness.

3 - Farmed mink are raised in distressful conditions that maximize chances for infection, virus circulation and mutations.

Even before COVID-19, farmed mink were infamous for their susceptibility to disease epidemics eg distemper virus, Aleutian disease of mink and influenza. Mink are predatory, solitary, semi-aquatic wide-ranging animals. They cannot adapt to an unnatural life in battery cages. COVID-19 can. Domestication did not change the essence of being a mink. Physiological and behavioral distress in farmed mink contribute to their vulnerability to SARS-CoV2 infection, disease and death and ultimately to human risk. Reduced genetic diversity (inbreeding) to achieve desirable fur properties, selective breeding for large size and fast growth and abnormal diet are also factors in farmed mink susceptibility to COVID-19 and many other diseases.

Farmed mink are an innately anti-social species that are forced to live under extreme confinement and artificially high densities. Mink farm populations may exceed 50,000 animals. Except February through April mating season, wild mink are solitary creatures. Defended wild mink home territories are strips of land along streams ranging from 250 to 2000 meters in length. According to the Fur Commission USA (Medford OR) *Standard Guidelines for the Operation of Mink Farms in the United States* (2014), the minimal floor space allowance for two caged mink is 1.15 ft^2 in a 12 inch high cage. The smallest natural wild mink range is ~10 yards x 250 yards = 22,500 ft^2, at least 19,000 times larger than farmed mink allotted cage floor space.

The mink immune system evolved to deal with infrequent pathogen encounters and rare contact with other mink spread out over huge natural areas. Consider how much (>19,000 times) easier it is for pathogens to spread among farmed mink. Under these abnormal crowded conditions, old mink pathogens find life is good and new pathogens like SARS-CoV-2 find a cozy new home. The industrial conditions that make it easy for people to raise mink also make it easy for zoonotic pathogens like SARS-CoV-2 to prosper.

Several mutant COVID-19 strains emerged in farmed mink in Europe in 2020. Mutations are a simple probability function derived from the number of infected hosts, the viral load in infected hosts, the number of transmission events and the number of "species jumps" (human-to-mink or mink-to-human). High density-high stress-highly susceptible farmed mink greatly increase infections, viral loads (billions of infectious viruses per mink), transmission events, species jumps and new variant risks ie mink "add more players to the SARS-Cov-2 evolution game".

4 - Escaped, feral and wild mink constitute a real potential reservoir for human SARS-CoV-2.

Along with mutations in SARS-CoV-2-infected mink, a larger long term issue is the potential for the virus to become established and spread independently in wild or feral animal populations. Millions of wild mink inhabit large swaths of the northern hemisphere. Wild mink or other mustelids could form a permanent virus reservoir which would significantly complicate and raise the cost of SARS-CoV-2 prevention and control. For example, if SARS-CoV-2 was completely eradicated in one region, but present in wild mink, it could re-emerge at any time. Wild mammals in the US are already the only epidemiologically relevant refuge for several human zoonotic diseases including rabies (fox, bat, skunk, raccoon), brucellosis (feral swine, bison, elk) and bovine tuberculosis (white tailed deer). No human infectious disease can be eliminated once it becomes established in an animal reservoir, especially a wild animal population.

5 - Mink may be the missing link. The viral ancestor of SARS-CoV-2 likely came from a tropical bat in southeast Asia. Tropical bat species host thousands of different corona viruses in apparently peaceful co-existence. It appears a SARS-CoV-2 ancestor bat corona virus unable to infect people recently colonized an unknown vertebrate in which the corona virus mutated to became capable of infecting people. No one knows the identity of this animal. Turtles, snakes and pangolins have been proposed as the "missing link" intermediate host bridging bats and people. Recently, both renowned Chinese bat Corona virus and SARS-CoV-2 expert Shi Zhengli and the WHO proposed that farmed mink may be the unknown link [4,5]. This hypothesis was proposed based on:

a - High susceptibility of mink to respiratory viruses in general and SARS-CoV-2 in particular.

b - Large industrialized global farmed population of 60 million mink in Europe, North America and Asia, including 20 million mink on 3,000 fur farms clustered in northeast China. A large animal population is necessary for the virus to mutate and adapt to humans.

c - Close daily farmed mink contact with many people (unlike bats, pangolins, snakes or turtles)

d - Widespread mink distribution in the wild as native (North America), feral or introduced species (Eurasia) across the northern hemisphere.

6 - Vaccinating mink against COVID-19 is not necessarily a solution, and it may be harmful to human health.

HL Mencken said "For every complex problem there is an answer that is clear, simple, and wrong." Some veterinarians and the mink industry propose vaccinating mink against COVID-19 to address the public health risk from mink. This may not be a tenable solution for several reasons.

a - Vaccines alone have never eliminated any human or animal disease. For example, mink farmers routinely vaccinate against influenza, distemper, *Pseudomonas*, botulism and mink enteritis virus, yet all of these infectious diseases remain epidemic or endemic risks on mink ranches worldwide. In addition, the new mink vaccines are unproven and untested in the field.

b - COVID-19 vaccination will not eliminate this viral infection in people or mink. Vaccines are almost always "non-sterilizing" ie they may prevent severe clinical disease but usually do not completely prevent infection or transmission. The US veterinary vaccines for mink by Zoetis and MedGene (Brookings, SD), expected to be released as early as May 2021, reportedly use recombinant COVID spike protein, the same molecular target as in all US human vaccines.

Therefore, mink vaccination will put additional evolutionary pressure on the COVID-19 virus that may increase the risk of human vaccine failure. The mink vaccine has human implications for viral fitness (ability to infect humans and animals), transmissibility, and antigenicity.

c - Vaccinating mink may simply make infected mink harder to detect as a subclinical disease but maintain their ability to create more virus variants. Vaccination also interferes with serological monitoring of farms for COVID-19, as vaccine response can appear indistinguishable from infection. For example, this is the reason that foot and mouth disease vaccination is banned in US livestock; vaccination would make an FMD outbreak hard to detect by hiding disease symptoms.

d - Even if a vaccine for mink is deployed, it is likely new vaccines will be needed routinely to adjust to new virus variants that make the original vaccine ineffective in people, mink or both. In addition, the two veterinary mink vaccines are untested in the field. There is no data yet on the effectiveness of the two US mink vaccines in preventing disease, infection or transmission.

Closing - It is not my intent to fear-monger or exaggerate risk. The COVID-19 virus has proven extremely unpredictable in bad directions. Given the high public health risk from SARS-CoV-2 in farmed or wild mink, the best public policy options are those in SB 832 including offering a more-than-fair-market value buyout to Oregon mink farmers as a justifiable and economical public health preventive and mitigation measure.

The mink industry is in decline in Oregon and across the US. Farm-level value of 204,000 mink pelts produced on Oregon fur farms in 2019 was about $4.4 million ($21.90 per pelt, down from $94.30 per pelt in 2011). If farmed mink are the missing link in the bat-to-human transmission chain that started or fast-tracked the COVID-19 pandemic, if farmed mink COVID mutant variants compromise human vaccines or increase human morbidity and mortality, or if SARS-CoV-2 becomes permanently entrenched in wild mustelid populations worldwide, is mink farming really worth the risk?

Thank you.

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1 Munnink BBO Sikkema RS, Nieuwenhuijse DF et al, 2021. Transmission of SARS-CoV-2 on mink farms between humans and mink and back to humans. *Science*. 2021 Jan 8; 371(6525):172-177. https://science.sciencemag.org/content/371/6525/172.long

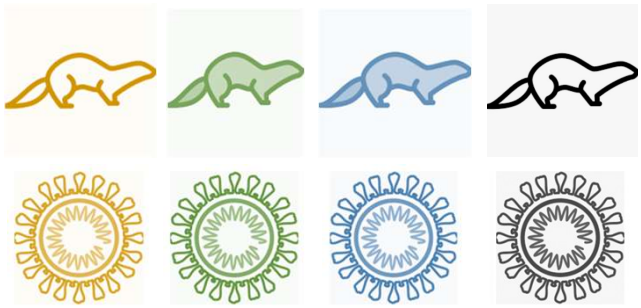
2 European Centre for Disease Prevention and Control, 2020. Detection of new SARS-CoV-2 variants related to mink – 12 November 2020. ECDC: Stockholm. https://www.ecdc.europa.eu/en/publications-data/detection-new-sars-cov-2-variants-mink

3 Brugere-Picoux J, Buisson Y, Angot JL, 2020. SARS-CoV-2: sensitivity of animal species and public health risks Opinion of the French National Academy of Medicine and the Veterinary Academy of France. 24 Nov 2020 https://www.academie-medecine.fr/sars-cov-2-sensitivity-of-animal-species-and-public-health-risks/?lang=en

4 Zhou P, Shi ZL, 2021. SARS-CoV-2 spillover events. *Science.* 2021 Jan 8; 371(6525):120-122. https://science.sciencemag.org/content/371/6525/120.long

5 WHO, 2021. WHO-convened global study of origins of SARS-CoV-2: China Part Joint WHO-China Study Team report 14 January-10 February 2021. Released 30 March 2021. https://www.who.int/publications/i/item/who-convened-global-study-of-origins-of-sars-cov-2-china-part

Attached as an Addendum are 17 powerpoint figures which illustrate the above major issues.



Public health, farmed mink and SARS-CoV-2

Jim Keen, DVM, PhD jekeen918@gmail.com

Public health, farmed mink and SARS-CoV-2: straight to the point

1 - Mink are hyper-susceptible to SARS-CoV-2 infection, disease and death

Mink are the *only* non-human animal and *only* intensely-farmed species that become severely ill and die from SARS-CoV-2.

2 - Farmed mink catch SARS-CoV-2 from people (spillover) and then return the favor (spillback)

Mink are the *only* animal known to be infected by humans and then pass the virus back to people … sometimes in a mutated form.

3 - Farmed mink are raised in distressful conditions that maximize chances for infection and mutations

Farmed mink are infamous for their susceptibility to epidemics. Mink are predatory, solitary, semi-aquatic wide-ranging animals. They cannot adapt to inbred, inhumane life in tiny battery cages co-housed with thousands of conspecifics. Negative consequences like zoonotic SARS-CoV-2 should not surprise.

4 - Escaped, feral and wild mink constitute a potential reservoir for human SARS-CoV-2

There is great risk that the virus will become established and spread among extensive wild or feral mink populations in the US. This will greatly complicate control efforts as a human outbreak source. Endangered wild mustelids eg wolverines, black-footed ferrets, fishers may also be at risk.

5 - Are mink the missing link?

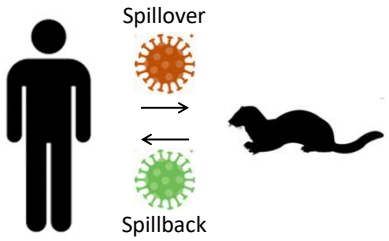
The SARS-CoV-2 ancestor came from a tropical bat in southeast Asia that could not infect people. The bat virus then colonized an unknown vertebrate where the virus bloomed and mutated to became adept at infecting humans. Farmed mink may be the “missing link” intermediate host bridging bats and people.

Farmed mink and COVID-19: a perfect public health storm

North American mink are only known non-human species with …

- Spillover from infected people causes severe mink COVID-19 outbreaks
  - 416 mink farm outbreaks in 11 nations; 17 farms in US (UT, WI, MI, OR)
  - Sustained mink-to-mink transmission on crowded industrial farms
  - High infection (>80%), deaths (~5%); 1/3 global farmed mink dead
- Spillback to people; sometimes with mutant SARS-CoV-2 strains
  - eg 214 mink farm human cases June to Nov 2020 in Denmark
  - Virulence may increase when viruses switch host species
- Potential to be permanent reservoir of SARS-CoV-2 infections
  - Large farmed, feral and wild mink populations in US and globally
  - Mink are clever and escape farms by the thousands annually
- Potential to generate mutant SARS-CoV-2 spillback strains
  ↓ human vaccine or ↓ anti-viral drug efficacy
  ↑ human transmission or ↑ human clinical disease
- Unknown why farmed mink are highly susceptible to SARS-CoV-2 but …
  - High mustelid (mink, ferret) susceptibility to many respiratory viruses
  - High mink ranch numbers and density makes virus spread easy

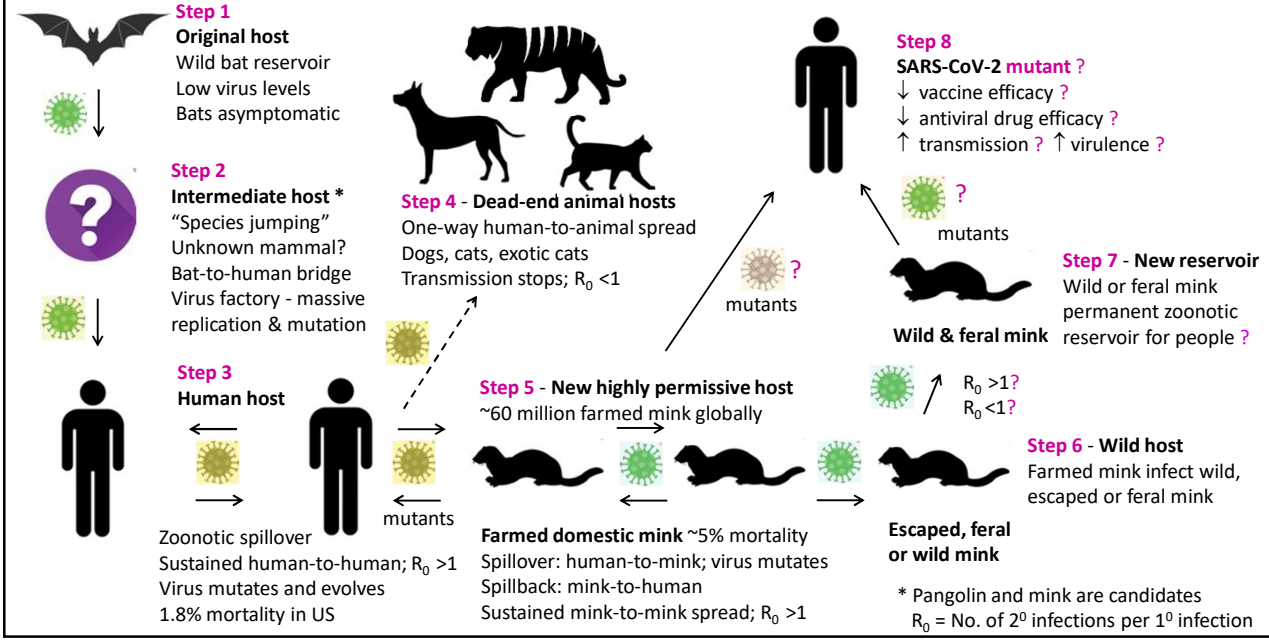
SARS-CoV-2 = virus that causes COVID-19



- All viruses including SARS-CoV-2 tend to mutate and evolve when they jump to a new host species
- Mutation rates are highest in hosts where virus replicates to high levels ie people and mink

SARS-CoV-2 zoonotic transmission chain

Step 5 & 6 already happened in Oregon
Step 7 may be happening in Oregon now



* Pangolin and mink are candidates
R_0 = No. of 2^0 infections per 1^0 infection

Two important US and global public health risks from farmed mink

I - Short-term hazards

- Immediate infection risk to people working on or near mink farms and their families
- Dangerous mutant SARS-CoV-2 spillback strains to broader human populations
- Sixty million farmed mink worldwide exposed thousands of people and vice-versa

Will SARS-CoV-2 become endemic in feral, escaped and wild mink across 40 US States ?

II - Long term zoonotic reservoir

- Zoonotic SARS-CoV-2 becomes established in wild or feral mink populations
- Continuous source of new human outbreaks even after current pandemic recedes
- Many current examples of wildlife as reservoirs of serious zoonotic human disease
- Eco-threat to endangered or rare wild mustelids eg black-footed ferret, wolverine, fisher

About 60% of 5,500 female bison in Greater Yellowstone are infected with zoonotic *Brucella abortus* bacteria

About 26% of 125,000 elk in Greater Yellowstone are infected with zoonotic *Brucella abortus* bacteria

Tuberculosis is endemic in white-tailed deer in northeastern Michigan and northern Minnesota

Swine brucellosis is endemic in nine million feral swine in 35 states including OR

Rabies virus is endemic in bats, skunks, foxes and raccoons across US

Farmed mink infected with SARS-CoV-2 from April 2020 to Feb 2021

- An estimated **20 million domestic mink** (1/3 of global total) were culled or died from SARS-CoV-2
- Outbreaks on **416 mink farms in 11 countries; at least 17 US outbreaks** in four States

Country	Infected farms		No. farmed mink & farms 2020 (pre-cull)	SARS-CoV-2 comments
	No.	%		
Denmark	290	24%	17 million; 15 million culled; 1200 farms	>100 infected mink escaped farms
Netherlands	69	53%	4.5 million; 128 farms	>2 million mink euthanized
Greece	21	?	1.2 million	
United States	17	6%	2.8 million; 275 farms in 23 states	Farms: UT, MI, WI, OR Feral mink: UT, OR
Sweden	13	33%	500K; 40 farms	
Spain	3	8%	750K; 38 farms	
Canada	2	2%	1.8 million; 98 farms	
Lithuania	2	2%	1.6 million; 86 farms	
Italy	2	13%	50K; 15 farms	
France	1	25%	20K; 4 farms	
Poland	1	<1%	5.1 million; 130 farms	
China	?	?	21 million; 3000 farms	No reports

Domestic mink
~60 million world wide before mink SARS-CoV-2 outbreaks and cull

Escaped domestic and feral mink

- Common - mink fast and clever
- Hybridize w/ wild mink

Wild North American mink

All three mink are the same American mink species: *Neovison vison*

Public health policy considerations …

- Prioritize COVID-19 vaccination of mink farm workers and their families
  - as in Wisconsin
- Prudent and rational to monitor, restrict and even ban farmed mink production
  - The Netherlands (global #3) banned mink farms starting in March 2021
  - Denmark (global #1) culled entire herd (17M); banned mink farms until 2022
- Consider one-time state government buy-out of mink farms at fair market value
  - Voluntary or compulsory buy-out policy; ban new mink farms
  - Many countries already ban or restrict mink farming on animal welfare grounds eg UK, Germany, Austria, Switzerland, Croatia, Austria, Czech Republic
- Prevent feral and wild mink from becoming a COVID-19 reservoir
  - Survey and monitor escaped, feral and wild mink near mink farms for SARS-CoV-2
  - Humanely euthanize infected feral or wild mink
  - Time is of the essence to prevent an endemic wild/feral mink SARS-CoV-2 reservoir
- Mink fur industry is in long slow decline; fur steadily losing favor in fashion industry
  - Small US industry; mostly serves Chinese and Russian luxury export market
  - Farmed mink welfare problematic; un-adapted to life in battery cages
  - Ecologically damaging feral and escaped mink and mink farm waste pollution

Background information on mink SARS-CoV-2 risk assessment & farmed mink …

The American Mink (*Neovison vison*)

Visual comparison of wild vs domestic

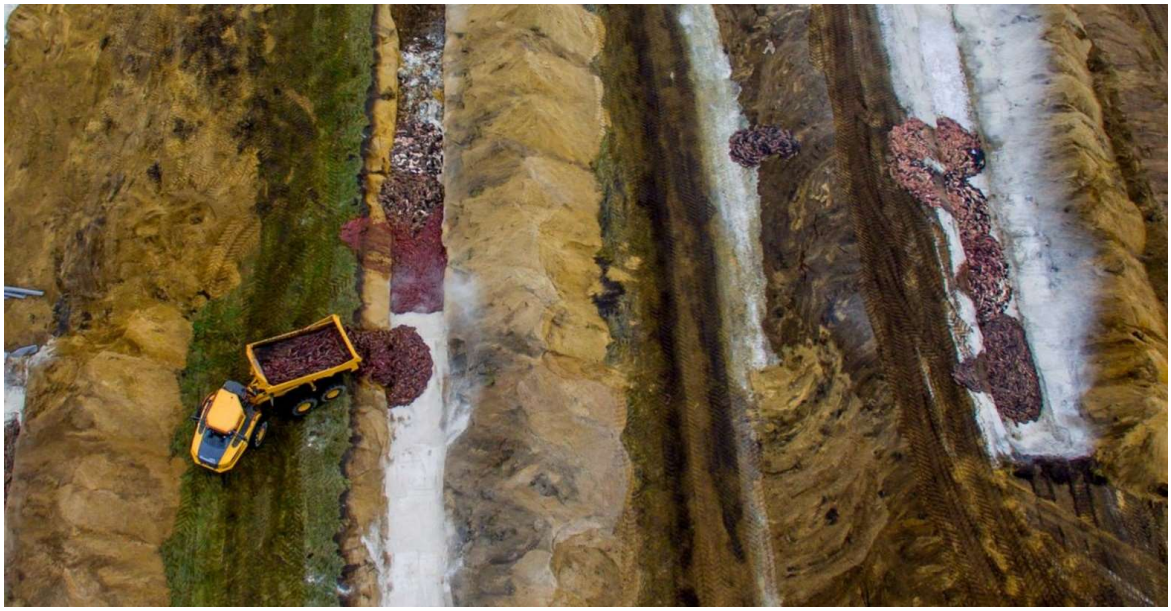
Domestic

- Large rounded head
- Proportionately small eyes and ears
- Dense undercoat
- Adult weight 8 lb

Wild

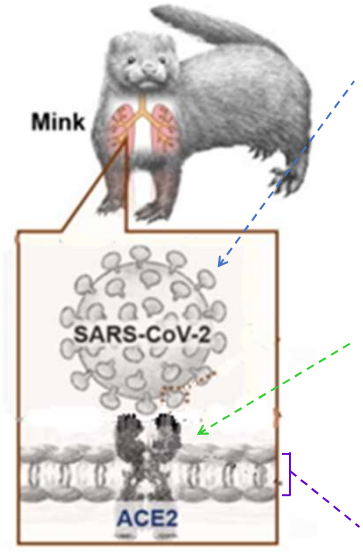
- Wedge shaped head
- Proportionately larger eyes and ears
- Longer guard hairs
- Adult wt 3 lb

Wisconsin mink farm



Burying thousands of dead or euthanized SAR-CoV-2 infected mink, Denmark, 12 Nov 2020 (Photo: *Wall Street Journal*)

SARS-CoV-2 "spike protein" binds to mink angiotensin-converting enzyme 2 (ACE2, the virus host receptor) in mink (or human) lungs



Spike protein of SARS-CoV-2

- The receptor binding domain (RBD) on the spike protein is where the virus binds to the ACE2 protein to enter and infect lung cells. By analogy, if the ACE2 protein is the lock on the door, then the spike protein RBD is the key that opens the lock.
- Most COVID-19 vaccines are designed to generate an immune response specifically against the spike protein RBD to block the virus from binding to and infecting host cells.
- Mutations in the viral spike protein RBD can make a vaccine less efficient ie the virus makes a new key to enter cells so that the vaccine immune response against the old RBD is no longer as effective.
- "Cluster 5" was a 2020 Danish mink farm SARS-CoV-2 variant with a mutated RBD

Angiotensin-converting enzyme 2 (ACE2) of mink or human

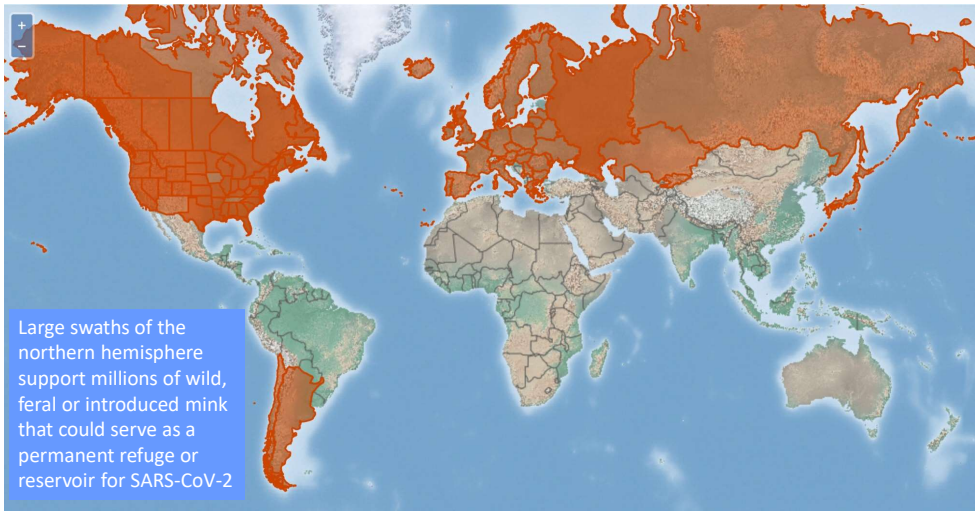
- ACE2 is a free or membrane-bound protein common in blood vessels and lung tissue
- The amino acid sequence and 3D structure of the ACE2 binding surface is highly variable across animal species and is used to predict susceptibility to SARS-CoV-2 infection
- The mink ACE2 receptor binding surface has several amino acid differences compared to the human ACE2 receptor binding surface. In theory, SARS-COV-2 should not be able to easily infect mink … and yet it does.

Outer lipid bilayer membrane of mink (or human) lung cell with embedded ACE2 protein

Image from: Hayashi et al 2020. Highly conserved binding region of ACE2 as a receptor for SARS-CoV-2 between humans and mammals. *Vet Q.* 2020 Dec; 40(1):243-249.

Potential SARS-CoV-2 refuge: distribution of American mink (*Neovison vison*) as a native, feral and invasive species

- Native range is non-desert North America
- Deliberately introduced (former Soviet Union) or fur-farm escapees elsewhere in Europe and in cone of South America
- Darker orange shading = widespread mink occurrence

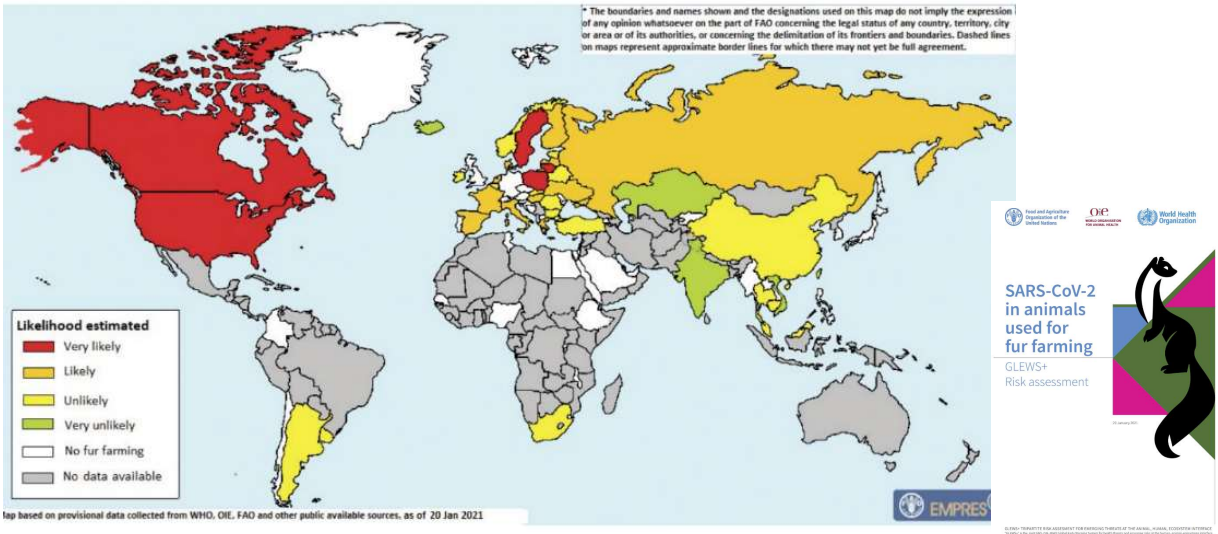


Wild or feral North American mink (*Neovison vison*) largely fill the vacant niche of Eurasian mink (*Mustela lutreola*) across northern Europe and Asia which were over-hunted or out-competed by the more aggressive and invasive North American mink

https://www.cabi.org/isc/datasheet/74428#toDistributionMaps

WHO & OIE farmed mink-COVID-19 risk assessment: likelihood x consequences

1 - What is risk of introduction and spread of SARS-CoV-2 within US mink fur farms?

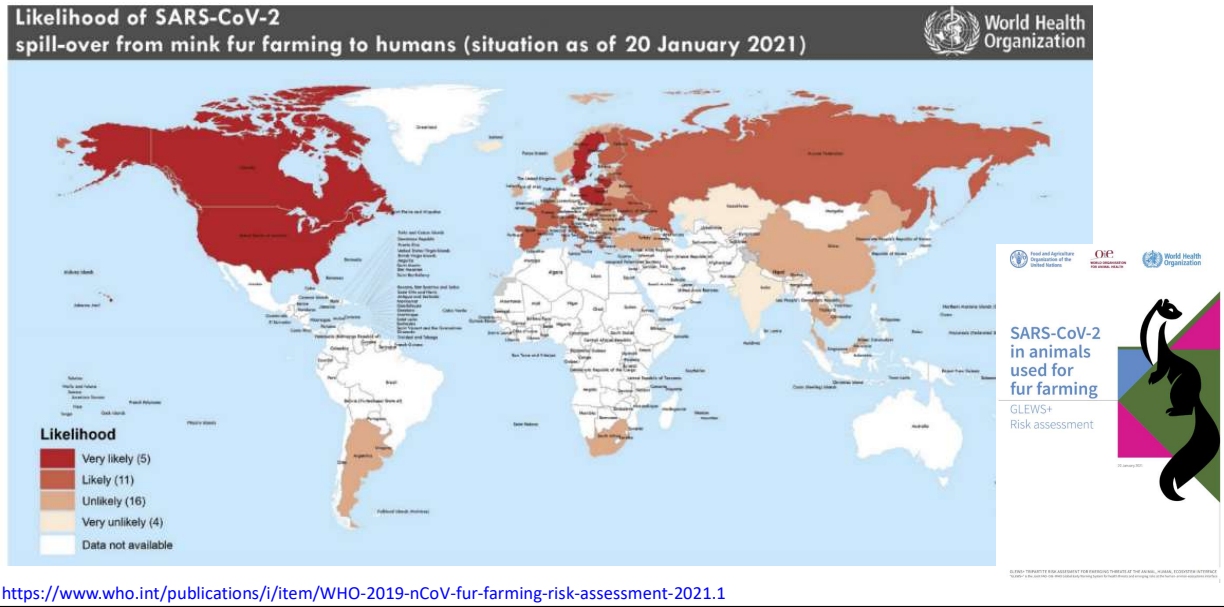


https://www.who.int/publications/i/item/WHO-2019-nCoV-fur-farming-risk-assessment-2021.1

Published 1.20.21

WHO & OIE farmed mink-COVID-19 risk assessment

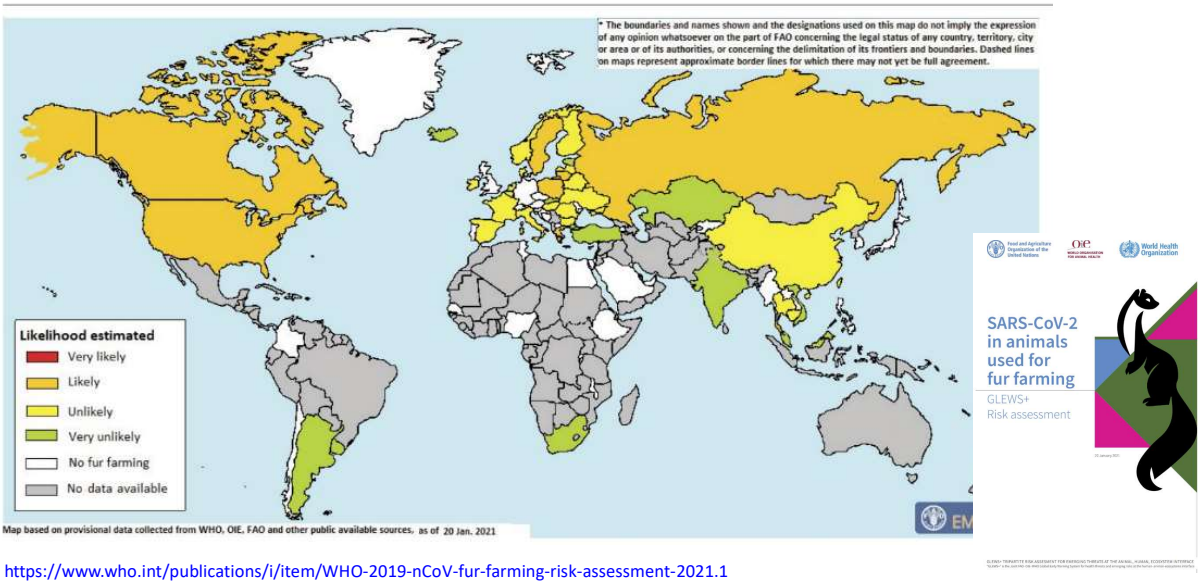
2 - What is public health risk from SARS-CoV-2 spillover from fur farms to humans?



https://www.who.int/publications/i/item/WHO-2019-nCoV-fur-farming-risk-assessment-2021.1

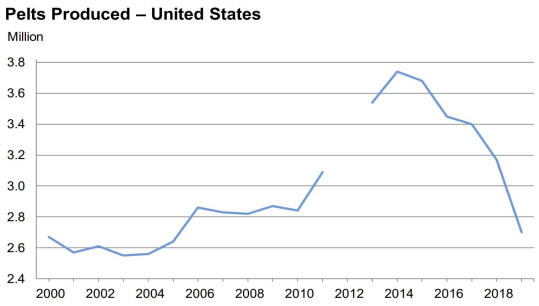
WHO & OIE farmed mink-COVID-19 risk assessment

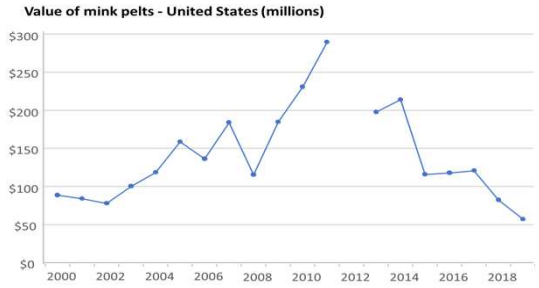
3 - What is risk of transmission of SARS-CoV-2 from mink fur farms to susceptible wildlife populations?

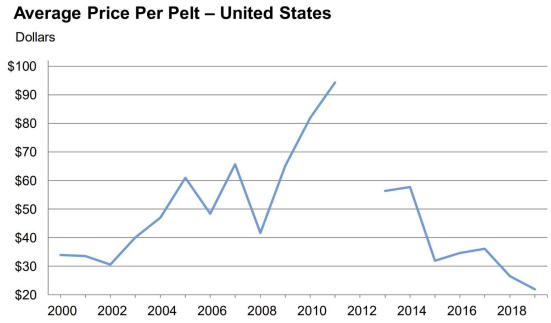


https://www.who.int/publications/i/item/WHO-2019-nCoV-fur-farming-risk-assessment-2021.1

Rise and fall of US farmed mink …







US mink industry is slowly dying …

- 2.7 million pelts produced in 2019, down 15% vs 2018
- Average price per pelt in 2019 was $21.90, an historic low, down $4.70 vs 2018, **down 77% from $94.30 in 2011**
- Total value of pelts in 2019 was $59.2 million, down 30% from $84.3 million in 2018; **down 80% from $292.5 million since 2011**
- Bred female mink to produce kits in 2020 = 359,850 down 48% from previous year

USDA National Agricultural Statistics Service, July 2020; no data for year 2012

Farm-level market value of Oregon farmed mink in 2019 was $4.4 million

	No of pelts produced			Value of pelts		
State	2018	2019	% decrease	2018	2019	% decrease
WI	1,030,600	1,016,220	1.4	$27,413,960	$22,255,218	18.8
UT	708,000	556,710	21.4	$18,832,800	$12,191,949	35.3
ID	302,220	267,740	11.4	$8,039,052	$5,863,506	27.1
OR	258,910	202,920	21.6	$6,887,006	$4,443,948	35.5

US mink farm

- Fur is steadily falling out of favor with the fashion industry. Both volume and price of pelts dropped by around half since 2014 according to the main exchange Kopenhagen Fur.
- Kopenhagen Fur, auctioneer for 40% of mink pelts worldwide, announced in Nov 2020 it would cease operations in 2-3 years due to COVIV-19 undermining the future of the global fur trade.
- Due to SARS-CoV-2 culling of 15-17 million farmed mink in Denmark and deaths or culling of perhaps 5 million more farmed mink across the globe, world farmed mink production will be far below normal of ~60 million mink pelts.
- According to the International Fur Federation (IFF), furriers worry about a mink pelt shortage by 2022. Mink pelt price increased by about 40% in early 2021. The IFF hopes mink farmers in Canada, Poland, America and Greece will replace Danish output. Russia and especially China are also expected to hike output.
- Several European nations banned mink farming on animal welfare grounds (eg UK, Austria, Croatia, Czech Republic, Norway (2025) or severely restricted it (eg Germany, Switzerland)
- The Netherlands, traditionally the number three mink pelt producer in the world, will ban mink farming in March 2021 to protect public health.