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House of Representatives
COMMONWEALTH OF PENNSYLVANIA
HARRISBURG

COMMITTEES

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BOARD MEMBER OF CENTER FOR RURAL PA – BOARD MEMBER

February 4, 2024

TO: Agriculture and Rural Affairs Committee Members

FROM: Eddie Day Pashinski, Majority Chair
Agricultural and Rural Affairs Committee
Dan Frankel, Majority Chairman
Health Committee

SUBJECT: Informational Meeting— **The Spread of Avian Influenza from Birds to Dairy Cattle to People: Understanding the Threat and Its Implications**

The Agriculture and Rural Affairs Committee and Health Committee will hold a **Joint Informational Meeting at 10:30 a.m Wednesday, February 26th** in room 515 Irvis Office Building.

The topic of the informational meeting is:

The Spread of Avian Influenza from Birds to Dairy Cattle to People: Understanding the Threat and Its Implications

Please contact your respective committee Agriculture and Rural Affairs Committee Paula Hunter Phunter@pahouse.net or Devin Mercado DMercado@pahouse.net Health Committee with your attendance plans. If you are not able to attend, please submit an official leave request form.

Thank you,

Eddie Day Pashinski & Dan Frankel

House Agriculture and Rural Affairs Committee and House Health Committee
Informational Meeting

The Spread of Avian Influenza from Birds to Dairy Cattle to People: Understanding the Threat and Its Implications

February 26, 2025 10:30 a.m.
515 IRVIS OFFICE BUILDING

10:30-10:35 a.m. Call to order and Introductions
Chairman Eddie Day Pashinski and Chairman Dan Frankel

- Dr. Andrew Hoffman, Dean
  University of Pennsylvania School of Veterinary Medicine
- Dr. Louise Moncla, Assistant Professor of Pathobiology
  University of Pennsylvania School of Veterinary Medicine
- Dr. Lisa Murphy, Professor of Toxicology/Resident Director, PADLS New Bolton Center
  University of Pennsylvania School of Veterinary Medicine
- Dr. Scott Hensley, Professor of Microbiology
  University of Pennsylvania Perelman School of Medicine

Q & A
12:00 noon Adjourn

Joint Informational Meeting of the Pennsylvania House of Representatives' Agriculture and Rural Affairs Committee and Health Committee on Highly Pathogenic Avian Influenza

Testimony of Dr. Andrew Hoffman, Gilbert S. Kahn Dean, University of Pennsylvania School of Veterinary Medicine

February 26, 2025

Thank you for convening this informational meeting on Highly Pathogenic Avian Influenza (HPAI) and for your ongoing support for efforts to contain the disease in the Commonwealth. Today, from the University of Pennsylvania, we are joined by three leading infectious disease experts across veterinary and human medicine who will provide a state-of-the-art overview of what we know about this virus, and ongoing work at our institution to address the current HPAI outbreak. Our goal today is to brief you on where we stand as a country, showing you how the virus has spread geographically and among species; explain the threats this virus poses to our agricultural and wildlife industries, as well as to humans, nationally and here in Pennsylvania; and update you on work at Penn to develop vaccines to safeguard livestock and poultry species, as well as humans, and importantly to prevent this outbreak from becoming the next pandemic.

HPAI is caused by the H5N1 strain of influenza type A. In the last two decades, infections with H5N1 in humans have mainly occurred in the Western Pacific Region including China and Southeast Asia, arising from close contact with domestic chickens or ducks carrying the virus often asymptomatically. From 2003 to 2024, there were 954 human cases of H5N1 in the West Pacific Region, with approximately 50% mortality.[1]

H5N1 strains, different from those identified in the West Pacific Region, were introduced from migrating waterfowl in North America in 2022, resulting in the re-emergence of HPAI with devastating consequences to poultry; 162 million birds have been lost since 2022, with approximately 10% of the United States' layers being lost in just the last 3 months. In March of 2024, it was also detected in dairy cattle for the first time in the US. Now, it has been found across at least 16 states. HPAI in cattle causes illness, decreased milk production, and 1-2% mortality, resulting in substantial economic consequences borne by farmers due to limited indemnity.

Infections in other species of wild birds and mammals, for example cats, cause illness and death in those species. Of the 68 humans in the US known to have contracted the virus since the beginning of 2024, one person with underlying medical conditions in Louisiana died on January

[1] World Health Organization. Available at https://cdn.who.int/media/docs/default-source/2021-dha-docs/cumulative-number-of-confirmed-human-cases-for-avian-influenza-a(h5n1)-reported-to-who--2003-2024.pdf

6, 2025. On February 14, 2025, a woman in Wisconsin with similar preexisting vulnerabilities was hospitalized with a H5N1 infection contracted from poultry. Multiple herds of dairy cattle have recently turned up positive in the milk for the *H5N1 genotype D1.1 that was also found in humans with H5N1 infection*, including the Louisiana patient who died. This indicates that H5N1 is repeatedly introduced by wild birds on each of these farms in addition to being spread between cattle, heightening concerns about biosecurity in the dairy industry. No human-to-human transmissions have been identified to date, but a priority of surveillance remains the detection of human-to-human transmission *consistent with pandemic potential.*

Despite enormous resources and efforts devoted to biosecurity measures in poultry and livestock, HPAI has not been stamped out in the US. Many new confirmed cases in commercial poultry in the Commonwealth have underscored the urgency of combating HPAI. Further, the virus appears to have adapted for sustained (i.e., endemic) infection in wildlife populations, making it unlikely to dissipate as a threat in the region. Just as the virus has changed over time, our approach needs to adapt and evolve, enabling us to respond appropriately to the *emergence of new sub-strains of H5N1* and to address a *long-term threat to animal agriculture*.

Only by working collaboratively across human and veterinary medicine, and across academic, local, state, and federal laboratories and agencies can we protect people and animals from HPAI. Overarching goals of control must include:

(1) tracking new animal and human cases and their origins;
(2) monitoring changes in the virus that make it more adaptable and transmissible (i.e., risk assessments); and
(3) observing any modifications in the virus that make it more resistant to antiviral medications or vaccination.

Consistent with these goals, the University of Pennsylvania continues to conduct diagnostic testing and field surveillance of domestic animals and a wide range of wildlife species, performing risk assessments of the virus' potential to emerge in human populations based on its ever-changing biology, public outreach and education about food safety and biosecurity through the media, and vaccine development in domestic animals and humans.

Leadership for this work comes from Penn faculty who head the Pennsylvania Animal Diagnostic Laboratory System (PADLS) at New Bolton Center, the Wildlife Futures Program, Penn Center for Excellence in Influenza Research and Response (Penn-CEIRR) at the Perelman School of Medicine, and research laboratories in the Department of Pathobiology at Penn Vet. Of critical importance, the work out of Penn involves numerous collaborations across the Commonwealth and country, including with the PA Game Commission, the PA Department of Agriculture, the PA Department of Health, and the US Department of Agriculture. We are most fortunate to have these partnerships; continued support for these collaborations will be critical to our success in mitigating the risks of this outbreak.

Introduction of Panelists

First, we will hear from Dr. Louise Moncla, Assistant Professor of Pathobiology, University of Pennsylvania **School of Veterinary Medicine**. Dr. Moncla earned a bachelor's degree in biology from the Penn State University and a PhD in microbiology from the University of Wisconsin in Madison. Dr. Moncla completed her post-doctoral research work at the Fred Hutchinson Cancer Center, where her work focused on using viral genomes to trace viral outbreaks. Since starting her lab in 2022, Dr. Moncla's research has focused on using genomic approaches to understand RNA virus emergence, evolution, and transmission, with a particular focus on highly pathogenic avian influenza viruses.

Following Dr. Moncla's testimony, we will hear from Dr. Lisa Murphy, Professor of Pathobiology/Resident Director, PADLS New Bolton Center, University of Pennsylvania School of Veterinary Medicine. Dr. Lisa Murphy received her BS in Biological Sciences from Stanford University and her VMD from the University of Pennsylvania's School of Veterinary Medicine. Dr. Murphy then worked as an Area Emergency Coordinator for USDA APHIS Veterinary Services in New England before returning to Penn Vet in 2005. Currently a Professor of Toxicology in the Department of Pathobiology, Dr. Murphy is the Resident Director of PADLS New Bolton Center. In March 2019, she became the co-director of the Pennsylvania Game Commission-funded Wildlife Futures Program and was named an Associate Director of Penn Vet's Institute for Infectious and Zoonotic Diseases in 2021.

Third, we will hear the testimony of Dr. Scott Hensley. Dr. Hensley is a Professor of Microbiology at the University of Pennsylvania and Director of the NIH-sponsored Penn Center of Excellence for Influenza Research and Response. He received his BA in Biology from the University of Delaware in 2000 and his PhD in Cell and Molecular Biology from the University of Pennsylvania in 2006. He completed a postdoctoral fellowship at the National Institutes of Health and launched his laboratory at Penn in 2010. Dr. Hensley oversees influenza virus surveillance and pandemic preparedness programs across the world, and his laboratory has been developing mRNA-based vaccines against influenza viruses for over a decade.

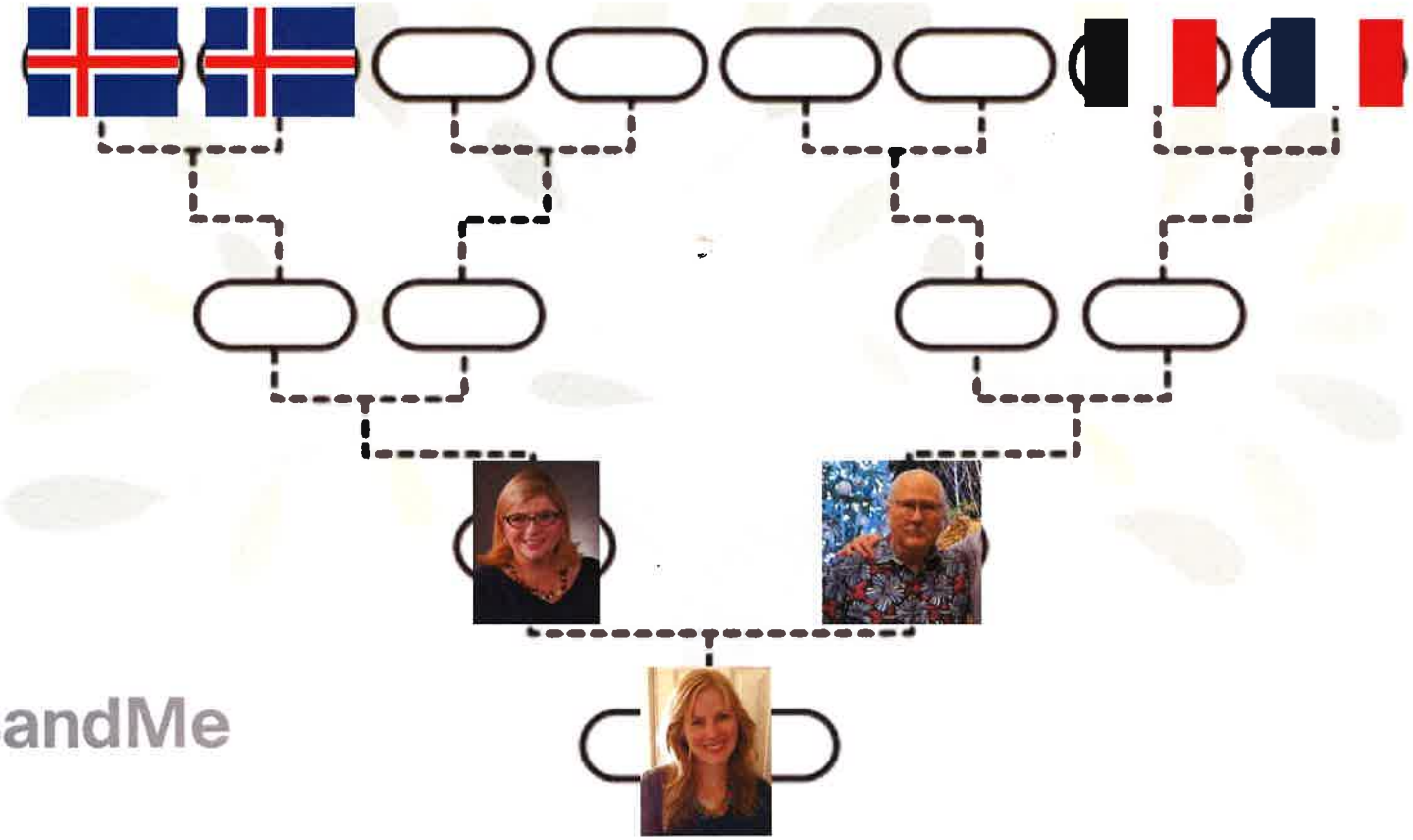
Highly pathogenic avian influenza in North America: how we got here

Louise Moncla
Department of Pathobiology
University of Pennsylvania
February 25, 2025

PennVet
University of Pennsylvania

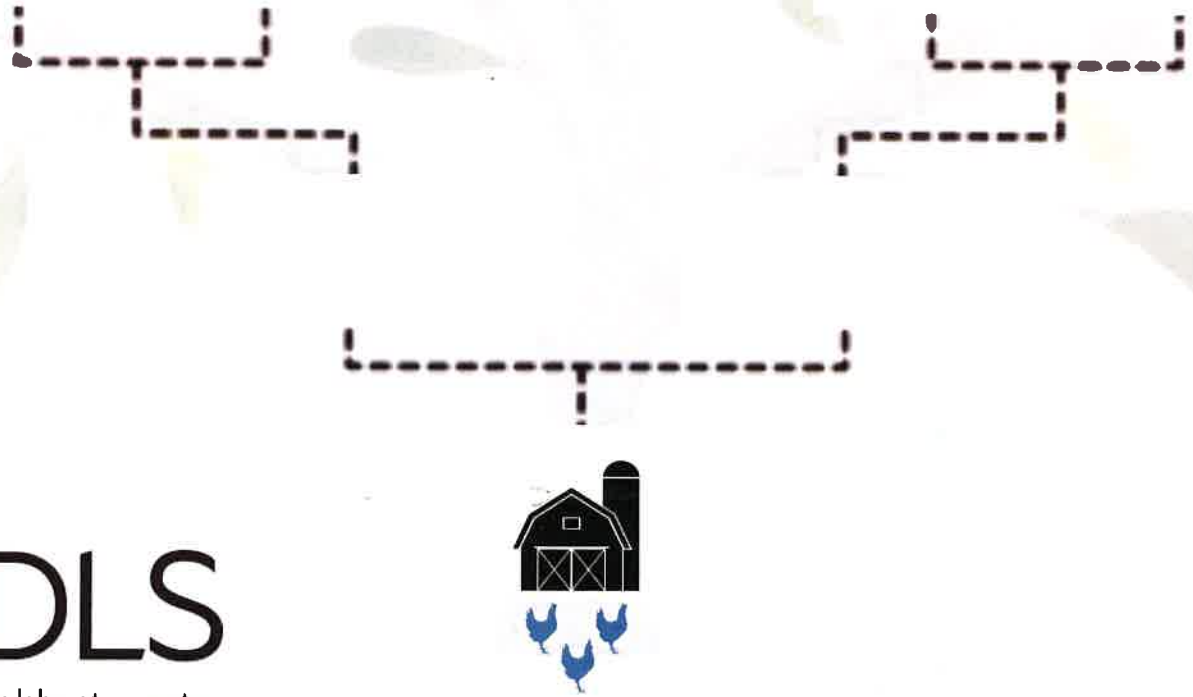
Our lab makes family trees of viruses to track outbreaks

Family trees tell you how individuals are related, based on genetics



23andMe

Virus family trees can resolve how outbreaks spread, and how cases are linked



PADLS
pennsylvania animal diagnostic laboratory system

Virus family trees can resolve how outbreaks spread, and how cases are linked

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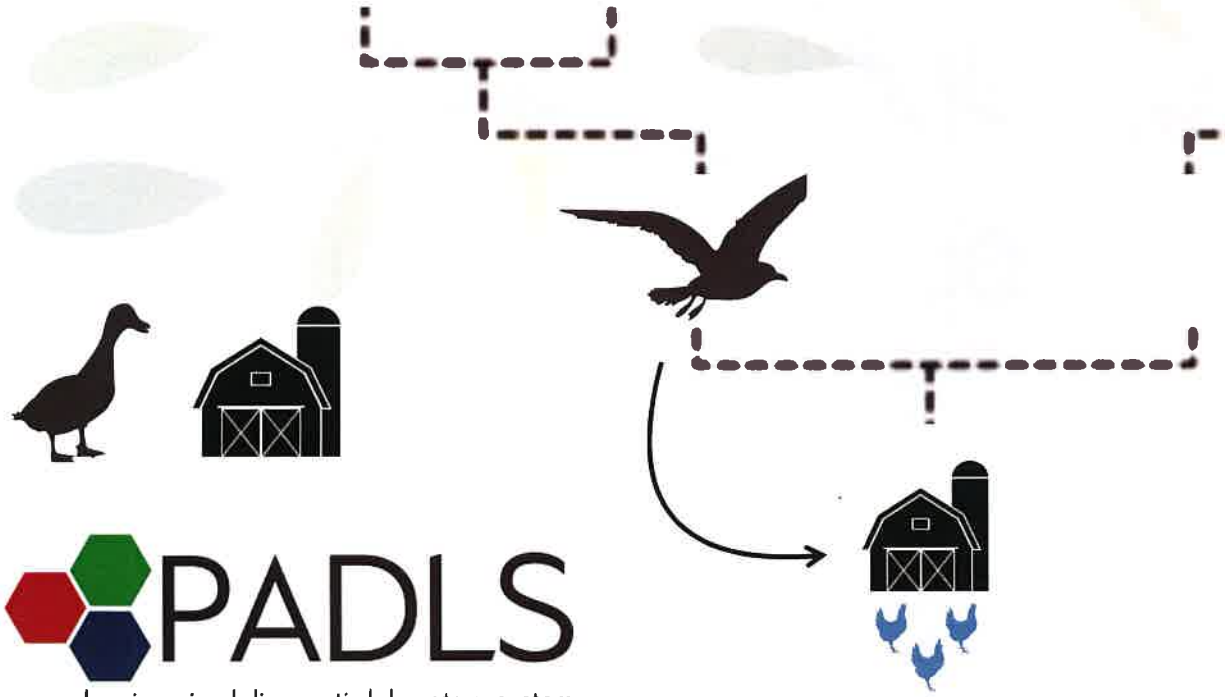
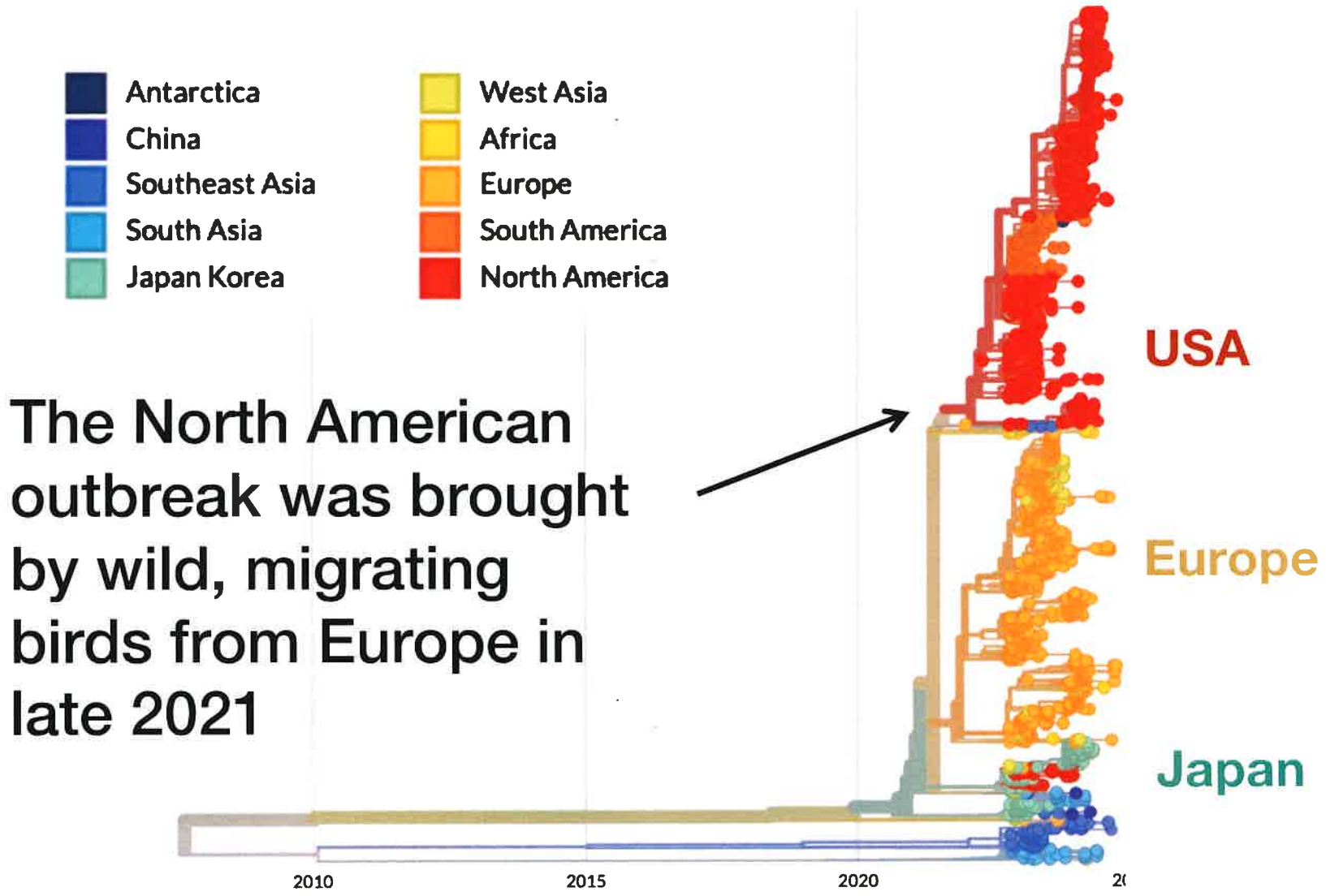
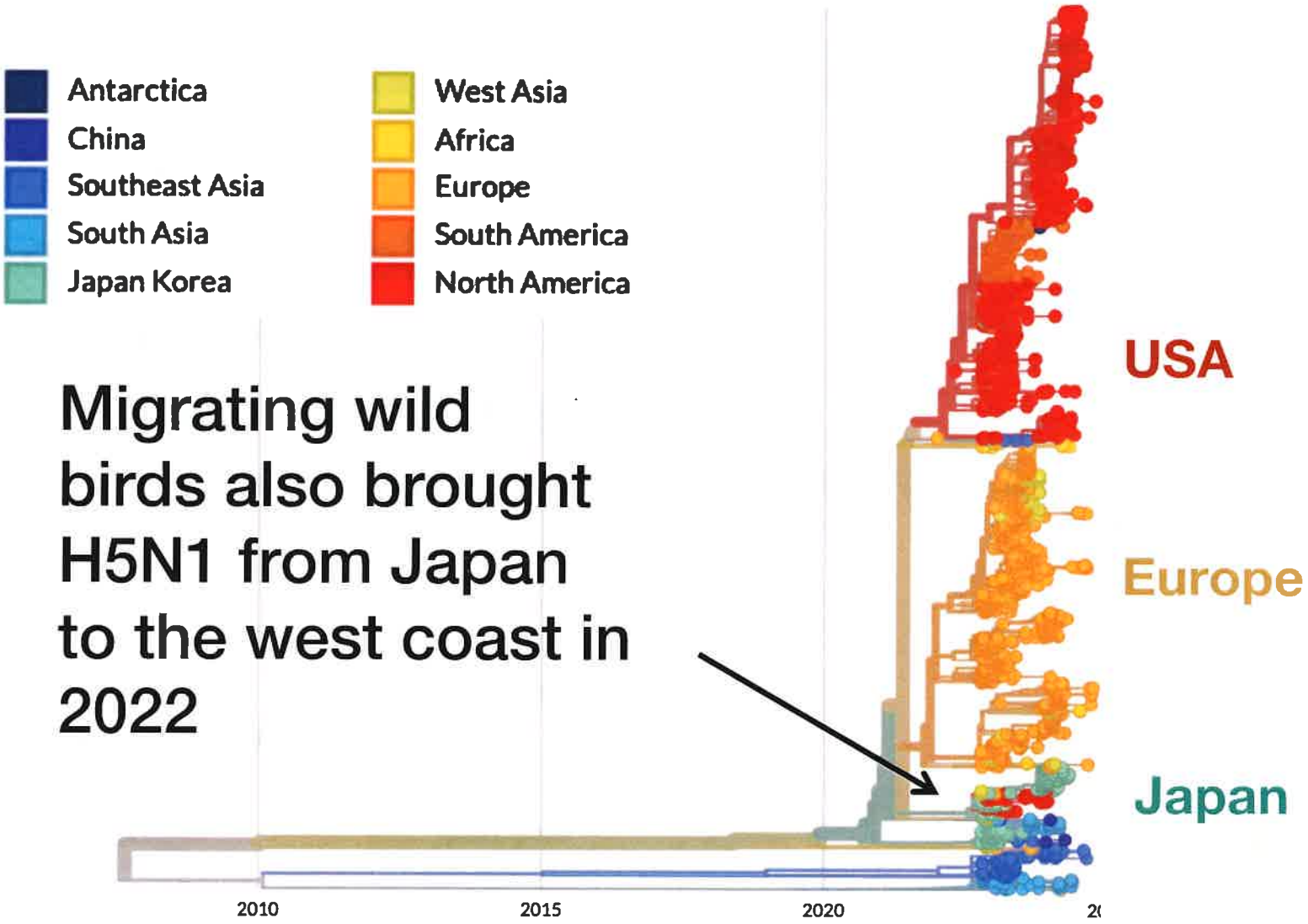


PADLS

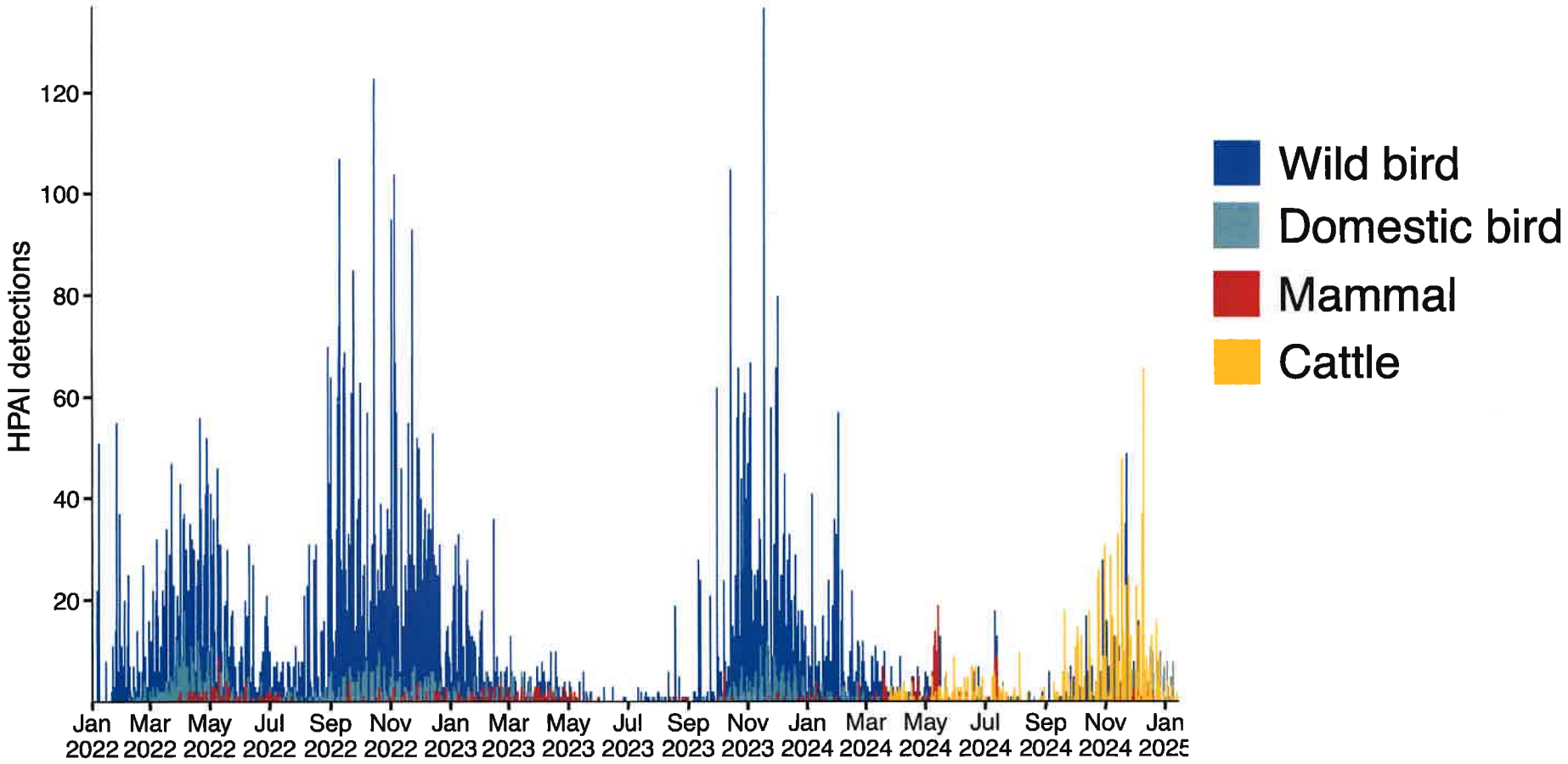
pennsylvania animal diagnostic laboratory system

How was H5N1 introduced into North America and what drove transmission in the US?


Antarctica
China
Southeast Asia
South Asia
Japan Korea
West Asia
Africa
Europe
South America
North America
The North American outbreak was brought by wild, migrating birds from Europe in late 2021
USA
Europe
Japan
2010
2015
2020

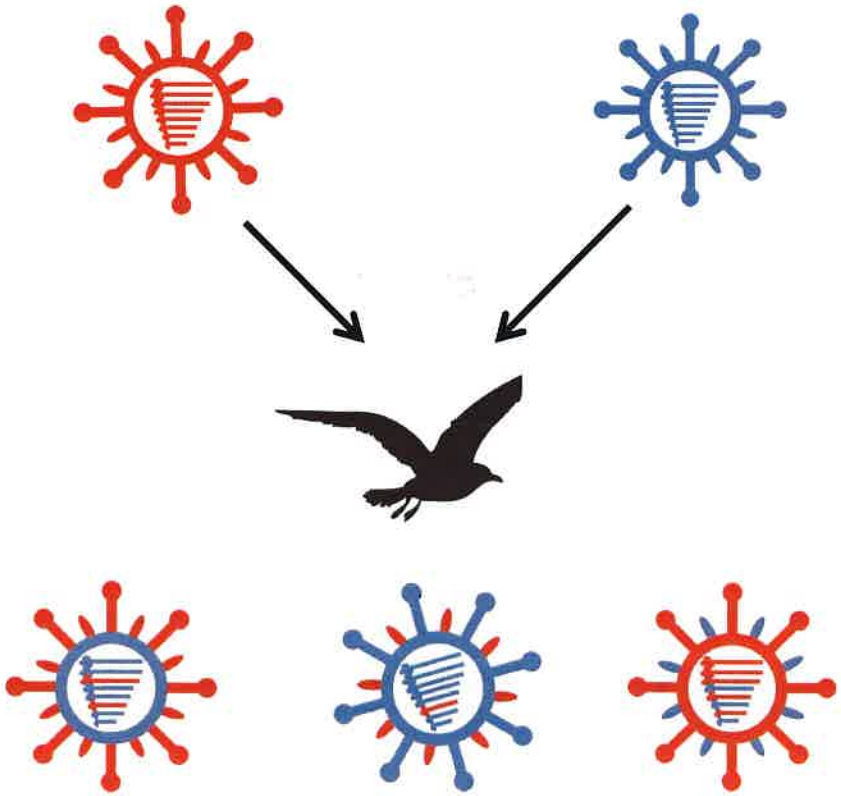

Antarctica
China
Southeast Asia
South Asia
Japan Korea
West Asia
Africa
Europe
South America
North America
Migrating wild birds also brought H5N1 from Japan to the west coast in 2022
USA
Europe
Japan
2010
2015
2020

H5N1 continues to circulate in wild birds in the US



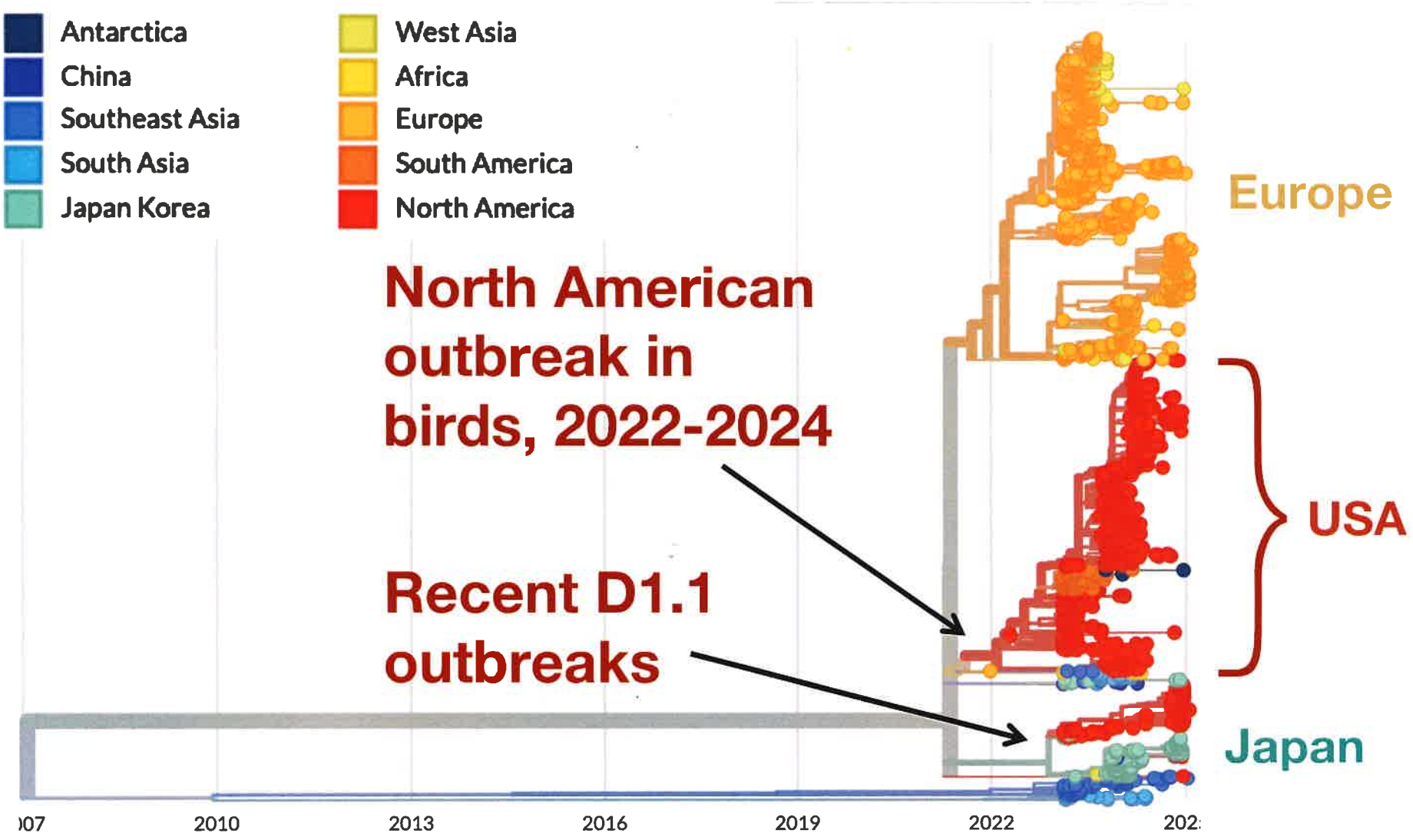
These viruses are now **circulating continuously in wild birds**, allowing for rapid geographic spread and repeated introductions into agriculture.

Recent outbreaks of D1.1 were caused by viruses that are mixing in wild birds



Testing shows bird flu in Lehigh Valley snow geese, a species migrating by the thousands

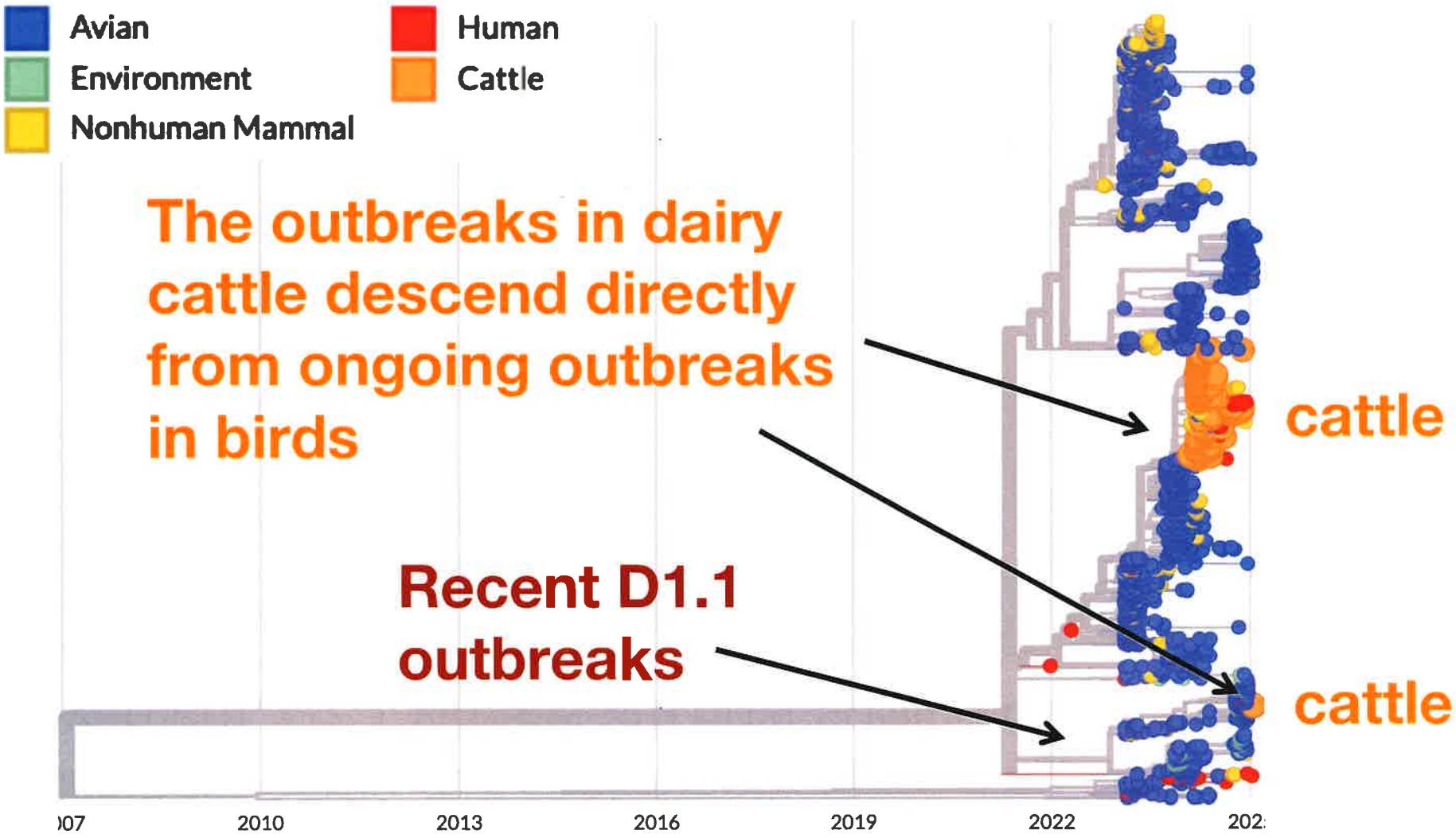
Updated: Jan. 02, 2025, 3:40 p.m. | Published: Jan. 02, 2025, 2:27 p.m.


Antarctica
China
Southeast Asia
South Asia
Japan Korea
West Asia
Africa
Europe
South America
North America
North American outbreak in birds, 2022-2024
Recent D1.1 outbreaks
Europe
USA
Japan
007
2010
2013
2016
2019
2022
202

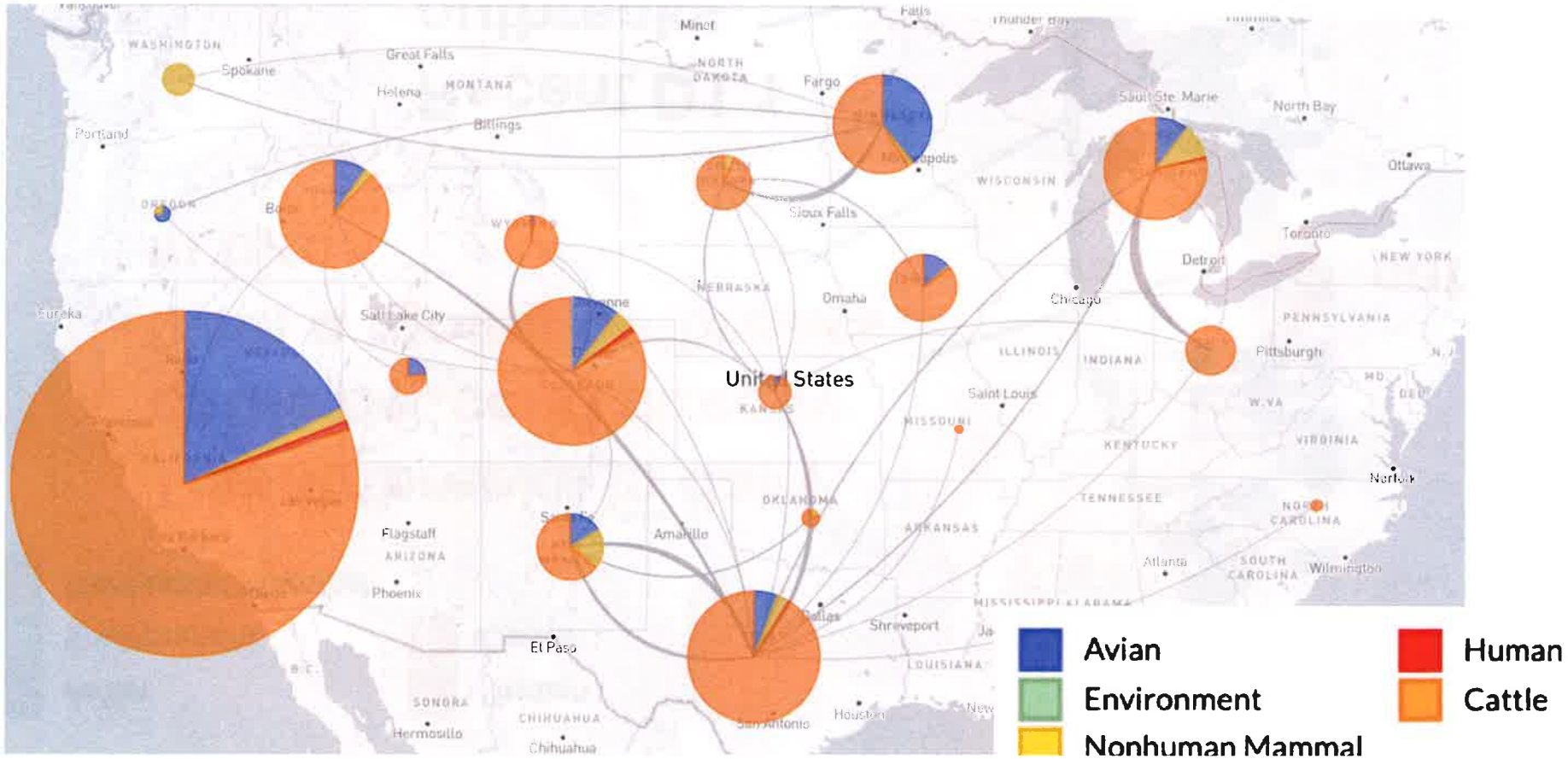
The New York Times

Bird Flu Spreads to Dairy Cows

U.S. regulators confirmed that sick cattle in Texas, Kansas and possibly in New Mexico contracted avian influenza. They stressed that the nation's milk supply is safe.

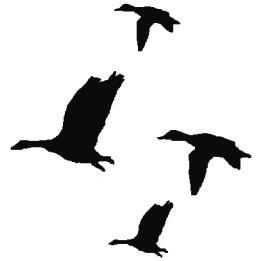

Avian
Environment
Nonhuman Mammal
Human
Cattle
The outbreaks in dairy cattle descend directly from ongoing outbreaks in birds
Recent D1.1 outbreaks
cattle
cattle
2010
2013
2016
2019
2022

While past cattle outbreaks were spread by cattle movement, D1.1 viruses are now spilling over from birds



Key takeaways:

1. Since 2022, H5N1 viruses have been circulating continuously in North America, spread by migrating wild birds.

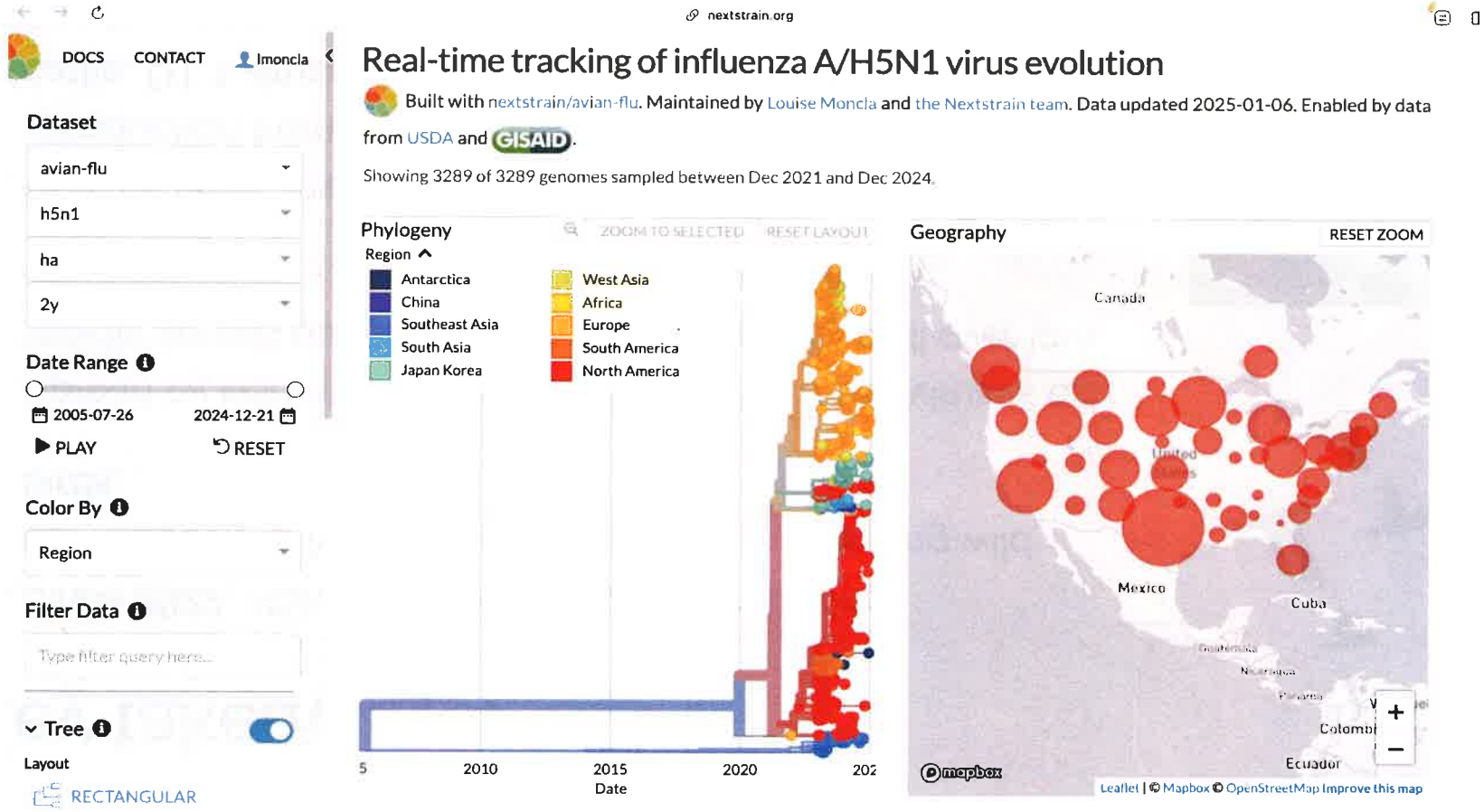


2. Spread by wild migrating birds means that these viruses can rapidly spread geographically, can repeatedly spill over into domestic poultry, and are mixing via reassortment.

3. Until recently, the outbreak in cattle was caused by a single introduction from birds, followed by transmission between cattle. D1.1 viruses have now spilled into cattle twice.

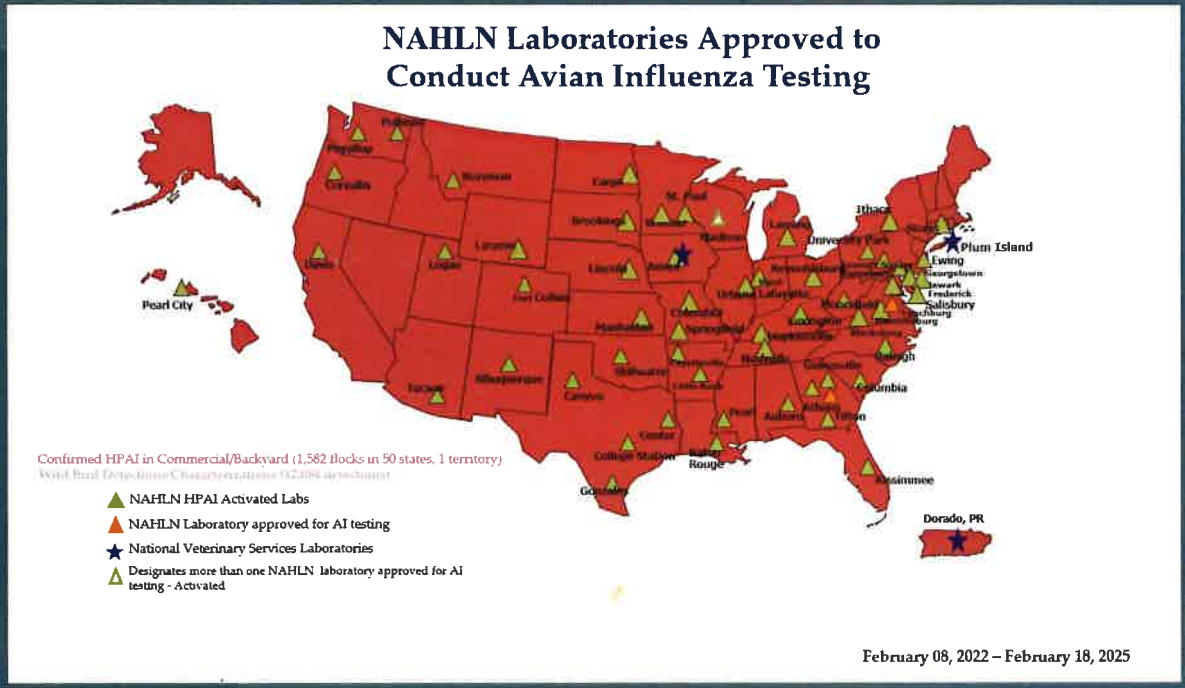
4. Strong testing, surveillance, and outbreak response are critical for outbreak mitigation.

“Family trees” available to view at: Nextstrain.org /avian-flu



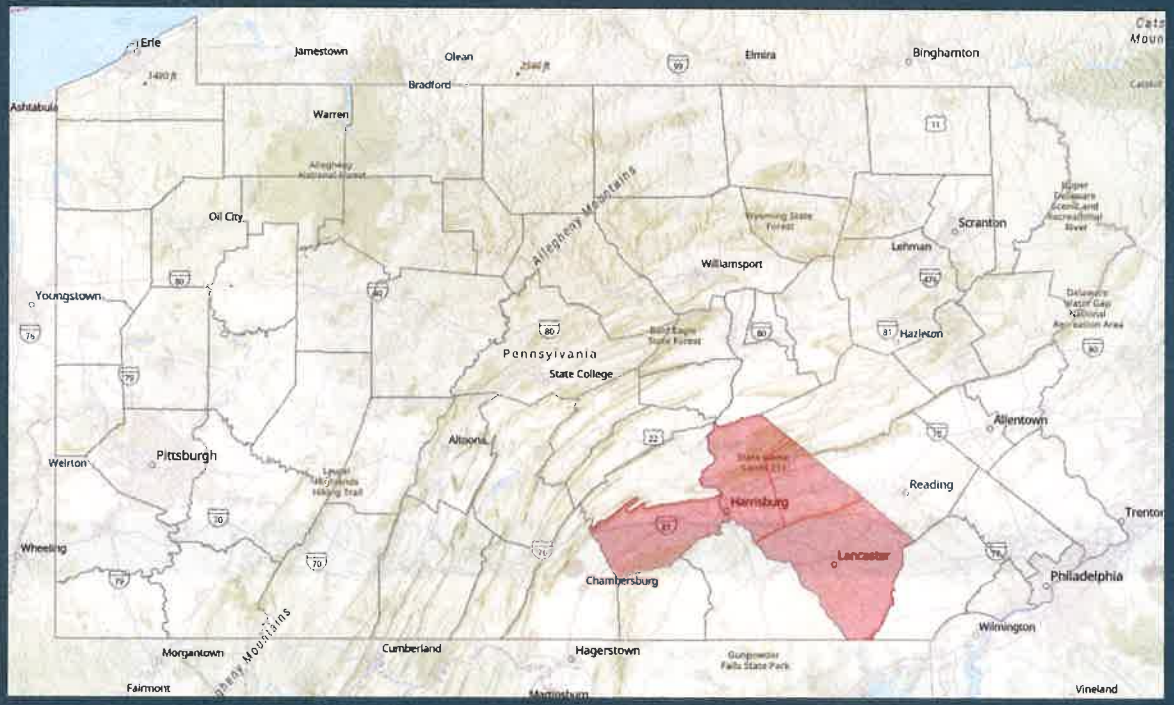
National Highly Pathogenic Avian Influenza (HPAI) Status

- 58 NAHLN labs currently activated in 42 states
- 451,606 domestic bird PCR tests have been run at NAHLN labs as of 2/18/2025
- 162.59 million birds affected from 754 commercial flocks & 828 backyard flocks
- 962 confirmed livestock cases
- 493 detections in other mammals



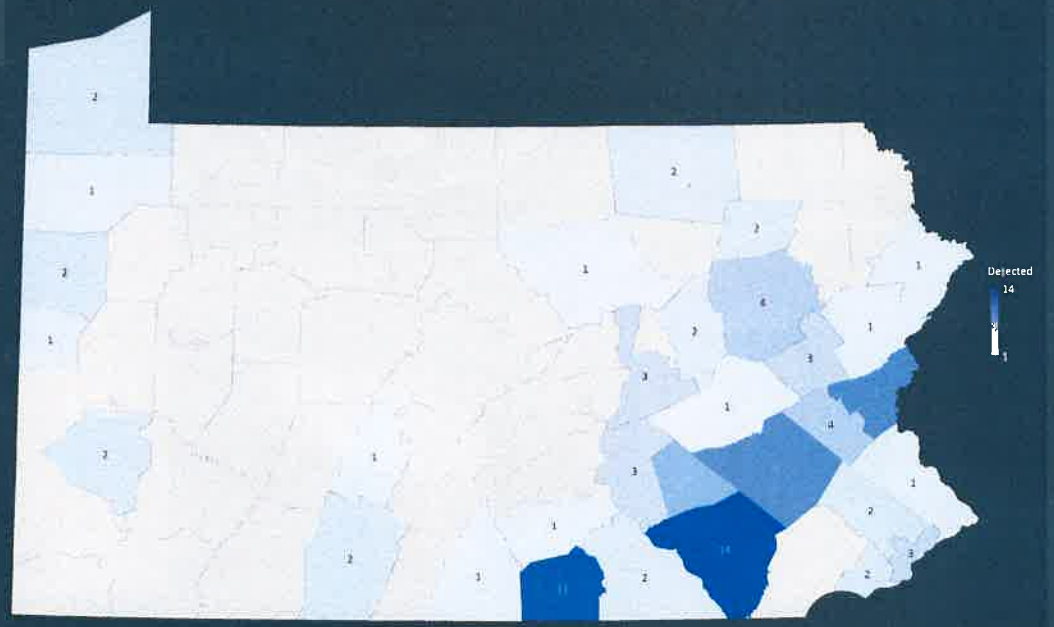
Highly Pathogenic Avian Influenza (HPAI) in Pennsylvania

- Over 20,000 samples collected from domestic and wild birds and mammals tested for HPAI by PADLS New Bolton Center since early 2022

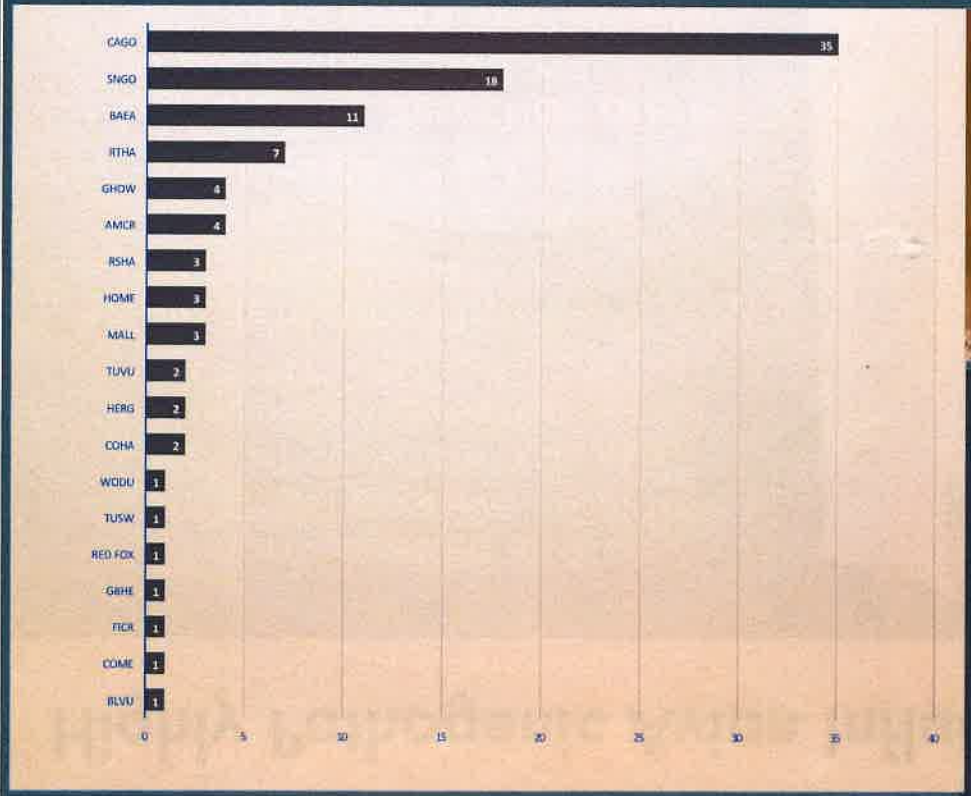


Highly Pathogenic Avian Influenza (HPAI) in Pennsylvania

- 101 non-negative and/or confirmed positive wildlife cases since January 1, 2025
  - Includes one red fox – Lehigh County
- Two detections in December 2024
  - Snowy owl – Erie County
  - Bald eagle – Pike County
- Last wildlife detection prior to December 2024 was a red-tailed hawk in Crawford County in May 2024



Highly Pathogenic Avian Influenza (HPAI) in Pennsylvania



Human H5N1 infections

Scott E. Hensley, Ph.D.
Professor of Microbiology
Director, Penn-CEIRR

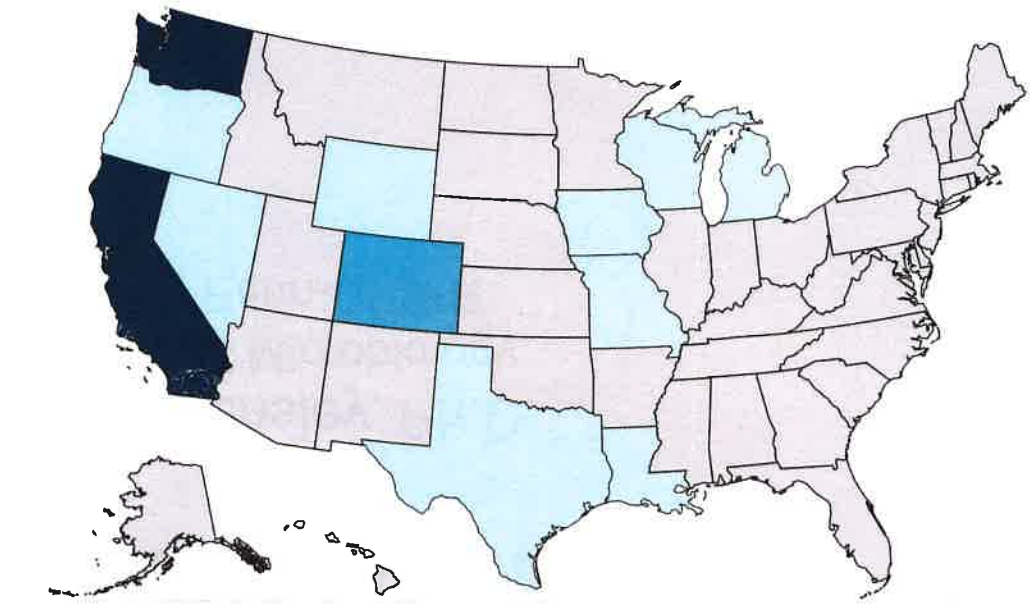
Most human H5N1 infections are from close contact with infected animals

National Total Cases: 69

Cases	Exposure Source
41	Dairy Herds (Cattle)*
23	Poultry Farms and Culling Operations*
2	Other Animal Exposure†
3	Exposure Source Unknown‡

NOTE: One additional case was previously detected in a poultry worker in Colorado in 2022. Louisiana reported the first H5 bird flu death in the U.S.

*Exposure Associated with Commercial Agriculture and Related Operations
†Exposure was related to other animals such as backyard flocks, wild birds, or other mammals
‡Exposure source was not able to be identified



Total cases

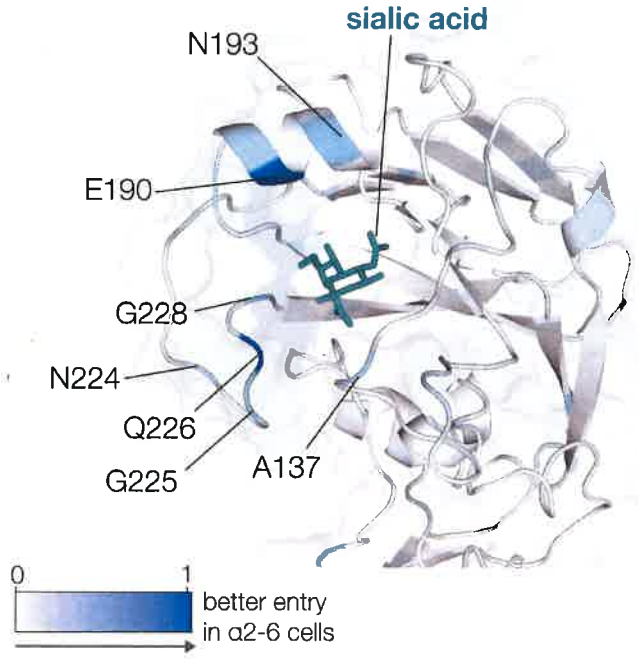
0 1-5 6-10 >10

www.cdc.gov

H5N1 viruses bind efficiently to bird cells

H5N1 viruses bind poorly to cells of the human upper airways

H5N1 viruses are a single mutation away from being able to infect human upper airway cells



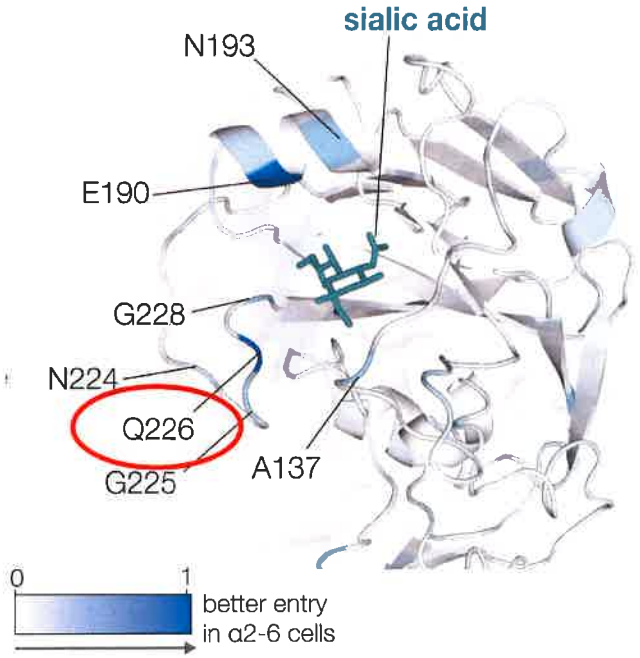
Dadonaite et al. PLoS Biology (2024)

Mutant H5N1 viruses have potential to cause serious disease

HEALTH

H5N1 bird flu virus in Canadian teenager displays mutations demonstrating virus' risk

The virus, which appears not to have spread to anyone else, underwent mutational changes virologists didn't want to see



CNN Health Subscribe Sign in

America's first bird flu death reported in Louisiana

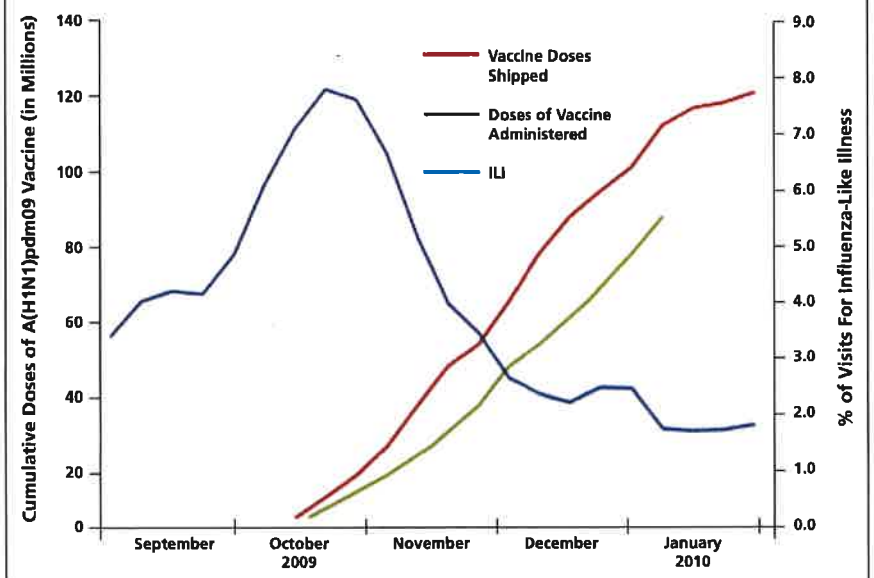
By Brenda Goodman, CNN

4 minute read · Updated 6:09 PM EST, Mon January 6, 2025

Can we develop an H5N1 avian flu vaccine?

It takes a long time to make conventional influenza vaccines

FIGURE 6-1. A(H1N1)pdm09 Vaccine By Date Shipped and Estimated Date of Administration, and Incidence of Influenza-Like Illness (ILI) in the United States[8,9 a,b]

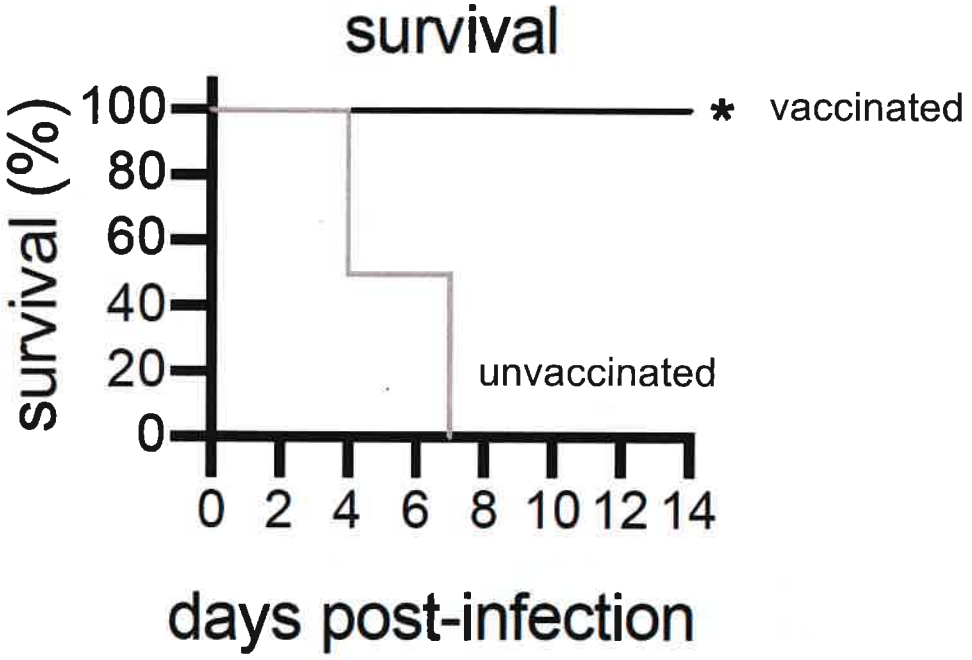


[a] The number of administered doses likely overestimates the population vaccinated, since pediatric patients received two doses. The data set acknowledges only the first dose, even if two doses were administered.

[b] Vaccine administration data were estimated based on guidance provided by Jay Butler, MD, former director of the CDC's H1N1 Vaccine Task Force, November 11, 2010.

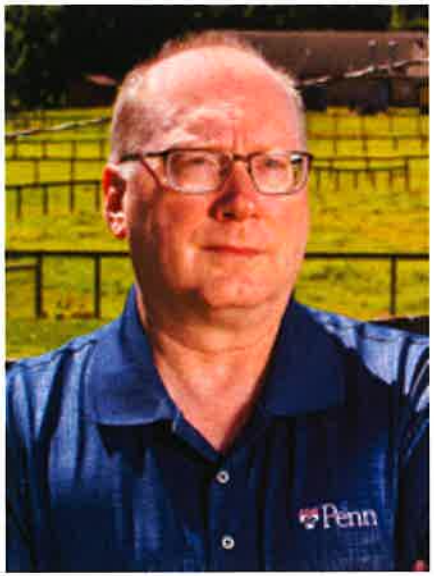
Center for Infectious Disease Research, University of Minnesota

H5 mRNA vaccine can be manufactured quickly and provide protection from H5N1 infection



Furey et al. *Nature Communications* (2024)

Vaccines might be able to reduce viral spread in livestock



Collaboration between Penn Medicine and Penn Vet

Summary

- Humans working closely with infected animals are at high risk of H5N1 exposure.
- The virus doesn't bind well to human cells, but single substitutions can change that equation.
- H5 vaccines could potentially be used in humans and livestock.