Highly Pathogenic Avian Influenza A(H5N1)

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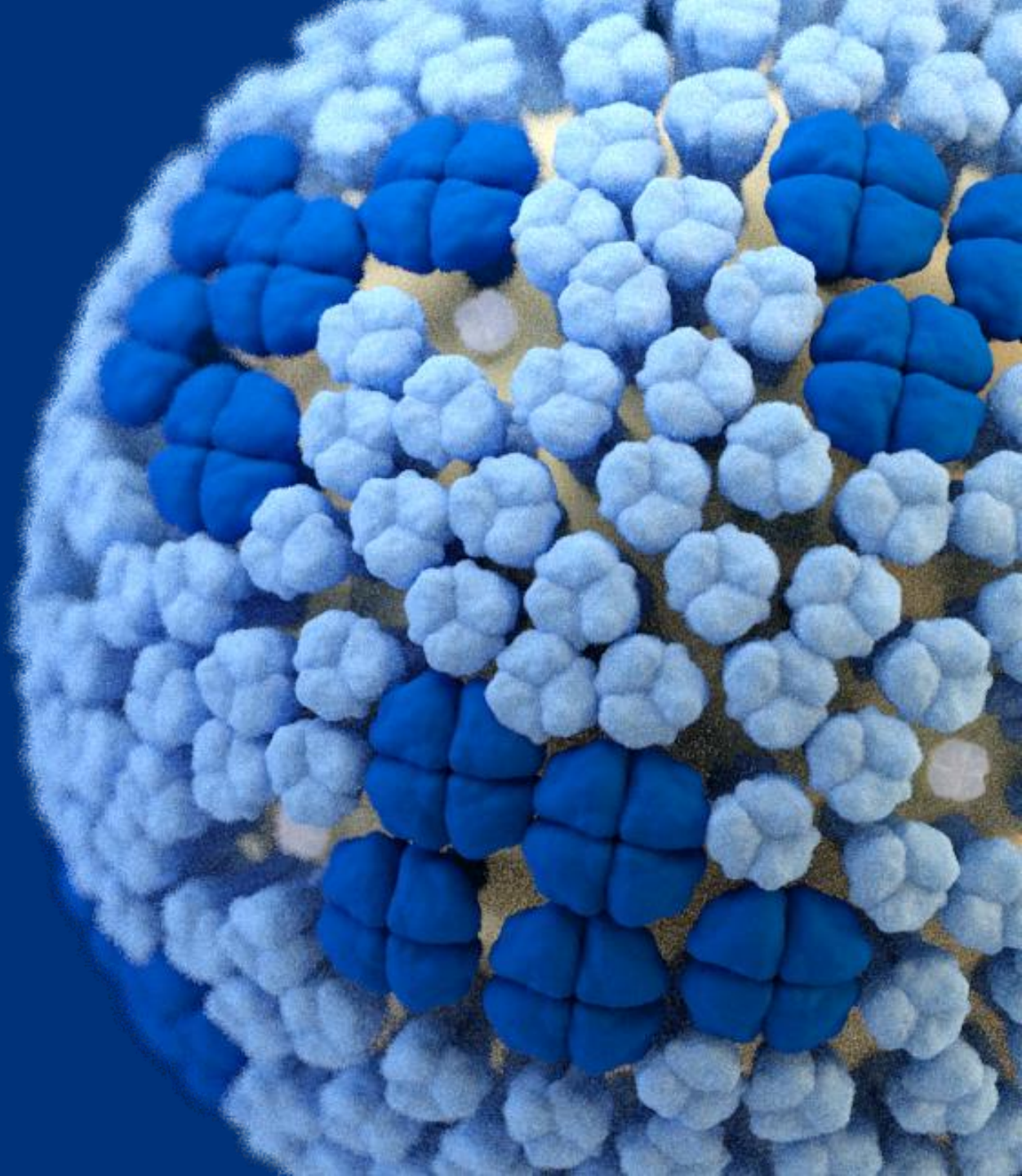
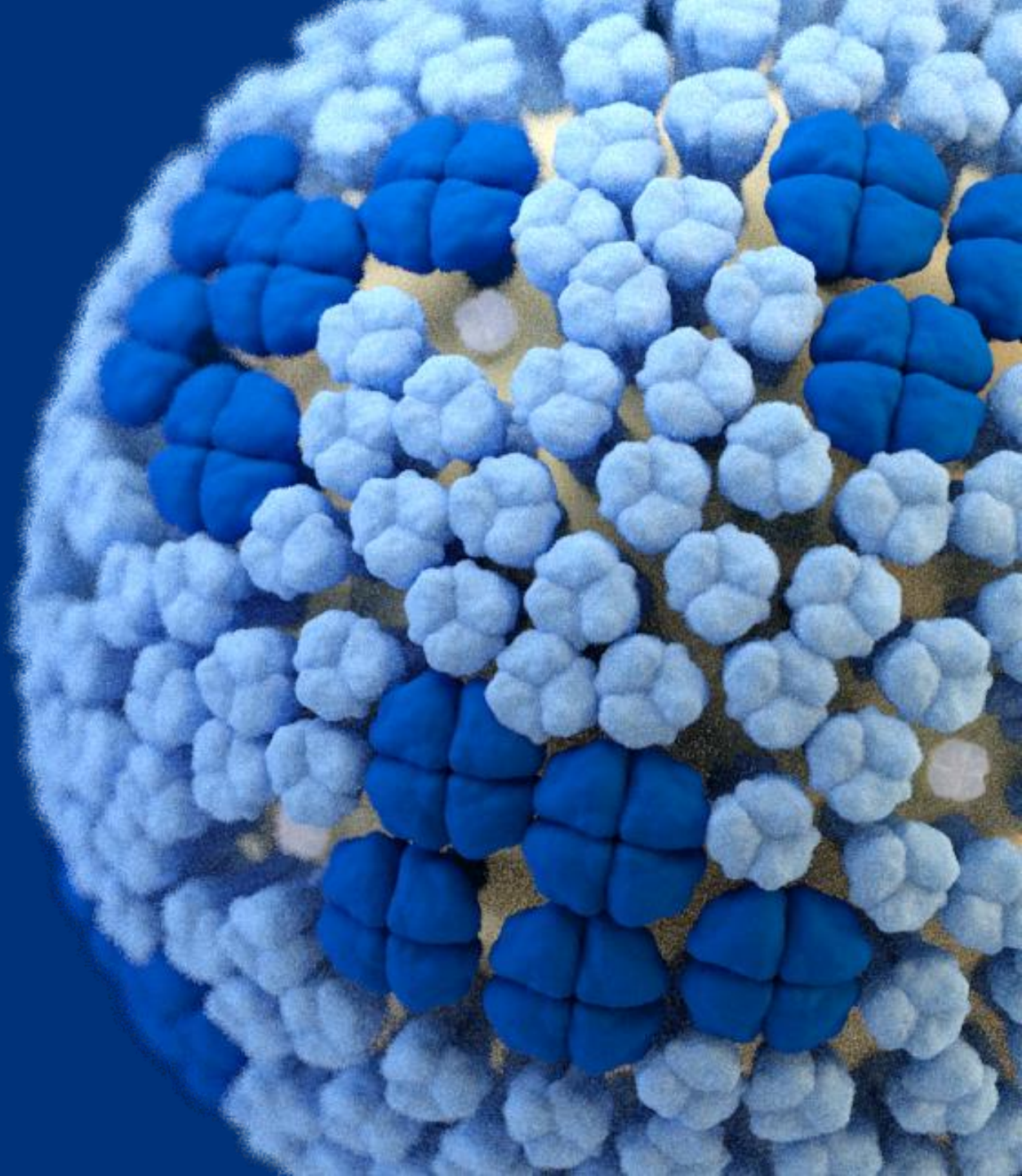


Zoonotic Influenza: Why Do We Care?



Emerging Influenza Viruses

Jernigan, Strausbaugh. Emerging Infections, Textbook of Infectious Diseases, 2004; Institute of Medicine, Emerging Infections, 1992; Jernigan, Cox. Textbook of Influenza. 2013

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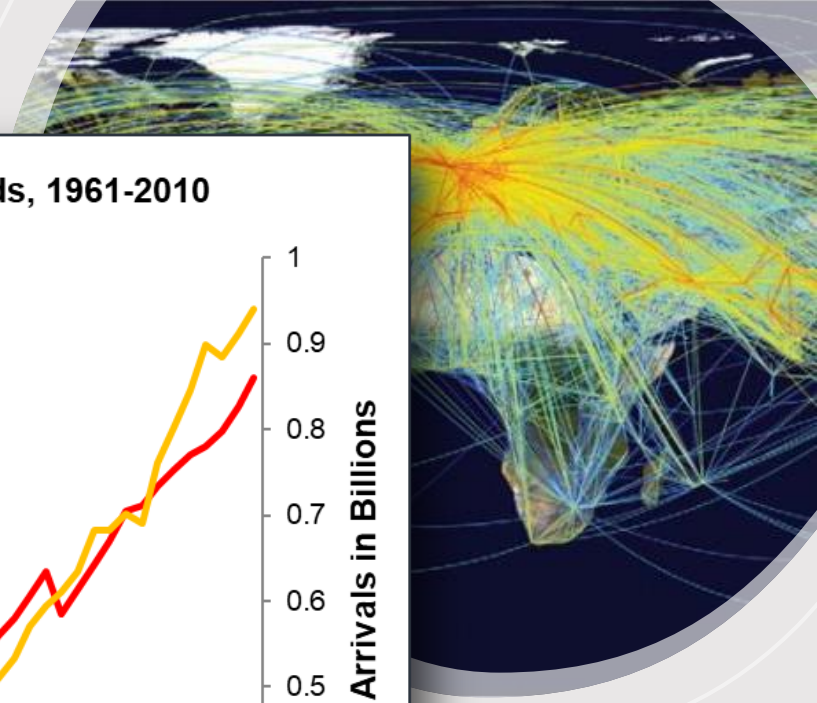
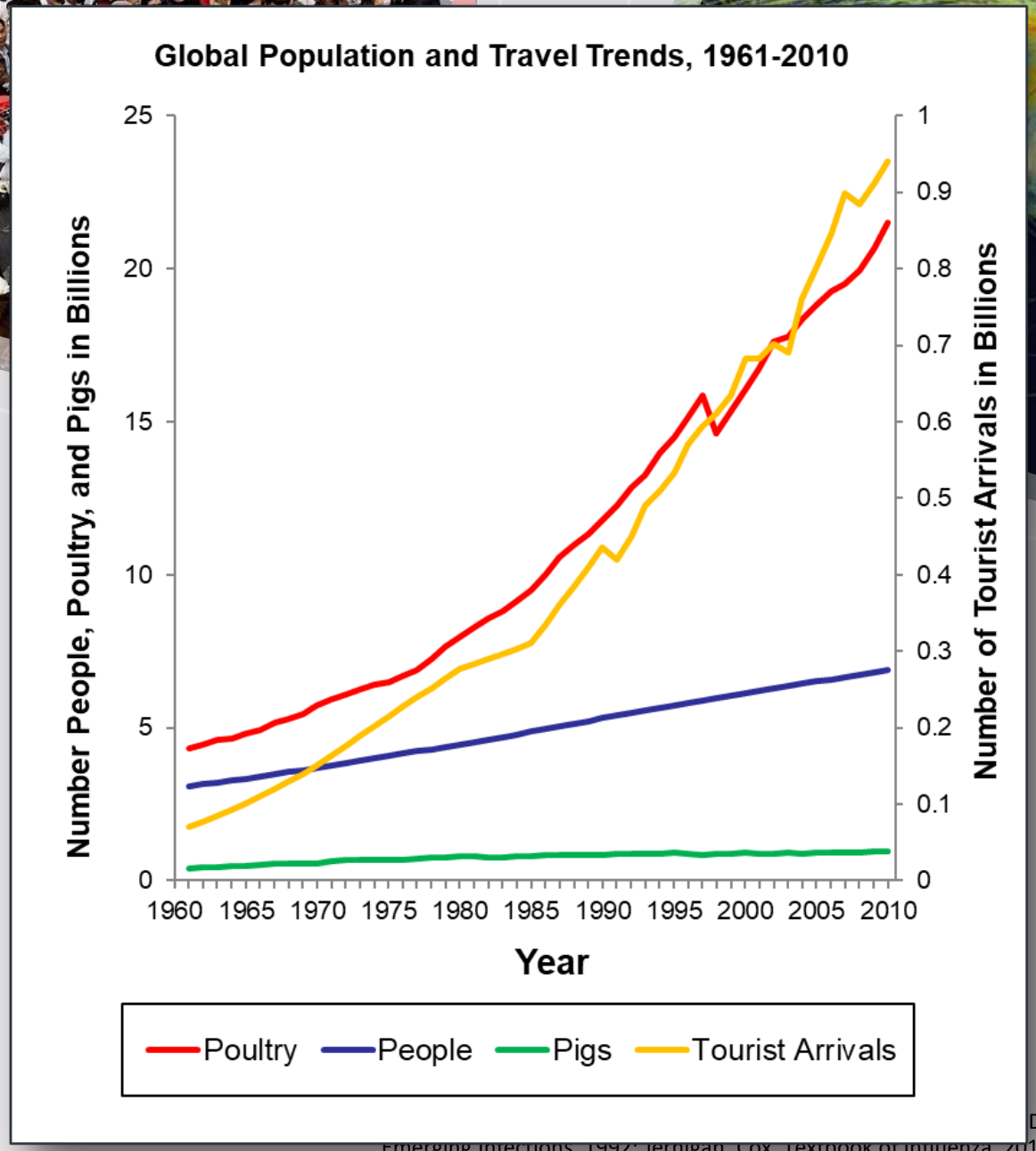
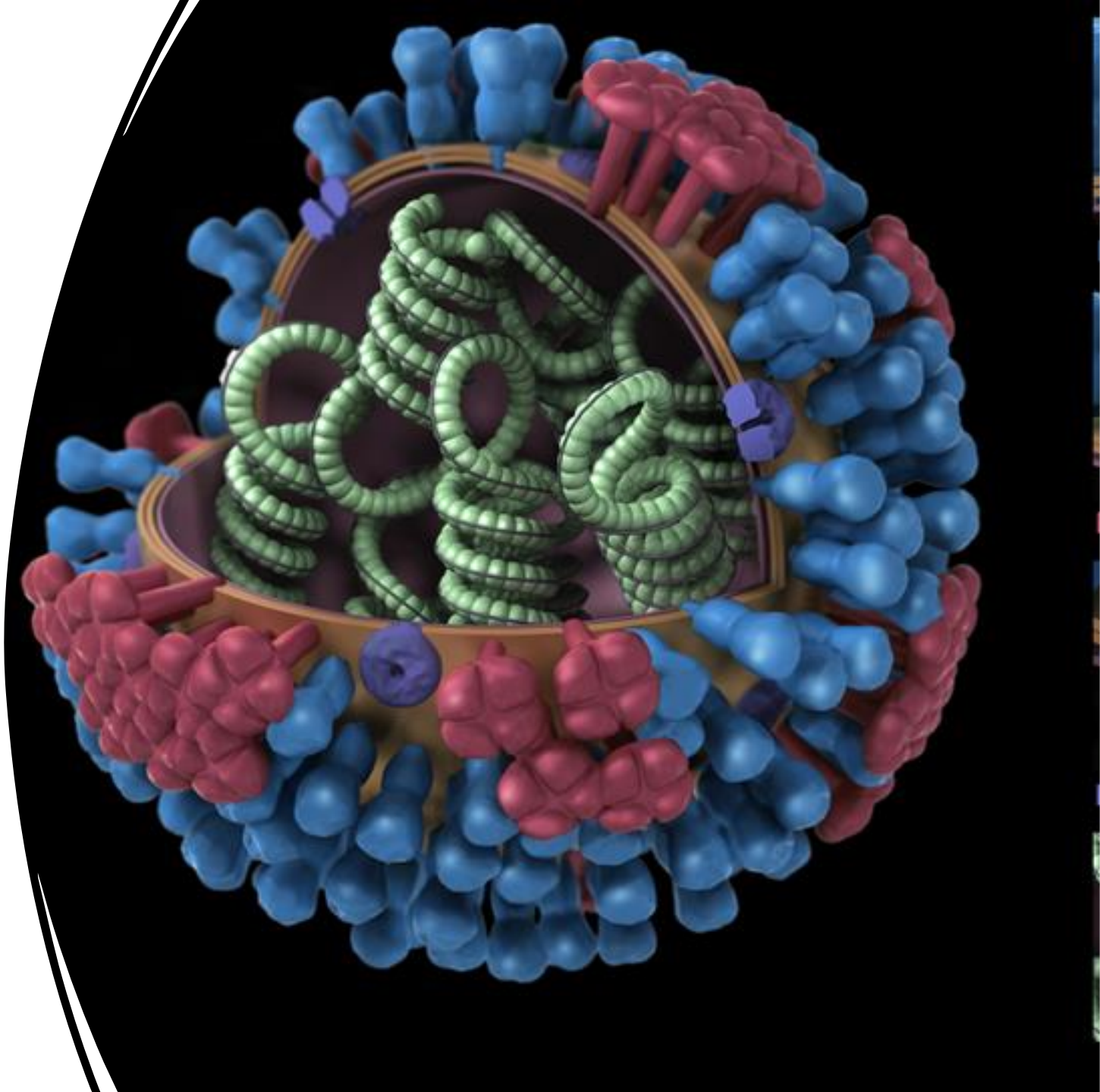


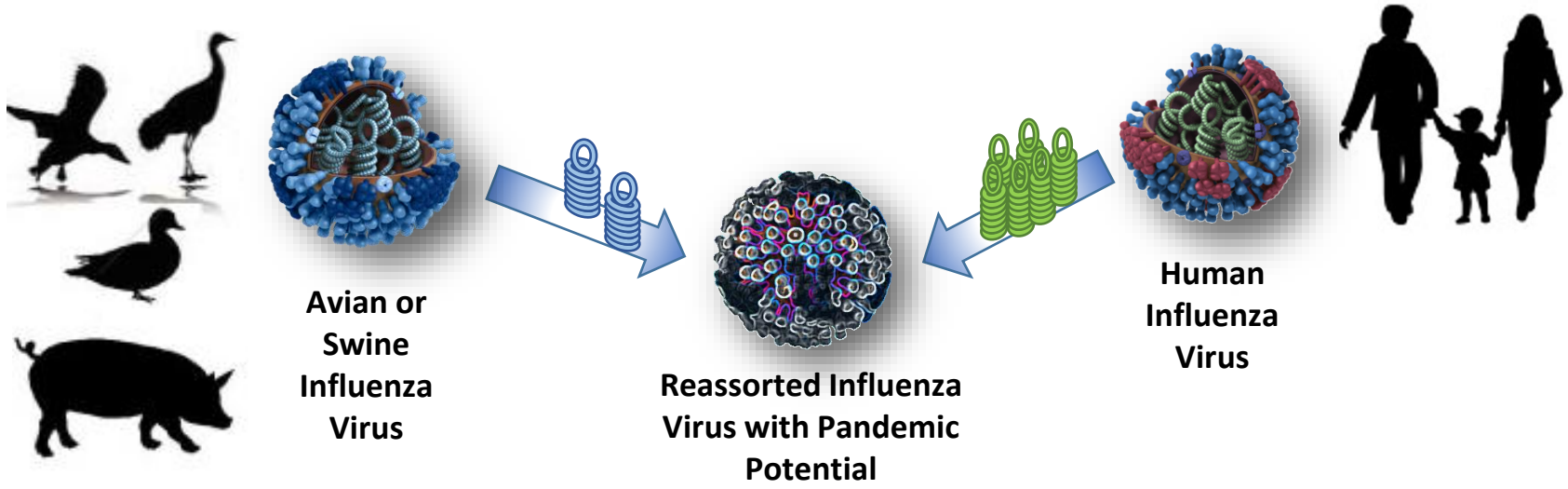


Diseases, 2004; Institute of Medicine,
Emerging Infections, 1992; Jernigan, Cox. Textbook of Influenza. 2013

Influenza A Viruses

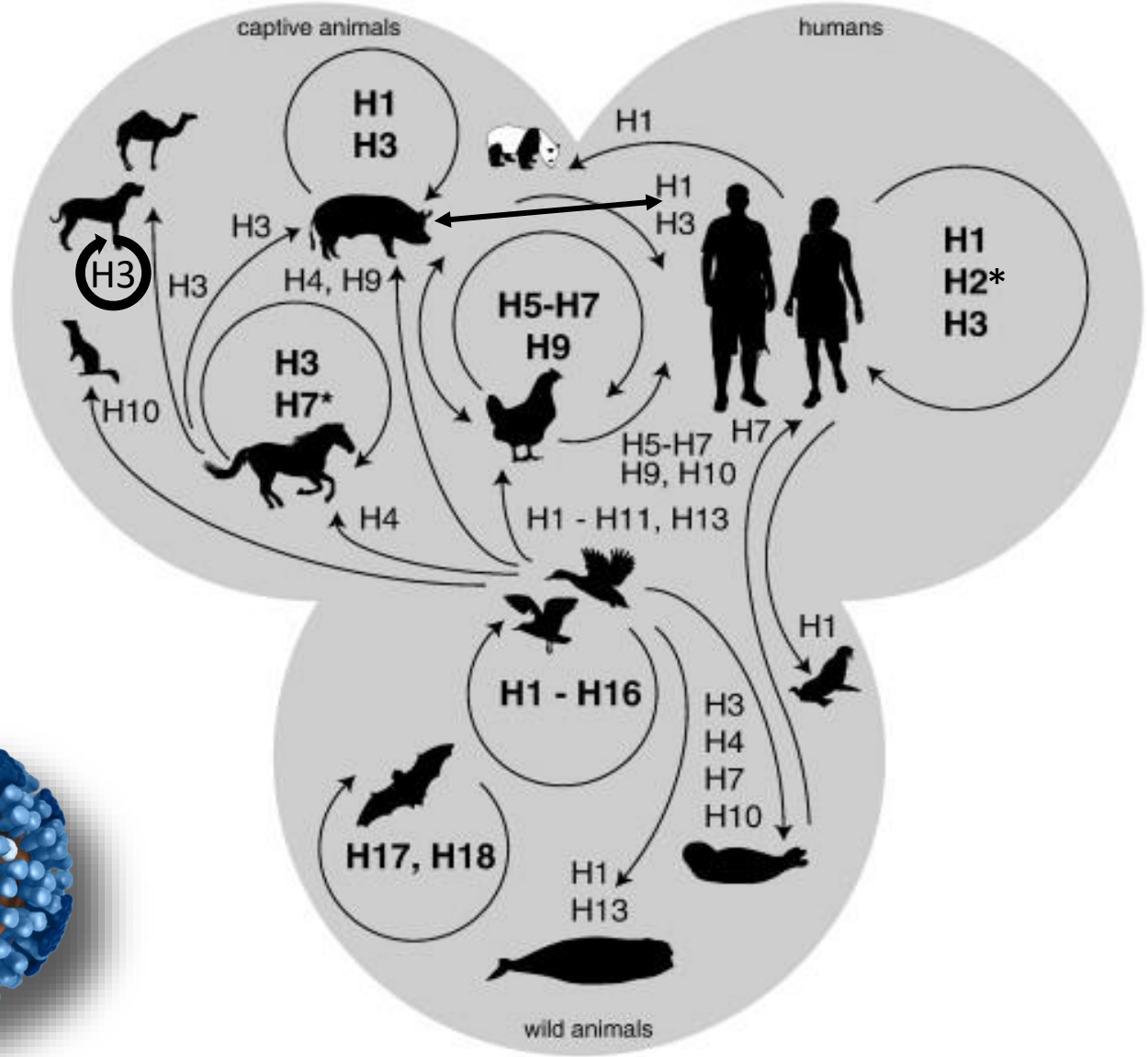


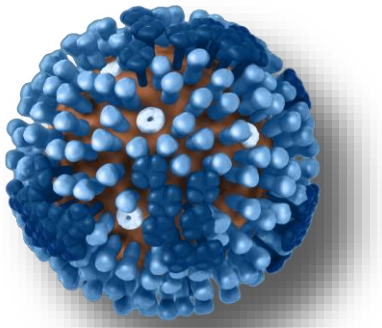
Shift: Reassortment of Influenza Viruses



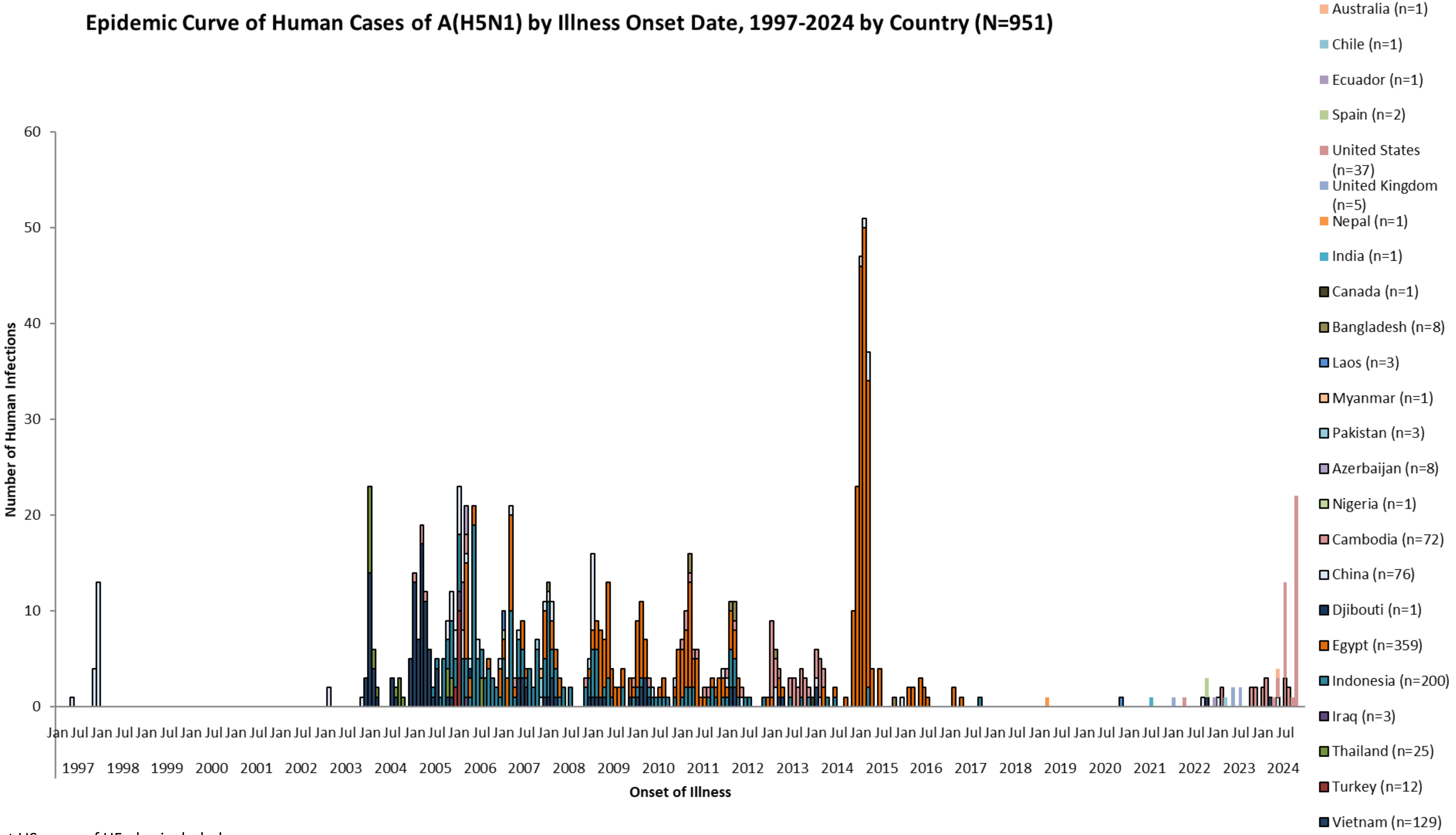
- Human-adapted viruses can arise from reassortment to cause efficient and sustained transmission
- Four influenza pandemics in last 100 years
- All have had genes from either avian or swine origin

Influenza A Virus Reservoirs and Inter-species (Zoonotic) Transmission





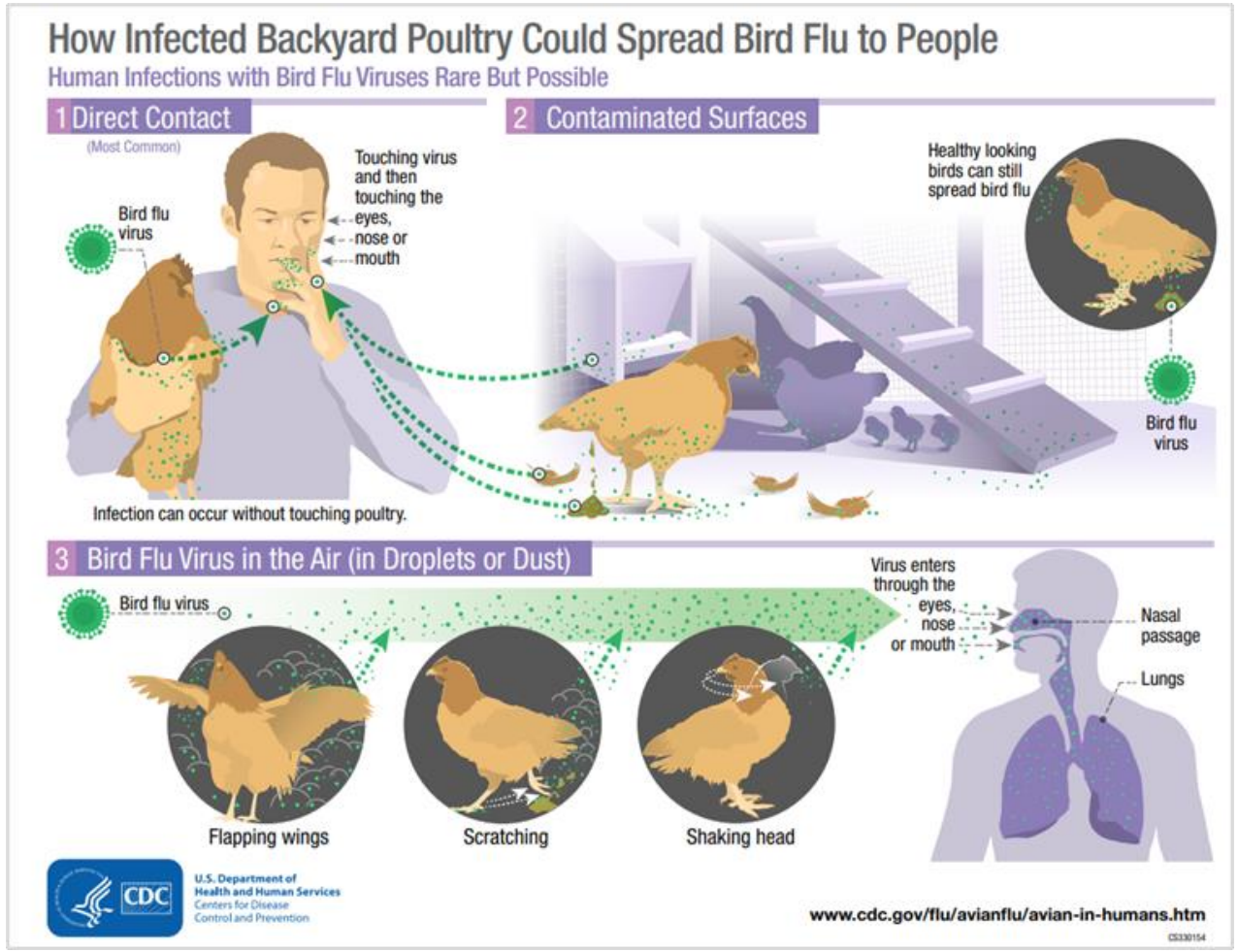
Source (modified): https://www.sciencedirect.com/science/article/pii/S2352771415000026?via%3Dihub



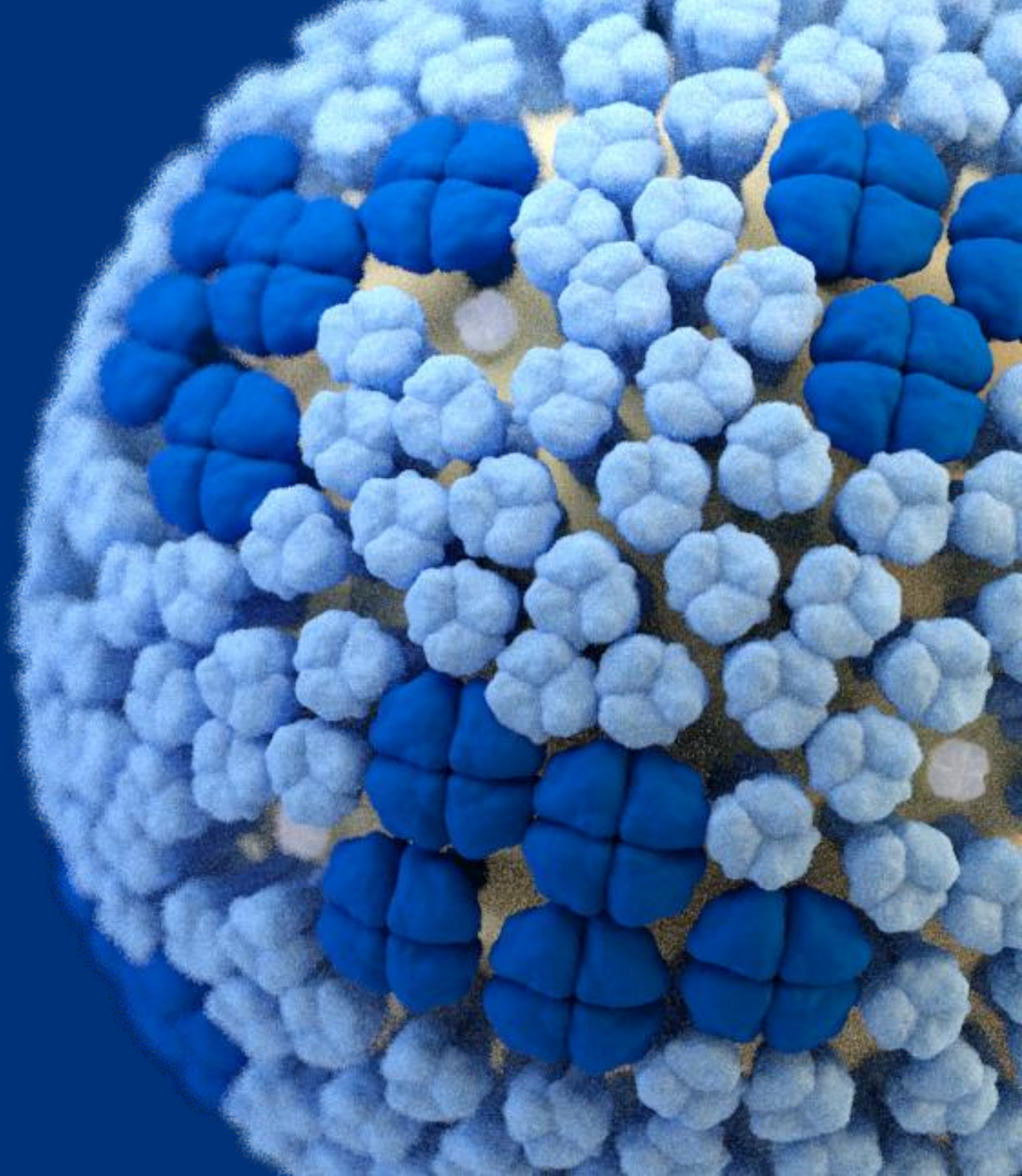
*Recent US cases of H5 also included

Human Exposures to HPAI A(H5N1) Viruses

- Historically, human infections have been the result of:
  - **Poultry exposures**
    - **Direct/close contact with sick/dead poultry**
    - Visiting a live poultry market
  - **Exposure to other infected animals**
    - **Direct contact or close exposure (swans, dairy cows)**
  - Limited, non-sustained human-to-human transmission has occurred globally in the past (not in U.S.)



Current Situation



H5N1 Case in Texas

- Patient age >18 years
- Working at a commercial dairy farm
- Developed conjunctivitis on approximately March 27, 2024
  - —No other symptoms reported
  - —Not hospitalized
  - —Isolation recommended
  - —Provided antiviral treatment and recovered
- No illness reported in household contacts
  - —Provided with influenza antiviral post-exposure prophylaxis
- No additional cases of human infection
- No human-to-human transmission

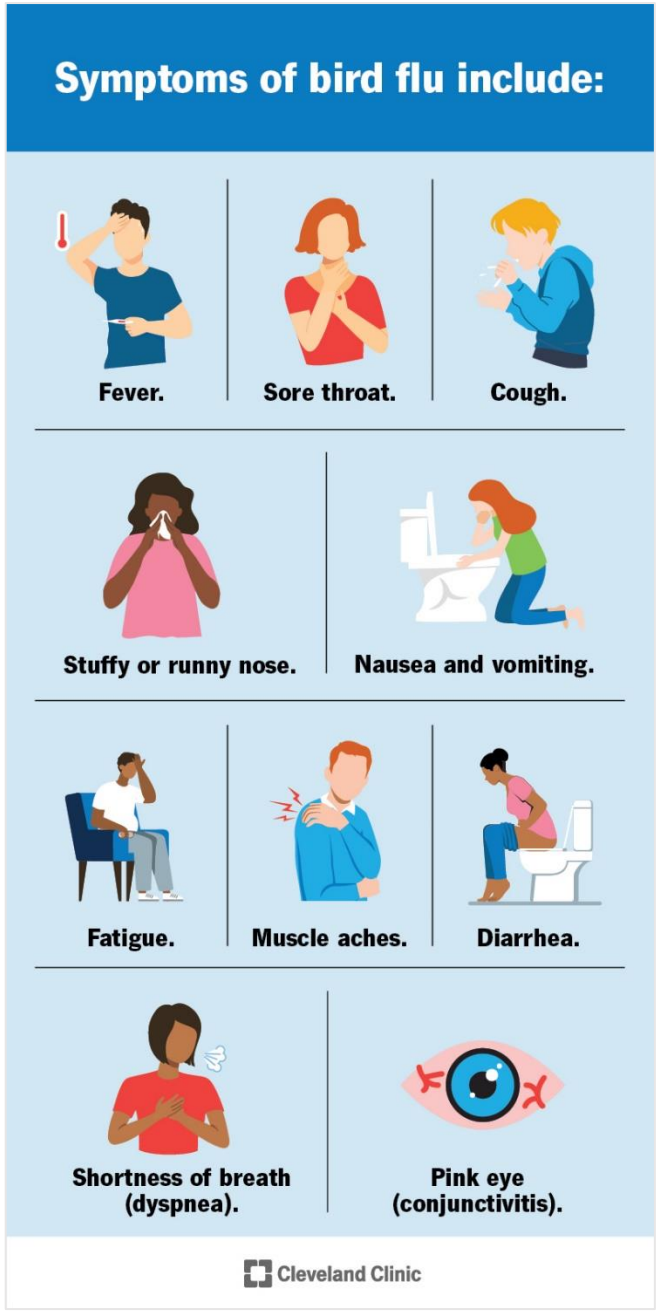
Health Alert: First Case of Novel Influenza A (H5N1) in Texas, March 2024 | Texas DSHS

CDC's Priorities

- Protecting public health and safety
- Supporting and engaging public health, agricultural, and other One Health partners
- Assessing HPAI A(H5N1) viruses for genetic changes and conducting comparative analysis of human and animal sequences
- Understanding risk to people from highly pathogenic avian influenza (HPAI) A(H5N1) viruses

Symptom Monitoring

- All people with direct or close exposure to infected animals **should be monitored for illness during exposure and for 10 days after their last exposure.**
- Signs/symptoms may include:
  - feeling feverish, cough, sore throat, runny or stuffy nose, muscle or body aches, headaches, fatigue, **eye redness (or conjunctivitis)**, shortness of breath or difficulty breathing
  - less commonly, diarrhea, nausea, vomiting, or seizures
- If signs/symptoms develop in person with relevant exposure, recommend they seek medical care and testing and isolate
- State and local health departments are monitoring workers on impacted farms and **can facilitate testing and treatment**

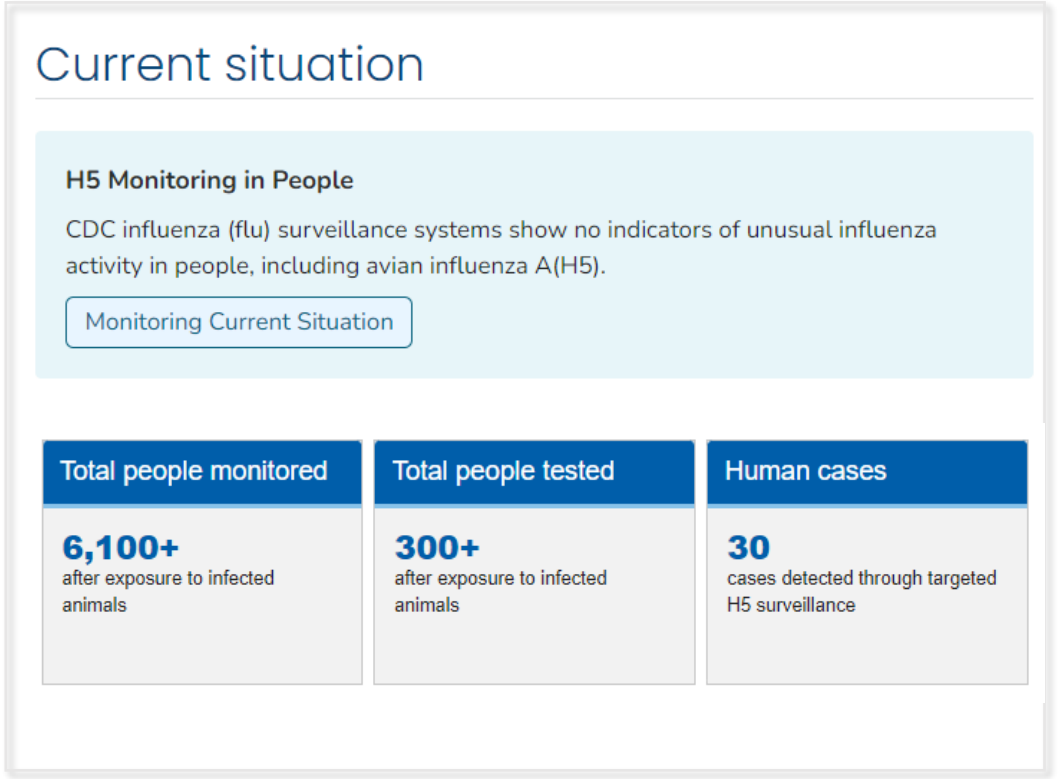


https://my.clevelandclinic.org/health/diseases/22401-bird-flu

Ongoing Human Monitoring

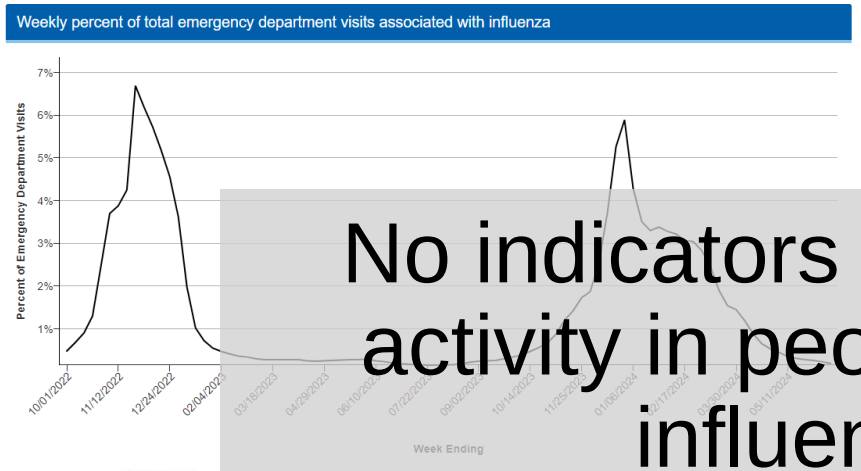
- CDC is continuing to support state and local health departments monitoring exposed people during and for 10 days after last exposure

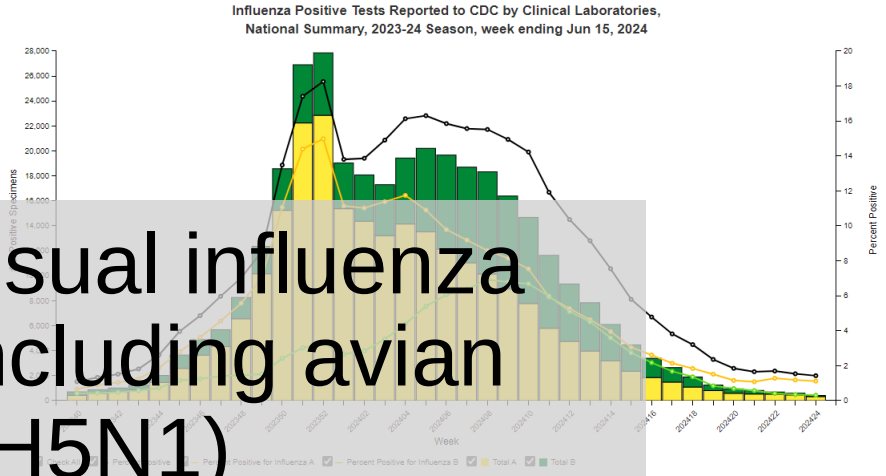
- **Since March 24, 2024** there have been:
  - At least 6,100 **people monitored**
    - 3,350 with exposures to dairy cows
    - 2,800 with exposures to birds, including poultry and other animals (non-dairy cow source)
  - At least 300 persons **tested for novel influenza A**
    - 103 with exposures to dairy cows
    - 200 with exposures to birds and other animals including poultry (non-dairy cow source)



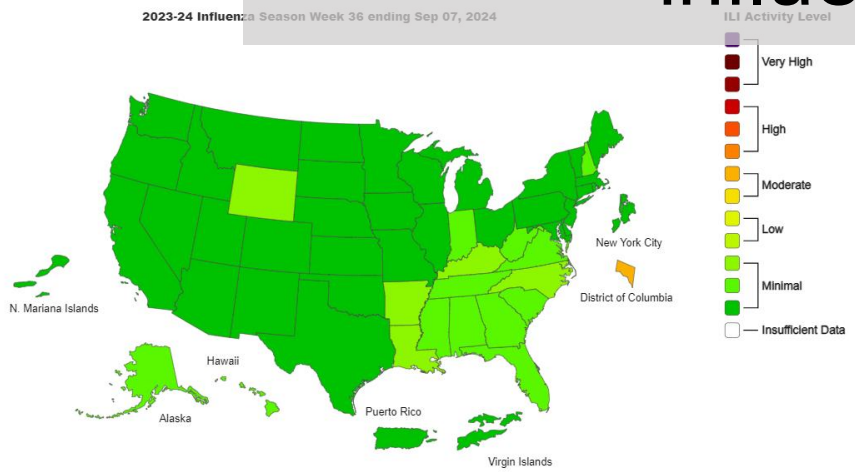
Surveillance, Human Monitoring, and Testing

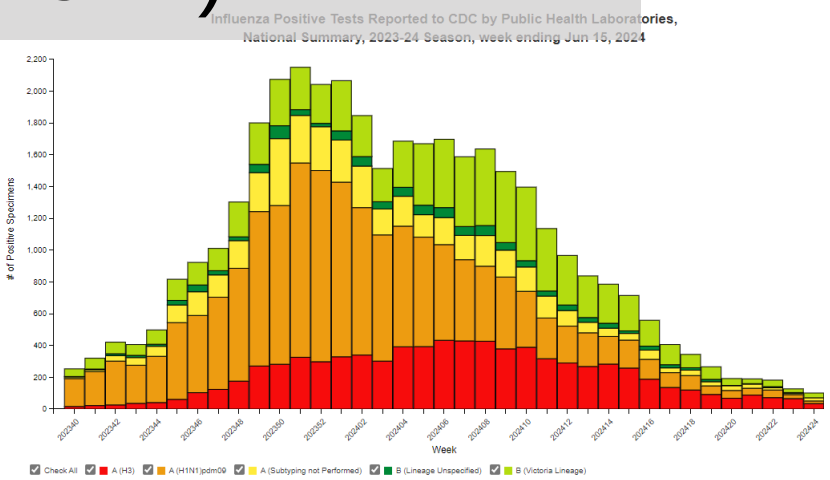
- Since February 2024, public health laboratory monitoring includes testing of more than **55,000+ specimens** using a protocol that would have detected H5





No indicators of unusual influenza activity in people, including avian influenza A(H5N1)





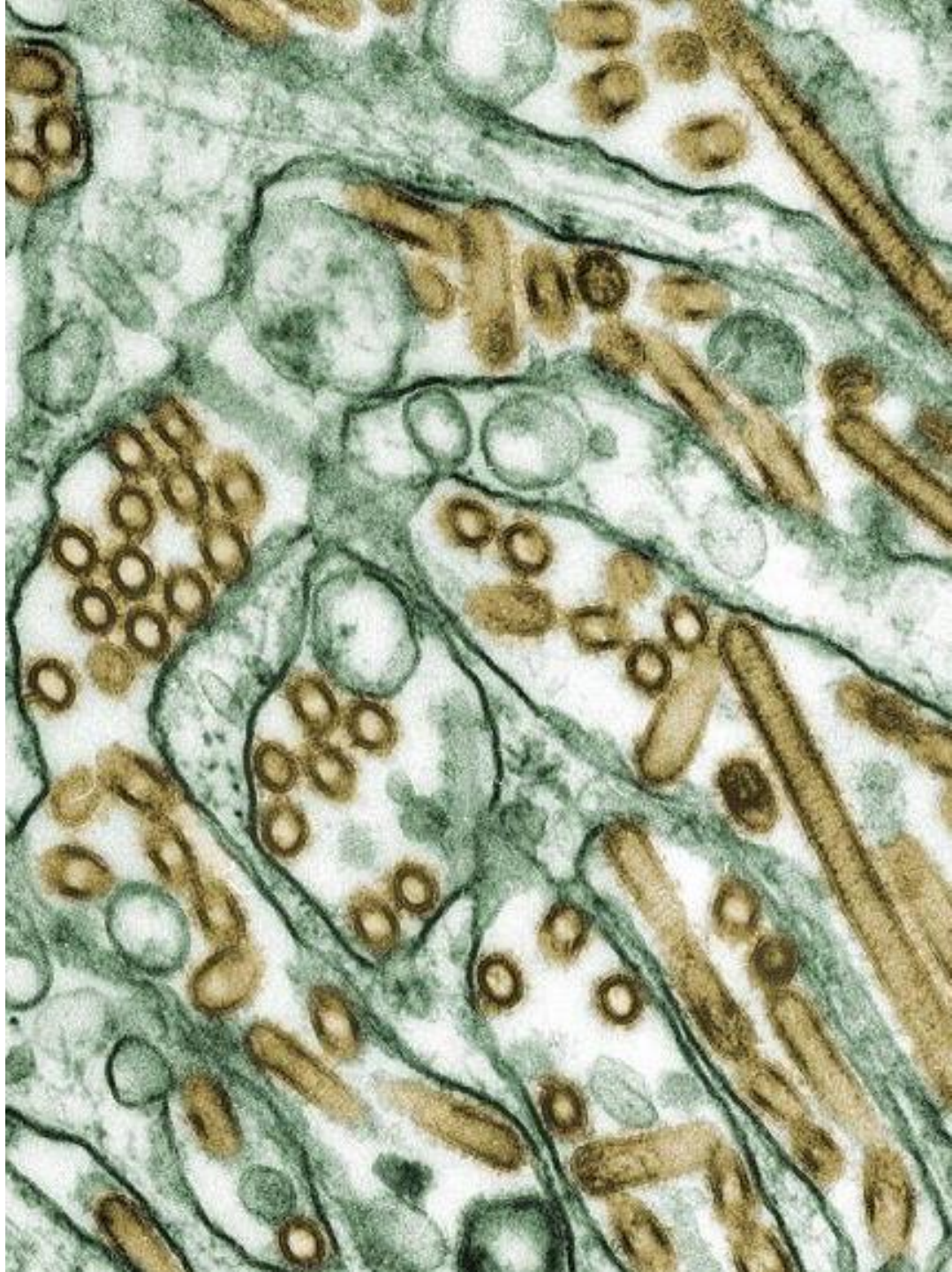
[How CDC is monitoring influenza data among people to better understand the current avian influenza A (H5N1) situation | Bird Flu | CDC](), [Weekly U.S. Influenza Surveillance Report | CDC]()

2024 HPAI A(H5) Human Cases, United States

- **2024 Human Cases =** 36
  - **Associated with dairy cattle exposures: 20**
    - March - July 2024: 4 cases in dairy farm workers (Texas, Michigan (2), Colorado) with exposure to infected or presumed infected dairy cattle
    - October 2024: 16 cases in dairy farm workers (California) with occupational exposure
    - All cases were clinically mild, offered antivirals, not hospitalized
  - **Associated with poultry exposures: 15**
    - July 2024: 9 cases in workers depopulating poultry (Colorado)
    - October 2024: 6 cases in workers depopulating poultry (Washington state)
    - All cases were clinically mild, offered antivirals, not hospitalized
  - **Missouri Case: 1**
    - September 2024: Patient hospitalized, had underlying medical conditions, given antivirals, discharged and recovered
    - No immediate known animal exposure
  - **No human-to-human transmission**

MO Serology Results

- MO state and local officials performed **retrospective investigation** of everyone who came into close contact with the patient
  - 7 contacts identified for additional investigation
  - 6 contacts tested (5 health care workers and 1 household member)
- **All tested health care workers were seronegative**
  - **D**id **NOT** have any serologic evidence of past infection with H5N1 bird flu
- Testing results from the MO case patient and household contact were similar
  - Both **showed evidence of an antibody immune response** to H5 in only one assay
- Similar immunologic results coupled with the epidemiologic data support **a single common exposure to bird flu rather than person-to-person spread within the household**
- Epidemiologic investigation has **not** identified an animal or animal product exposure



H5N1 Virus Sequence-Assessing Virus Genetic Changes

- *Diagnostics:* No impact to current CDC influenza diagnostic assay's ability to detect A(H5N1) viruses
- *Treatments*: No known markers of resistance to FDA approved antiviral drugs (PA inhibitor: baloxavir; NA inhibitors: oseltamivir, peramivir, and zanamivir; M2 inhibitors: amantadine and rimantadine)
- Candidate Vaccine Viruses (CVVs)
  - HA of human influenza virus very closely related to two available CVVs
  - CVVs expected to provide good protection against this virus

Seroprevalence Studies

- CDC is collaborating with two state health departments and one NGO on H5N1 seroprevalence studies

- Michigan
  - Negative results from first round of data collection last month
  - Additional results to be reported out soon

- Colorado has completed enrollment in their study, and CDC is testing specimens in our lab

- CDC and Ohio Department of Health completed enrollment of a serosurvey with bovine practitioners; CDC is testing specimens in our lab

Ferret Animal Model Studies

Studies to assess severity and transmission:

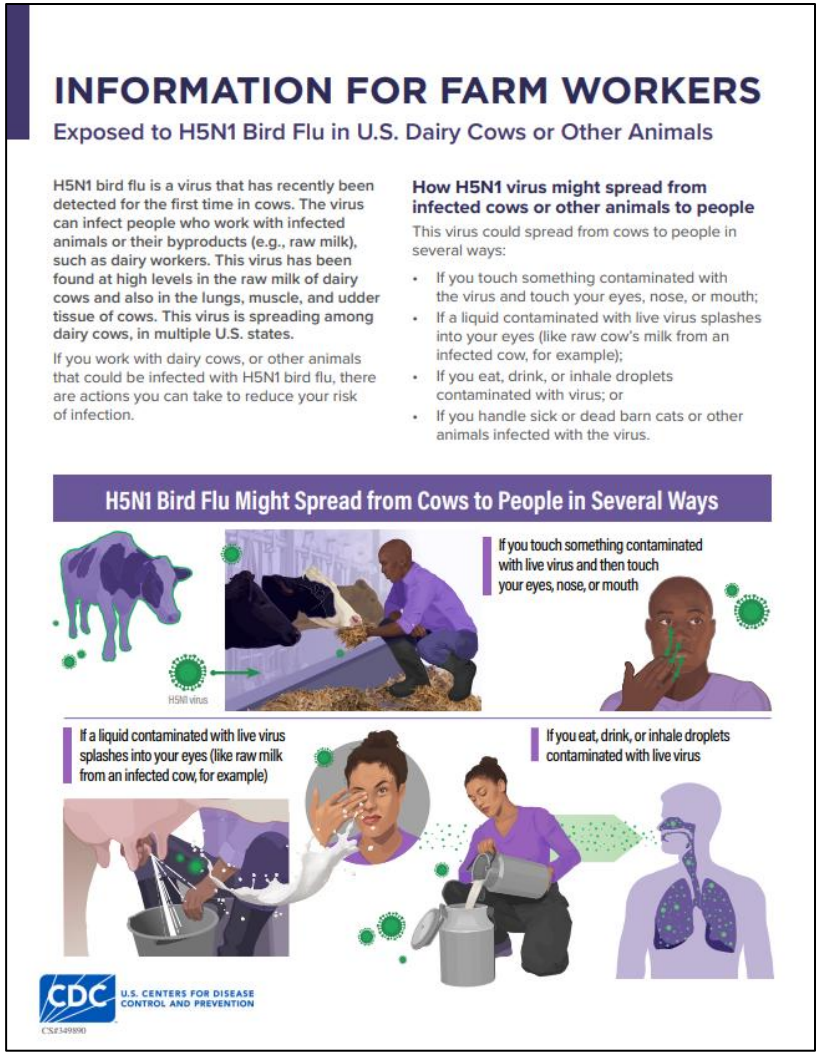
- A/Texas/37/2024 HPAI A(H5N1)
  - caused severe illness in ferrets
  - lethal in 100% of ferrets
  - efficient spread via direct contact
  - less-than-efficient spread via respiratory droplets
- A/Michigan/90/2024 HPAI A(H5N1)
  - caused less severe disease in ferrets
  - not lethal in any ferret
  - efficient spread via direct contact
  - less-than-efficient spread via respiratory droplets

Study to assess ocular exposure:

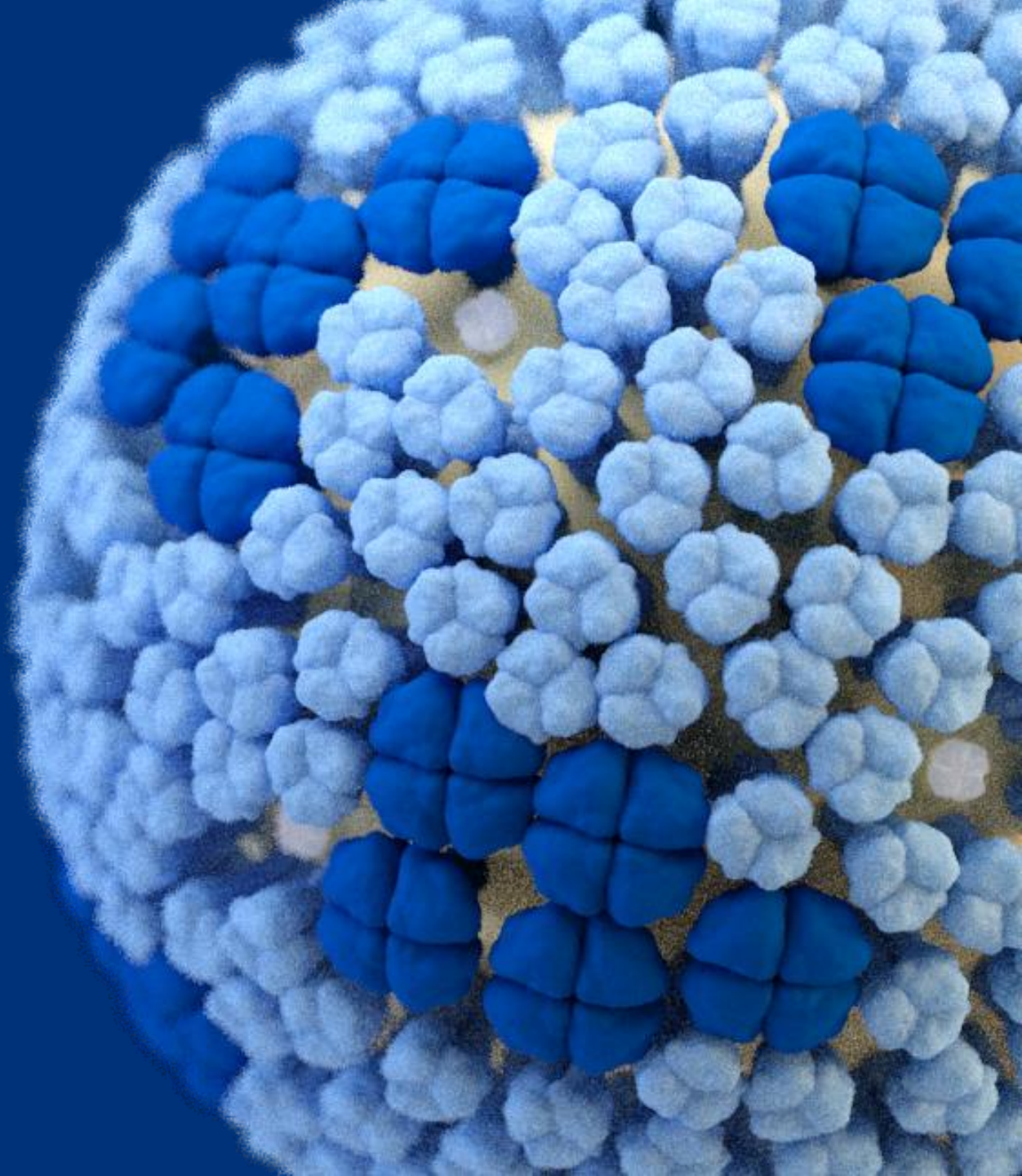
- Ferrets were experimentally exposed to A/Chile/25945/2023 HPAI A(H5N1) via ocular route
  - caused severe disease with fever and weight loss
  - nasal specimens contained detectable virus
  - virus was found outside of the respiratory tract: intestinal tract, central nervous system, eyes
  - able to spread virus to healthy ferrets via direct contact

Targeted Outreach to Farmworkers

- CDC continues to support outreach to farm workers around the topic of H5N1 bird flu
  - Social media outreach on Meta (Facebook and Instagram) and digital display and audio (Pandora)
  - Local radio station advertisements
  - Collection of H5N1 Informational videos
  - More than 42.7 million total impressions across social and digital media
- **Investments to protect the health of farmworkers**
  - Seasonal Flu Vaccination Initiative
  - Pilot program with pharmacy networks to provide free testing of symptomatic persons



HPAI A(H5N1): Worker Protection Update



Who is at Risk

Working with animals or materials, including raw milk, infected or contaminated with novel Influenza A virus increases people's risk for illness, examples of workers at risk include:

- Poultry and dairy and other livestock farmers and workers
- Backyard bird flock owners
- Veterinarians and veterinary staff
- Animal health responders
- Public health responders
- Dairy laboratory workers
- Food processing workers handling raw milk and other confirmed or potentially contaminated materials
- Slaughterhouse workers performing certain tasks on lactating dairy cattle

Personal Protective Equipment (PPE)

When working with animals, products, or materials that are or may be infected or contaminated with novel influenza A virus, wear the following PPE*:

- NIOSH Approved® particulate respirator
- Fluid-resistant coveralls
- Optional waterproof apron over the top of coveralls
- Safety goggles
- Optional face shield over the top of goggles
- Boot covers or boots
- Head cover or hair cover
- Disposable gloves with optional outer work gloves

* Detailed specifications for these PPE items can be found in full guidance on website

Things to Consider When Using PPE

- Certain circumstances can increase the risk of heat-related illnesses and injuries, including
  - Wearing PPE and certain clothing ensembles
  - Increased temperature and humidity
  - Increased physical activity
- Fogging of goggles can affect vision
  - Encourage workers to pay attention to hazards like animal movement; clothes snagging; cuts or punctures; and slips, trips, and falls
- Prohibiting storage of food and personal items in potentially contaminated areas, including where PPE is put on and removed can prevent cross contamination

Learn more about PPE and heat-related illness

PPE Infographics

PROTECT YOURSELF FROM H5N1 BIRD FLU

Wear personal protective equipment

H5N1 bird flu is a virus that could make you sick if you breathe it in or if it gets in your eyes, nose, or mouth. You can also get sick if you touch your eyes, nose, or mouth after touching contaminated surfaces, clothing, skin, or hair. Wear personal protective equipment (PPE) when in contact with or around animals confirmed or potentially infected, including dairy cows, or confirmed or potentially contaminated raw milk, surfaces, or other items. You may need more PPE than what you use for your normal duties. Your employer should provide the recommended PPE at no cost. **Ask your supervisor if you have questions about what type of PPE to wear or when or how to use it.**

RECOMMENDED PPE TO PROTECT AGAINST H5N1 BIRD FLU

- Head cover or hair cover
- Safety goggles
- Optional face shield over the top of goggles
- NIOSH Approved® particulate respirator (such as an N95®)
- Coveralls that keep you dry
- Optional waterproof apron over the top of coveralls
- Disposable gloves with optional outer work gloves
- Boot covers or boots

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

CS#351866

SCAN TO LEARN MORE →

PROTECT YOURSELF FROM H5N1 BIRD FLU

Put on personal protective equipment safely

What to know before you put on personal protective equipment (PPE)

- Leave clean personal clothing and items, food, and drinks in clean areas provided by your employer
- Follow directions from your employer for entering and leaving the worksite
- Use separate designated areas to put on clean PPE and remove dirty PPE
- Wash your hands for 20 seconds with soap and water or, if not available, use an alcohol-based hand sanitizer

After you wash your hands, put on PPE in a clean area in this order:

1. Coveralls that keep you dry
2. Boot covers or boots
3. Waterproof apron, if needed
4. NIOSH Approved® particulate respirator
5. Safety goggles
6. Head cover or hair cover
7. Face shield, if needed
8. Hard hat, if needed
9. Disposable gloves
10. Outer work gloves, if needed

Remove PPE before entering any clean areas including restrooms, breakrooms, and administrative areas

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

SCAN TO LEARN MORE →

PROTECT YOURSELF FROM H5N1 BIRD FLU

Remove personal protective equipment safely

What to know before you remove personal protective equipment (PPE)

- Remove PPE before entering any clean areas including restrooms, breakrooms, and administrative areas
- Set aside reusable PPE for cleaning and disinfection and throw away disposable PPE according to your employer's guidance

Remove PPE in this order:

1. Remove outer work gloves, if worn
2. Lightly rinse outer clothing (boot covers or boots and apron)
3. Remove hard hat, if worn
4. Remove waterproof apron, if worn
5. Remove boot covers or boots
6. Remove coveralls
7. Remove face shield, if worn
8. Remove head cover or hair cover
9. Remove goggles
10. Remove respirator
11. Remove disposable gloves
12. Wash your hands again for 20 seconds with soap and water or, if soap and water are not available, use an alcohol-based hand sanitizer

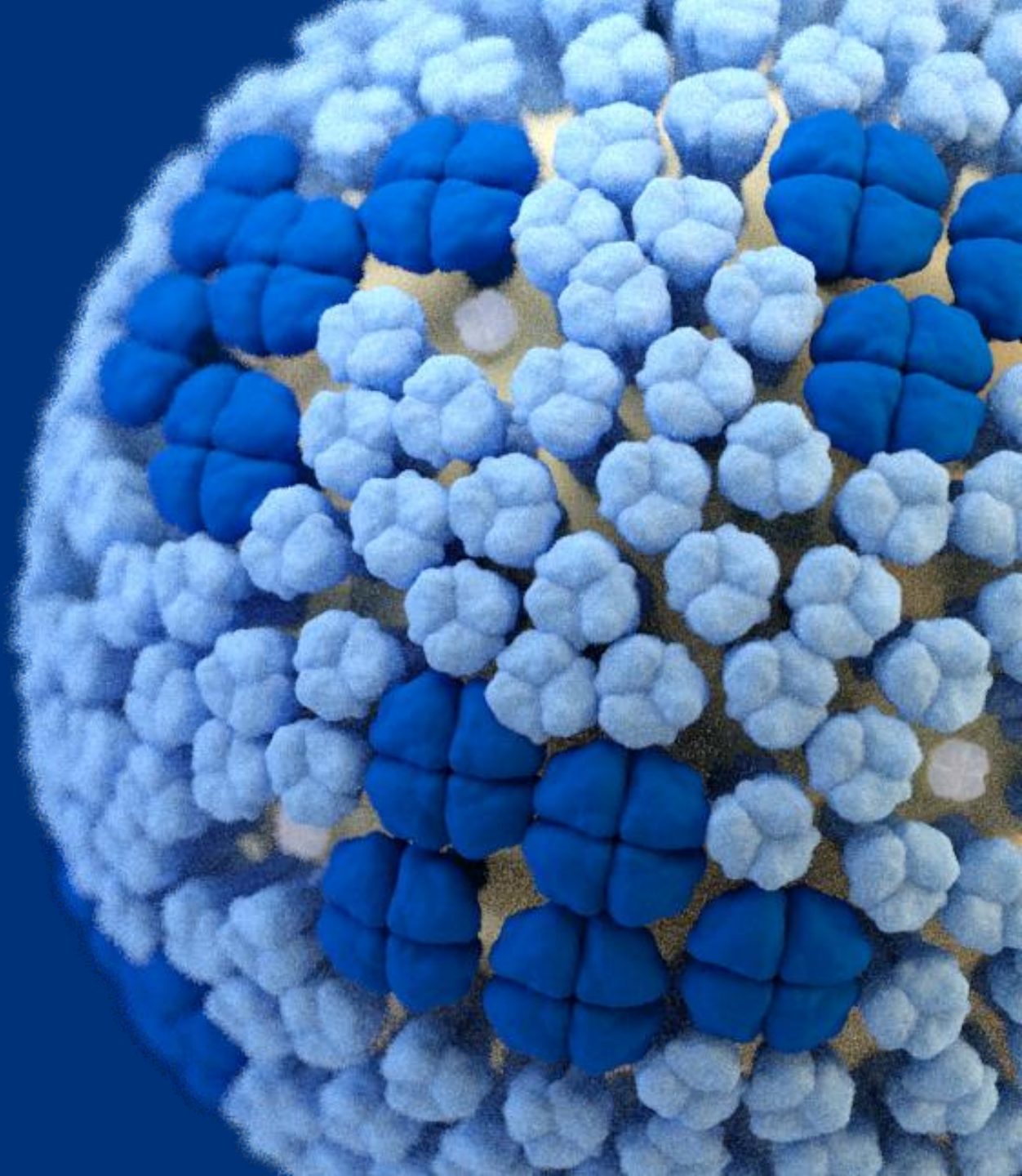
After removing PPE:

- Do not use reusable PPE until it has been properly cleaned and disinfected
- Clean and disinfect reusable PPE based on guidance from your employer
- If possible, shower at work after your shift and put on clean clothing. If there are no showers at work, clean up as much as possible, put on clean clothing, and go straight from work to shower.
- Leave all contaminated clothing and equipment at work to be cleaned

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

SCAN TO LEARN MORE →

Unpasteurized (Raw) Milk and HPAI



CDC Recommendations on Raw Milk

- A(H5N1) virus has been detected in raw cow milk of infected cows.
- Pasteurization kills A(H5N1) viruses and pasteurized milk is safe to drink.
- People should not drink raw milk or consume products made from raw milk.
- CDC recommends against consuming raw milk contaminated with live A(H5N1) virus to develop antibodies against A(H5N1) virus to protect against future disease.

https://www.cdc.gov/food-safety/foods/raw-milk.html

Influencing Behavior – Raw Milk Consumption

- Social media has played a role in popularity of raw milk consumption
  - Misinformation regarding H5 immunity and other perceived health benefits
- How can we impact the “moveable middle”?

Why Is Social Media Telling Us It’s OK to Drink Raw Milk?

tout the health benefits of unpasteurized milk, but this drink can be dangerous.

Influencers promote raw milk despite FDA health warnings as bird flu spreads in dairy cows

By **Laura Doan**
Updated on: May 15, 2024 / 10:00 AM EDT / CBS News

Seriously, don't drink the raw milk: Social media doubles down despite bird flu outbreak

Mary Walrath-Holdridge
USA TODAY

State laws resulting in increased availability of raw milk linked to more outbreaks and illnesses

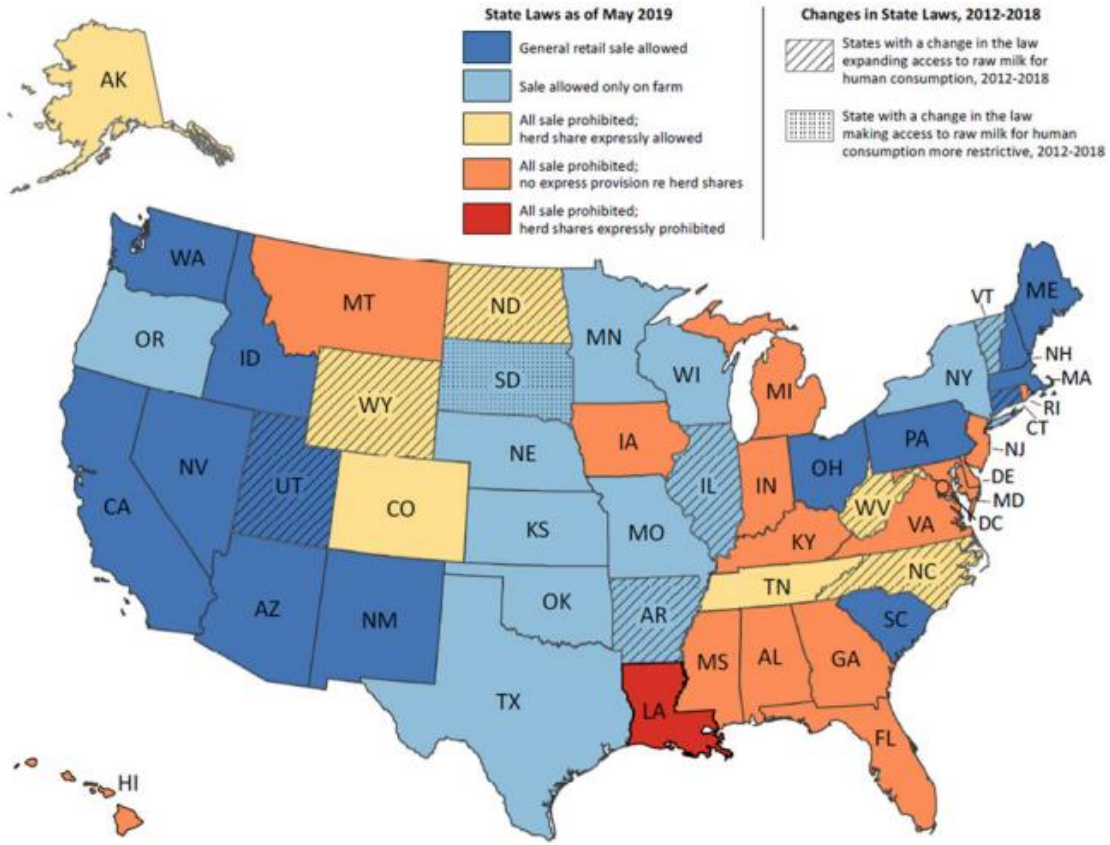


Fig. 3. Laws related to the sale of unpasteurised milk as of May 2019 and changes to laws 2012–2018 – United States. Provisions reviewed to generate this map are referenced in Table 4.

Epidemiology and Infection

cambridge.org/hyg

Original Paper

Cite this article: Koski L *et al* (2022). Foodborne illness outbreaks linked to unpasteurised milk and relationship to changes in state laws – United States, 1998–2018. *Epidemiology and Infection* **150**, e183, 1–13. https://doi.org/10.1017/S0950268822001649

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Foodborne illness outbreaks linked to unpasteurised milk and relationship to changes in state laws – United States, 1998–2018

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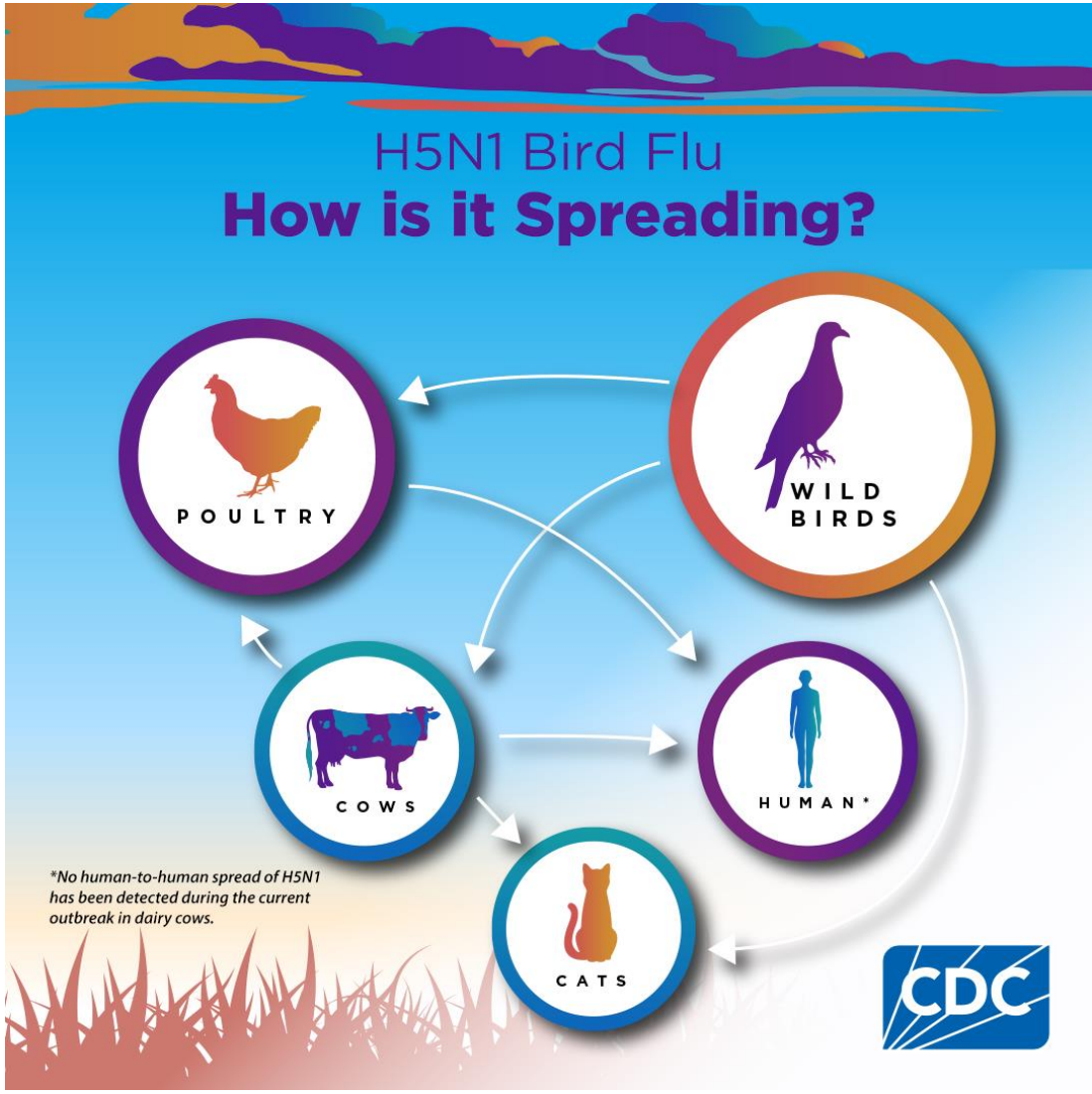
Abstract

Consumption of unpasteurised milk in the United States has presented a public health challenge for decades because of the increased risk of pathogen transmission causing illness outbreaks. We analysed Foodborne Disease Outbreak Surveillance System data to characterise unpasteurised milk outbreaks. Using Poisson and negative binomial regression, we compared the number of outbreaks and outbreak-associated illnesses between jurisdictions grouped by legal status of unpasteurised milk sale based on a May 2019 survey of state laws. During 2013–2018, 75 outbreaks with 675 illnesses occurred that were linked to unpasteurised milk; of these, 325 illnesses (48%) were among people aged 0–19 years. Of 74 single-state outbreaks, 58 (78%) occurred in states where the sale of unpasteurised milk was expressly allowed. Compared with jurisdictions where retail sales were prohibited ($n = 24$), those where sales were expressly allowed ($n = 27$) were estimated to have 3.2 (95% CI 1.4–7.6) times greater number of outbreaks; of these, jurisdictions where sale was allowed in retail stores ($n = 14$) had 3.6 (95% CI 1.3–9.6) times greater number of outbreaks compared with those where sale was allowed on-farm only ($n = 13$). This study supports findings of previously published reports indicating that state laws resulting in increased availability of unpasteurised milk are associated with more outbreak-associated illnesses and outbreaks.

Public Health Risk

- Overall risk to the public remains **low**
- Increased risk with exposure to infected animals or environment – occupational, recreational



Highly Pathogenic Avian Influenza A(H5N1) Virus in Animals: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations | Avian Influenza (Flu) (cdc.gov)

CDC Response Resources

Situation Updates

- H5 Bird Flu: Current Situation

Surveillance Updates

- How CDC is monitoring influenza data among people to better understand the current avian influenza A (H5N1) situation

Communication Tools

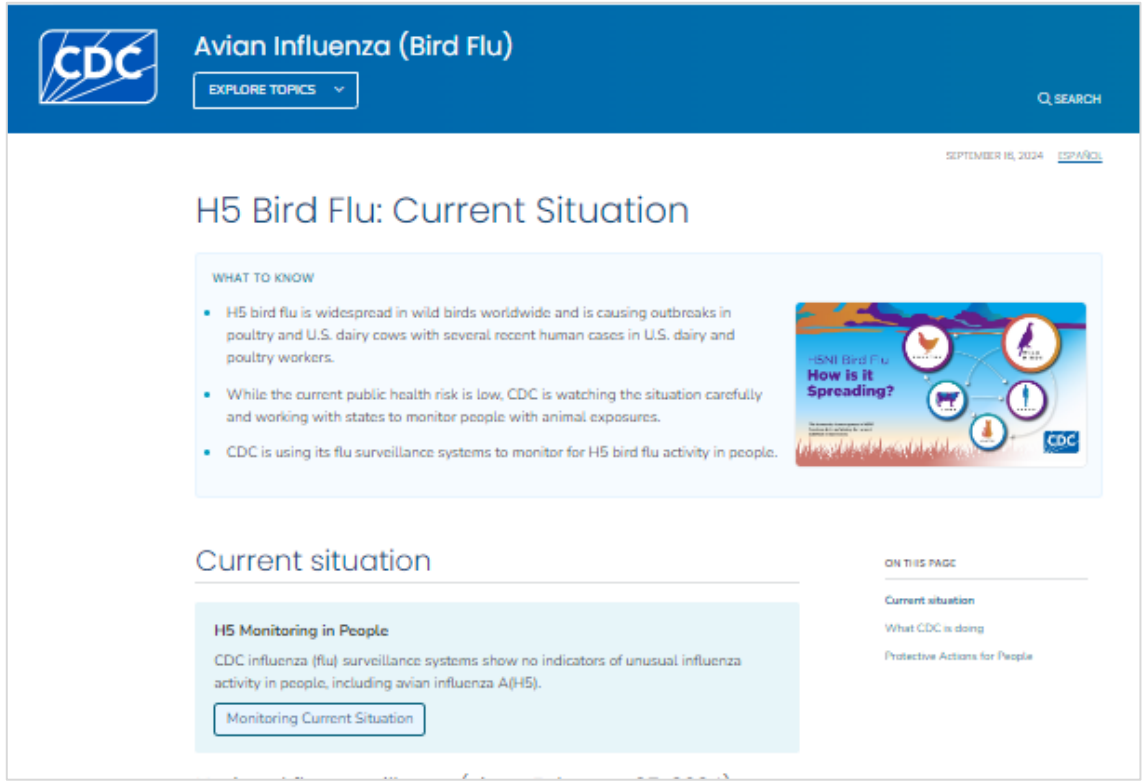
- Avian Influenza Social Media Toolkit
- H5N1 Informational Videos

Resource Index

- Bird Flu | Bird Flu | CDC

Updated Recommendations

- Interim Guidance for Employers to Reduce the Risk of Novel Influenza A for People Working with or Exposed to Animals | Bird Flu | CDC
- Information for Workers Exposed to H5N1 Bird Flu | Bird Flu | CDC



https://www.cdc.gov/bird-flu/situation-summary/index.html

Thank you