Highly Pathogenic Avian Influenza A (H5N1)

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Influenza Virus Overview

- Endemic in 7 animal species/groups
  - Birds: wild aquatic birds and domestic poultry
  - Livestock: swine, horses
  - Dogs
  - Bats
  - Humans

- Two categories of avian influenza viruses based on their impact in birds
  - Low pathogenicity (LPAI) - no disease or mild illness
  - Highly pathogenic (HPAI) – severe disease or fatal

- Viruses that circulate in humans are different from those in animals.

- Animal viruses can sometimes infect people.

- Pandemics can start when a strain jumps into a human from an animal, causes illness and transmits efficiently from person to person.

In 1996, HPAI H5N1 virus first identified in domestic waterfowl in Southern China. Virus is named A/goose/Guangdong/1/1996.

In 1997, poultry outbreaks detected in China and Hong Kong; 18 human cases (6 fatal) identified.

The original H5N1 virus caused over 860 reported human infections with over 50% mortality.

Emergence and Evolution of H5N1 Bird Flu

1996-1997
H5N1 bird flu virus first detected
In 1996, HPAI H5N1 virus first identified in domestic waterfowl in Southern China. Virus is named A/goose/Guangdong/1/1996.
In 1997, poultry outbreaks detected in China and Hong Kong; 18 human cases (6 fatal) identified.
The original H5N1 virus caused over 860 reported human infections with over 50% mortality.

2003-2005
H5N1 spreads to Africa, the Middle East and Europe
H5N1 re-emerges in 2003 resulting in widespread poultry outbreaks across Asia.
In 2005, wild birds spread H5N1 to poultry in Africa, the Middle East and Europe.
HA gene diversifies into many genetic groups called clades.
Multiple genetic lineages (genotypes) are detected across the Eastern hemisphere.

2003-2005

2014-2016
H5N6 and H5N8 viruses emerge
Reassortment (gene-swapping) of H5 viruses from poultry and wild bird leads to emergence and detection of H5N6 and H5N8 virus subtypes.
HA diversifies further into clade 2.3.4.4 in Asia, Africa, Europe, the Middle East and North America.
HS viruses with various NA genes continue to be detected, including in U.S. wild birds and poultry.

2018-2020
Clade 2.3.4.4b viruses spread widely
H5N6 and H5N8 viruses become the predominant subtypes detected globally replacing majority of original H5N1 virus.
As of 2022, these subtypes have resulted in 7 confirmed human cases of A(H5N8) and more than 70 A(H5N6) cases.
HA diversifies further into clade 2.3.4.4b and it becomes the predominant clade circulating in Asia, Africa, Europe, and the Middle East.

2021-2022
H5N1 Identified in Canada, United States
Reassortment leads to emergence of new H5N1 virus belonging to clade 2.3.4.4b with a wild bird adapted N1 NA gene.
Clade 2.3.4.4b H5N1 viruses become the predominant subtype in Asia, Africa, Europe, and the Middle East by the end of 2021.
The virus is detected in Canada and U.S. wild birds in late 2021. In February 2022, the virus begins causing outbreaks in U.S. commercial and backyard poultry.
Human H5N1 Cases Since 1997

More than 900 sporadic human infections reported from 23 countries.
Recent Human Influenza A (H5N1) Worldwide

• 2023
  • Cambodia 6 cases (Clade 2.3.2.1c)
  • Chile 1 case (Clade 2.3.4.4b)
  • China 1 case (Clade 2.3.4.4b)
  • United Kingdom 4 cases (Clade 2.3.4.4b) all asymptomatic

• 2024
  • Cambodia 5 cases (Clade 2.3.2.1c)
  • Vietnam 1 cases (Clade 2.3.2.1c)
  • Australia 1 case (Clade 2.3.2.1a) travel history to India
Overview of Situation: Avian Impact United States

- 9,499 wild bird detections in 49 states

- Domestic bird outbreaks since 2022: 96.94 million birds across 1,152 flocks in 48 states
  - 497 commercial
  - 655 backyard

HPAI H5 Outbreaks (commercial and backyard flocks) by month, 2022-2024, US
HPAI H5 in Mammals United States, 2022-2024

H5N1 Situation Update – Dairy Herds

• Early 2024
  • Dairy cow illness began
  • Significant decreases in milk production and quality

• March 25
  • USDA reported HPAI confirmed in cows from TX and KS

• As of 6/17/24
  • USDA confirmed HPAI in dairy herds in 101 farms across 12 states
CDC’s Priorities

• Supporting and engaging public health and agricultural partners
• Protecting human health and safety
• Understanding risk to people from H5N1 viruses
• Assessing H5N1 viruses for genetic changes
CDC Role

- Part of USG interagency response with USDA, FDA, ASPR, and more
- Supporting state monitoring of exposed persons and testing
- Epidemiological field studies
- Providing updated recommendations
- Monitoring influenza activity
- Extensive partner outreach
- Conducting in-depth, ongoing risk assessments and virus characterization

Protect Yourself From H5N1 When Working With Farm Animals

H5N1 is a bird flu virus that could make you sick. Wear recommended personal protective equipment (PPE) when working directly or closely with sick or dead animals, animal feces, litter, raw milk, and other materials that might have the virus.

1. Fluid-resistant coveralls
2. Waterproof apron, if needed for job task
3. NIOSH Approved Respirator (e.g., N95 filtering facepiece respirator or elastomeric half mask respirator)
4. Properly-fitted unvented or indirectly vented safety goggles or face shield
5. Head cover or hair cover
6. Gloves
7. Boots

While wearing PPE:
- Use separate designated clean areas, one for putting on PPE and one for taking off PPE.
- Avoid touching your eyes, mouth, and nose after touching any contaminated material.
- Do not eat, drink, smoke, vape, chew gum, dip tobacco, or use the bathroom.

Follow these steps to safely remove PPE:
1. Remove the apron, if worn
2. Clean and disinfect boots
3. Remove boots
4. Remove coveralls
5. Remove gloves
6. Wash hands with soap and water or alcohol-based

After removing PPE:
- Shower at the end of the work shift.
- Leave all contaminated clothing and equipment at work.
- Watch for symptoms of illness while you are working with potentially sick animals or materials. Continue watching for symptoms for 10 days after finishing working. If you get sick, tell your supervisor and talk with a doctor.

Reusable and disposable PPE:
- While removing PPE, dispose of all disposable PPE appropriately and set aside reusable PPE.
- Clean and disinfect reusable PPE after every use.
Public Health Risk

• Overall risk to the public remains low
• Increased risk with exposure to infected animals or environment – occupational, recreational
• Exposed individuals should monitor for symptoms after first exposure and for 10 days after last exposure
Symptom Monitoring in Exposed Persons

CDC recommends that all persons exposed to HPAI-virus infected birds, cattle, or other animals be monitored for symptoms consistent with HPAI infection starting the first day of exposure and continuing until 10 days after the last exposure. Monitoring exposed individuals can help to rapidly identify human cases, provide appropriate treatment, prevent onward spread, and help understand the scope of human risk.

*CDC numbers are based on state reports and CDC defers to states for updated information on people being monitored and tested.

### February 2022 – Present

CDC and state and local health departments monitor people exposed to infected birds, poultry or other animals for 10 days after exposure. Between February 2022 and now, there have been:

- At least 9,800 people monitored and
- At least 350 people tested for novel influenza A

### Current HPAI in Cattle Outbreak (2024)

CDC and state and local health departments monitor people exposed to infected cattle for 10 days after exposure. Between March 2024 and now, there have been:

- At least 550 people monitored
- At least 45 persons tested for novel influenza A
- Three cases of avian influenza A(H5N1) identified
H5N1 Human Cases

- **April 1** – Texas announced first human infection of HPAI A(H5N1) virus
- **May 22** – Michigan announced second human infection
- **May 30** – Michigan announced third human infection

- Adults working at dairy farms and in contact with cows
- No human-to-human transmission
H5N1 Virus Sequence

• HPAI A/H5N1 clade 2.3.4.4.b
  • No changes indicative of ability to transmit for animal to animal or human to human

• 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

• Candidate Vaccine Viruses (CVVs)
  • HA of H5 specimen from human very closely related to two available CVVs
  • CVVs expected to provide good protection against this virus
Ferret Studies: H5 2.3.4.4b

• Intranasally infected ferrets - A/Texas/37/2024
  • Caused severe illness and death in all 6 infected ferrets
    • Different from seasonal influenza viruses that makes ferrets sick but isn’t lethal
  • Transmitted efficiently by direct contact (3 of 3 infected) but not efficiently by respiratory droplet (1 of 3 infected)
    • Different from seasonal viruses that infect 100% of ferrets via respiratory droplet

• Exposed via eyes – A/Chile/25945/2023
  • Caused severe disease
  • Detectable virus in the nose
  • Transmitted to other ferrets via direct contact

• Interpretation
  • Possibility for serious illness among people exists
  • Virus would need to change before it can spread easily via respiratory droplet
  • Confirms that exposure via the eye can results in infection and cause other symptoms
# Summer Surveillance Priorities

- Seasonal influenza activity is low nationally
- Goal: Maintain seasonal surveillance
- Continued subtyping
- Expanding PHL Specimen sources
  - HRSA/local clinics in impacted states
  - Subtyping of commercial specimens
  - ICU/hospitalized specimens

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<th>Description</th>
<th>Partners</th>
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<tr>
<td>1</td>
<td>Identification of human infections via symptom monitoring among workers and others with recent exposures to HPAI A/H5 infected animals on farms or other locations.</td>
<td>State and local public health; CDC and USDA support as requested</td>
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<td>Conduct outreach and education to people exhibiting animals (specifically swine, cattle and avian species) at or attending agricultural fairs. (A detailed agricultural fair resource document is being developed using a one health approach and will be shared as soon as it is ready.)</td>
<td>State and local public health and departments of agriculture; CDC and USDA support as requested</td>
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<td>3</td>
<td>Encourage ongoing influenza testing (preferably RT-PCR) of individuals with compatible illness (e.g. respiratory illness with or without a fever or conjunctivitis) throughout the summer, particularly for persons with recent history of relevant exposures (e.g., dairy cows, raw milk, wild birds, poultry, agricultural fair attendance).</td>
<td>State and local public health; CDC and USDA support as requested</td>
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<td>4</td>
<td>Enhance surveillance for novel influenza A detection among severely ill patients by subtyping influenza A positive specimens from patient hospitalized or in the ICU.</td>
<td>State and local public health; CDC support as requested</td>
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<td>5</td>
<td>Enhance surveillance for novel Influenza A detections in the community by maintaining the flow of influenza positive specimens to and subtyping of influenza A positives by public health laboratories and investigation of unexplained clusters of respiratory illness.</td>
<td>State and local public health; CDC support when possible and when requested</td>
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<td>6</td>
<td>Monitor influenza surveillance data for any unexpected patterns.</td>
<td>State and local public health; CDC</td>
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<td>7</td>
<td>Local data anomaly detection and investigation.</td>
<td>State and local public health; CDC</td>
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How CDC is monitoring influenza data to better understand the current avian influenza A (H5N1) situation in people

Updated May 31, 2024

Weekly Snapshot for Week Ending May 25th, 2024

This week CDC reported the third human case of H5 bird flu associated with the dairy cow outbreak.

CDC influenza (flu) surveillance systems show no indicators of unusual influenza activity in people, including avian influenza A (H5N1).

This page provides information on how CDC systems that monitor national, state, and local level influenza data are being used during the current avian influenza A (H5N1) situation.

- Influenza virus and illness activity are monitored year-round through a collaborative effort between CDC and many partners, including state, local, and territorial health departments; public health and clinical laboratories; clinics; and emergency departments.
- Human cases of novel influenza, which are human infections with non-human influenza A viruses that are different from currently spreading seasonal human influenza viruses, are nationally notifiable. Every identified case is investigated and reported to CDC.
- CDC is actively looking at multiple flu indicators during the current situation to monitor for influenza A (H5N1) viruses, including looking for spread of the virus to, or among people, in jurisdictions where the virus has been
Data Displayed

- Case Reporting (H5 specific)
  - H5 cases by state map

- Public Health Laboratory (H5 specific)
  - Type and subtype by week-national and regional; state - season.
  - H5 added if/when we have 5 positives reported to the system.

- Clinical Laboratory Trends (not H5 specific)
  - Percent positive A/B - national, regional, state

- Emergency Departments (not H5 specific)
  - Trends in influenza discharge diagnoses - national, state and county level

- Wastewater Surveillance (not H5 specific)
  - Influenza A percentiles compared to 2023-24 influenza season - by site
Surveillance Data “Flags”

Data Sources

• Traditional Surveillance
  • Continually looking for unusual trends
• Syndromic Surveillance (NSSP)
  • Daily county level flags
  • Generated based on a trend model applied to the % of visits with an influenza diagnosis code in ED data
• Wastewater
  • High Influenza A levels
  • H5 specific detections from WastewaterSCAN sites

Investigation Process

• Communication will be made with STLT partners
• CDC will review data from traditional surveillance components available at the local level (e.g., clinical and public health labs, hospital surveillance) to determine if seasonal flu might be causing that flag.
• CDC will compare these localities to those with ongoing cattle detections.
Surveillance Results

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

https://www.cdc.gov/flu/bird-flu/h5-monitoring.html
Public Health Risk

• Overall risk to the public remains low
• Increased risk with exposure to infected animals or environment – occupational, recreational
• Exposed individuals should monitor for symptoms after first exposure and for 10 days after last exposure

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

— Situation Updates:
  — CDC A(H5N1) Bird Flu Response Update | Avian Influenza (Flu)

— Surveillance Updates
  — How CDC is monitoring influenza data among people to better understand the current avian influenza A (H5N1) situation | Avian Influenza (Flu)

— Technical Report
  — Technical Report: Highly Pathogenic Avian Influenza A(H5N1) Viruses | Avian Influenza (Flu) (cdc.gov)

— Updated Recommendations
  — Highly Pathogenic Avian Influenza A(H5N1) Virus in Animals: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations
  — Recommendations for Worker Protection and Use of Personal Protective Equipment (PPE) to Reduce Exposure to Novel Influenza A Viruses Associated with Severe Disease in Humans
Thank you