H5N1 Transmission and Infections in Humans: Colorado's Experience

NASEM | Sept. 29, 2025

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Background: HPAI in Colorado timeline

January 2022

USDA detects H5N1 in wild birds.*

February 2022

USDA confirmed outbreak of H5N1 in a commercial turkey flock in Indiana.*

Late March 2022

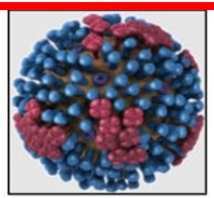
H5N1 detected in wild goose in Colorado.*

Mid April 2022

H5N1 detected in commercial chicken flock in Colorado.*

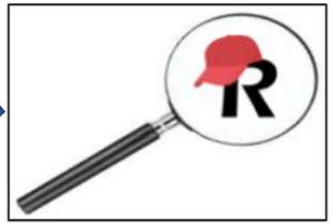
Late April 2022

Colorado resident tests positive for H5N1 using RT-PCR.**



May 2022 - March 2024

Ongoing surveillance of high risk individuals.***



Late March 2024

H5N1 detected in lactating dairy cattle in Texas.*

Late April 2024

Dairy cattle in Colorado confirmed to have H5N1.*

July 2024

Egg layer facilities in Colorado confirmed to have H5N1.

*Image from USDA
**Image from CDC
*** Image from REDCap

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Colorado cases of H5N1 2.3.4.4b in 2024

Dairy cattle:

- 64 confirmed positive herds

Poultry:

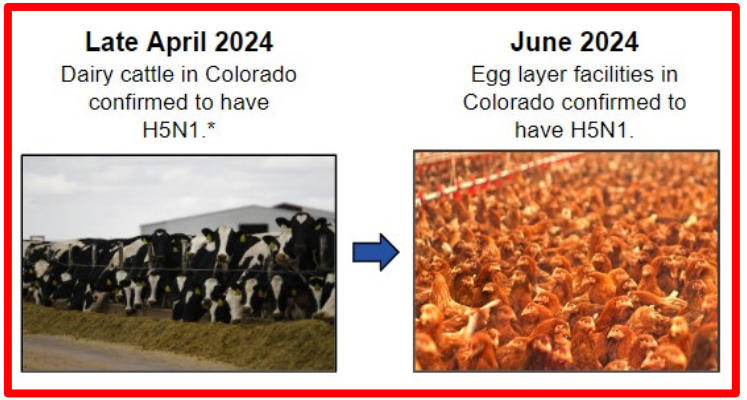
- 7 backyard flocks confirmed positive
- 4 commercial flocks confirmed positive - **3.5M birds**

Domestic cats:

- 8 confirmed positive
- Mixed exposures: dairy, wildlife, and raw pet food

Human cases:

- 10 confirmed positive
  - 1 dairy farm associated
  - 9 poultry farm associated



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Colorado H5N1 dairy experience

Public health response to dairy farms

1. Initial producer interview - worker exposures and practices
2. Site visit
    a. Coordination with state and federal agriculture agency partners
    b. Observe workspaces
    c. Provide information to workers on risk and risk reduction
    d. Delivery of PPE (masks, goggles, face shields, gloves)
    e. Test symptomatic workers, offer oseltamivir
3. Establish monitoring for worker health

Dairy farm outcomes

Affected farms	64
Farms that received PPE	43
Monitored workers	~1.5k
Tested workers	19
Human cases	1

Image source: https://www.cdc.gov/bird-flu/situation-summary/mammals.html

Serologic evidence of recent infection with H5N1

CDC Morbidity and Mortality Weekly Report (*MMWR*) Search

Serologic Evidence of Recent Infection with Highly Pathogenic Avian Influenza A(H5) Virus Among Dairy Workers — Michigan and Colorado, June–August 2024

Weekly / November 7, 2024 / 73(44);1004–1009

Print

Alexandra M. Mellis[1]; Joseph Coyle[2]; Kristen E. Marshall[3,4]; Aaron M. Frutos[1,5]; Jordan Singleton[5,6]; Cara Drehoff[3,5]; Angiezel Merced-Morales[1]; H. Pamela Pagano[1]; Rachel O. Alade[5,7]; Elizabeth B. White[1]; Emma K. Noble[1]; Crystal Holiday[1]; Feng Liu[1]; Stacie Jefferson[1]; Zhu-Nan Li[1]; F. Liani Gross[1]; Sonja J. Olsen[1]; Vivien G. Dugan[1]; Carrie Reed[1]; Sascha Ellington[1]; Sophia Montoya[3]; Allison Kohnen[3]; Ginger Stringer[3]; Nisha Alden[3]; Peter Blank[2]; Derick Chia[2]; Natasha Bagdasarian[2]; Rachel Herlihy[3]; Sarah Lyon-Callo[2]; Min Z. Levine[1] (VIEW AUTHOR AFFILIATIONS)

View suggested citation

Summary

What is already known about this topic?

Infections with highly pathogenic avian influenza (HPAI) A(H5) viruses have been detected sporadically in dairy farm workers in the United States since April 2024. Public health response efforts include active monitoring of workers exposed to HPAI A(H5) virus for illness.

Article Metrics

Altmetric:

2576

News (278)
Blogs (13)
Policy documents (1)
X (466)
Wikipedia (1)

Source: MMWR, Serologic Evidence of Recent Infection with A(H5N1) Virus—Michigan and Colorado, 2024

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Exposures and PPE use among seropositive workers

- Among 115 workers, 8 had serologic evidence of infection with A(H5) virus (both neutralizing antibody titers and HI antibody titers ≥1:40).
- Seropositive workers were more likely to clean the milking parlor compared to seronegative workers (100% and 38%, p <0.001), and more likely to milk cows (88% and 57%, p =0.14).
- None of the workers with serologic evidence of infection used respiratory protection; three used recommended eye protection.

Serologic evidence of recent infection with H5N1

- Among workers, (46 of 115; 40%) reported feeling ill shortly before or during farm outbreaks.
- Among the 8 with serologic evidence of infection, 4 reported illness.
- Signs and symptoms included red, draining, or itching eyes (3 of 4).
- These signs and symptoms were also frequently reported among seronegative workers (26 of 42; 62%).

TABLE 3. Characteristics of illnesses reported by dairy workers, by seropositivity to highly pathogenic avian influenza A(H5) (N = 115) — Colorado and Michigan, 2024

Reported signs and symptoms*	Serologic test result, no. (%) Negative n = 107	Positive n = 8
Any self-reported illness	42 (39)	4 (50)
No. of days from exposure† to onset, median (IQR)	15 (4 to 27)	−5 (−11 to 1)
Cough	13 (31)	0 (—)
Diarrhea	6 (15)	1 (25)
Difficulty breathing	7 (17)	0 (—)
Fatigue	21 (50)	0 (—)
Fever (≥100.4°F [≥38°C])	7 (17)	0 (—)
Feverishness or chills	15 (37)	1 (25)
Headache	19 (45)	1 (25)
Muscle aches	19 (45)	0 (—)
Nausea or vomiting	4 (9.5)	0 (—)
Rash	4 (9.5)	0 (—)
Red, draining, or itching eyes	26 (62)	3 (75)
Runny nose or nasal congestion	20 (48)	1 (25)
Seizure	0 (—)	0 (—)
Sneezing	13 (31)	1 (25)
Sore throat	24 (57)	1 (25)

Source: MMWR, Serologic Evidence of Recent Infection with A(H5N1) Virus—Michigan and Colorado, 2024

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PPE use by dairy farmworkers exposed to H5N1

Morbidity and Mortality Weekly Report (*MMWR*)

Search

Personal Protective Equipment Use by Dairy Farmworkers Exposed to Cows Infected with Highly Pathogenic Avian Influenza A(H5N1) Viruses — Colorado, 2024

Weekly / November 7, 2024 / 73(44);999–1003

Print

Kristen E. Marshall, PhD[1,2]; Cara C. Drehoff, DVM[1,3]; Nisha Alden, MPH[1]; Sophia Montoya, PSM[1]; Ginger Stringer, PhD[1]; Allison Kohnen, DVM[1]; Alexandra Mellis, PhD[4]; Sascha Ellington, PhD[4]; Jordan Singleton, MD[3]; Carrie Reed, DSc[4]; Rachel Herlihy, MD[1]; Colorado Field Team (VIEW AUTHOR AFFILIATIONS)

View suggested citation

Summary

What is already known about this topic?

Use of personal protective equipment (PPE) by farmworkers can protect them when they are working with highly pathogenic avian influenza A(H5N1)–infected cows.

What is added by this report?

Dairy farmworkers in Colorado who were interviewed about PPE use during work activities with ill cows reported 28% higher use of PPE after detection of A(H5N1) virus on the farm than before detection, including a 40% increase in reported use of eye protection during milking. Reported use of respirators and other masks was low.

Article Metrics

Altmetric:

3 Total citations
3 Recent citations

Source: MMWR, PPE Use by Dairy Farmworkers Exposed to A(H5N1)—Colorado, 2024

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PPE access and use on dairy farms

- Use varied by work duties, including whether someone worked with sick cows.
- PPE access before outbreaks was high for some items:
  - Gloves 88%
  - Rubber boots or boot covers 71%
  - Head covers 69%
  - Eye protection 76%
- Reported mask use was low, with roughly half of workers reporting respirator* or other mask use after H5N1 was detected.
- PPE use while working with sick cows increased after H5N1 was detected on surveyed farms (mean of 28%); eye protection use while milking cows increased the most (40%).

CDC Protect Yourself From H5N1 When Working With Farm Animals
https://www.cdc.gov/bird-flu/situation-summary/inhumans.html

*N95 respirator use among workers who were exposed to ill cows after detection of A(H5N1) virus was 26%.

Colorado H5N1 poultry experience

Public health response on poultry farms

U.S. Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Weekly / Vol. 73 / No. 34

August 29, 2024

Cluster of Influenza A(H5) Cases Associated with Poultry Exposure at Two Facilities — Colorado, July 2024

Cara C. Drehoff, DVM[1,2]; Elizabeth B. White, PhD[3]; Aaron M. Frutos, PhD[2,3]; Ginger Stringer, PhD[1]; Alexis Burakoff, MD[1]; Nicole Comstock, MSPH[1]; Alicia Cronquist, MPH[1]; Nisha Alden, MPH[1]; Isaac Armistead, MD[1]; Allison Kohnen, DVM[1]; Radhika Ratnabalasuriar, MD[1]; Emily A. Travanty, PhD[1]; Shannon R. Matzinger, PhD[1]; Alexandria Rossheim, MS[1]; Aleigha Wellbrock[1]; H. Pamela Pagano, DrPH[3]; Dennis Wang, MD[2,4]; Jordan Singleton, MD[2,4]; Rebekah A. Sutter, MPH[2,5]; C. Todd Davis, PhD[3]; Krista Kniss, MPH[3]; Sascha Ellington, PhD[3]; Marie K. Kirby, PhD[3]; Carrie Reed, DSc[3]; Rachel Herlihy, MD[1]; H5N1 Field Investigation Team

https://www.cdc.gov/mmwr/volumes/73/wr/mm7334a1.htm

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Event timeline

July 11-26: CDPHE responds onsite by screening, testing, and treating symptomatic workers

Poultry at facility A confirmed to have HPAI H5N1

Facility A reports ill workers to CDPHE

Facility B starts depopulation with approximately 400 contract workers

July 8

July 9

July 11

July 14

July 15

Facility A starts depopulation with approximately 250 contract workers

Poultry at facility B test non-negative for HPAI

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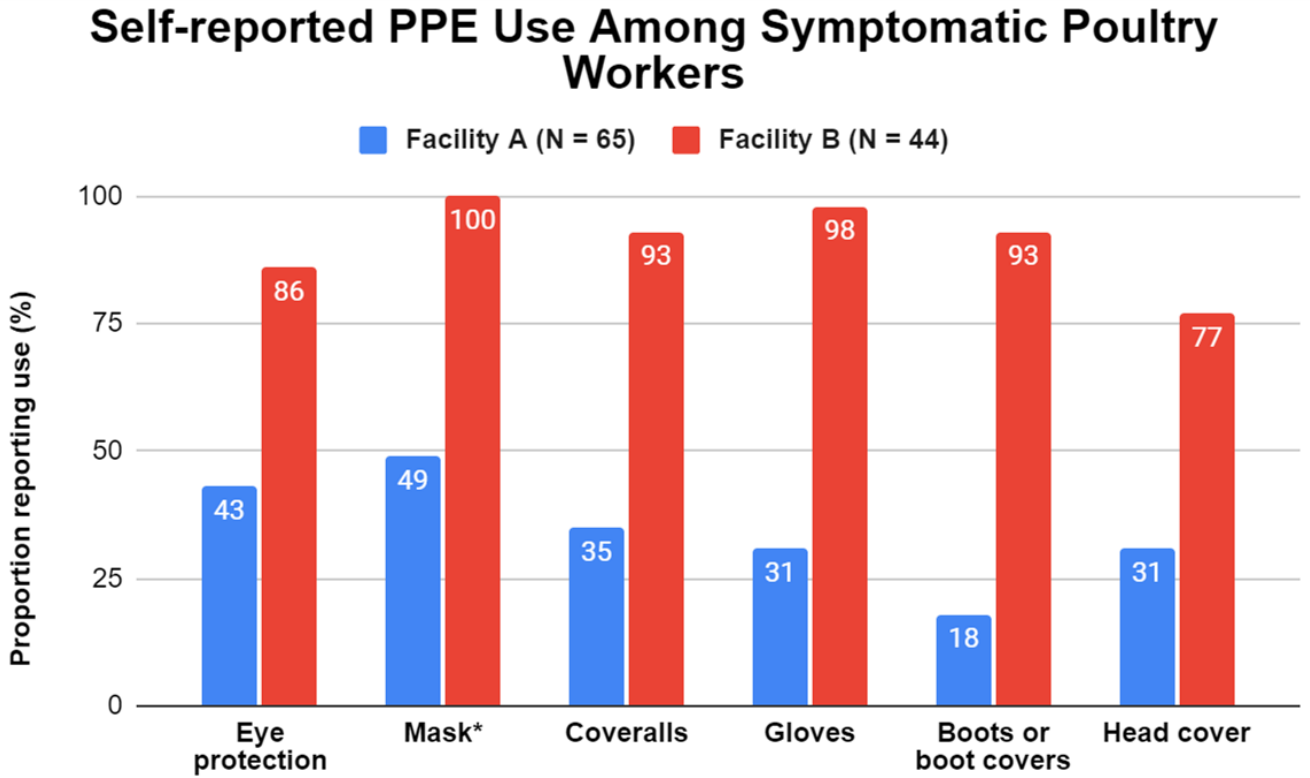
Summary of symptomatic worker results

Characteristic	Facility A (N = 265)	Facility B (N = 398)
Number symptomatic, n (%)	65 (25%)	44 (11%)
Influenza A(H5) positive	6 (9%)	3 (7%)
COVID-19 positive	1 (2%)	18 (41%)

PPE use among symptomatic poultry workers



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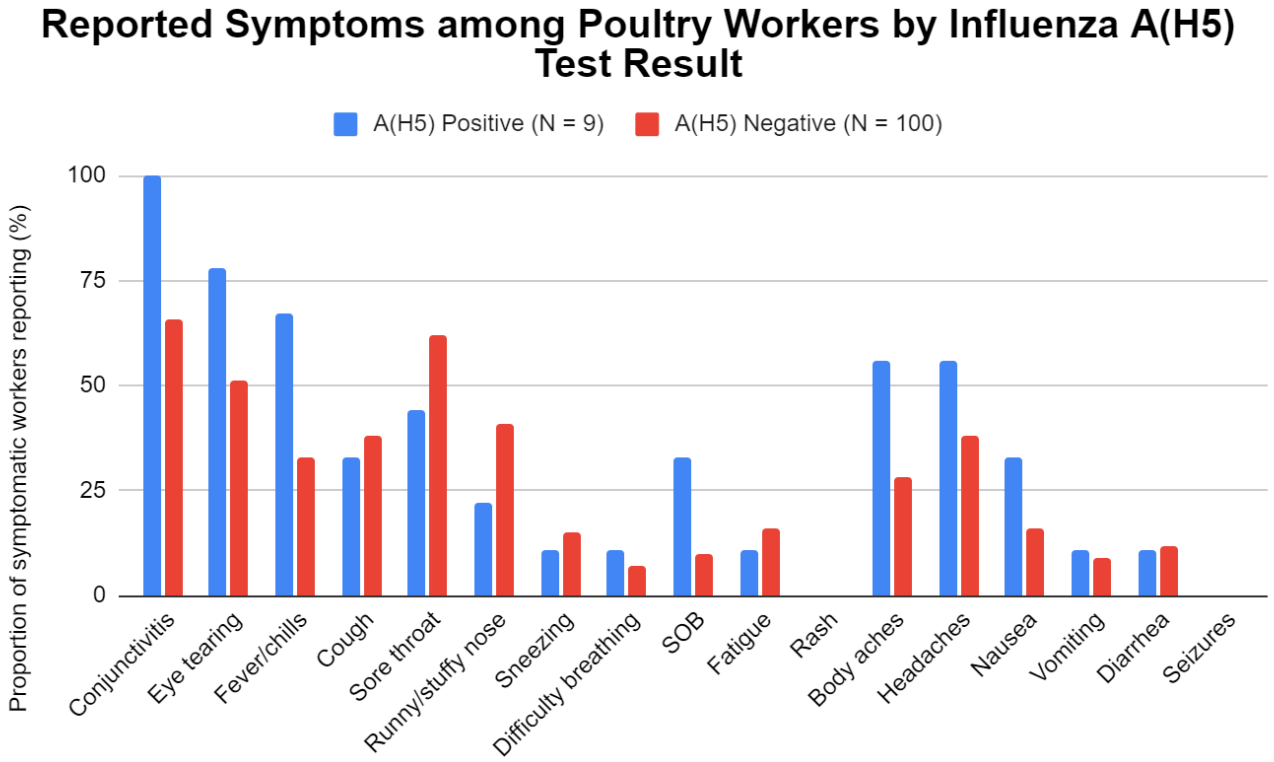
Reported symptoms among poultry workers



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Acknowledgments

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- Colorado local public health agencies
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- USDA veterinary and field staff
- Colorado dairy and poultry producers and veterinarians
- Colorado and contract dairy and poultry workers

Thank you!

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