



## 2024 Influenza A Virus HPAI H5N1 Outbreak Weekly Report August 8, 2024

### Introduction

In March 2024, several cases of highly pathogenic avian influenza A (HPAI) H5N1 virus were confirmed in dairy cattle in Texas, with cases spreading to at least eight other states (<https://www.biorxiv.org/content/10.1101/2024.05.01.591751v1>). In addition, a human case of influenza from the same clade and genotype was also diagnosed in a dairy worker from Texas around the same time. As part of an effort to track this outbreak, the United States Department of Agriculture (USDA) Agricultural Research Service (ARS) and the USDA National Veterinary Services Laboratories (NVSL) have been working to collect and sequence samples from additional cattle as well as avian species and other animals that also appeared to be infected with HPAI that might be related to the virus from the Texas dairy cattle. The genomic sequences of each virus isolate (consisting of the eight genomic segments sequenced for each individual isolate) are assembled from the sequenced short read data, and after undergoing quality control, are submitted to the GenBank sequence repository where they become publicly available. To enhance the ability of the USDA to rapidly submit sequences to GenBank, personnel from the Bacterial and Viral Bioinformatics Resource Center (BV-BRC) have been collaborating with USDA scientists to assist them with the submission of assembled HPAI genomic sequences to GenBank. The Centers for Disease Control and Prevention (CDC) in a similar manner, track human cases of H5N1 influenza.

The BV-BRC provides a database of complete and partially sequenced microbial genomes from both viral and bacterial pathogens. This data is derived from the GenBank repository and includes metadata obtained from the GenBank record as well as associated NCBI BioProject, BioSample, and SRA repository records. All this metadata provides users with the ability to search for specific datasets from the BV-BRC web site using the filtering and sorting features built into BV-BRC web-retrieval tools. To provide rapid access to sequences and other data and information from the 2024 HPAI outbreak, the BV-BRC provides an outbreak-specific web page with links to this information: ([https://www.bv-brc.org/outbreaks/H5N1/#view\\_tab=overview](https://www.bv-brc.org/outbreaks/H5N1/#view_tab=overview)).

### Human Cases

Human cases of H5N1 Influenza A virus infection from North America.

Case Report Dates	Location (#cases)	Likely Infection Source	Total Number	Number Confirmed by Sequencing
04/01/2024 – 07/03/2024	Texas (1) Michigan (2) Colorado (1)	Dairy cows	4	1 (Texas 2024) 2 (Michigan 2024) 1 (Colorado 2024)
04/28/2022 – 07/25/2024	Colorado (10)	Poultry	10	1 (2022); 4* (2024)

\*This includes sequences from an additional 3 human isolates collected on July 22, 2024 by the CDC and made available on GenBank after this week's BV-BRC sequence update.

A current summary of human avian influenza virus infections can be found at <https://www.cdc.gov/bird-flu/situation-summary/index.html>.

### Sequence Statistics (As of August 8, 2024)

The numbers below provide statistics on the publicly available H5N1 genomic sequences collected from North American isolates in 2024. These sequences are available from the BV-BRC database using the links in the table below. We report the number of isolates along with the number of sequenced genomic segments (usually 8 per isolate). These numbers include sequences generated by the USDA and submitted to GenBank by both the USDA and BV-BRC; USDA sequences assembled by the BV-BRC from SRA data not yet submitted to GenBank; and sequences submitted to GenBank from all other sources.

#### Influenza A sequence counts from the BV-BRC database

Outbreak Report Date	All Influenza A virus Sequences	All H5N1 Sequences	2024 H5N1 Sequences
May 22, 2024	1,061,787	53,030	2,379 (296 isolates)
May 29, 2024	1,065,763	54,632	2,563 (318 isolates)
June 12, 2024	1,082,498	57,301	5,132 (641 isolates)
June 19, 2024	1,087,487	58,045	5,728 (714 isolates)
June 26, 2024	1,091,952	59,465	7,112 (889 isolates)
July 3, 2024	1,092,769	60,280	7,927 (991 isolates)
July 10, 2024	1,096,341	61,469	8,863 (1,108 isolates)
July 17, 2024	1,098,276	63,324	10,534 (1,317 isolates)
July 26, 2024	1,099,887	63,650	10,812 (1,350 isolates)
July 31, 2024	1,106,264	67,556	14,619 (1,875 isolates)
August 8, 2024 <sup>1</sup>	<a href="#">1,106,782</a>	<a href="#">68,079</a>	<a href="#">15,140</a> (1,941 isolates)

<sup>1</sup>The BV-BRC genomic database links provided for these totals are dynamic and provide current numbers at the time the link is followed. Therefore, these numbers will increase over time.

#### Influenza A sequences from SRA and not yet submitted to GenBank

The BV-BRC checks the sequence read archive (SRA) database each week for submitted raw sequence read data that has not yet been assembled and submitted to GenBank. This past week, an additional 488 H5N1 genomic sequences from 61 isolates were identified, assembled, and loaded into the BV-BRC database. These isolates from the USDA were from Cat (2); Cattle (42); Chicken (14); House Sparrow (1); Raccoon (1); Western Kingbird (1). All of these isolates were from the USA with no state specified and no collection date other than 2024 indicated. An additional 33 sequences from 5 isolates were loaded from GenBank records. All of these were collected in April, 2024 and were from Texas (4 isolates) and Idaho (1 isolate). The Idaho isolate and 3 of the Texas isolates were from cattle, and the other Texas isolate was from grackle. No new human sequences were loaded this week, but as mentioned above, the sequences from 3 new human isolates from Colorado have just been made available and will be loaded next week.

The tables on the next two pages summarize North American H5N1 2024 isolates collected in 2024 as of August 5, 2024, and include both GenBank and SRA-derived isolates.

### H5N1 US virus isolates collected and sequenced in 2024 by host

Host	# Isolates
Alpaca	8
American crow	13
American white pelican (Pelecanus erythrorhynchos)	1
American wigeon	1
Australian wood duck (Chenonetta jubata)	1
Bald eagle	13
Black scoter	1
Blackbird	4
Brant goose	1
Canada goose	49
Cat	47
Cat, Domestic	32
Cattle	1288
Chicken	149
Common eider	1
Common grackle	12
Common loon	6
Common raven	3
Crow	4
Duck	2
Goat	30
Goose	3
Great black-backed gull	10
Great horned owl	4
Harris hawk	2
Hawk	3
Herring gull	9

Homo sapiens	5
Hooded merganser (Lophodytes cucullatus)	1
House mouse	2
House sparrow	2
Lesser scaup (duck)	1
Mallard duck	2
Mountain lion	4
Mute swan	2
Peregrine falcon	2
Pigeon	2
Raccoon	8
Red fox	11
Red-tailed hawk	13
Redhead duck (Aythya americana)	1
Ruddy turnstone (Arenaria interpres)	1
Sanderling (Calidris alba)	29
Scoter	2
Skunk	18
Snow goose	6
Surf scoter	1
Turkey	102
Turkey vulture	8
Western gull	2
Western kingbird	1
Western sandpiper	1
White-winged scoter	16
Wild-bird	1
<b>Grand Total</b>	<b>1941</b>

**H5N1 US virus isolates collected and sequenced in 2024 by state**

<b>State</b>	<b># Isolates</b>
California	8
Colorado	27
Idaho	125
Illinois	2
Indiana	5
Iowa	13
Kansas	19
Maryland	2
Massachusetts	137
Michigan	71
Minnesota	87
Missouri	7
Montana	4
New Hampshire	1
New Mexico	64
North Carolina	11
Ohio	42
Oklahoma	1
Oregon	3
South Carolina	3
South Dakota	34
Texas	209
Utah	2
Virginia	6
Washington	7
Wyoming	46
USA (no state designated)	1,005
<b>Grand Total</b>	<b>1,941</b>

## Phylogenetic Analysis

The latest phylogenetic trees for all eight segments can be accessed using the URL below, which includes all human isolates with available sequence data [https://www.bv-brc.org/outbreaks/H5N1/#view\\_tab=phylogenetics](https://www.bv-brc.org/outbreaks/H5N1/#view_tab=phylogenetics). These trees were generated on August 6, 2024, and contain the last batch of assembled SRA sequences that were uploaded to the BV-BRC database on August 5, 2024.

## News

Title	Date	Source
<a href="#">Colorado's bulk-tank testing IDs more avian flu in dairy herds   CIDRAP</a>	August 6	CIDRAP
<a href="#">USDA confirms more H5N1 in dairy cows, wild birds, and small mammals   CIDRAP</a>	August 5	CIDRAP
<a href="#">Cambodia reports second H5N1 case in less than a week   CIDRAP</a>	August 5	CIDRAP
<a href="#">CDC A(H5N1) Bird Flu Response Update August 2, 2024</a>	August 2	CDC
<a href="#">The pathogens that could spark the next pandemic</a>	August 2	Nature
<a href="#">How bird flu is changing Minnesota's state and county fairs - Axios Twin Cities</a>	August 2	Axios
<a href="#">Getting ahead of H5N1 bird flu   CEPI</a>	August 1	CEPI
<a href="#">CDC will offer seasonal flu shots to farmworkers to lower bird flu risk</a>	July 30	STAT
<a href="#">CDC urges livestock workers get seasonal flu vaccine to cut pandemic risk   CIDRAP</a>	July 30	CIDRAP

## Publications

Title	Date	Source
<a href="#">A decavalent composite mRNA vaccine against both influenza and COVID-19   mBio</a>	August 6	ASM
<a href="#">Genetic risk factors for COVID-19 and influenza are largely distinct   Nature Genetics</a>	August 5	Nature
<a href="#">Tracking the spread of avian influenza A(H5N1) with alternative surveillance methods: the example of wastewater data</a>	August 2	The Lancet Infectious Disease
<a href="#">Pathogens prioritization: a scientific framework for epidemic and pandemic research preparedness</a>	July 30	WHO
<a href="#">Investigating whether H5N1 is a risk to human populations in Brazil</a>	-	SciELO Brazil