



2024 Influenza A Virus HPAI H5N1 Outbreak Weekly Report August 28, 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).

Human Cases

Human cases of H5N1 Influenza A virus infection from North America. (No changes this week.)

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)

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 28, 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. No new Human sequences have been reported or submitted to SRA or GenBank.

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	1,106,782	68,079	15,140 (1,941 isolates)
August 16, 2024	1,111,297	66,272	12,883 (1,658 isolates)
August 22, 2024	1,116,181	66,560	13,274 ² (1,694 isolates)
August 28, 2024	1,114,197	67,438	14,058 (1,792 isolates)

¹The 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.

²Updated from 13,171 to fix error in the total number.

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, the USDA submitted 68 (544 genome sequences/isolate) isolates in SRA. These SRA records have been assembled, annotated and loaded in BV-BRC.

The following tables summarize North American H5N1 2024 isolates collected in 2024 as of August 28, 2024, and include both GenBank and SRA-derived isolates.

H5N1 US virus isolates collected and sequenced in 2024 by host

Host	# Isolates
Alpaca	5
American Wigeon	1
American Robin	2
Bald Eagle	13
Black Scoter	1
Blackbird	4
Brandt goose	1
Canada goose	50
Cat	51
Cat, domestic	23
Cattle	1159
Chicken	153
Common Eider	1
Common grackle	10
Common Loon	6
Crow	17
Duck	2
Eurasian collared dove	1
Goat	30
Great-Horned Owl	4
Gull	10
Harris hawk	2
Hawk	9
Herring Gull	9
Hooded Merganser	1
Human	8
Lesser Scaup	1

Mallard	2
Mountain lion	4
Mouse	2
Mute Swan	2
Pelican	1
Peregrine Falcon	2
Pigeon	1
Raccoon	8
Raven	3
Redhead duck	1
Red Fox	6
Red-tailed hawk	6
Ruddy Turnstone	1
Sanderling	29
Sandpiper	1
Scoter	3
Skunk	18
Snow Goose	6
Sparrow	3
Turkey	90
Vulture	8
Western gull	2
Western Kingbird	1
White-Winged Scoter	16
Wild bird	1
Wood duck	1
Grand Total	1792

H5N1 US virus isolates collected and sequenced in 2024 by state

State	# Isolates
California	8
Colorado	41
Idaho	156
Illinois	2
Indiana	5
Iowa	36
Kansas	20
Maine	1
Maryland	2
Massachusetts	128
Michigan	78
Minnesota	148
Missouri	7
Montana	4
New Hampshire	3
New Mexico	72
North Carolina	11
Ohio	42
Oklahoma	1
Oregon	3
Rhode Island	5
South Carolina	3
South Dakota	47
Texas	209
Utah	2
Virginia	14
Washington	7
Wyoming	46
USA (no state designated)	691
Grand Total	1792

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. These trees should be available in a few days, and will contain all new sequences uploaded to the BV-BRC database by August 27, 2024.

News

Title	Date	Source
With Only Gloves To Protect Them, Farmworkers Say They Tend Sick Cows Amid Bird Flu - KFF Health News	August 27	KFF Health News
Avian flu virus confirmed in Michigan dairy herd CIDRAP	August 26	CIDRAP
India's Odisha state culls birds after Avian flu outbreak Reuters	August 25	Reuters
DBIA Offers \$10,000 Grants for On-Farm H5N1 Biosecurity Efforts - Wisconsin Cheese Makers Association	August 13	Wisconsin Cheese Maker Association

Publications

Title	Date	Source
A broad-spectrum vaccine candidate against H5 viruses bearing different sub-clade 2.3.4.4 HA genes	August 19	Nature
Statins for the prevention of cardiovascular events associated with avian influenza: the COVID-19 pandemic as a reference	August 17	Annals of Medicine
Region-selective and site-specific glycation of influenza proteins surrounding the viral envelope membrane Scientific Reports	August 16	Nature