Influenza at the human-animal interface

Summary and risk assessment, from 20 January to 19 March 2025[1]

- **New human cases[2]:** From 20 January to 19 March 2025, based on reporting date, the detection of influenza A(H5N1) in five humans, influenza A(H9N2) virus in four humans, influenza A(H1N1) variant ((H1N1)v) virus in one human, and influenza A(H1N2)v virus in one human were reported officially.
- **Circulation of influenza viruses with zoonotic potential in animals:** High pathogenicity avian influenza (HPAI) events in poultry and non-poultry continue to be reported to the World Organisation for Animal Health (WOAH).[3] The Food and Agriculture Organization of the United Nations (FAO) also provides a global update on avian influenza viruses with pandemic potential.[4]
- **Risk assessment[5]:** Sustained human to human transmission has not been reported from these events. Based on information available at the time of the risk assessment, the overall public health risk from currently known influenza viruses circulating at the human-animal interface has not changed remains low. The occurrence of sustained human-to-human transmission of these viruses is currently considered unlikely. Although human infections with viruses of animal origin are infrequent, they are not unexpected at the human-animal interface.
- **Risk management:** New candidate vaccine viruses (CVVs) for zoonotic influenza viruses for pandemic preparedness purposes were selected for development at the February 2025 WHO consultation on influenza vaccine composition for use in the northern hemisphere 2025-2026 influenza season. A detailed summary of zoonotic influenza viruses characterized since September 2024 is published here and updated CVVs lists are published here.
- **IHR compliance:** All human infections caused by a new influenza subtype are required to be reported under the International Health Regulations (IHR, 2005).[6] This includes any influenza A virus that has demonstrated the capacity to infect a human and its haemagglutinin gene (or protein) is not a mutated form of those, i.e. A(H1) or A(H3), circulating widely in the human population. Information from these notifications is critical to inform risk assessments for influenza at the human-animal interface.

[1] This summary and assessment covers information confirmed during this period and may include information received outside of this period.

[2] For epidemiological and virological features of human infections with animal influenza viruses not reported in this assessment, see the reports on human cases of influenza at the human-animal interface published in the Weekly Epidemiological Record here.

[3] World Organisation for Animal Health (WOAH). Avian influenza. Global situation. Available at: https://www.woah.org/en/disease/avian-influenza/#ui-id-2.

[4] Food and Agriculture Organization of the United Nations (FAO). Global Avian Influenza Viruses with Zoonotic Potential situation update. Available at: https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential.

[5] World Health Organization (2012). Rapid risk assessment of acute public health events. World Health Organization. Available at: https://iris.who.int/handle/10665/70810.

[6] World Health Organization. Case definitions for the 4 diseases requiring notification to WHO in all circumstances under the International Health Regulations (2005). Case definitions for the four diseases requiring notification in all circumstances under the International Health Regulations (2005).

Avian influenza viruses in humans

Current situation:

Since the last risk assessment of 20 January 2025, one laboratory-confirmed human case of A(H5N1) infection was reported to WHO from Cambodia, one from the United Kingdom of Great Britain and Northern Ireland and three from the United States of America (USA).

A(H5N1), Cambodia

On 26 February 2025, Cambodia notified the WHO of a human case of influenza A(H5N1) in a boy from Prey Veng Province. The case had onset of fever, cough and fatigue on 17 February. He was initially seen at a local private clinic and given medication, but as his condition did not improve, he was transferred to Phnom Penh and hospitalized at a private hospital on 20 February. The case's condition deteriorated, and he developed shortness of breath and was transferred on 24 February to a national hospital, which is a sentinel surveillance site for severe acute respiratory infection (SARI). Upon admission the case was isolated, nasopharyngeal (NP) and oropharyngeal (OP) swab specimens were collected and oseltamivir administered. On 25 February, the specimens tested positive for influenza A(H5N1) by reverse transcription-polymerase chain reaction (RT-PCR) at the National Institute of Public Health of Cambodia. The results were later confirmed by the Institut Pasteur du Cambodge (IPC) on 26 February. Sequence analysis of the HA gene revealed the virus belongs to clade 2.3.2.1e (previously classified as clade 2.3.2.1c)[7], and is similar to viruses circulating among birds, including poultry, and detected in human cases since late 2023 in Cambodia. The case was reported to have had exposure to sick and dead backyard chickens. Samples collected from the backyard chickens tested positive for A(H5N1). The case died on 25 February. No further cases were detected among the contacts of the case.

This case is the second human infection with influenza A(H5N1) reported in Cambodia in 2025.

A(H5N1), United Kingdom

On 25 January 2025, the United Kingdom reported to WHO the detection of A(H5N1) in one individual in England who was sampled as part of a zoonotic influenza surveillance study launched by the UK Health Security Agency (UKHSA) in March 2023 to monitor people with close contact to infected birds.

The individual was recruited to the surveillance study while working at a farm where birds were infected with A(H5N1) viruses and was found to be symptomatic. A sample collected on 23 January was confirmed A(H5)-positive at the national reference laboratory on 24 January. One symptomatic household contact tested negative. Sequencing of virus from the infected birds the case had contact with were determined to be of A(H5N1) clade 2.3.4.4b and the DI.2 genotype, which is prevalent within Europe at the current time. The DI.2 genotype is distinct from the A(H5) clade 2.3.4.4b genotypes that have been detected in North America.[8]

The UKHSA has previously notified WHO (in May, June, and July 2023) about four individuals who tested positive for influenza A(H5) virus as part of the UKHSA Zoonotic Influenza Surveillance Study.[9]

---

[7] Ort JT, Zolnoski SA, Lam TT, Neher R, Moncla LH. Development of avian influenza A(H5) virus datasets for Nextclade enables rapid and accurate clade assignment. bioRxiv [Preprint]. 2025 Feb 3:2025.01.07.631789. doi: 10.1101/2025.01.07.631789. PMID: 39829835; PMCID: PMC11741357.

[8] UKHSA. Human case of avian flu detected in England, 27 January 2025. Available at: https://www.gov.uk/government/news/human-case-of-avian-flu-detected-in-england.

[9] UKHSA. Investigation into the risk to human health of avian influenza (influenza A H5N1) in England: technical briefing 5, Updated 14 July 2023. Available at: https://www.gov.uk/government/publications/avian-influenza-influenza-a-h5n1-technical-briefings/investigation-into-the-risk-to-human-health-of-avian-influenza-influenza-a-h5n1-in-england-technical-briefing-5.

A(H5N1), USA[10,11,12,13]

In the USA, one laboratory-confirmed A(H5) infection was reported in an adult from the state of Ohio who worked at a commercial poultry facility where HPAI A(H5N1) virus had been detected in birds and was involved in depopulation activities. The individual had respiratory symptoms, was hospitalized, discharged and recovering at the time of the update. Genetic sequencing of the virus from this individual identified an avian influenza A(H5N1) virus from clade 2.3.4.4.b belonging to the genotype D1.3 genotype and no markers known that would impact the effectiveness of influenza antivirals or existing candidate vaccine viruses or changes associated with mammalian adaptation were identified.

Another laboratory-confirmed A(H5) infection was reported in an adult from the state of Wyoming who had direct contact with poultry infected with avian influenza A(H5) virus that died on their property. The individual was reported to have underlying health conditions that can be risk factors for severe influenza illness. This person has been discharged from the hospital and was recovering at the time of the update. Initial upper respiratory specimens were negative for influenza viruses; a lower respiratory specimen collected several days later in the hospital was positive for avian influenza A(H5N1) virus. Genetic sequencing of the virus from this individual identified an avian influenza A(H5N1) virus from clade 2.3.4.4.b belonging to the genotype D1.1, and the genetic mutation in the polymerase basic 2 (PB2) protein (E627K) that has previously been associated with more efficient virus replication in people and other mammals and has been detected in viruses from past human infections with A(H5) viruses.

Additionally, one laboratory-confirmed case was reported in an adult from the state of Nevada who worked at a commercial dairy cattle farm in an area where HPAI A(H5N1) viruses had been detected in cows. This individual developed conjunctivitis and recovered. Genetic sequencing of the virus from this individual identified an avian influenza A(H5N1) virus from clade 2.3.4.4.b also belonging to genotype D1.1, with a sequence nearly identical to that of the viruses that USDA reported from dairy cows in Nevada that the person worked with.[14] Sequencing also identified the D701N genetic mutation in the PB2 protein that has previously been associated with more efficient virus replication in mammalian cells and has been detected in viruses from past human infections with A(H5) viruses.

Low pathogenicity and high pathogenicity avian influenza viruses have been detected in birds in the United States. Since 2022, the HPAI A(H5) virus has been detected in commercial and backyard flocks in 48 states, impacting over 100 million birds. To date, 71 people have tested positive for A(H5) virus in the United States since 2022, with all but one of these cases occurring in 2024. All cases have been associated with exposure to either A(H5N1)-infected poultry or dairy cattle, except for two cases where the exposure source could not be identified.[15] To date, no human-to-human

---

[10] US CDC. Weekly US Influenza Surveillance Report: Key Updates for Week 6, ending February 8, 2025. Available at: https://www.cdc.gov/fluview/surveillance/2025-week-06.html.

[11] US CDC. Weekly US Influenza Surveillance Report: Key Updates for Week 7, ending February 15, 2025. Available at: https://www.cdc.gov/fluview/surveillance/2025-week-07.html.

[12] US CDC. CDC A(H5N1) Bird Flu Response Update, February 26, 2025. Available at: https://www.cdc.gov/bird-flu/spotlights/h5n1-response-02262025.html.

[13] US CDC. CDC A(H5N1) Bird Flu Response Update March 19, 2025. Available at https://www.cdc.gov/bird-flu/spotlights/h5n1-response-03192025.html.

[14] USDA. The Occurrence of Another Highly Pathogenic Avian Influenza (HPAI) Spillover from Wild Birds into Dairy Cattle. Available at:https://www.aphis.usda.gov/sites/default/files/dairy-cattle-hpai-tech-brief.pdf

[15] United States Centers for Disease Control and Prevention. H5 Bird Flu: Current Situation. Available at: https://www.cdc.gov/bird-flu/situation-summary/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fbird-flu%2Fphp%2Favian-flu-summary%2Findex.html.

transmission of influenza A(H5) virus has been identified in the USA. A(H5N1) virus infections in dairy cattle and wild and domestic birds continue to be reported in the USA.[16]

According to reports received by WOAH, various influenza A(H5) subtypes continue to be detected in wild and domestic birds in the Americas, Asia and Europe. Infections in non-human mammals are also reported, including in marine and land mammals.[17] A list of bird and mammalian species affected by HPAI A(H5) viruses is maintained by FAO.[18]

Risk Assessment for avian influenza A(H5) viruses:

1. What is the current global public health risk of additional human cases of infection with avian influenza A(H5) viruses?
Most human cases so far have been infections in people exposed to A(H5) viruses, for example, through contact with infected poultry or contaminated environments, including live poultry markets, and occasionally infected mammals and contaminated environments. While the viruses continue to be detected in animals and related environments humans are exposed to, further human cases associated with such exposures are expected but unusual. The impact for public health if additional cases are detected is minimal. The current overall global public health risk of additional human cases is low.

2. What is the likelihood of sustained human-to-human transmission of currently circulating avian influenza A(H5) viruses?
No sustained human-to-human transmission has been identified associated with the recent reported human infections with avian influenza A(H5). There has been no reported human-to-human transmission of A(H5N1) viruses since 2007, although there may be gaps in investigations. In 2007 and the years prior, small clusters of A(H5) virus infections in humans were reported, including some involving health care workers, where limited human-to-human transmission could not be excluded; however, sustained human-to-human transmission was not reported.

Available evidence suggests that influenza A(H5) viruses circulating have not acquired the ability to efficiently transmit between people, therefore the likelihood of sustained human-to-human transmission is thus currently considered unlikely at this time.

3. What is the likelihood of international spread of avian influenza A(H5) viruses by travellers?
Should infected individuals from affected areas travel internationally, their infection may be detected in another country during travel or after arrival. If this were to occur, further community-level spread is considered unlikely as current evidence suggests these viruses have not acquired the ability to transmit easily among humans.

A(H9N2), China

Since the last risk assessment of 20 January 2025, four human cases of infection with A(H9N2) influenza viruses were notified to WHO from China on 7 February 2025. All four cases were detected through the influenza-like illness (ILI) surveillance system. The cases were detected in Guangdong (one), Hunan (two) and Sichuan (one) provinces. One case, in an adult, had underlying conditions at

[16] United States Department of Agriculture. Highly Pathogenic Avian Influenza (HPAI) Detections in Livestock, 19 July 2024. Available at: https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/livestock.
[17] World Organisation for Animal Health (WOAH). Avian influenza. Global situation. Available at: https://www.woah.org/en/disease/avian-influenza/#ui-id-2.
[18] Food and Agriculture Organization of the United Nations. Global Avian Influenza Viruses with Zoonotic Potential situation update. Available at: https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential/bird-species-affected-by-h5nx-hpai/en.

the time of illness and was hospitalized with pneumonia. The other cases (two children and one adult) had mild illnesses. Each case had a known history of exposure to poultry prior to the onset of symptoms. Environmental samples collected from areas associated with two cases (live poultry markets) tested positive for influenza A(H9) virus while samples from the environments associated with the other two cases (backyard areas) tested negative. No further cases were detected among contacts of these cases and there was no epidemiological link between the cases.

Risk Assessment for avian influenza A(H9N2):

1. What is the global public health risk of additional human cases of infection with avian influenza A(H9N2) viruses?
Most human cases follow exposure to the A(H9N2) virus through contact with infected poultry or contaminated environments. Most human infections of A(H9N2) to date have resulted in mild clinical illness in most cases. Nearly 130 human infections with A(H9N2) cases have been reported to date since 2003, and six of these have been severe or fatal and three of these were known to have underlying medical conditions. Since the virus is endemic in poultry in multiple continues in Africa and Asia[19], further human cases associated with exposure to infected poultry are expected but remain unusual. The impact to public health if additional cases are detected is minimal. The overall global public health risk of additional human cases is low.

2. What is the likelihood of sustained human-to-human transmission of avian influenza A(H9N2) viruses?
At the present time, no sustained human-to-human transmission has been identified associated with the event described above. Current evidence suggests that influenza A(H9N2) viruses from these cases have not acquired the ability of sustained transmission among humans, therefore sustained human-to-human transmission is thus currently considered unlikely.

3. What is the likelihood of international spread of avian influenza A(H9N2) virus by travellers?
Should infected individuals from affected areas travel internationally, their infection may be detected in another country during travel or after arrival. If this were to occur, further community level spread is considered unlikely as current evidence suggests the A(H9N2) virus subtype has not acquired the ability to transmit easily among humans.

Swine Influenza Viruses

Current situation:

Since the last risk assessment of 20 January 2025, one detection of an influenza A(H1N1)v virus was reported from China and one detection of an influenza A(H1N2)v was reported from the USA.

Influenza A(H1N1)v, China

On 7 February 2025, China notified WHO of a human case of Eurasian avian-like swine influenza A(H1N1) virus in a child from Yunnan Province. She developed mild upper respiratory tract symptoms on 12 November 2024 and a respiratory sample was collected on 13 November 2024 as part of routine influenza-like illness (ILI) surveillance. Close contacts remained asymptomatic and tested negative for influenza. She had exposure to backyard pigs however samples collected from the pigs tested negative for Eurasian avian-like swine influenza A(H1N1) viruses. The virus from this case was a clade 1C.2.3 virus.

[19] Food and Agriculture Organization of the United Nations (FAO). Global Avian Influenza Viruses with Zoonotic Potential situation update. Available at: https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential.

Influenza A(H1N2)v, USA

A laboratory-confirmed human infection with an influenza A(H1N2)v virus was reported in an adult from the state of Iowa. The individual sought health care during the week ending 18 January 2025, was hospitalized, and recovered. An investigation by public health officials did not identify direct or indirect swine contact. No further cases were identified associated with this case. The virus from this case belonged to clade 1B.2.1 which is known to circulate in swine in the USA.

Risk Assessment:

1. What is the public health risk of additional human cases of infection with swine influenza viruses?

Swine influenza viruses circulate in swine populations in many regions of the world. Depending on geographic location, the genetic characteristics of these viruses differ. Most human cases are exposed to swine influenza viruses through contact with infected animals or contaminated environments. Human infection tends to result in mild clinical illness in most cases. Since these viruses continue to be detected in swine populations, further human cases are expected but remain unusual. The impact for public health if additional cases are detected is minimal. The overall risk of additional human cases is low.

2. What is the likelihood of sustained human-to-human transmission of swine influenza viruses?

No sustained human-to-human transmission was identified associated with the events described above. Current evidence suggests that contemporary swine influenza viruses have not acquired the ability of sustained transmission among humans, therefore sustained human-to-human transmission is thus currently considered unlikely.

3. What is the likelihood of international spread of swine influenza viruses by travelers?

Should infected individuals from affected areas travel internationally, their infection may be detected in another country during travel or after arrival. If this were to occur, further community level spread is considered unlikely as current evidence suggest that these viruses have not acquired the ability to transmit easily among humans.

For more information on zoonotic viruses, see the report from the WHO Consultation on the Composition of Influenza Virus Vaccines for Use in the 2025-2026 Northern Hemisphere Influenza Season held on 24-27 February 2025 at the following link: Antigenic and genetic characteristics of zoonotic influenza A viruses and development of candidate vaccine viruses for pandemic preparedness in the 2025-2026 northern hemisphere influenza season.

Overall risk management recommendations:

Surveillance and investigations

- Due to the constantly evolving nature of influenza viruses, WHO continues to stress the importance of global strategic surveillance in animals and humans to detect virologic, epidemiologic and clinical changes associated with circulating influenza viruses that may affect human (or animal) health. Continued vigilance is needed within affected and neighbouring areas to detect infections in animals and humans. Close collaboration with the animal health and environment sectors is essential to understand the extent of the risk of human exposure and to prevent and control the spread of animal influenza.
- As the extent of influenza virus circulation in animals is not clear, epidemiologic and virologic surveillance and the follow-up of suspected human cases should continue systematically. Guidance on investigation of non-seasonal influenza and other emerging acute respiratory diseases has been published on the WHO website.

- Countries should increase avian influenza surveillance in domestic and wild birds, enhance surveillance for early detection in cattle populations in countries where HPAI is known to be circulating, include HPAI as a differential diagnosis in non-avian species, including cattle and other livestock populations, with high risk of exposure to HPAI viruses; monitor and investigate cases in non-avian species, including livestock, report cases of HPAI in all animal species, including unusual hosts, to WOAH and other international organizations, share genetic sequences of avian influenza viruses in publicly available databases, implement preventive and early response measures to break the HPAI transmission cycle among animals through movement restrictions of infected livestock holdings and strict biosecurity measures in all holdings, employ good production and hygiene practices when handing animal products, and protect persons in contact with suspected/infected animals.[20]
- When there has been human exposure to a known outbreak of an influenza A virus in domestic poultry, wild birds or other animals – or when there has been an identified human case of infection with such a virus – enhanced surveillance in potentially exposed human populations becomes necessary. Enhanced surveillance should consider the health care seeking behaviour of the population, and could include a range of active and passive health care and/or community-based approaches, including: enhanced surveillance in local influenza-like illness (ILI)/SARI systems, active screening in hospitals and of groups that may be at higher occupational risk of exposure, and inclusion of other sources such as traditional healers, private practitioners and private diagnostic laboratories.
- Vigilance for the emergence of novel influenza viruses of pandemic potential should be maintained at all times including during a non-influenza emergency. In the context of the co-circulation of SARS-CoV-2 and influenza viruses, WHO has updated and published practical guidance for integrated surveillance.

Notifying WHO

- All human infections caused by a new subtype of influenza virus are notifiable under the International Health Regulations (IHR, 2005).[21] State Parties to the IHR (2005) are required to immediately notify WHO of any laboratory-confirmed[22] case of a recent human infection caused by an influenza A virus with the potential to cause a pandemic[23]. Evidence of illness is not required for this report.
- WHO published the case definition for human infections with avian influenza A(H5) virus requiring notification under IHR (2005): https://www.who.int/teams/global-influenza-programme/avian-influenza/case-definitions.

Virus sharing and risk assessment

- It is critical that these influenza viruses from animals or from people are fully characterized in appropriate animal or human health influenza reference laboratories. Under WHO's Pandemic Influenza Preparedness (PIP) Framework, Member States are expected to share influenza viruses with pandemic potential on a **timely basis**[24] with a WHO Collaborating Centre for influenza of

[20] World Organisation for Animal Health. Statement on High Pathogenicity Avian Influenza in Cattle, 6 December 2024. Available at: https://www.woah.org/en/high-pathogenicity-avian-influenza-hpai-in-cattle/.
[21] World Health Organization. Case definitions for the four diseases requiring notification in all circumstances under the International Health Regulations (2005).
[22] World Health Organization. Manual for the laboratory diagnosis and virological surveillance of influenza (2011). Available at: https://apps.who.int/iris/handle/10665/44518
[23] World Health Organization. Pandemic influenza preparedness framework for the sharing of influenza viruses and access to vaccines and other benefits, 2nd edition. Available at: https://iris.who.int/handle/10665/341850
[24] World Health Organization. Operational guidance on sharing influenza viruses with human pandemic potential (IVPP) under the Pandemic Influenza Preparedness (PIP) Framework (2017). Available at: https://apps.who.int/iris/handle/10665/25940

GISRS. The viruses are used by the public health laboratories to assess the risk of pandemic influenza and to develop candidate vaccine viruses.

- The Tool for Influenza Pandemic Risk Assessment (TIPRA) provides an in-depth assessment of risk associated with some zoonotic influenza viruses – notably the likelihood of the virus gaining human-to-human transmissibility, and the impact should the virus gain such transmissibility. TIPRA maps relative risk amongst viruses assessed using multiple elements. The results of TIPRA complement those of the risk assessment provided here, and those of prior TIPRA analyses will be published at http://www.who.int/teams/global-influenza-programme/avian-influenza/tool-for-influenza-pandemic-risk-assessment-(tipra).

Risk reduction

- Given the observed extent and frequency of avian influenza in poultry, wild birds and some wild and domestic mammals, the public should avoid contact with animals that are sick or dead from unknown causes, including wild animals, and should report dead birds and mammals or request their removal by contacting local wildlife or veterinary authorities.
- Eggs, poultry meat and other poultry food products should be properly cooked and properly handled during food preparation. Due to the potential health risks to consumers, raw milk should be avoided. WHO advises consuming pasteurized milk. If pasteurized milk isn't available, heating raw milk until it boils makes it safer for consumption.
- WHO has published practical interim guidance to reduce the risk of infection in people exposed to avian influenza viruses.

Trade and travellers

- WHO advises that travellers to countries with known outbreaks of animal influenza should avoid farms, contact with animals in live animal markets, entering areas where animals may be slaughtered, or contact with any surfaces that appear to be contaminated with animal excreta. Travelers should also wash their hands often with soap and water. All individuals should follow good food safety and hygiene practices.
- WHO does not advise special traveller screening at points of entry or restrictions with regards to the current situation of influenza viruses at the human-animal interface. For recommendations on safe trade in animals and related products from countries affected by these influenza viruses, refer to WOAH guidance.

Links:

WHO Human-Animal Interface web page
https://www.who.int/teams/global-influenza-programme/avian-influenza
WHO Influenza (Avian and other zoonotic) fact sheet
https://www.who.int/news-room/fact-sheets/detail/influenza-(avian-and-other-zoonotic)
WHO Protocol to investigate non-seasonal influenza and other emerging acute respiratory diseases
https://www.who.int/publications/i/item/WHO-WHE-IHM-GIP-2018.2
WHO Public health resource pack for countries experiencing outbreaks of influenza in animals:
https://www.who.int/publications/i/item/9789240076884
Cumulative Number of Confirmed Human Cases of Avian Influenza A(H5N1) Reported to WHO
https://www.who.int/teams/global-influenza-programme/avian-influenza/avian-a-h5n1-virus
Avian Influenza A(H7N9) Information
https://www.who.int/teams/global-influenza-programme/avian-influenza/avian-influenza-a-(h7n9)-virus
World Organisation of Animal Health (WOAH) web page: Avian Influenza
https://www.woah.org/en/home/

Food and Agriculture Organization of the United Nations (FAO) webpage: Avian Influenza
https://www.fao.org/animal-health/avian-flu-qa/en/
OFFLU
http://www.offlu.org/