Epidemiological Update Avian Influenza A(H5N1) in the Americas Region

24 January 2025

Global Context

Since 2020, the highly pathogenic avian influenza virus (HPAI)[1] subtype H5N1 of clade 2.3.4.4b has caused an unprecedented number of deaths in wild birds and poultry in numerous countries in Africa, Asia and Europe *(1)*. The Influenza A(H5N1) virus currently circulating in the Americas belongs to a HPAI genotype resulting from a recombination that occurred in wild birds in Europe and low pathogenicity strains in wild and domestic birds during its global spread *(2)*. In 2021, the virus spread through waterfowl flyways to North America and, in 2022, to Central and South America *(1)*. By 2023, epidemic outbreaks in animals were reported from 14 countries and territories, mainly in the Americas *(1, 3)*.

Since 2022, 19 countries on three continents have reported outbreaks in mammals to the World Organization for Animal Health (WOAH) *(4)*. In recent years, there has been an increase in the detection of A(H5N1) viruses in non-avian species worldwide, including terrestrial and marine mammals, both wild and domestic (companion and production).

Although reports of transmission of clade 2.3.4.4b viruses between mammals worldwide are scarce, the current situation of contagion in dairy cattle in the United States of America, as well as massive deaths reported in marine mammals and infections in mink and fox farms in Europe, point to transmission between mammals, and further investigations are needed for confirmation *(5, 6, 7)*.

Historically, since the beginning of 2003 and as of 12 December 2024, 954 human cases of avian influenza A(H5N1), including 464 deaths (48.6% case fatality), were reported to the World Health Organization (WHO) across 24 countries.*(8)* Between 2021 and as of 12 December 2024, 92 detections of influenza A(H5N1) virus in humans were reported to WHO, of which 64% (n= 59) occurred in the United States *(8)*.

[1] Broadly speaking, the multiple strains of avian influenza virus can be classified into two categories according to the severity of disease presentation in poultry: low pathogenic avian influenza viruses (LPAIV) and highly pathogenic avian influenza viruses (HPAIV).

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Summary of the situation in the Americas Region

Between 2022 and as of epidemiological week (EW) 52 of 2024, a total of 19 countries and territories in the Americas Region reported 4,388 animal outbreaks[2] of H5N1 avian influenza to WOAH, representing an additional 740 outbreaks, since the last epidemiological update published by the Pan American Health Organization/World Health Organization (PAHO/WHO) on 15 November 2024 (**Table 1**) *(9)*. Further details on outbreak identifications in domestic and wild mammals and birds in Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Ecuador, the Plurinational State of Bolivia, Guatemala, Honduras, the Falkland Islands, Mexico, Panama, Paraguay, Peru, the United States, Uruguay, and the Bolivarian Republic of Venezuela can be found in **Tables 2-3** and **Figures 1-5** *(4)*.

A total of 71 human infections caused by avian influenza A(H5) have been reported in four countries in the Americas between 2022 and 17 January 2025, an additional 22 cases compared to the last epidemiological update published by PAHO/WHO *(9)*. Sixty-eight cases were reported in the United States *(10)*, one case in Canada confirmed on 13 November 2024 *(11)*, one case in Chile reported on 29 March 2023 *(12)*, and one case in Ecuador reported on 9 January 2023 *(13)*.

During 2024 alone and as of 17 January 2025, 68 human cases have been reported in Canada and the United States, of which 54 reported between October 2024 and January 2025 *(10, 11, 14)*.

Situation by country and/or territory in outbreaks in birds

Between 2022 and as of EW 52 of 2024, a total of 19 countries and territories in the Americas Region reported 3,137 outbreaks of avian influenza in domestic and/or wild birds to WOAH, an additional 150 outbreaks compared to the last epidemiological update published by PAHO/WHO *(4, 9)*. Of these outbreaks, 2,389 occurred in domestic birds and 748 in wild birds (**Table 1**) *(4)*. Between EW 1 and EW 52 of 2024, eight countries and territories in the Americas (Brazil, Canada, Colombia, Ecuador, the Falkland Islands, Mexico, Peru, and the United States) have reported outbreaks in both domestic and wild birds (**Table 2**) *(4)*.

A summary of the situation in countries and territories in the Americas Region that reported outbreaks of avian influenza A(H5N1) in birds during 2024 and up to EW 52 is presented below in alphabetical order.

In **Brazil**, between EW 1 and EW 52 of 2024, 15 outbreaks of avian influenza A(H5) have been confirmed in wild birds in the states of Espírito Santo, Rio de Janeiro, Rio Grande do Sul and São Paulo *(4)*.

In **Canada**, between EW 1 and EW 52 of 2024, 120 HPAI A(H5N1) outbreaks in poultry and wild birds have been reported to WOAH in 11 provinces and territories, including Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Nunavut, Ontario, Prince Edward Island, Quebec, and Saskatchewan *(4)*.

[2]Note: Please note that the current figures represent the number of outbreaks, which may include multiple epidemiologically linked records and updates to reported case counts for each outbreak. As a result, the totals may be lower than those in previous reports. These figures reflect only officially verified outbreaks reported to WOAH, ensuring accuracy in accordance with WOAH standards.

In **Colombia**, between EW 1 and EW 52 of 2024, seven outbreaks of HPAI A(H5N1) in backyard poultry were reported to WOAH in the department of Choco, municipality of Acandí (two outbreaks) and in the department of Magdalena, municipality of Remolino (five outbreaks) *(4)*.

In **Ecuador**, between EW 1 and EW 52 of 2024, an outbreak of HPAI A(H5N1) in backyard poultry was reported to WOAH. The outbreak was identified in Pastaza province in February. Since then, no new outbreaks have been reported *(4)*.

In the **Falkland Islands**, between EW 1 and EW 52 of 2024, 18 outbreaks of avian influenza in birds were reported, all related to wild birds. The last reported outbreak was in December *(4, 15)*.

In **Mexico**, between EW 1 and EW 52 of 2024, WOAH was notified of 7 outbreaks of avian influenza in wild and domestic birds. The outbreaks occurred in six states in the country: Aguascalientes, Chihuahua, Jalisco, Mexico, Michoacán, and Oaxaca *(4)*.

In **Peru**, between EW 1 and EW 52 of 2024, 61 outbreaks of HPAI A(H5) were reported to WOAH, mostly in backyard domestic poultry in 12 departments: Ancash, Arequipa, Cajamarca, Cusco, Ica, Junín, La Libertad, Lambayeque, Lima, Moquegua, Lima Province, and Exclusive Economic Zone of Peru *(4)*.

In the **United States**, since the beginning of 2024, 278 outbreaks of avian influenza A(H5) virus in wild birds, commercial poultry and/or backyard poultry have been reported to WOAH in 40 states in the country[3] *(4)*. Between March 2024 and 17 January 2025, the United States. authorities also report outbreaks of avian influenza (H5) in commercial poultry in 50 states, affecting a total of 136,327,394 poultry. During this same period, 51 jurisdictions have been identified with avian influenza (H5) in wild birds, with a total of 10,969 detections in these birds *(10)*. In the past 30 days, outbreaks have been identified in 52 poultry commercial flocks and 38 outbreaks in backyard flocks in Arkansas, California, Delaware, Georgia, Indiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, South Carolina, Virginia, and Wisconsin, affecting 13.23 million birds *(16)*.

Situation by country and/or territory in outbreaks in mammals

Since 2022 and as of EW 52 of 2024, eight countries and territories have reported 1,284 outbreaks of avian influenza A(H5N1) in mammals in Argentina, Brazil, Canada, Chile, the Falkland Islands, Peru, the United States, and Uruguay (**Table 1**) *(4)*. This represents an additional 590 outbreaks since the last epidemiological update published by PAHO/WHO *(4, 9)*. Four countries and territories in the Americas (Argentina, Canada, the Falkland Islands, and the United States) have reported 982 outbreaks of avian influenza in mammals during 2024 (**Table 2**) *(4)*.

[3] Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Washington, West Virginia, Wisconsin, Wyoming.

The following is an alphabetical summary of the situation in countries and territories in the Region of the Americas that reported outbreaks of avian influenza A(H5N1) in mammals during 2024.

In **Argentina**, between EW 1 and EW 52 of 2024, an outbreak of H5 avian influenza in a South American sea lion in the province of Chubut was reported to WOAH. Since then, no new outbreaks have been reported *(4)*.

In **Canada**, between EW 1 and EW 52 of 2024, the provinces of Alberta, Nova Scotia, Nunavut, Prince Edward Island, and Quebec have reported nine outbreaks in wild mammals. The last identified outbreak was reported in December 2024 *(4, 17)*.

In the **Falkland Islands**, between EW 1 and EW 52 of 2024, an outbreak of avian influenza was identified in a juvenile elephant seal in October 2024. The animal was found dead on Sea Lion Island *(15)*.

In the **United States**, since early 2024 up to EW 52, 962 outbreaks in wild and domestic mammals have been reported to woah in 25 states[4]. Following the first notification in March 2024 in dairy cattle of influenza A(H5N1) in the country, outbreaks have been identified in 16 states[5], affecting 928 dairy herds as of 16 January 2024. In the past 30 days, 36 cases in dairy cattle have been reported in the states of California (n=35) and Michigan (n=1) *(18)*. Additionally, avian influenza A(H5N1) virus has been detected in 38 species of domestic and wild mammals in the country. Detections include primarily red foxes (21%), house mice (19%), and domestic cats (16%) *(19)*.

Between 30 October and 6 November 2024, the United States authorities announced the detection of H5N1 avian influenza in two pigs on a non-commercial backyard farm in Oregon, where the virus had previously also been identified in poultry. The viral load in the infected pigs was reported to be very low, and the genotype identified (D1.2) matched that found in the poultry samples *(20)*.

Situation by country and/or territory with human cases

The following is a summary of the situation in Canada and the United States with respect to human infections with avian influenza A(H5N1). During 2024 and as of 17 January 2025, human cases of avian influenza A(H5N1) have been reported in Canada and the United States *(10, 11)*. Since the last epidemiological update published by PAHO/WHO, 21 new cases of influenza A(H5N1) have been confirmed, all in the United States (9, 10).

On 14 November 2024, **Canada** confirmed its first human case of influenza A(H5N1) in a teenager from British Columbia, initially reported on 9 November 2024. Genomic sequencing linked the virus to the outbreak in poultry in the region (clade 2.3.4.4b, genotype D1.1) and detected the E627K mutation in the PB2 gene, associated with increased replication in mammals. The source of infection is still unknown, and no additional cases have been reported *(11)*.

[4] Alaska, Arizona, California, Colorado, Idaho, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Montana, Nevada, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, South Dakota, Texas, Utah, Vermont, Washington y Wyoming.

[5] California, Colorado, Idaho, Iowa, Kansas, Michigan, Minnesota, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, South Dakota, Texas, Utah y Wyoming.

In the **United States**, during 2024 as of 17 January 2025, 67 human cases of influenza A(H5N1) have been confirmed in California (n= 38), Colorado (n= 10), Iowa (n= 1), Louisiana (n= 1), Michigan (n= 2), Missouri (n= 1), Oregon (n= 1), Texas (n= 1), Washington (n= 11), and Wisconsin (n= 1). Of these cases, 40 have been linked to exposure to diseased or infected dairy cattle, whereas 23 are linked to exposure to poultry (**Table 4**) *(10, 21)*. The source of exposure for two cases in California and one case in Missouri could not be determined, and as investigations have been completed, human-to-human transmission has been ruled out *(22)*. As of 17 January 2025, human-to-human transmission of avian influenza A(H5N1) virus has not been reported *(10)*.

Since 24 March 2024 and through January 17, 2025, dedicated avian influenza A(H5) targeted surveillance efforts have monitored more than 13,400 people for exposure to infected animals and more than 600 of them have been tested for avian influenza A(H5).

Table 1. Number of outbreaks in domestic and wild birds and mammals in the Americas Region reported to WOAH between 2022 up to EW 52 of 2024.

Country/Territory	Number of outbreaks	In birds		In mammals	
		Wild	Domestic	Wild	Domestic
Argentina	146	Yes	Yes	Yes	
Bolivia	38	Yes	Yes		
Brazil	166	Yes	Yes	Yes	
Canada	533	Yes	Yes	Yes	Yes
Chile	209	Yes	Yes	Yes	
Colombia	70	Yes	Yes		
Costa Rica	10	Yes	Yes		
Cuba	1	Yes	Yes		
Ecuador	37	Yes	Yes		
Falkland Islands	19	Yes		Yes	
Guatemala	1	Yes			
Honduras	4	Yes			
Mexico	77	Yes	Yes		
Panama	9	Yes	Yes		
Paraguay	5		Yes		
Peru	371	Yes	Yes	Yes	
Uruguay	25	Yes	Yes	Yes	
The United States	2,665	Yes	Yes	Yes	Yes
Venezuela	2	Yes	Yes		
Total	**4,388**				

Source: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2024 [cited 15 January 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Table 2. Avian influenza outbreaks in birds and mammals in the Region of the Americas during 2024, as of EW 52.

Country/Territory	Number of outbreaks	In birds		In mammals	
		Wild	Domestic	Wild	Domestic
Argentina	2			Yes	
Brazil	1	Yes			
Canada	114	Yes	Yes	Yes	
Colombia	7		Yes		
Ecuador	1		Yes		
Falkland Islands	19	Yes		Yes	
Mexico	6	Yes	Yes		
Perú	61	Yes	Yes		
United States	1.240	Yes	Yes	Yes	Yes
Total	**1,451**				

Source: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2024 [cited 15 January 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Table 3. Outbreaks of A(H5N1) in mammals in the Americas from 2022 to EW 52 of 2024.

Mammals	Argentina	Brazil	Canada	Chile	The United States	Falkland Islands	Peru	Uruguay
Arctocephalus australis (fur seals)	Yes	Yes						Yes
Camelidae (alpaca)					Yes			
Canis latrans (coyote)					Yes			
Canis lupus familiaris (domestic dog)			Yes					
Capra hircus (domestic goat)					Yes			
Didelphis virginiana (Virginia opossum)					Yes			
Felidae					Yes			
Felis silvestris catus (domestic cat)			Yes		Yes			
Dairy cattle					Yes			
Halichoerus grypus (grey seal)			Yes		Yes			
Leopardus geoffroyi					Yes			
Leptailurus serval					Yes			
Lontra canadensis (northern river otter)					Yes			
Lontra felina (seaotter)				Yes				
Lontra provocax (otter)				Yes				
Lynx canadensis					Yes			
Lynx rufus (bobcat)					Yes			
Martes americana (sable)					Yes			
Mephitidae					Yes			
Mephitis mephitis (skunk)			Yes		Yes			
Microtus ochrogaster (prairie voles)					Yes			
Mirounga leonina (southern elephant seal)	Yes					Yes		
Mus musculus (house mouse)					Yes			
Nasua nasua (cochi or South American coati)								Yes
Neogale vison (American mink)			Yes		Yes			
Otaria flavescens (South American sea lion)	Yes	Yes		Yes			Yes	Yes
Panthera leo (lion)							Yes	
Panthera pardus orientalis (Amur leopard)					Yes			
Panthera tigris (tiger)					Yes			
Pekania pennanti (fisher)					Yes			
Peromyscus sonoriensis (western deer mousel)					Yes			
Phoca vitulina / Halichoerus grypus (seal)			Yes		Yes			
Procyon lotor (raccoon)			Yes		Yes			
Puma concolor (puma)					Yes			
Pusa hispida (Ringed seal)					Yes			
Sciurus aberti (squirrel)					Yes			
Swine					Yes			
Sus scropha (domestic pig)					Yes			
Sylvilagus audubonii (desert rabbit)					Yes			
Tursiops truncatus (bottlenose dolphin)					Yes			
Ursus americanus / U. arctos horribilis (bear)			Yes		Yes			
Ursus arctos (brown bear)					Yes			
Ursus maritimus (polar bear)					Yes			
Vulpes vulpes (fox)			Yes		Yes			

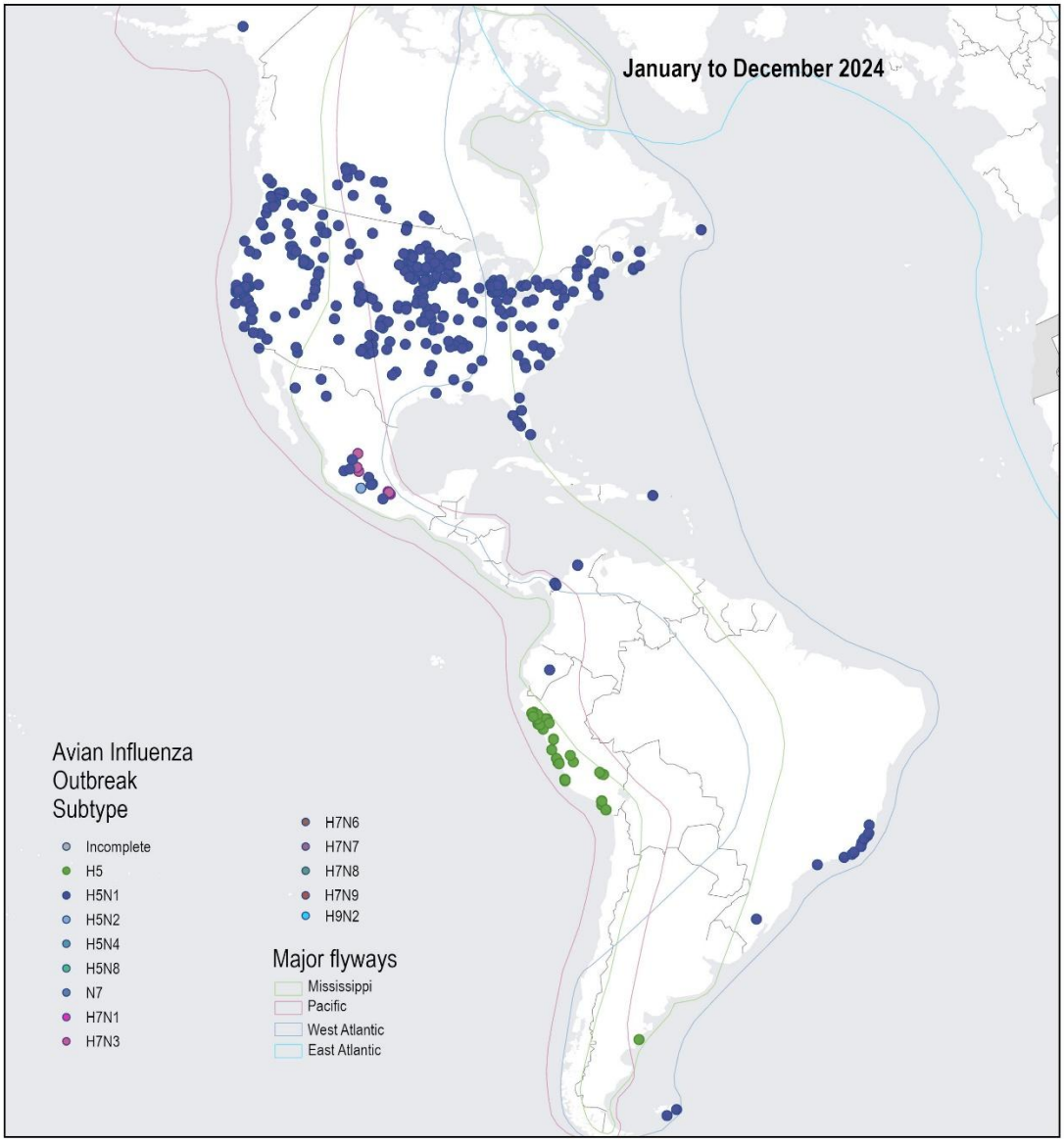
Fuente: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2025 [cited 14 January 2025]. Available from: https://wahis.woah.org/#/event-management; and United States Department of Agriculture, Animal and Plant Health Inspection Service. USDA Animal and Plant Health Inspection Service Shares Update on H5N1 Detection in Oregon Swine, Bovine Vaccine Candidate Progression. Washington, D.C.: USDA; 2025. Available from: https://www.aphis.usda.gov/news/agency-announcements/usda-animal-plant-health-inspection-service-shares-update-h5n1-detection

Tabla 4. Cases of avian influenza A(H5) infections in humans in the United States during 2024 as of 15 January 2025.

State	Linked to livestock	Linked to poultry	Other animal exposure	Origin Unknown	Total by State
California	36	0	0	2	38
Colorado	1	9	0	0	10
Iowa	0	1	0	0	1
Louisiana	0	0	1	0	1
Michigan	2	0	0	0	2
Missouri	0	0	0	1	1
Oregon	0	1	0	0	1
Texas	1	0	0	0	1
Washington	0	11	0	0	11
Wisconsin	0	1	0	0	1
Total	**40**	**23**	**1**	**3**	**67**

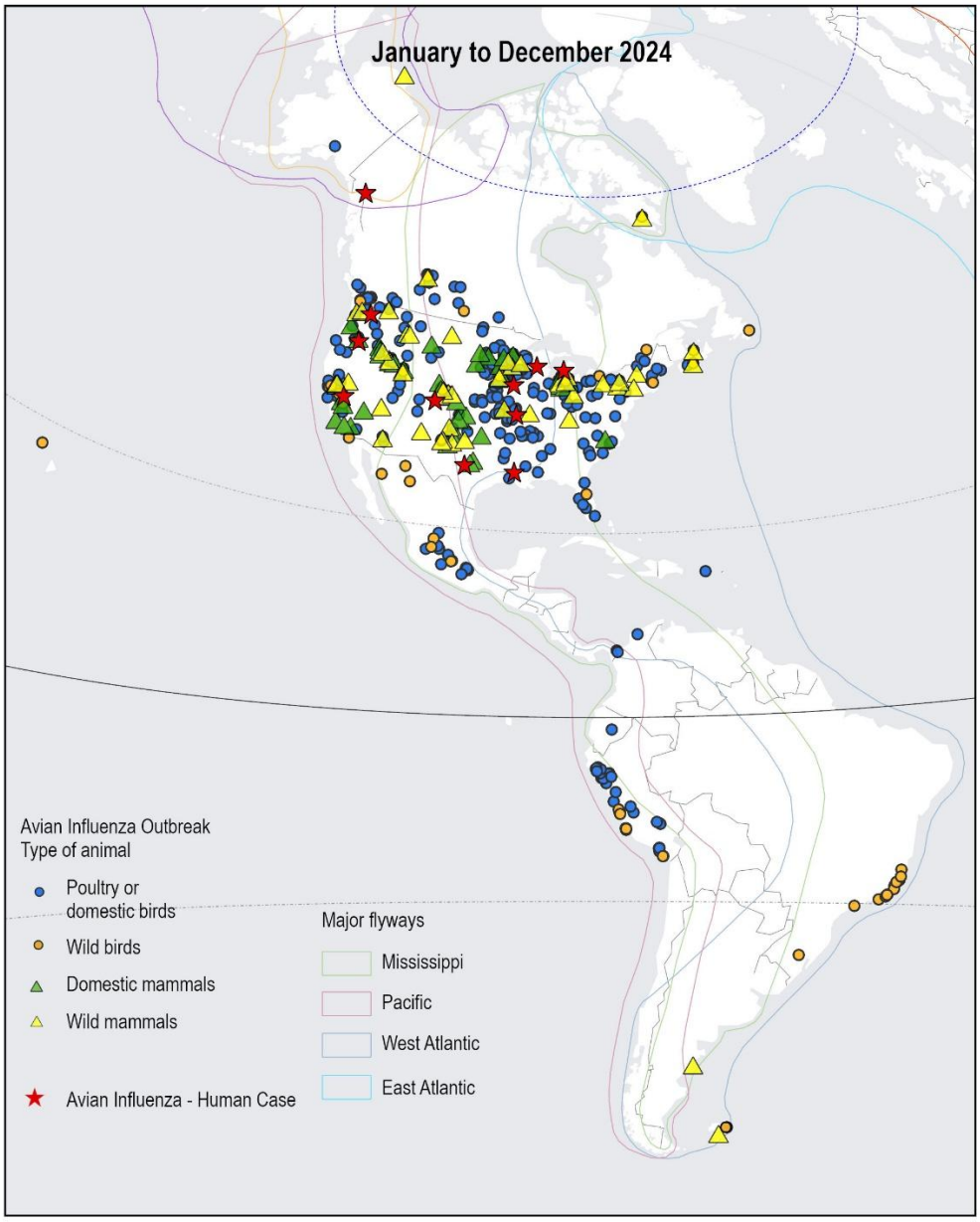
Source: United States Centers for Disease Control and Prevention (U.S. CDC). Avian Influenza H5. Atlanta: CDC; 2025. [cited 15 January 2025]. Available from: https://www.cdc.gov/bird-flu/situation-summary/index.html.

Figure 1. Historical avian influenza outbreaks by subtype and main migratory routes of wild birds between January and December 2024 in the Americas Region.



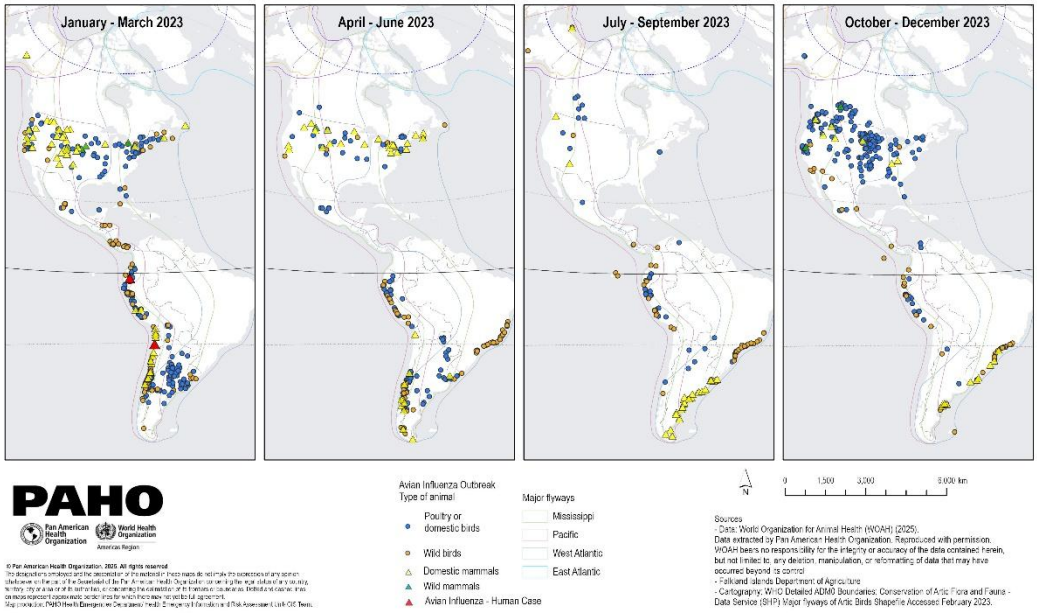
Fuente: Adapted from World Organisation for Animal Health. Avian Influenza. Paris: WOAH; 2025 [cited 15 January 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Figure 2. History of avian influenza outbreaks between January and December 2024 by species and main migratory routes of wild birds in the Americas Region.



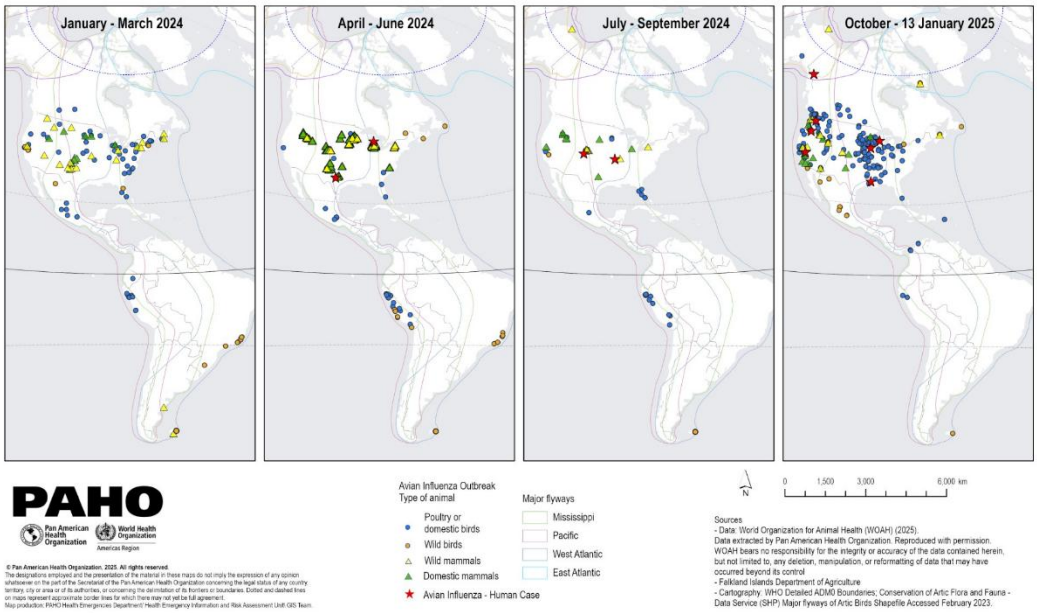
Source: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2025 [cited 15 January 15, 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Figure 3. History of avian influenza outbreaks and main migratory routes of wild birds by type of animal during 2023 in the Americas Region.



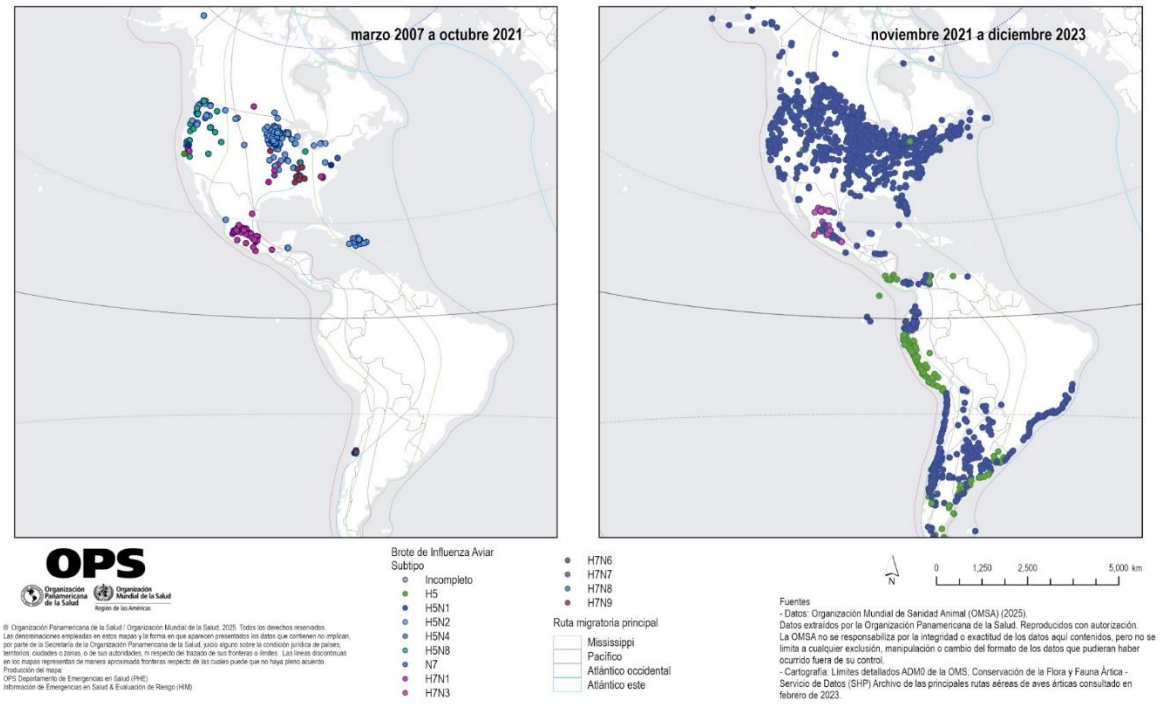
Source: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2025 [cited 15 January 15, 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Figure 4. Monthly history of avian influenza outbreaks and main migratory routes of wild birds by type of animal during 2024 and as of 13 January 2025 in the Americas Region.



Source: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2025 [cited 15 January 15, 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Figure 5. Historical clustering of avian influenza outbreaks by subtype and main migratory routes of wild birds by type of animal between March 2007 and December 2023 in America's Region



Source: Adapted from World Organization for Animal Health. Avian Influenza. Paris: WOAH; 2025 [cited 15 January 15, 2025]. Available from: https://wahis.woah.org/#/event-management; and Falkland Islands Department of Agriculture. Avian Influenza Information; Stanley: IFAD; 2024 [cited 15 January 2025]. Available from: https://falklands.gov.fk/agriculture/avian-influenza

Recommendations for Member States

While largely affecting animals, avian influenza outbreaks pose continuing risks to public health. Together, the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the World Organization for Animal Health (WOAH) urge Member States to work collaboratively and intersectorally to preserve animal health and protect human health *(1, 3, 5, 7)*.

The sporadic cases of avian influenza A(H5N1) 2.3.4.4b clade virus detected in humans are mostly associated with direct contact with infected animals and contaminated environments. Current evidence reflects that the virus does not appear to be easily transmitted from one person to another. However, it is imperative to strengthen intersectoral surveillance to detect any possible changes in this situation *(3)*.

WOAH has specific recommendations on the avian influenza situation in birds and mammals. These recommendations advise countries to maintain intensified surveillance for the disease in domestic and wild birds, preventing the spread of the disease by implementing biosecurity measures *(23)*. WOAH recommends controlling the movement of susceptible domestic animals and their products and protecting people in close contact with sick animals. It is crucial to monitor susceptible domestic and wild animals, investigating mortality increases in

wild animals. In addition, timely reporting and sharing of avian influenza virus genetic sequences are essential for understanding the epidemiology of the disease *(23)*.

PAHO/WHO urges Member States to work collaboratively and intersectorally to preserve animal health and protect public health. It is essential that avian influenza preventive measures be implemented at the source, protocols for detection, notification, and rapid response to outbreaks in animals be established, surveillance for both animal and human influenza be strengthened, epidemiological and virological investigations be carried out in relation to animal outbreaks and human infections, sharing of genetic information about viruses, fostering collaboration between animal and human health settings, effective risk communication, and ensuring preparedness for a potential influenza pandemic at all levels *(24, 25)*.

The following are the main lines of recommendation for Member States with a One Health approach, which include coordination for intersectoral surveillance and response, as well as prevention measures and risk communication.

Intersectoral coordination

The risk of infection in mammals and humans increases when there is contact with infected birds or exposure to contaminated environments *(3)*. PAHO/WHO recommends strengthening intersectoral actions such as the establishment of standardized protocols that are inclusive of all relevant sectors, with well-established roles that facilitate the exchange of information and its analysis. The development of a strategy for early detection and response, based on the One Health approach, including both human and animal risk, as well as the training of human resources, is fundamental. In addition, integrated surveillance systems that facilitate national reporting are essential. Integration of the stakeholder perspective and roles of the One Health approach is essential and should be promoted *(26)*.

High-level political commitment, stakeholder mapping and analysis, joint needs assessment, and the establishment of communication channels are key elements of multisectoral coordination for health emergency preparedness. These pillars should be implemented through a transparent, reliable, and accountable framework *(26)*.

Surveillance of human cases

Surveillance and follow-up of exposed persons and their contacts is recommended for early identification of cases or transmission events at the human-animal interface (27). Because of the constantly evolving nature of influenza viruses, PAHO/WHO continues to emphasize the importance of strengthening severe acute respiratory infection (SARI) and influenza syndrome (ILI) surveillance, as well as strengthening event-based surveillance *(1)*.

This allows the detection of virological, epidemiological, and clinical changes associated with circulating influenza viruses that may impact human health. In addition to the active case-finding, contact identification and follow-up activities carried out during the epidemiological investigation of zoonotic events, it is advisable to alert and sensitize clinicians to consider the diagnosis of avian influenza and to strengthen existing surveillance systems in areas near poultry farms, areas where human cases and animal outbreaks have been reported, or where the source of infection is suspected *(28)*. To complement surveillance for SARI and ILI, PAHO/WHO recommends establishing early warning systems to detect unusual

events and to have a more complete picture of the situation, and to conduct a joint and coordinated risk assessment between the human, animal, and environmental sectors in a timely manner.

PAHO/WHO reiterates to Member States the need to maintain and strengthen seasonal and zoonotic influenza virus surveillance, including the immediate submission of human influenza samples caused by avian influenza to the WHO Collaborating Center at the United States Centers for Disease Control and Prevention (U.S. CDC).

Because information on the circulation of avian influenza A(H5N1) viruses is important for human influenza vaccine composition and to generate data for preparedness and response, countries are encouraged to share animal influenza samples with the WHO Collaborating Center at St. Jude Children's Hospital, which focuses exclusively on the threat posed to humans by zoonotic influenza viruses.

Laboratory diagnosis of human cases

Collection of human samples

Samples should be collected by trained personnel in compliance with all biosafety standards, including the use of appropriate personal protective equipment (PPE) for respiratory viruses.

The recommended specimens are the same type of specimens used for routine influenza surveillance. The nasopharyngeal swab is the optimal specimen collection method for influenza diagnostic testing. However, a combined nasal and pharyngeal swab or aspirate specimen may be collected.

In the context of influenza A(H5) infection in humans recently described in the United States, it has been observed that it is possible to have a negative nasopharyngeal swab but a positive conjunctival swab *(29, 30)*. Therefore, in suspected cases or in persons exposed to influenza A(H5) with symptoms of conjunctivitis, it is suggested, in addition to the nasopharyngeal swab, to consider taking a conjunctival swab. It is essential to follow the established protocols and collect both nasopharyngeal and ocular samples in patients with conjunctivitis, for a complete evaluation of possible infection by the A(H5N1) virus *(31)*.

A sterile dacron/nylon swab should be used for specimen collection. Cotton-tipped and wooden-tipped swabs are not recommended as they interfere with specimen processing and inhibit molecular diagnostic reactions. Swabs should be placed in a viral transport tube containing 3 ml of sterile viral transport medium and transported in the same tube with viral transport medium (VTM).

Collection of specimens within four days of onset of symptoms is recommended for the highest yield of influenza virus and best detection. Sampling of asymptomatic contacts is not recommended unless deemed necessary according to national guidelines.

Samples should be kept refrigerated (4-8°C) and sent to the laboratory (National Influenza Center or National Reference Laboratory) where they should be processed within 24-72 hours of collection (**Figure 6**). If samples cannot be shipped within this period, it is recommended to freeze at -70°C (or below) until samples are shipped (ensuring that the cold chain is maintained).

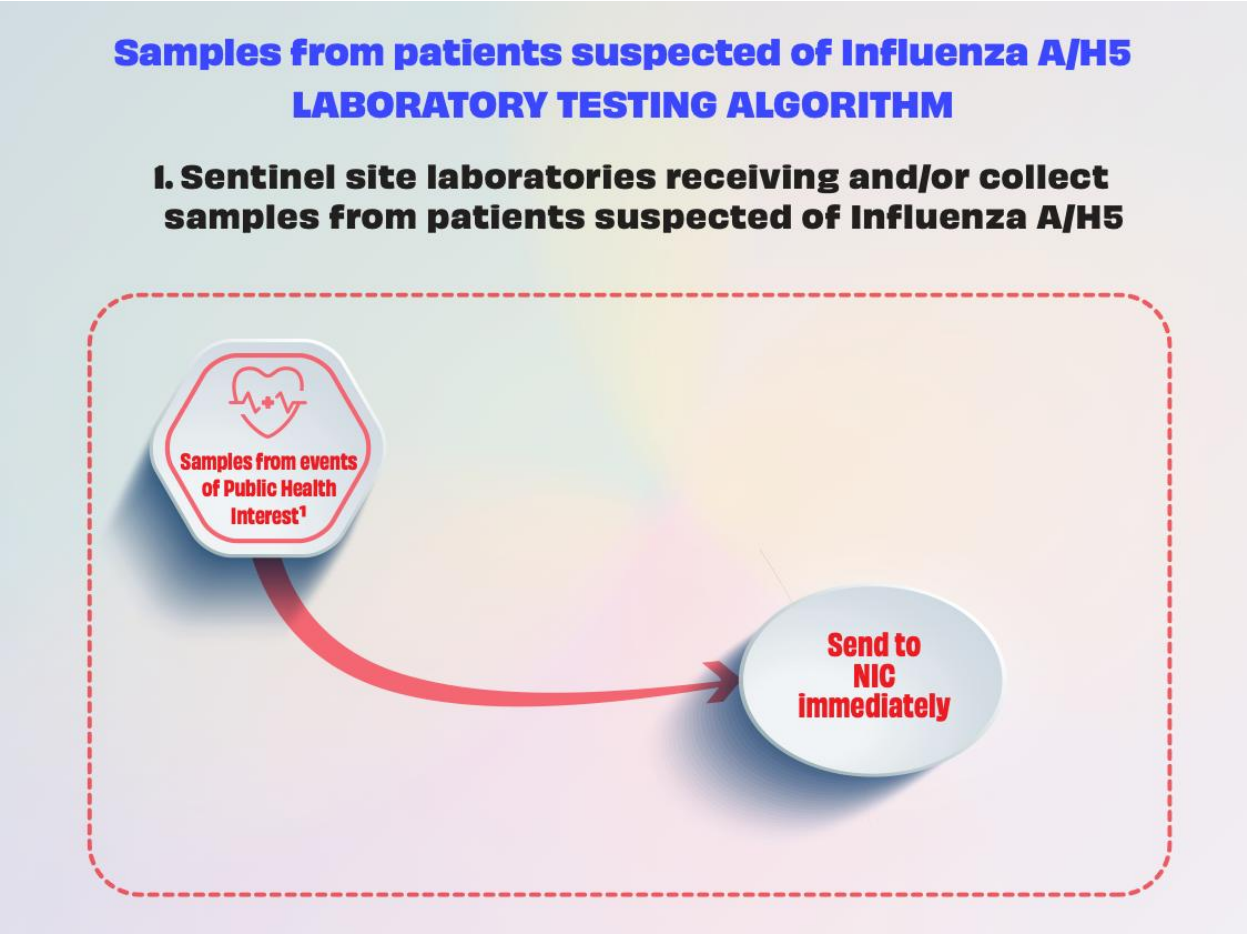
Sample flow and laboratory testing algorithm

In the Americas, all National Influenza Centers (NICs) and National Reference Laboratories (NRLs) for human influenza, as part of the WHO Global Influenza Surveillance and Response System (GISRS), use molecular diagnostic protocols and reagents developed and validated by the WHO-CC at U.S. CDC.

Upon identification of suspected cases of human infection with avian influenza A(H5), a respiratory specimen should be collected and submitted to the NIC or NRL for analysis (**Figure 6**) *(32)*.

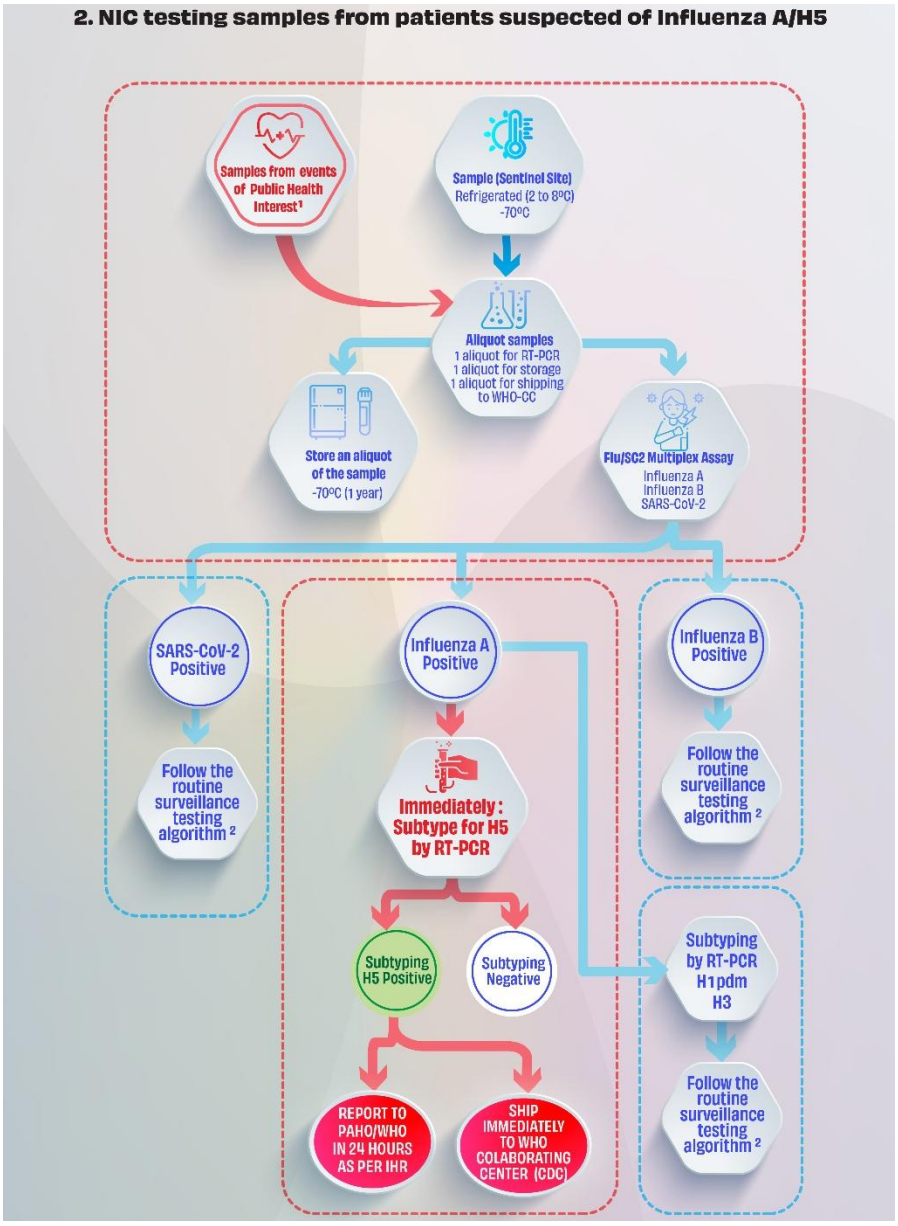
Specimens collected from suspected human cases exposed to birds or humans infected with avian influenza A(H5) should be tested for influenza. Influenza A positive specimens should be further subtyped for H5 (**Figure 7**) *(32, 33)*.

Figure 6. Sample flow for samples of suspected cases of Influenza A(H5) at sentinel sites and decentralized laboratories.



Source: Pan American Health Organization. Samples from suspected Influenza A(H5) patients - Laboratory testing algorithm. 2 December 2022. Washington, D.C.: PAHO; 2022. Available from: https://www.paho.org/en/documents/samples-patients-suspected-influenza-ah5-laboratory-testing-algorithm.

Figure 7. NIC analyzing samples of suspected cases of Influenza A(H5)



Source: Pan American Health Organization. Samples from suspected Influenza A(H5) patients - Laboratory testing algorithm. 2 December 2022. Washington, D.C.: PAHO; 2022. Available from: https://www.paho.org/en/documents/samples-patients-suspected-influenza-ah5-laboratory-testing-algorithm.

Laboratory reagents

U.S. CDC kits for real-time reverse transcriptase-polymerase chain reaction (qRT-PCR) detection of influenza viruses are available through the International Reagent Resource (IRR).

For influenza detection and subtyping of influenza A(H5), the following kits and controls for molecular detection are available:

- Influenza SARS-CoV-2 Multiplex Assay (RUO) (500 reactions) (Catalog No. FluSC2PPB-RUO), dried primers and probes

- Influenza SARS-CoV-2 Multiplex Assay Positive Controls Kit (RUO) (500 reactions) (Catalog No. FluSC2PC-RUO)
- U.S. CDC Real-Time RT-PCR Influenza Virus A(H5) (Asian Lineage) Subtyping Panel (VER 4) (RUO) (Catalog No. FluRUO-13)
- U.S. CDC Influenza A(H5N1) (Asian Lineage) Real-Time RT-PCR Positive Control with Human Cell Material (RUO) (Catalog No. VA2715)

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- U.S. CDC Influenza A(H5N1) (Asian Lineage) Real-Time RT-PCR Positive Control with Human Cell Material (RUO) (Catalog No. VA2715)

Interpretation of results

The U.S. CDC kit markers (targets) for detection of influenza A/H5 subtype are as follows: INFA (M), H5a (HA), H5b (HA) and RP.

When using the U.S. CDC influenza A(H5) subtyping kit:

- Samples positive for INFA, H5a and H5b markers are considered **positive for influenza A(H5).**
- Samples positive for a single H5 marker are considered **presumptive for influenza A(H5).**

In both cases, specimens should be submitted to a WHO-CC for further characterization or confirmation (in the case of presumptive results). However, a positive specimen for influenza A(H5) (both marker positive) should be reported immediately.

PAHO/WHO is currently working to support Member States in preparing for and responding to influenza A(H5). For additional assistance, contact laboratoryresponse@paho.org.

Shipment of samples

U.S. CDC is the WHO-CC in the Americas Region for receiving human samples positive for avian influenza A(H5).

International and air shipment of human specimens to the WHO-CC at the U.S. CDC must meet all international standards in accordance with the International Air Transport

Association (IATA), with special documents required for transport to the United States that are different from the documents for routine shipment of seasonal influenza specimens.

It is important to note that specimens should **not** be submitted to U.S. CDC as routine influenza specimens. PAHO should be contacted to coordinate shipment to the WHO-CC at laboratoryresponse@paho.org

Response to human cases

Upon detection of human infection, early notification is essential for investigation and implementation of appropriate measures including isolation and early treatment of the case, active search for other cases associated with the outbreak, and identification of close contacts for appropriate management and follow-up *(28)*.

It is recommended that the human health sector, the animal health sector and the environmental sector work together on risk analysis at the human-animal-environment interface. It is recommended that, upon detection of suspected avian influenza (HPAI or LPAI) in animals, the animal health and environmental sectors should alert and summon health personnel in the areas where transmission is occurring, and where there is a greater probability of infection in persons exposed to these viruses, to be attentive to symptoms compatible with influenza-like illness and to participate in investigations of persons exposed to infected animals. In addition, when avian influenza is suspected in humans, it is recommended that the health sector alert and call upon animal health and environmental personnel to investigate possible cases in domestic and wild animals and to detect possible sources of infection *(24)*.

Member States are encouraged to promote awareness messages to the general public to avoid contact with sick or dead animals, contact with animals at farms and animal markets, entering areas where animals may be slaughtered, contact with any surface that appears to be contaminated with animal feces, and slaughtering or eating sick animals. As well as messages for anyone exposed to animals infected, or possibly infected, with avian influenza A(H5N1) virus to seek immediate medical attention if they develop symptoms and to report such exposure. In addition, it is important to alert clinicians to the risk of zoonotic infection in patients exposed to birds or animals, especially in areas with confirmed or suspected circulation of influenza A(H5N1) virus, in areas with limited animal surveillance, and in any type of occupational exposure *(5, 7)*.

Case Investigation

It is recommended that the human health sector, the animal health sector, and the environmental sector work together on risk analysis at the human-animal-environment interface. It is recommended that, upon detection of suspected avian influenza (HPAI or LPAI) in animals, the animal health and environmental sectors should alert and summon health personnel in the areas where transmission is occurring, and where there is a greater probability of infection in persons exposed to these viruses, to be attentive to symptoms compatible with influenza syndrome, and to participate in investigations of persons exposed to infected animals. In addition, when avian influenza is suspected in humans, it is recommended that the health sector alert and summon animal health and environmental personnel to investigate possible cases in domestic and wild animals to detect possible sources of infection *(20)*.

Member States are encouraged to promote awareness messages to the general public to avoid contact with sick or dead animals, contact with animals at farms and animal markets, entering areas where animals may be slaughtered, contact with any surface that appears to be contaminated with animal feces, and slaughtering or eating sick animals. As well as messages for anyone exposed to animals infected, or possibly infected, with avian influenza A(H5N1) virus to seek immediate medical attention if they develop symptoms and to report such exposure. Additionally, it is important to alert clinicians to the risk of zoonotic infection in patients exposed to birds or animals, especially in areas with confirmed or suspected circulation of the influenza A(H5N1) virus, in areas with limited animal surveillance, and in any type of occupational exposure *(5)*.

Case research

In the presence of a confirmed or suspected human infection caused by an influenza virus with pandemic potential, including an avian virus, it is recommended:

- A thorough epidemiological investigation of the history of animal exposure, travel and ill contacts should be carried out. The investigation should not be delayed, even if confirmatory laboratory results are awaited.
- Epidemiological investigation should include early identification of unusual respiratory events, which could signal person-to-person transmission of the new virus.
- Clinical specimens collected at the time and place where the case occurred should be tested and sent to the WHO-CC for characterization within one week of detection.
- Standard infection prevention and control (IPC) procedures and standard precautions should always be applied and appropriate PPE should be used according to risk (based on the most likely modes of transmission) to protect the health of investigators. PPE should be used when in contact with symptomatic persons and in situations where person-to-person transmission is suspected.
- The epidemiological investigation should include information from official veterinary services and the private sector (animal production) on the origin of the animals and records of movements on and off the premises. This information will help define the scope (location) of investigations in humans exposed to infected animals.
- Information from official veterinary services could provide guidance on possible influenza events (both notifiable and non-notifiable) occurring in the area and farms related to the event.
- For more information regarding the investigation of non-seasonal influenza cases, the World Health Organization's "Protocol for Investigating Non-Seasonal Influenza and Other Emerging Acute Respiratory Diseases" is available from: https://apps.who.int/iris/handle/10665/329895 *(25)*.

Notification of human cases

- A **confirmed case** of human infection with avian influenza should be reported **immediately** through two channels: to the WHO Regional Contact Point for the International Health Regulations (IHR) through the National IHR Focal Point (NFP), and to the GISRS administered by PAHO and WHO (flu@paho.org). The report should include all available results of the epidemiological investigation of the case and the virological characteristics of the virus.

- A suspected case of human infection with avian influenza should be reported **immediately** to the GISRS (flu@paho.org), and information on the suspected case may be shared with the WHO IHR Regional Contact Point, as this is an unusual event. The report should include all available results of the epidemiological investigation of the case and the characteristics of the virus.

Animal surveillance, diagnosis and response

The FAO, WHO, and WOAH urge countries to prevent avian influenza at its source to facilitate a rapid response. The implementation of a comprehensive surveillance program, including wild birds and poultry, both backyard and commercial, is essential for early detection. Targeted risk-based surveillance strategies should be combined with a strengthening of general surveillance. The FAO, WHO, and WOAH also urge the inclusion of influenza A(H5) infection in differential diagnoses for non-avian species, including livestock and other farm animals, as well as domestic and captive-bred wildlife populations at high risk of exposure to A(H5) viruses. Highly pathogenic avian influenza events in all animal species, including unusual hosts, should be reported to WOAH and other international bodies *(5)*. In this regard, awareness-raising among trained stakeholders and the community in general, particularly in rural areas, is key to promoting prevention and health surveillance. The information collected can allow modeling of the spread and strengthen risk analyses to increase their accuracy *(1, 24, 25)*.

Avian influenza is included in the WOAH list of notifiable diseases by the competent authorities. This includes notification of infections with HPAI viruses, infections in birds other than poultry with highly pathogenic influenza A viruses, and infections in domestic and captive wild birds with low pathogenic avian influenza viruses, provided that natural transmission has been demonstrated in humans and is associated with severe consequences *(34)*.

At the regional level, there are veterinary laboratories with the capacity to detect and type the virus in both serological and molecular samples. A proficiency testing round is being conducted by the WOAH regional reference laboratory in Campinas, São Paulo, Brazil, with the support of PANAFTOSA-PAHO/WHO at the present time. Previously, the round conducted in 2021 proved a good aptitude of the participating laboratories to perform serological (ELISA, HI and AGID) and molecular (RT-qPCR) diagnostic tests in order to reach a final diagnosis of avian influenza. This round included Argentina, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Paraguay, Peru, and Uruguay, in addition to Brazil as the coordinating laboratory. Other veterinary services laboratories participated in other proficiency tests in 2022 with excellent results, for example, those developed by the WOAH reference laboratory of the United States Department of Agriculture (USDA) Ames, Iowa, United States, in which the Vesicular Disease Diagnostic Laboratory of Panama participated, or coordinated by GD Laboratory as in the case of the National Service of Health, Safety and Agrifood Quality of Mexico.

Surveillance strategies combine serological and molecular techniques to detect both previous exposure to the virus and the current presence of the virus, which is crucial for early detection. In poultry, virus subtyping in birds focuses primarily on identifying Influenza A virus subtypes H5 or H7. These analyses that allow differentiating the presence of highly pathogenic avian influenza are sufficient to support field actions. The collection of nervous tissue samples from wild birds during the investigation of suspicious outbreaks is highlighted to optimize pathogen detection.

The regional reference laboratory in Campinas, Brazil, is collaborating in the diagnostic confirmation and subtyping of South American countries. Full virus sequencing is being carried out with the support of other laboratories including the USDA WOAh reference laboratory in Ames, Iowa, United States.

Shipment of samples

It is recommended that samples from animals detected with the virus be submitted for analysis, data generation and reference material for the development of human vaccines for zoonotic influenza response. For this purpose, animal samples should be sent to the WHO-CC at St. Jude Children's Hospital. Special documents are required for transport to the United States, and all international standards must be met.

For more information on logistics and shipping of human or avian influenza A(H5) samples, please contact PAHO/WHO at laboratoryresponse@paho.org.

Sequencing and genomic surveillance

Sequencing

The submission of animal or human influenza A(H5) positive samples to the appropriate WHO-CC **should be prioritized** for antigenic and genomic characterization of the sample.

For this reason, measures should be taken to avoid running out of samples, such as reserving an aliquot of the sample for shipment to the CC-WHO prior to initiating virus sequencing processes.

For laboratories that have sequencing capabilities, in addition to sending the positive sample to the Collaborating Center, they are encouraged to sequence the viruses to generate genomic data, and to share the sequences in a timely manner on the GISAID global platform.

The publication of sequences in GISAID requires the use of the nomenclature recommended by the WHO *(35)*:

- The format for humans is:
  [influenza type]/[region]/[internal reference number]/[year of collection].
  E.g.: A/Wisconsin/2145/2001

- For all other animal hosts:
  [type of influenza]/[host]/[region]/[internal reference number]/[year of collection].
  E.g.: A/chicken/Rostov/864/2007

Genomic Surveillance

Human influenza A(H5) virus: Since the beginning of 2020, WHO-reported influenza A(H5) viruses detected infecting humans are of gene group 2.3.4.4b. Although changes (A/Chile/25945/2023 (PB2-D701N and PB2-Q591K) A/Texas/37/2024 (PB2-E627K) that are associated with viral adaptation to mammalian hosts have been detected in genetic sequences from Chile and Texas, there is no evidence of human-to-human spread *(36, 37)*.

The results of sequence analyses available for human cases in the United States confirmed avian influenza A(H5N1) virus of clade 2.3.4.4b, closely related to genotype B3.13 detected in dairy cattle, suggesting direct animal-to-human transmission *(3)*. Both the viruses detected in cows and in two human cases maintain mainly genetic characteristics of avian influenza viruses, genetic changes that would make them more apt to infect or transmit between humans *(38)*. Known markers that could reduce susceptibility to antivirals (NA-S247N and PA-I38M), including oseltamivir and baloxavir, were found in some of the available sequences of influenza A(H5N1) viruses from human cases. Although these changes may decrease susceptibility to antivirals in laboratory tests, their clinical impact still requires further evaluation through additional studies. *(5)*.

Animal influenza A(H5) virus: clade 2.3.4.4b that was introduced in late 2021 into North America by wild birds has spread across the continent throughout 2022 and 2023. Worldwide circulation of the virus has led to opportunities to generate multiple genotypes with varied clinical signs. Through routine monitoring and viral sequencing, few sequences with markers of mammalian adaptation were found. These mutations probably occurred after transmission to the mammalian host and do not appear to be transmitted forward *(5)*. The information currently available for avian influenza cases in dairy cattle in the United States shows no new mutations possibly associated with further transmission to humans *(3)*. Available sequences for the 2.3.4.4b gene cluster of avian and mammalian viruses indicate that markers associated with reduced susceptibility to antivirals are rare *(5, 39)*. FAO, WHO, and WOAH recommend sharing avian influenza virus genetic sequences and associated metadata in publicly available databases. *(5, 7)*.

Zoonotic influenza vaccine candidate viruses: The WHO Global Influenza Surveillance and Response System (GISRS), in collaboration with the veterinary and animal health sector, including the WHO/FAO Network of Expertise on Animal Influenza (OFFLU), periodically evaluates candidate vaccine viruses for pandemic preparedness purposes. The list of candidate zoonotic influenza vaccine viruses, including A(H5N1) viruses and potency test reagents, is updated on the WHO website *(40)*. Although most dairy cattle viruses of clade 2.3.4.4b have amino acid substitutions at antigenic sites, they react well antigenically to at least one of the candidate vaccine viruses (CVV) 2.3.4.4b. CVVs for influenza A(H5) of the 2.3.4.4b gene pool are determined and available *(41)*.

Regular genetic and antigenic characterization of contemporary zoonotic influenza viruses is also published on the WHO website. An update on A(H5N1) viruses of clade 2.3.4.4b identified in dairy cattle in the United States has also been made available *(7)*.

This includes a candidate A(H5N8) virus, in fact, A/Astrakhan/3212/2020, as well as an A(H5N1) virus, A/chicken/Ghana/AVL-76321VIR7050-39/2021 and the new candidate A(H5N1) virus clade 2.3.2.1c, A/Cambodia/SVH240441/2024 (42). The vaccine virus A/Astrakhan/3212/2020 is closely related to the recently detected circulating influenza A(H5) strains (41).

Risk communication and community participation

Risk communication is a fundamental component of preparedness and response to health emergencies, especially those with pandemic or epidemic potential *(42)*. Early and transparent communication with populations, as well as clear messages about behaviors and preventive measures to be adopted by communities, is vital to reduce transmission. In addition, adequate risk communication will help to reduce rumors, myths and misinformation

related to the outbreak and will allow populations to make the right decisions to reduce the risk of contagion *(43)*.

FAO, WHO, and WOAH urge countries to communicate the risk of avian influenza by alerting and training health care workers and persons occupationally exposed to the virus on how to protect themselves *(1, 5, 7)*. The general public, and those exposed to sick and/or dead animals, should also be informed to encourage prompt notification of the competent authorities. Guidance should be provided to seek medical attention in case of illness and to communicate to their health care provider about any exposure to animals *(1, 5, 7)*. A differentiated communication strategy should be considered according to the audience (e.g. livestock and backyard producers, rural communities, ordinary citizens, wildlife stakeholders, indigenous groups, etc.) *(43)*.

PAHO/WHO recommends that Member States take the following actions among their risk communication preparedness measures in the event of an outbreak of avian influenza *(43)*:

- Delegate an individual or team responsible for risk communication to review existing risk communication plans or strategies in pandemic or epidemic contexts and make adjustments or updates necessary to strengthen preparedness and response to an eventual outbreak. WHO has guidelines for risk communication plans related to respiratory diseases.
- Gather existing information and/or conduct joint public health, animal health and environmental qualitative and/or rapid quantitative assessments to understand the characteristics of the communities most at risk, communication patterns and channels, language, religion, influencers. This information is vital in order to formulate appropriate preparedness and response actions for risk communication.
- Generate trust through early, transparent and timely communication, with dissemination through multiple platforms, methods and channels. To maintain public confidence, it is also key to communicate even in the midst of uncertainty, clarifying what is known and what is not.
- Identify communities with whom to work on risk communication actions and allow them to participate in their implementation, to ensure that interventions are collaborative and that the community takes ownership of the communication processes. Community involvement will contribute to the adoption of preventive behaviors.
- Broadcast messages to the public on symptom identification and prevention, particularly to populations with greater potential for exposure to the virus: rural environments, farmers, farm workers, backyard poultry owners. Messages should be broadcast on the channels and through the platforms consulted by each type of audience.
- Activate social listening for rumors and misinformation through digital platforms and other relevant information exchange channels (hotlines, web portals, etc.), to respond to possible false messages circulating among the public and adapt messages according to the needs detected by this monitoring.

Prevention measures for birds and animals

According to WOAH, the implementation of strict biosecurity and hygiene measures are essential to prevent outbreaks of avian influenza in animals. These include ensuring that

poultry and other domestic animals susceptible to avian influenza infection do not have contact with wild birds, ensuring sanitary conditions in production areas, clothing and personnel, and reporting bird diseases and deaths, and suspicions of avian influenza infection in other domestic animals, to animal health services. If infection in poultry or other domestic animals is detected, the current regulations applied by the animal health authority should be followed to contain, control and rapidly eradicate the disease. These actions result in a significant decrease in environmental viral contamination *(7)*.

WOAH encourages national authorities to consider the development of compensation schemes for farm owners and producers whose production was affected by the measures implemented by the authorities *(34)*. According to WOAH, the use of HPAI vaccination in poultry is a decision of the national animal health authorities, in coordination with poultry producers, and should be adapted to the epidemiological and socioeconomic context of the countries *(43)*. Avian influenza vaccination alone should not be considered as a sustainable solution to control avian influenza and should be part of comprehensive disease control strategies *(34)*.

Prevention measures in humans

People at risk of infection are those directly or indirectly exposed to infected birds and other animals (domestic, wild or captive), e.g., individuals who have close and regular contact with infected domestic animals, or during slaughter, or cleaning and disinfection of affected farms. For this reason, the implementation of good animal husbandry and hygiene practices is recommended when handling animal products, such as the use of adequate PPE and other protective measures to avoid zoonotic transmission in these operators *(7, 39)*.

Since people exposed to the virus in work environments or who have contact with infected or potentially infected animals are at higher risk, it is recommended that the necessary preventive and personal protective measures be taken to prevent possible infection. PPE should be properly put on, used and removed, and disposed of or decontaminated in a safe manner. Individuals who need to use PPE should be trained in their proper use in various environmental conditions *(7, 45)*.

Investigations are continuing to determine the risk to humans from consumption of raw or unpasteurized milk contaminated with influenza A(H5N1) virus. FAO and WHO recommend consuming pasteurized milk because of the potential health risks associated with various zoonotic pathogens *(7)*.

Clinical management

In the event of suspected infections caused by avian influenza A/H5, PAHO/WHO recommends *(46)*:

Perform initial triage of patients

- In the first contact with the health system, patients with signs of Severe Acute Respiratory Infection (SARI) should be rapidly identified.
- It is crucial to prioritize immediate care for severe cases and avoid any delay in emergency care.

Apply infection prevention and control precautions.

- Implement standard precautions in all cases.
- Use contact and droplet precautions in suspected severe influenza cases.
- If aerosol-generating procedures are performed, add airborne precautions in addition to contact and droplet precautions.

Triage patients according to the severity of their condition.

- Patients should be placed in designated areas according to the severity of their illness and acute care needs.
- Those with complications such as severe pneumonia, sepsis, organ dysfunction or co-infections should be hospitalized in intensive or critical care areas, as appropriate.

Hospital care and management of complications

- Severe patients with ARRI generally require hospitalization to manage complications such as pneumonia, sepsis, or exacerbations of chronic disease.
- In case of acute organ failure, admission to the Intensive Care Unit (ICU) should be immediate for close monitoring and advanced care. ICU admission of these patients should not be delayed.

Continuous monitoring and follow-up

- Provide constant follow-up in the ICU to assess the patient's progress and adjust treatment as needed.

Regarding antiviral treatment and prevention among persons with exposure to zoonotic influenza virus, PAHO/WHO recommends (47):

- Antiviral treatment of patients with severe influenza (including novel influenza A infection associated with high mortality or unknown risk of severe disease):
    - conditional recommendation for the use of oseltamivir in treatment,
    - conditional recommendation against the use of peramivir,
    - conditional recommendation against the use of zanamivir.

- Antiviral treatment of patients with non-severe influenza:
    - conditional recommendation for use of baloxavir in patients with non-severe influenza and high risk of progression to severe disease;
- Person exposed to zoonotic influenza virus associated with high mortality or unknown risk of severe disease:
    - For asymptomatic persons exposed to zoonotic influenza viruses associated with high mortality in humans or at unknown risk of causing severe disease, illness within the previous 2 days, baloxavir, laninamivir, oseltamivir, and zanamivir are suggested for administration (conditional recommendation).

Full recommendations are available here.

Vaccination in the context of avian influenza

Although the seasonal influenza vaccine is not designed for the prevention of zoonotic influenza in humans, vaccination would help to reduce the risk of co-infection and possible genomic recombination of avian and human viruses, which could result in new strains with pandemic potential *(48, 49)*.

WHO recommends vaccination against seasonal influenza in persons at risk of influenza A (H5) virus infection, especially in areas with avian influenza circulation in animals. This recommendation applies to workers in the poultry and livestock industry, veterinary services personnel involved in surveillance and disease control, as well as persons who may be in contact with birds, workers in wildlife care centers, and those in the field who perform tasks involving the handling of these animals *(48)*.

Vaccination with seasonal influenza vaccines should be used in combination with other control measures, such as infection prevention and control measures and the use of personal protective equipment, to reduce the risk of zoonotic infection in these populations *(48)*.

There are some licensed vaccines for **human use** against avian influenza A(H5), but their use is only recommended for certain groups at high risk of exposure. Since the risk of zoonotic infection remains low, WHO does not recommend vaccination of the population with these vaccines in the interpandemic period *(48, 50)*.

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