

Gulf Rapid Risk Assessment: Highly Pathogenic Avian Influenza H5N1

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This document has been developed by the Gulf Center for Disease Prevention and Control (Gulf CDC) for the awareness of public health authorities within countries of the Gulf Cooperation Council (GCC). The rapid risk assessment provides guidance based on the information available to the Gulf Public Health Emergencies Network as of 6 August 2024.

I. Event Background

(a) Signal detected by Gulf CDC

Update as of 6 August 2024:

The Gulf CDC has detected new signals of Highly Pathogenic Avian Influenza H5N1 (HPAI H5N1) infections caused by contact with infected cattle in multiple states within the United States of America. Since the first signal on April 2nd 2024, three additional signals have been detected, totaling four human cases. All cases were symptomatic, with three presenting conjunctivitis alone and one presenting symptoms typical of acute respiratory illness associated with influenza virus infection.

Regarding human HPAI H5N1 cases related to poultry exposure, since October 25 2023, there have been 9 signals detected by the Gulf CDC, totaling 16 cases, of which 3 have died. There has been no confirmed human-to-human transmission globally to date.

The Gulf CDC has been detecting an increasing number of signals of Highly Pathogenic Avian Influenza H5N1 (HPAI H5N1) infections globally. Since the establishment of Gulf CDC's Epidemic Intelligence in October 2022, a total of 125 avian influenza H5N1 signals¹ were detected. Of these signals, 19 were signals of human cases, totaling 17 cases and 7 deaths (see table 1.). All

¹ Signals are not inclusive of all global infections. List of global infections can be found on: <https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential/en>

cases were symptomatic with respiratory manifestations, such as cough and severe pneumonia, as well as fever; some developed further complications involving failure of the liver, kidneys, and jaundice.

Table 1. Signals of HPAI H5N1 human cases detected by the Gulf CDC between October 2022 and July 2024

Date of signal detection	Location	Description of case	Presumed Exposure
21-10-2022	Viet Nam	5-year-old girl, developed cough, fever, jaundice, renal, and liver failure. Survived	Backyard poultry (chickens and ducks)
01-12-2022	China	38-year-old woman, developed pneumonia and passed away.	Backyard poultry
26-02-2023	Cambodia	11-year-old girl developed sever pneumonia and passed away. 1 contact, her father, tested positive² but was asymptomatic.	Not reported.
05-03-2023	China	53-year-old woman, developed severe pneumonia and survived.	Backyard poultry
10-10-2023	Cambodia	50-year-old man, symptoms were not reported, and passed away	Backyard poultry
11-10-2023	Cambodia	A 2-year-old girl, developed symptoms of coughing, high temperature and vomiting, and passed away.	Backyard poultry
26-11-2023	Cambodia	A 21-year-old woman and a 4-year-old girl are both in critical condition.	
28-01-2024	Cambodia	A three-year-old boy, symptoms were not reported	Backyard poultry (chickens and ducks)
29-01-2024	Cambodia	A 69-year-old man, symptoms were not reported.	Backyard poultry
12-02-2024	Cambodia	A 9-year-old boy developed symptoms of fever, cough and breathing difficulties and passed away, and a 16-year-old boy who did not have respiratory symptoms	Backyard poultry
25-02-2024	Cambodia	A 17-year-old girl, developed symptoms of fever, cough, fatigue and breathing difficulty	Backyard poultry
24-03-2024	Viet Nam	A 21-year-old developed symptoms of high fever, abdominal pain around the navel, and loose stools and passed away.	Not reported
02-04-2024	United States of America	The case experienced eye inflammation as their only symptom, further information about the patient was not provided.	Dairy cattle

23-05-2024	Australia	The case was a child, symptoms were not reported, and further information about the patient was not provided The case was a child, developed symptoms were not reported, and further information about the patient was not provided	Backyard poultry
23-05-2024	United States of America	The case was a farm worker, developed; symptoms were not reported, and further information about the patient was not provided.	Dairy cattle
03-06-2024	United States of America	The case was a dairy worker who developed reported upper respiratory tract symptoms including cough without fever, and eye discomfort with watery discharge, further information about the patient was not provided.	Dairy cattle
04-07-2024	United States of America	The case was a dairy worker, symptoms were not reported, and further information about the patient was not provided. The case was a dairy worker, developed symptoms were not reported, and further information about the patient was not provided.	Dairy cattle
08-07-2024	Cambodia	A three-year-old boy, symptoms of fever, cough, fatigue and breathing difficulty.	Backyard poultry
14-07-2024	United States of America	Four cases and a fifth presumptive, developed conjunctivitis and eye tearing, as well as more typical flu symptoms of fever, chills, coughing and sore throat/runny nose	Poultry farm
04-08-2024	Cambodia	A four year old boy, symptoms of fever, cough, dyspnea.	Backyard poultry

Update as of 6 August 2024:

Other notable signals: On 12 May 2024, Gulf CDC detected a report of large sums of seagull deaths that occurred in Lake Dukan, Iraq. Initial tests confirmed avian influenza as the cause, with further test results pending. The Veterinary Department reported that the deaths were limited to seagulls, with no other bird species affected. Following this, an unofficial report emerged about a severe outbreak of a “deadly disease” affecting birds and poultry (geese, turkeys, chickens) in Salah Al-Din’s Khurmatu district. The Kirkuk Veterinary Hospital Administration announced on May 26, 2024, that it raised the alert level following the outbreak of avian influenza (H5N1) in al-Sulaymaniya.

In addition to human cases, the detected reports suggest that avian influenza outbreaks in domestic and wild bird populations across multiple regions have increased, indicating a wider geographic spread of the virus since mid-2022. Other mammalian species (such as sea lions, dolphins, foxes, raccoons, minks, cougars,) are being infected as well.

(b) Hazard detected (Possible zoonoses and important animal diseases outbreaks)

1. Global Burden and Epidemiology

Update as of 6 August 2024:

A significant outbreak of HPAI H5N1 bird flu was detected in dairy cows across multiple US states in the spring of 2024. This marked the first time this strain of avian influenza had been identified in cows. The virus spread rapidly within and between dairy herds in several states, leading to a widespread outbreak. Additionally, the virus infected not only cows but also poultry and cats, demonstrating its ability to infect various species (1). Furthermore, unpasteurized milk samples were found positive for viral fragments, but studies conducted by the US FDA and department of Agriculture found the samples to be negative HPAI H5N1 virus (2). While the virus caused illness in cows, the mortality rate was relatively low. However, the impact on milk production and potential long-term consequences are still under investigation (3).

As per WOA-World Animal Health Information System (WAHIS), several global HPAI events were reported between 19-30 July 2024 from the following countries: Germany, Belgium, France, UK, Hungary, Latvia, Austria, South Africa, Brazil, Australia, Bhutan, Falkland Islands, USA and Mexico. Most of the events were dominated by HPAI H5N1 and were reported as recurrence of eradicated disease. HPAI H5N1 appeared in Brazil and continued to circulate in several states in USA in unusual host species - dairy cattle. Moreover, other highly pathogenic strains such as H7N6 in South Africa and H7N8, H7N9, H7N3 in Australia were reported as new strains in these countries.

Avian influenza viruses are commonly found in wild birds, primarily affecting waterfowl. HPAI A(H5N1) viruses, in particular, have been characterized by their ability to cause severe illness and high mortality rates in infected birds, particularly chickens, turkeys, and other domestic poultry.

During 2020, the HPAI A(H5N1) **clade 2.3.4.4b** virus emerged from previously circulating A(H5Nx) viruses and has become a panzootic with unexpected characteristics. This virus has caused the largest HPAI epidemic historically observed in Europe, with a total of 2,467 outbreaks in poultry, 47.7 million birds culled in the affected establishments, 187 outbreaks in captive birds, and 3,573 HPAI virus detections in wild birds with an unprecedented geographical extent affecting 37 European countries(4). In late 2021, the clade 2.3.4.4b A(H5N1) virus also crossed the Atlantic Ocean to North America along migration routes, causing outbreaks in poultry and wild birds in several Canadian provinces and the U.S.A. where a record number of birds were affected (in 2022, more than 49 million birds in 46 states have either died or been culled (5). The current global trends suggest that the virus transmission is deviating from its usual seasonal cycle in many regions. Given the extensive spread of clade 2.3.4.4b A(H5N1) viruses among wild birds, predatory and scavenger mammals, which consume these birds, have experienced sporadic

infections of the virus.

There have been increasing reports of spill over to **non-avian species** including wild terrestrial and marine mammals, such as minks, ferrets, foxes, raccoons, seals, mountain lions, dolphins, cats and dogs. While the occurrence of these infections was likely, the number of them was unexpected.

Fortunately to date, there is limited evidence for mammal-to-mammal spread and minimal evidence of acquisition of adaptive genetic mutations outside of those in polymerase basic protein 2 (PB2) gene.

From January 2022 through June 4, 2024, 29 sporadic human cases of A(H5N1) were reported from nine countries, including 15 cases of severe or critical illness, and seven deaths, six cases of mild illness, and eight asymptomatic cases(6).

2. Transmission

Update as of 6 August 2024:

An HPAI H5N1 virus isolated from infected cow milk was characterized in mice and ferrets. The virus spread systemically, including to the mammary glands of both species, similar to older HPAI H5N1 virus isolates. The bovine HPAI H5N1 virus bound to sialic acids expressed in human upper airways and inefficiently transmitted to exposed ferrets (one of four exposed ferrets seroconverted without virus detection), suggesting that bovine HPAI H5N1 possesses features that may facilitate infection and transmission in mammals (1), however, these are very preliminary data that require further confirmation.

In the case of poultry farmers/workers, industrial fans used to combat extreme heat can compromise the seal on PPE such as masks and eye protection. Additionally, aerosolized virus particles and contaminated equipment can serve as vectors, facilitating transmission (7).

While the primary transmission route of HPAI A(H5N1) is bird-to-bird, there have been sporadic cases of bird to mammal as described above. With the notable exception of infections in sea mammals, mammal cases are usually linked to close contact with infected birds or contaminated environments. There is no evidence of human-to-human transmission of the clade 2.3.4.4b virus.

II. Health Condition Background (in humans)

While the spectrum of clinical symptoms of HPAI H5N1 in humans may vary, infections can lead to an unusually aggressive course, characterized by rapid deterioration and fatality. Initial symptoms of HPAI H5N1 infection include a high fever, usually exceeding 38°C, and influenza-like illness (ILI) symptoms; one common ILI feature observed is the early development of

manifestations in the lower respiratory tract. Some patients may also experience diarrhoea, vomiting, abdominal pain, chest pain, and bleeding from the nose and gums as early symptoms (8).

The incubation period for HPAI H5N1 appears to be longer than that of normal seasonal influenza, which typically lasts around two to three days. Current data suggests an incubation period ranging from two to eight days for H5N1 infection, with some cases possibly extending up to 17 days (8).

It should be noted that these data relate to clades other than 2.3.4.4b; it is expected, but not certain that infections caused by clade 2.3.4.4b viruses will behave similarly. In general, our understanding of HPAI H5N1 infection clinical manifestations in humans remains limited, as it is an emerging disease. The current understanding may also evolve due to the virus's rapid and unpredictable mutation tendencies (8).

III. Situation Update (in GCC)

There have been no reports of HPAI H5N1 infections in any species across the GCC countries in 2022-2024 to the knowledge of the Gulf CDC as of 15 July 2024. The HPAI H5N1 avian influenza virus was first detected in a GCC neighboring country, Egypt, in December 2005 during migratory bird sampling. It was closely related to a virus found in Qinghai Lake, China, suggesting transcontinental spread through wild bird migration. Despite control measures, the virus became endemic, with poultry outbreaks exhibiting a seasonal pattern, peaking from November to March. The highest number of outbreaks occurred in major poultry-producing governorates. Active surveillance programs detected HPAI H5N1 virus primarily in the commercial sector, followed by an increase in prevalence and detection in all poultry sectors, including co-infections with H9N2 influenza virus. While H9N2 influenza virus became more common, A(H5) viruses remained present (9)

IV. Risk assessment

(a) RRA Risk Question(s)

What is the likelihood of HPAI H5N1 human-to-human transmission occurring in the GCC countries and what is the impact of such transmission?

(b) Risk Characterization: Estimation of Likelihood and Impact

1. Likelihood of HPAI H5N1 human-to-human transmission in GCC countries

i. Introduction of virus in the community through local spillover from non-human species

Avian influenza viruses (AIVs) face significant barriers before they can successfully adapt to transmit among humans. Among the mutations that are known to aid AIV overcoming these transmission barriers are (noting that rare infection can still occur without the changes below):

- Polymerase basic protein 2 (PB2) is a protein that plays a critical role in viral replication. Mutations within the AIV PB2 gene can lead to more severe infections in humans. Notable mutations associated with AIV PB2 adaptation to mammals include PB2-E627K, PB2-D701N, and PB2-T271A. Other mutations such as PB2-S590G and PB2-R591Q have also demonstrated similar effects (10). Many of the clade 2.3.4.4b viruses isolated from mammals have acquired these mutations; the mutations remain rare in viruses from birds.
- Hemagglutinin (HA) is responsible for binding to sialic acid (SA) receptors on the host cell surface and initiating viral entry. AIVs predominantly bind to α 2-3-linked SA receptors, which are abundant in avian species. To support airborne transmission between humans, AIVs must undergo mutations to acquire the ability to bind to α 2-6-linked SA receptors, which are predominant in the human upper respiratory tract (URT). Mutations within the HA gene, as well as the neuraminidase (NA) gene, which is involved in viral entry and release, might contribute to increased binding affinity for the human α 2-6-linked SA receptors. Notable mutations associated with α 2-6 binding adaptation include HA-Q222L, HA-E190D/HA-G225D, and NA-S430G (11). Mutations that increase α 2-6-linked SA receptors are rare in the clade 2.3.4.4b A(H5N1) viruses.
- Stabilizing HA mutations often accompany the receptor binding changes necessary for human adaptation of AIV. These mutations might increase the virus' pH and heat stability, enabling it to persist and transmit more effectively among humans. A notable mutation associated with increased stability is HA-H103Y although other substitutions, many of which are poorly defined, can have similar effects (12). There is no evidence for stabilizing HA mutations in the clade 2.3.4.4b A(H5N1) viruses, although the samples tested has been in a small number.
- The human innate immune system possesses mechanisms that exert antiviral effects against AIVs, such as the RIG-I and MxA proteins. Mutations have been identified that enhance the ability of influenza viruses to avoid these responses. It remains unclear if previous infections with seasonal influenza A viruses confer adaptive immunity to zoonotic and potentially pandemic viruses and how this influences population-based immunity (12). There is, however, an expected levels of NA cross reactive antibodies to the A(H5N1) N1 in humans due to exposure to A(H1N1)pdm09 viruses.

While recent clade 2.3.4.4b A(H5N1) viruses have not been detected in the Gulf countries, their connectivity to other countries through agricultural trade and bird migration (particularly during the upcoming hunting season during the colder seasons) shows that the importation of the virus is plausible as is spillover to humans². The likelihood (See the Gulf CDC Risk Characterization Matrix, Annex 2. or refer to the Gulf CDC Technical Guide for Rapid Risk Assessments of Acute Public Health Events on gulfcdc.org) of this spillover to humans is currently *likely*. Spillover likelihood may be marginally higher for poultry workers and poultry/live bird market visitors due to their popularity in the region.

ii. Introduction of virus into community through importations from countries reporting recent spillover events

Table 2. Probability of an infected human case imported to a GCC country with HPAI H5N1 in the next 30 days (Using Modelling of BlueDot and IATA data, July 2024)

Countries of importation on risk	United Arab Emirates	Bahrain	Saudi Arabia	Oman	Qatar	Kuwait
List of Countries based on the Highest Importation Likelihood to a GCC Country						
Cambodia	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%
USA	0.04%	0.00%	0.00%	0.00%	0.01%	0.00%

Modeling projections from BlueDot (2024) using IATA data indicate a low probability of a HPAI H5N1 cases being imported into GCC countries within the next 30 days, Table 2. Recent detections of several cases within the United States of America and Cambodia were caused by exposure to infected poultry or cattle (for some USA cases), with no instances of human-to-human transmission.

iii. Likelihood of the assessed risk

Given the factors assessed in (i) and (ii), the overall likelihood of introduction of the virus is *unlikely*, but *not negligible* (See Gulf CDC Risk characterization matrix, Annex 2). There is no current global evidence of human-to-human transmission of the clade 2.3.4.4b viruses. Nevertheless, the worst-case-scenario of the virus mutating and developing the potential for human-to-human transmission should be considered.

As such, the likelihood of human-to-human transmission is estimated to be **unlikely** at this time.

² The Gulf CDC does not assess the level of importation likelihood of the virus through non-human species, as this estimation is beyond its human public health mandate and beyond this RRA’s question.

2. Impact of Human HPAI H5N1 Infections in GCC countries

i. GCC countries' capacities

Recent status of the capacities in the GCC countries in 2022-2023 are listed in Table 3.

Table 3. Recent reported status of GCC countries capacities to prepare, detect and response to avian influenza, as reported to the Gulf CDC during the PHEN roundtable meetings.

GCC country	Capacity Update
United Arab Emirates	Infectious disease programs or services have been set up for zoonosis. The zoonosis program was established, and it has a national action plan, policies, strategies, and a monitoring and evaluation framework. However, national programs have not been set up for specific zoonotic diseases. H5-based vaccines are not available but therapeutics for influenza infections are available.
Bahrain	Several infectious disease programs or services have been established, including those for zoonotic diseases. Currently, there are no national strategies for zoonosis, but program strategies are under development. H5-based vaccines are not available but therapeutics for influenza infections are available.
Saudi Arabia	An infectious disease program specifically addressing zoonosis has been established alongside various other programs. The zoonosis program has a national prioritization framework, an integrated surveillance system among different sectors, routine multisectoral risk assessment and monitoring activities. There are multi-sector emergency teams to work together for responding to any zoonotic threats. H5-based vaccines are not available but therapeutics for influenza infections are available.
Oman	A specific program has been set up for zoonosis. The zoonosis program has a national policy in place and is currently active. However, it does not have a national strategy, action plan, or a monitoring and evaluation framework like the other infectious disease programs. H5-based vaccines are not available but therapeutics for influenza infections are available.
Qatar	Programs or services for infectious diseases have been set up, including those for zoonosis. The zoonosis program was established between 1979 and 2019. It does not have national action plan, strategies, nor policies with a national monitoring and evaluation framework. H5-based vaccines are not available but therapeutics for influenza infections are available.
Kuwait	Infectious disease programs or services are available for zoonosis. The zoonosis program was established between 1969 and 2020, and the program is active and has a national action plan, policies, strategies, and a monitoring and evaluation framework. H5-based vaccines are not available but therapeutics for influenza infections are available.

As some GCC countries still lack strategic plans or programs needed to control and prevent the spread of avian influenza, there may be significant delays in detection of the first few cases. For example, there are limited systems in place developed for ensuring regular collaboration and coordination (including routine sharing of information, joint investigations, etc.) between the Health and Agricultural sectors. This detection delay may lead to the infected individual seeking healthcare at a later stage of the infection, risking further complications and severe symptoms. At worst, these individuals could shed the virus and start a chain of human-to-human transmission.

ii. Therapeutics

Despite the global unavailability of specific antiviral drugs for HPAI H5N1, case management capacities of the GCC countries for influenza infections are generally high (e.g. access to neuraminidase inhibitors, such as, oseltamivir (commercially known as Tamiflu or Osetla³), peramivir and zanamivir, and baloxavir. Thus, symptomatic management of human infections (if local spillover or internationally importations are detected early enough) is expected to be high, reducing the potential impact on individual health complications.

Update as of 6 August 2024:

iii. Vaccines

Existing HPAI H5N1 vaccines have shown promise in protecting against the currently circulating HPAI H5N1 clade 2.3.4.4b strain. Studies have demonstrated that these vaccines induce significant cross-protective antibodies vaccinated individuals. These vaccines could offer interim protection until updated vaccines specifically targeting the current strain are developed and available (13).

Several HPAI H5N1 vaccines have been developed, with some tested and evaluated in clinical trials and have received regulatory approvals for stockpiling (in case of a pandemic) as shown in Table 4. These vaccines are categorized as either pre-pandemic or pandemic, depending on approval timing, and produced using an egg-based production method. While these vaccines have been approved, the vaccine effectiveness and safety in targeted populations, beyond clinical trials settings, are not yet well established.

As for candidate vaccine viruses (CVVs), the WHO coordinates the development of CVVs. Specifically, a library of H5 CVVs has been created, with recommendations for further development made during bi-annual meetings (information available on this [link](#)). On 29 July 2024, WHO launched a project to accelerate the development of HPAI H5N1 mRNA vaccine candidates as well (14).

15 EU countries have participated in a joint EU procurement of up to 40 million doses from one manufacturer with Finland starting the vaccination of workers with exposure to animals in July 2024 (15).

Seasonal influenza vaccines do not include protection against HPAI H5N1. These vaccines are formulated annually to match the circulating strains of seasonal influenza viruses in humans, such as H1N1, H3N2, and influenza B. There is no evidence to suggest that seasonal influenza vaccines provide cross-immunity against HPAI H5N1. Vaccines specifically targeting HPAI H5N1 are developed separately and are stockpiled for potential pandemic use. Overall, the existing H5N1 vaccines could offer cross-protection while continuous monitoring of circulating viruses and ongoing development of new vaccines remain crucial for optimal protection.

³ Other brands of oseltamivir in the GCC: Tabuflu, Oselow, Fluvir, Seltafu, Taminil, Flucap

Table 4: List of HPAI H5N1 pandemic and pre pandemic vaccines approved by other regulatory bodies

Name	Type	Approved by?	References
Influenza Virus Vaccine, H5N1	Egg-based	U.S. FDA Approved	https://www.fda.gov/media/74534/download?attachment
Influenza A (H5N1) Virus Monovalent Vaccine, Adjuvanted	Egg-based	U.S. FDA Approved	https://www.fda.gov/media/87479/download?attachment
Influenza A (H5N1) Monovalent Vaccine, Adjuvanted	Cell-based	U.S. FDA Approved	https://www.fda.gov/media/135020/download?attachment
Pandemic influenza vaccine H5N1 AstraZeneca	Egg-based	EMA Approved	https://www.ema.europa.eu/en/documents/product-information/pandemic-influenza-vaccine-h5n1-astrazeneca-epar-product-information_en.pdf
Adjupanrix (previously Pandemic influenza vaccine (H5N1) (split virion, inactivated, adjuvanted)	Egg-based	EMA Approved	https://www.ema.europa.eu/en/documents/product-information/adjupanrix-epar-product-information_en.pdf

Regarding **cattle** vaccines, the US Department of Agriculture is exploring the potential for HPAI H5N1 vaccines to protect cattle from infection, reduce milk production losses, and prevent the virus from mutating and spreading to humans. Several companies are developing candidate vaccines. However, regulatory challenges and concerns about international trade and vaccine efficacy in cattle complicate the situation (16).

As for **poultry** use vaccines, INNOVAX-ND-H5 has received marketing authorization from the European Commission, marking the first centrally registered vaccine in the EU against the currently circulating HPAI H5 clade 2.3.4.4b avian influenza virus. (17,18) Netherlands has begun vaccination of poultry, including domestic and wild birds, as a part of its preventive strategy (19).

Thus, the potential impact of HPAI A (H5N1) infections if transmission occurs in the GCC region is assessed to be **Moderate**.

(c) Risk Characterization: Overall Risk Definition

Risk assessed					
Negligible	Very Low	Low	Moderate	High	Critical

(d) Level of Confidence

This risk assessment is associated with a low level of confidence due to limitations in engaging the agricultural stakeholders in the GCC countries for relevant data (e.g. history of avian influenza detections in poultry, distribution and population of waterfowl species, maps of migratory bird pathways).

(e) Risk Statement

Update as of 6 August 2024:

The overall risk of human-to-human transmission occurring in the Gulf remains **low**.

Based on the available data at this point of time, within the next 3 months, the overall risk of a human-to-human transmission occurring in the Gulf is assessed as **Low**. This risk level may be higher for certain population groups (e.g. poultry workers, animal market visitors) or in case of any development in the global and regional epidemic situation.

V. Recommendations

GCC countries should consider the following recommended actions for better preparedness, readiness, and response against HPAI H5N1:

1. Reviewing national implementation status of activities agreed within the joint GCC meeting on AIV in 2005 (Annex 3), **in line with Global strategy for the prevention and control of high pathogenic avian influenza (2024–2033)⁴.**
2. Revise and update national policies and procedures across sectors (health, animal and environmental) for detecting AIV and responding including: culling, establishing free-zones, and waste management for affected farms and sites.
3. Activating or establishing a national multi-sectoral one-health preparedness committee of relevant stakeholders. Stakeholders may include:
 - Other public health entities.
 - Ministry of Agriculture; or other responsible entity for wildlife or animal health
 - Ministry of Information/Culture; for coordinating and managing effective communication strategies to raise awareness, educate the public, and counter misinformation.
 - Ministry of Foreign Affairs; for cross-border implications
 - Other relevant authorities, such as those involved in border-customs, forecasting, water, food, and marine.

This committee shall capitalize on the existing Gulf entities such as GCC, Gulf Health Council (GHC), and GCDC and shall plan for regular meetings to monitor and plan for outbreak management and response, as well as the guide joint implementation of activities and effective communications in the event of an outbreak.

4. Conduct simulation exercises to test current levels of readiness for a local spill-over event and human-to-human transmission, with a focus One Health (on multi-sector) readiness.
5. Prioritize the surveillance efforts for timely detection of virological, epidemiological, and clinical changes associated with circulating influenza viruses with focus on H5N1 in humans, birds, and cows (specifically in poultry and dairy farms), with timely information sharing for risk assessment and options for response measure.
6. **Use the Import Risk Analysis⁵ (Chapter 2.1 of the OIE Terrestrial Animal Health Code) to ensure a standardized, objective, and defensible method for assessing disease risks associated with importing animals and animal products.**
7. **Ensure stakeholder awareness of reporting mechanisms of HPAI H5N1 cases to the**

⁴ <https://eswi.org/cnt/article/global-strategy-prevention-and-control-high-pathogenic-avian-influenza-2024-2033-1360>

⁵ https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmlfile=chapitre_import_risk_analysis.htm

- National IHR focal point, which will inform other GCC countries through the Gulf CDC.
8. Review and ensure availability of diagnostic tests of the virus, antiviral drugs and personal protective equipment (PPE) stockpiles, in collaboration with other GCC countries, some of these capacities and therapeutics are mentioned in this RRA.
 9. Establish and maintain a HPAI H5N1 vaccine stockpile, through bilateral discussions with manufacturers or through GHC joint procurement mechanisms, and develop a vaccination roll-out strategy, including the target population and delivery mechanisms. Consider individuals with exposure to poultry as a high-risk group.
 10. Encourage environmental, agricultural, and municipal authorities to take proactive measures in regulating live bird markets, focusing on the surveillance and implementation of recommended tools.
 11. Increase awareness and risk communication for populations at risk (e.g. poultry workers, dairy farm workers, animal market visitors, bird hunters) for the appropriate use of PPE when in contact with birds.
 12. Strengthen biosecurity measures on poultry and dairy farms, including restricted access to livestock areas, proper sanitation, and use of PPEs if HPAI H5N1 is present or suspected.
 13. Ensure public communication plans and pre-prepared announcements are in place.
 14. Consider restriction on the import of fowl, poultry meat, hatching eggs and fodder from countries infected by HPAI H5N1 and those suspected of being infected; as well as restriction on imports of waterfowl, terrestrial and ornamental birds from affected countries.
 15. Enhance cooperative laboratory capacities between GCC countries and among different sectors (health and agriculture) to rapidly respond to zoonotic threats.
 16. Establish GCC agreement on information sharing, resource mobilization and experts network, utilizing existing mechanisms at GHC, Gulf CDC, and the GCC General Secretariat.
 17. Ensure that travel health guides are updated and include the latest evidence-based recommendations for travelers to affected countries, with known outbreaks of animal H5N1.

VI. References

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VII. Annexes

Annex 1: Gulf CDC Signals of Avian Influenza H5N1 detected from 22 October to 24 July 2024.

Date	Country	Hazard
20-10-22	Vietnam	Avian Influenza H5N1*
01-12-22	China	Avian Influenza H5N1*
23-01-23	Spain	Avian Influenza H5N1
08-02-23	Taiwan	Avian Influenza H5N1
08-02-23	United Kingdom	Avian Influenza H5N1
26-02-23	Cambodia	Avian Influenza H5N1* (2 cases)
05-03-23	China	Avian Influenza H5N1*
06-03-23	Peru	Avian Influenza
09-03-23	France	H5N1
19-03-23	UK	Avian Influenza H5N1
27-03-23	Chile	Avian Influenza H5N1
05-04-23	Belgium	Avian Influenza H5N1
05-04-23	US	Avian Influenza H5N1
09-04-23	Chile	Avian Influenza
09-04-23	US	H5N1
09-04-23	US	Avian Influenza H5N1
09-04-23	Chile	Avian Influenza H5N1
16-04-23	Israel	H5N1
20-04-23	USA	Avian Influenza H5N1
21-04-23	Japan	H5N1
07-05-23	Italy	Avian Influenza H5N1
30-05-23	Brazil	H5N1
04-06-23	England	Avian Influenza

25-06-23	Poland	Avian Influenza H5N1
28-06-23	Poland	Avian influenza H5N1
29-06-23	Brazil	Avian Influenza H5N1
29-06-23	Poland	Avian influenza H5N1
09-07-23	Italy	HPAI H5N1
09-07-23	Latvia	HPAI H5N1
09-07-23	Hungary	HPAI H5N1
09-07-23	Ireland	HPAI H5N1
09-07-23	Germany	HPAI H5N1
09-07-23	Togo	HPAI H5N1
09-07-23	Sweden	HPAI H5N1
09-07-23	Norway	HPAI H5N1
11-07-23	Scotland	HPAI H5N1
12-07-23	Russia	HPAI H5N1
12-07-23	Finland	HPAI H5N1
12-07-23	Poland	HPAI H5N1
13-07-23	Germany	HPAI H5N1
13-07-23	Belgium	HPAI H5N1
13-07-23	Belgium	HPAI H5N1
13-07-23	Belgium	HPAI H5N1
13-07-23	Belgium	HPAI H5N1
13-07-23	Germany	HPAI H5N1
17-07-23	Brazil	HPAI H5N1
17-07-23	Finland	HPAI H5N1
19-07-23	Ireland	HPAI H5N1
19-07-23	Ireland	HPAI H5N1
19-07-23	Switzerland	HPAI H5N1

19-07-23	Indonesia	H5N1
19-07-23	Brazil	H5N1
19-07-23	Brazil	H5N1
19-07-23	Estonia	H5N1
19-07-23	Argentina	H5N1
19-07-23	Belgium	H5N1
23-07-23	Colombia	H5N1
27-07-23	South Korea	H5N1
27-07-23	United States	H5N1
30-07-23	Czech Republic	H5N1
02-08-23	Northern Ireland	H5N1
10-10-2023	Cambodia	Avian Influenza H5N1*
11-10-2023	Cambodia	Avian Influenza H5N1*
18-10-2023	Israel	Influenza A H5N1 virus
19-10-2023	United States of America	Influenza A H5N1 virus
25-10-2023	South Georgia and the South Sandwich Islands	Influenza A H5N1 virus
25-10-2023	India	Influenza A H5N1 virus
26-10-2023	Japan	Influenza A H5N1 virus
02-11-2023	Bulgaria	Influenza A H5N1 virus
05-11-2023	Falkland Islands (Malvinas)	Influenza A H5N1 virus
08-11-2023	United States of America	Influenza A H5N1 virus
08-11-2023	United States of America	Influenza A H5N1 virus
08-11-2023	United States of America	Influenza A H5N1 virus
15-11-2023	Canada	Influenza A H5N1 virus
19-11-2023	Cambodia	Influenza A H5N1 virus
23-11-2023	Croatia	Influenza A H5N1 virus
23-11-2023	United States of America	Influenza A H5N1 virus

23-11-2023	Italy	Influenza A H5N1 virus
26-11-2023	Cambodia	Influenza A H5N1 virus*
26-11-2023	Japan	Influenza A H5N1 virus
07-12-2023	Israel	Influenza A H5N1 virus
28-01-2024	Cambodia	Influenza A H5N1 virus*
29-01-2024	Cambodia	Influenza A H5N1 virus*
01-02-2024	Cambodia	Influenza A H5N1 virus
12-02-2024	Cambodia	Influenza A H5N1 virus*
25-02-2024	Cambodia	Influenza A H5N1 virus*
24-03-2024	Viet Nam	Influenza A H5N1 virus*
02-04-2024	United States of America	Influenza A H5N1 virus*
29-04-2024	United States of America	Influenza A H5N1 virus
29-04-2024	United States of America	Influenza A H5N1 virus
29-04-2024	United States of America	Influenza A H5N1 virus
20-05-2024	United States of America	Influenza A H5N1 virus
23-05-2024	Australia	Influenza A H5N1 virus*
23-05-2024	United States of America	Influenza A H5N1 virus*
26-05-2024	India	Influenza A H5N1 virus
27-05-2024	United States of America	Influenza A H5N1 virus
27-05-2024	United States of America	Influenza A H5N1 virus
30-05-2024	Iraq	Influenza A H5N1 virus
02-06-2024	United States of America	Influenza A H5N1 virus
02-06-2024	India	Influenza A H5N1 virus
03-06-2024	United States of America	Influenza A H5N1 virus*
04-07-2024	United States of America	Influenza A H5N1 virus*
08-07-2024	Cambodia	Influenza A H5N1 virus*
14-07-2024	United States of America	Influenza A H5N1 virus*
*: indicates human cases		

Annex 2: Gulf CDC Risk Characterization Matrix

Likelihood	Impact				
	<i>Negligible</i>	<i>Minor</i>	<i>Moderate</i>	<i>Major</i>	<i>Severe</i>
<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>
<i>Unlikely</i>	<i>Negligible</i>	VERY LOW	LOW	LOW	MODERATE
<i>Likely</i>	<i>Negligible</i>	LOW	LOW	MODERATE	MODERATE
<i>Highly likely</i>	<i>Negligible</i>	LOW	MODERATE	MODERATE	HIGH
<i>Almost certain/sure</i>	<i>Negligible</i>	MODERATE	MODERATE	HIGH	CRITICAL

Annex 3: Recommendations made by the joint GCC meeting on AIV in 2005

Historically, in response to the call from H.E. the Saudi Minister of Agriculture to address the global outbreak of avian influenza, specifically H5N1, and protect the GCC countries from its prevalence, a meeting was held in Riyadh on November 16th, 2005. During the meeting, discussions encompassed the worldwide epidemiological developments of avian influenza and the national plans and strategies aimed at combating the pandemic (11). Following comprehensive deliberations, the Ministers proposed the increasing capacities of the GCC countries to prepare for, detect and respond to avian influenza. These recommendations reflect the collective joint efforts and commitment of the GCC countries to combat avian influenza and mitigate its impact on public health and agricultural sectors.

1. Pooling the technical and human resources of each member country to support all GCC countries.
2. Continuously monitoring the global epidemiological developments of avian influenza. Implementing national plans and working towards establishing a unified GCC strategy to combat avian influenza.
3. Sharing information and experiences among the ministries of health and agriculture in the GCC and appointing a liaison officer in each ministry to facilitate direct communication between member countries.
4. Prohibiting the import of birds, poultry products (meat, eggs, poultry feed, etc.) from countries confirmed or suspected to be affected by the pandemic. Strengthening quarantine procedures and promptly sharing relevant information on the import ban within the GCC member states. Additionally, banning the import of ornamental, waterfowl, and wild birds from worldwide sources.
5. Immediately reporting any suspected cases of H5N1 within any GCC country to the other member states through the designated liaison officers.
6. Directing the Standing Committee of Animal Resources to hold continuous meetings and develop a unified future plan for the GCC countries to combat such pandemics and

- outbreaks, including the establishment of an early warning program.
7. Coordinating efforts among the ministries of health, agriculture, and other relevant governmental authorities in the GCC for the exchange of information on avian influenza.
 8. Activating comprehensive early warning and epidemiological surveillance systems to effectively address the avian influenza pandemic.
 9. Ensuring the availability of necessary resources for prevention, diagnosis, and treatment of avian influenza in GCC countries.
 10. Conducting awareness programs to educate the public about the risks, modes of transmission, and necessary precautions to reduce the likelihood of infection.
 11. Keeping abreast of global developments in the production of a specific vaccine for avian influenza and initiating negotiations with manufacturers to ensure timely availability.
 12. Collaborating among GCC member states to collectively combat the disease in both bird and human populations once detected.

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