



## **TAFS Update – Avian Influenza Global Situation February 2023**

### **New challenges**

The spread of Avian influenza (AI) among wild birds, is known since the turn of the century. Wild bird species, being the natural host and reservoir of AI viruses, determine when and where the disease will spread with their migratory movements (1,2). Climate change and the consequent modification of wild bird's migration patterns has been causing flock mixing of populations that did not used to be in contact. Consequently, viral circulation among these flocks, has been increasing the chances of viral modification occurrence (3). Recent genetic mutations, likely increased the capacity of the AI virus to replicate or to infect a broader range of bird species, enhancing its environmental adaptivity, and leading to the radically increase of the number of infected wild birds over the last year (1,2).

### **Loss of seasonality**

Worldwide, the subtype detected in the current epidemic season is H5N1, with some regional lineage variability (4). Over the last 15 years, Avian Influenza data submitted to World Organization for Animal Health (WOAH) demonstrated a seasonal spread of the disease, linked to migration pattern of wild birds, with the number of outbreaks being the lowest in September and rising from October to February, when it used to be the yearly outbreak peak (5).

During summer, typically very few cases used to be detected. However, in 2022, the figures skyrocketed to 5300 cases of Highly pathogenic avian influenza (HPAI) in poultry and both in captive and wild birds (6). The unusual persistence of the virus over summer has been linked to its spread via water birds and it means that for the first time there was no clear separation between two epidemic years (7). AI may have become endemic in Europe and consequently, the risk of disease spread will now be present all year-round (8).



## **Avian influenza in mammals**

The year was also marked by the detection of an increasing number of transmission events of A(H5) viruses to farmed and wild animals in Europe and North America. The virus was detected in farmed minks in Spain (9), foxes in the Netherlands (10) and in several wild species across the US, including foxes, bears, skunks, racoons, among others. (11). Due to the segmented morphology Influenza A virus genome and the possibility of one host being infected with two different viral strains simultaneously, the risk an antigenic shift occurring, which could lead to the creation of a “new” virus possibly more adapted to human hosts is always present (12). The infection and spread of the virus in mammals show not only the possibility but also evidence of viral adaptation to replicate in mammals and highlights the increased risk of AI virus transmission to humans (11).

Over the last year, two human infection A(H5N1) cases were detected in Spain, one in China A(H9N2) and another infection in Vietnam A(H5) without NA-type result (11). The risk of infection for the general population in the EU/EEA has been classified as low for occupationally exposed people, and low to medium with high uncertainty due to the high diversity of circulating avian influenza viruses in bird populations (13)

## **Impact**

In Europe, during the season 2021-2022, the number of AI cases was the largest ever recorded, with an overall number of detections 1.7 times higher than in the 2020–2021 epidemiological year, and 2.4 times higher than 2016–2017 (13). and around 50 million birds were culled in affected farms (7). In England, since early November, mandatory housing has been made a legal requirement in for all poultry and captive birds (14), which is, an extra challenge for alternative housing and free-range poultry production schemes, as farmers are operating under the risk of having to cull entire flocks (15). An increasing number of outbreaks has also been detected in Asia and in the Americas (16). In the last region, HPAI has now been confirmed in 10 countries (17) and the United States of America registered a yearly record of over 50 million affected birds (18).



## **Vaccines as complementary disease control tools**

Even though AI vaccines are available, these are not widely used on poultry farms. Some of the challenges, which have been hindering the adoption of national vaccination policies, include the unpredictable effectiveness of vaccines against emerging viral subtypes, logistical and animal welfare challenges connected with animal manipulation and individual bird protection uncertainty under mass vaccination operations, together with the fear of viral mutation due to co-infection with wild strains and masked viral circulation (19). Given the high variability of Influenza viruses, a universal vaccine that would be protective against antigenically diverse influenza viruses has been labeled as the “Holy grail” by virologists (12). Such a universal vaccine is not currently available. However, over the last year there have been positive steps in the development of such a solution (20).

The possibility of importing animals which may harbor the virus, despite of vaccination is a concern for trade, so European countries currently do not accept the import of vaccinated animals (12). There is innovation in vaccine development (21), in particular in the development of multivalent marked vaccines (22) among other new technologies which are being explored in animal trials (19,23).

However, acceptance from trading partners will be essential for the approval of vaccines as control tools and to support further vaccine technology research and development to overcome the abovementioned challenges (24).

In May 2022, the European Council approved the conclusions on a strategic approach for the development of vaccines as a complementary tool for the prevention and control of HPAI (25). Highlighting the importance of scientific developments in vaccine technologies and targeted vaccination strategies. The commission was invited to explore strategies to ensure a robust vaccine supply and to develop, with member states, an operational roadmap to support dialogue and discussions regarding the acceptability of HPAI vaccination in international trade (25).

Given the current challenges associated with the dispersion of HPAI, vaccines will be needed as complementary tools to biosecurity and early warning systems to contain further outbreaks of HPAI. Avoiding mass animal culling events, which are neither accepted by the public (24) or effective to contain the virus, given its now endemic state in certain regions. Changes in trading conditions of vaccinated animals and their products are needed to support investments in vaccine technological development.



## References

1. Miller BJ. Why unprecedented bird flu outbreaks sweeping the world are concerning scientists. *Nature*. 2022 Jun 1;606(7912):18–9.
2. Sidik SM. Why is bird flu so bad right now? *Nature*. 2022;
3. Gilbert M, Slingenbergh J, Xiao X. Climate change and avian influenza. *Rev sci tech Off int Epiz*. 2008;27(2):459–66.
4. Food Safety Authority E, Adlhoch C, Fusaro A, Gonzales JL, Kuiken T, Marangon S, et al. Avian influenza overview September-December 2022. */efsajournal EFSA Journal* [Internet]. 2023 [cited 2023 Jan 23];21(1):7786. Available from: <https://doi.org/10.2903/j.efsa.2022.7786>
5. World Organisation for Animal Health (WOAH). Avian Influenza - WOA H - World Organisation for Animal Health [Internet]. [cited 2023 Jan 5]. Available from: <https://www.woah.org/en/disease/avian-influenza/>
6. Adlhoch C, Fusaro A, Gonzales JL, Kuiken T, Marangon S, Niqueux É, et al. Avian influenza overview June – September 2022. *EFSA Journal*. 2022 Oct 11;20(10).
7. Avian influenza cases in poultry and water birds on the rise | EFSA [Internet]. [cited 2023 Jan 17]. Available from: <https://www.efsa.europa.eu/en/news/avian-influenza-cases-poultry-and-water-birds-rise>
8. Adlhoch C, Fusaro A, Gonzales JL, Kuiken T, Marangon S, Niqueux É, et al. Avian influenza overview March – June 2022. *EFSA Journal*. 2022 Aug 1;20(8).
9. Agüero M, Monne I, Sánchez A, Zecchin B, Fusaro A, Ruano MJ, et al. Highly pathogenic avian influenza A(H5N1) virus infection in farmed minks, Spain, October 2022. *Eurosurveillance* [Internet]. 2023 Jan 19 [cited 2023 Jan 23];28(3):2300001. Available from: <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2023.28.3.2300001>
10. Bird flu virus in foxes adapted to mammals - WUR [Internet]. [cited 2023 Jan 23]. Available from: <https://www.wur.nl/en/research-results/research-institutes/bioveterinary-research/show-bvr/bird-flu-virus-in-foxes-adapted-to-mammals.htm>
11. USDA APHIS | 2022-2023 Detections of Highly Pathogenic Avian Influenza in Mammals [Internet]. [cited 2023 Jan 23]. Available from: <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-mammals>



12. Transmission of Avian Influenza A Viruses Between Animals and People | Avian Influenza (Flu) [Internet]. [cited 2023 Jan 23]. Available from: <https://www.cdc.gov/flu/avianflu/virus-transmission.htm>
13. Food Safety Authority E, Adlhoch C, Fusaro A, Gonzales JL, Kuiken T, Marangon S, et al. Avian influenza overview September-December 2022. /efsajournal EFSA Journal [Internet]. 2023 [cited 2023 Jan 25];21(1):7786. Available from: <https://doi.org/10.2903/j.efsa.2023.7786>
14. Avian influenza: Housing order to be introduced across England - GOV.UK [Internet]. [cited 2023 Jan 17]. Available from: <https://www.gov.uk/government/news/avian-influenza-housing-order-to-be-introduced-across-england>
15. Avian influenza: Unspeakable damage and unexplainable consequences - Poultry World [Internet]. [cited 2023 Jan 17]. Available from: <https://www.poultryworld.net/health-nutrition/health/avian-influenza-unspeakable-damage-and-unexplainable-consequences/>
16. World Organisation for Animal Health (WOAH). High Pathogenicity Avian Influenza (HPAI)- Situation Report 36 [Internet]. [cited 2023 Jan 4]. Available from: <https://www.woah.org/en/document/high-pathogenicity-avian-influenza-hpai-situation-report-36/>
17. Epidemiological Update Outbreaks of avian influenza and public health implications in the Region of the Americas - 11 January 2023 - PAHO/WHO | Pan American Health Organization [Internet]. [cited 2023 Jan 17]. Available from: <https://www.paho.org/en/documents/epidemiological-update-outbreaks-avian-influenza-and-public-health-implications-region-0>
18. H5N1 Bird Flu Detections across the United States (Backyard and Commercial) | Avian Influenza (Flu) [Internet]. [cited 2023 Jan 16]. Available from: <https://www.cdc.gov/flu/avianflu/data-map-commercial.html>
19. New Avian influenza vaccines emerging - WUR [Internet]. [cited 2023 Jan 3]. Available from: <https://www.wur.nl/en/article/new-avian-influenza-vaccines-emerging.htm>
20. Feranmi F. Universal flu vaccine protects against influenza A and B. 2022 [cited 2023 Jan 23]; Available from: <https://www.who.>
21. Researchers Work to Develop Bird Flu Vaccine to Contain Future Outbreaks - University of Wisconsin School of Veterinary Medicine [Internet]. [cited 2023 Jan 3]. Available from: <https://www.vetmed.wisc.edu/researchers-work-to-develop-bird-flu-vaccine-to-contain-future-outbreaks/>



22. Li G, Feng J, Quan K, Sun Z, Yin Y, Yin Y, et al. Generation of an avian influenza DIVA vaccine with a H3-peptide replacement located at HA2 against both highly and low pathogenic H7N9 virus. <https://doi.org/10.1080/21505594.2022.2040190> [Internet]. 2022 [cited 2023 Jan 25];13(1):530–41. Available from: <https://www.tandfonline.com/doi/abs/10.1080/21505594.2022.2040190>
23. Trial with three vaccines against bird flu - WUR [Internet]. [cited 2023 Jan 3]. Available from: <https://www.wur.nl/en/research-results/research-institutes/bioveterinary-research/show-bvr/trial-with-three-vaccines-against-bird-flu.htm>
24. Stokstad E. Wrestling with bird flu, Europe considers once-taboo vaccines. *Science* (1979). 2022 May 13;376(6594):682–3.
25. Council approves conclusions on a strategic approach for the development of vaccination as a complementary tool for the prevention and control of highly pathogenic avian influenza (HPAI) - Consilium [Internet]. [cited 2023 Jan 3]. Available from: <https://www.consilium.europa.eu/en/press/press-releases/2022/05/24/council-approves-conclusions-on-a-strategic-approach-for-the-development-of-vaccination-as-a-complementary-tool-for-the-prevention-and-control-of-highly-pathogenic-avian-influenza-hpai/>