

First human death case of avian influenza A(H5N2) in Mexico requires urgent actions and global preparedness against future pandemic

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DEAR EDITOR,

Avian influenza A (H5N2) is one of nine subtypes of the influenza A (H5) virus. Although it primarily affects wild birds, it can potentially infect people and other animals through direct contact with diseased animals or contaminated environments as shown in Figure 1. Human infections with avian influenza A viruses are uncommon, but when they do occur, the sickness can be mild, severe or even lethal. In almost all cases, poultry is the primary source of this virus's transmission to humans [1,2].

As of May 2024, Mexico reported its first fatal case of human infection with the avian influenza A(H5N2) virus, while similar avian influenza viruses H5 subtypes like A(H5N1), A(H5N6), and A(H5N8) have infected humans without sustained human-to-human transmission, no additional cases of A(H5N2) have been reported till now [3,4]. According to the

Centers for Disease Control and Prevention, human infections with HPAI A(H5N1) have been reported in 23 countries since 1997, with a 50% fatality rate, and HPAI A(H5N6) in two countries since 2014, with a fatality rate above 40%. [1,4] In Korea, on December 1, 2004, ducks at a farm were culled after quarantine officials detected a suspected low pathogenic H5N2 strain of avian influenza. In Japan, between June and December 2005, the H5N2 virus or antibodies against it were found in chickens at 40 farms in Ibaraki Prefecture and one farm in Saitama Prefecture [5,6]. From 2003 to 2012, Taiwan had isolated outbreaks of H5N2 in hens [7]. In January 2012, a confirmed H5N2 outbreak was reported in Bingiriyaya, Sri Lanka almost 6,000 chickens were slaughtered after testing positive for the virus. [8,9] In 2015, the Midwestern United States saw a serious H5N2 outbreak, which resulted in the killing or culling of around 50.5 million birds, the majority of

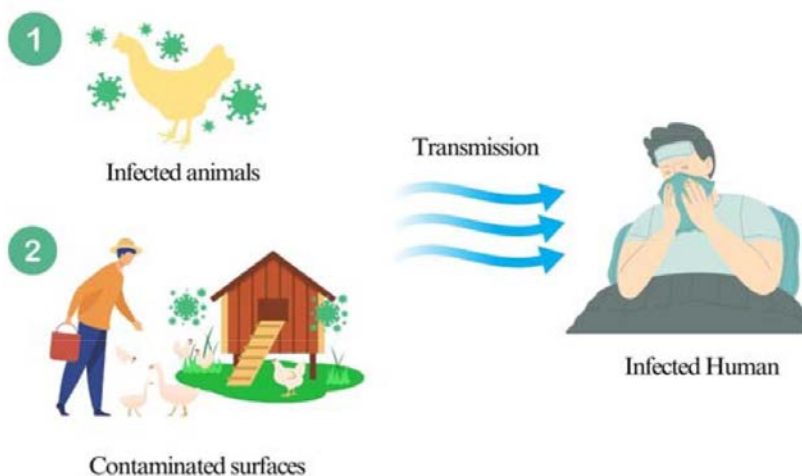


FIGURE 1. Transmission of avian influenza A(H5N2) through direct animal contact and environmental exposure

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which were depopulated using foam to stem the spread. Iowa, the country's largest egg producer, lost over 30 million chickens on its own. The US Department of Agriculture reported in January 2017 that H5N2 had been discovered in a duck in Fergus County, Montana [10-12].

In May 2024, Mexico announced its first fatal human case of the avian influenza A(H5N2) virus. The patient was a 59-year-old resident of the State of Mexico with several underlying health conditions and no known exposure to poultry or other animals. On April 17, the patient began experiencing fever, difficulty breathing, diarrhea, nausea, and general discomfort, got admitted to the hospital on April 24 and died the same day. Laboratory tests revealed the presence of influenza A virus in the respiratory sample, which was previously categorized as non-subtypeable. However, further sequencing identified it as A(H5N2). 29 contacts were identified and tested after this incident, all of whom tested negative for SARS-CoV-2 and influenza, with no additional health issues reported. Before this, A(H5N2) infections in poultry were identified in Michoacán and the State of Mexico (near the patient's house) in March and April 2024, but there is still no definite link between the human case and these outbreaks [3].

Following this incident, the World Health Organization has not updated its guidelines, but it has drawn attention to the ongoing importance of global surveillance in identifying and tracking influenza virus variations and promptly disseminating data for risk assessment shown in Figure 2.

The WHO proposes several more effective surveillance measures, including active and passive animal monitoring, high-risk population monitoring, and hospital inspections. Extensive investigations, contact tracing, and clinical testing are necessary in both proven and suspected cases. It is recommended that visitors adhere to food safety

regulations, maintain proper cleanliness, and refrain from bringing animals into areas that are impacted. World Health Organization also suggests reporting all human infections with new influenza A viruses regardless of the symptoms. Research indicates that certain antiviral medications, most notably neuraminidase inhibitors (oseltamivir, zanamivir), may shorten the time that viruses take to replicate and increase the likelihood that certain patients may survive. However, despite these efforts, several challenges including a lack of particular vaccines for A(H5) in humans remain, though there are pandemic preparation vaccinations available [3]. For active immunization of chickens, the Nobilis AI H5N2 vaccine is utilized. It is composed of a water-oil emulsion containing an inactivated antigen of the type A (subtype H5) Avian Influenza virus. Vaccinating healthy chickens with this vaccine will help lower the incidence of Avian Influenza type A (subtype H5) [13].

This first global case of avian influenza A(H5N2) in humans in Mexico has raised concerns because the patient had no prior exposure to poultry or animals, making the source of transmission unclear. Although the patient's underlying health conditions are suspected to have contributed to vulnerability, this link lacks conclusive evidence. The virus was identified in neighboring poultry where the patient lived before this incidence, indicating a danger of human infection as well as the possibility of clusters caused by exposure to diseased birds or polluted settings. A study of 2022 found that low pathogenic avian influenza H5N2 viruses continue to circulate in Mexico and travel to other countries, implying that Mexico could be a hotspot for future outbreaks. However, surveillance continues, including immune response testing in exposed individuals. WHO currently sees the risk to the public as low for avian influenza A(H5N2), but they're staying alert and ready to change their assessment if more people get



FIGURE 2. WHO recommendations for protection against A(H5N2) infections

infected because if that happens, it would become a bigger concern [3,4].

Given the possibility of a pandemic involving avian influenza A(H5N2) in the future, the world and Mexico must prioritize pressing issues. First and foremost, because the patient caught the virus without any prior exposure, this example highlighted gaps in our understanding of how this virus transmits to humans. This emphasizes the necessity for further investigation into transmission processes. Second, global surveillance networks are needed to detect and monitor changes in influenza viruses. Increased international coordination is one way to ensure timely information exchange and collaboration during a pandemic response. Fourth, improving the framework for public health and capacity-building strategies can help to decrease the impact of future outbreaks, particularly in areas with a high chicken density or avian influenza prevalence. Finally, minimizing the risk of transmission would include raising public awareness and education on preventive measures such as avoiding close contact

with sick animals and preserving hygiene. If we successfully execute these preventive measures, the world, including Mexico, will be better positioned to respond to and prepare for any pandemics involving avian influenza A (H5N2) in the future.

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REFERENCES

1. CDC. Avian Influenza Type A Viruses [Internet]. Avian Influenza (Bird Flu). 2024 [cited 2024 Jun 23]. Available from: https://www.cdc.gov/bird-flu/about/?CDC_AAref_Val=https%3A%2F%2Fwww.cdc.gov%2Fflu%2Favianflu%2Finfluenza-a-virus-subtypes.htm
2. CDC. What Causes Bird Flu Virus Infections in Humans [Internet]. Avian Influenza (Bird Flu). 2024. Available from: <https://www.cdc.gov/bird-flu/virus-transmission/avian-in-humans.html>
3. World Health Organization. Human infection caused by avian Influenza A(H5N2)-Mexico [Internet]. www.who.int. Available from: <https://www.who.int/emergencies/disease-outbreak-news/item/2024-DON524>
4. World Health Organization. Influenza (Avian and other zoonotic) [Internet]. www.who.int. World Health Organization: WHO; 2018. Available from: [https://www.who.int/news-room/fact-sheets/detail/influenza-\(avian-and-other-zoonotic\)](https://www.who.int/news-room/fact-sheets/detail/influenza-(avian-and-other-zoonotic))
5. Okamatsu M, Saito T, Yamamoto Y, Mase M, Tsudoku S, Nakamura K et al. Low pathogenicity H5N2 avian influenza outbreak in Japan during the 2005-2006. *Vet Microbiol.* 2007;124(1-2):35-46. <http://doi.org/10.1016/j.vetmic.2007.04.025>
6. Suspected bird flu case found in S. Korea [Internet]. global.chinadaily.com.cn. [cited 2024 Jun 23]. Available from: https://global.chinadaily.com.cn/english/doc/2004-12/22/content_402389.htm
7. Lee CC, Zhu H, Huang PY, Peng L, Chang YC, Yip CH et al. Emergence and evolution of avian H5N2 influenza viruses in chickens in Taiwan. *J Virol.* 2014;88(10):5677-86. <http://doi.org/10.1128/JVI.00139-14>
8. Bingiriya bird flu: Don't panic, say health officials By Kumudini Hettiarachchi [Internet]. www.sundaytimes.lk. [cited 2024 Jun 23]. Available from: https://www.sundaytimes.lk/120205/News/nws_23.html
9. 6,000 chickens destroyed after bird flu scare - report [Internet]. www.adaderana.lk. [cited 2024 Jun 23]. Available from: <https://www.adaderana.lk/news.php?nid=16756>
10. United States-Department of Agriculture. Final Report for the 2014–2015 Outbreak of Highly Pathogenic Avian Influenza (HPAI) in the United States. Available at: <https://www.aphis.usda.gov/media/document/2086/file> (Accessed: 23 June 2024).
11. Avian influenza epidemic spurs nationwide rise in egg prices [Internet]. Los Angeles Times. 2015 [cited 2024 Jun 23]. Available from: <https://www.latimes.com/business/la-fi-egg-prices-20150530-story.html>
12. Purdy C. The same bird flu that wiped out millions of US egg laying hens is back [Internet]. Quartz. 2017 [cited 2024 Jun 23]. Available from: <https://qz.com/881586/usda-finds-avian-influenza-bird-flu-strain-that-killed-us-egg-hen-population-in-2015>
13. Nobilis AI H5N2 [Internet]. MSD Animal Health Middle East. [cited 2024 Jun 23]. Available from: <https://www.msd-animal-health-me.com/products/nobilis-ai-h5n2/#:~:text=It%20is%20an%20inactivated%20Avian>