Surveillance of Avian Influenza in Vaccinated Poultry: A Systematic Review of Strategies and Implementation Challenges

Y. Yanshi[1] (y.yanshi@uu.nl), S. Pletts[2], I. Li[3], J. L. Gonzales[4], S. Dellicour[3], E. A.J. Fischer[1], G. V. Schaik[1], C. Guinat[2], T. Vergne[2]

[1] *Utrecht University, Utrecht, Netherlands*
[2] *National Veterinary School of Toulouse, Toulouse, France*
[3] *Université Libre de Bruxelles, Brussels, Belgium*
[4] *Wageningen Bioveterinary Research, Lelystad, Netherlands*

Background:
Highly Pathogenic Avian Influenza (HPAI) is one of the most significant transboundary animal diseases worldwide affecting poultry, with far-reaching consequences for animal health, trade, food security, and public health (1). Repeated incursions of HPAI in the recent years, have led to unprecedented outbreaks across Europe, prompting renewed consideration of vaccination as a complementary preventive and control measure alongside enhanced biosecurity, movement restrictions, and stamping-out (2). While vaccination has the potential to reduce clinical disease, mortality, and viral shedding (3), its implementation introduces important surveillance complexities that must be addressed to ensure early detection of virus circulation and to maintain confidence in disease freedom claims (4).

One of the principal challenges of surveillance in vaccinated populations is the reduction of clinical signs and mortality without completely preventing infection, thereby increasing the risk of subclinical or silent virus circulation (5). Therefore, surveillance systems must remain sufficiently sensitive to detect infection at low-prevalence and potential viral evolution within vaccinated flocks.

In the European Union, ongoing policy discussions on avian influenza vaccination emphasize the need for robust surveillance systems capable of demonstrating absence of virus circulation, providing epidemiological evidence for control measures, and supporting safe trade (5). Several countries outside Europe, particularly in Asia, Africa, and Latin America, have longstanding experience with vaccination programmes and have developed diverse surveillance approaches tailored to vaccinated poultry populations (3). Despite this, there has been limited synthesis of how surveillance is structured in vaccinated settings. Gaps in the implementation of diagnostic approaches, as well as operational, epidemiological, and regulatory challenges remain.

The objective of this work is to describe the surveillance strategies having been in use for vaccinated poultry, and summarize reported challenges in its implementation.

Methods:
A systematic review was conducted following PRISMA guidelines. Comprehensive searches were performed across major bibliographic databases and relevant grey literature sources to identify studies describing avian influenza surveillance in vaccinated poultry populations. Eligible records include observational studies, surveillance reports and policy documents detailing surveillance objectives, sampling strategies, diagnostic tools, and implementation challenges. Screening is currently at the full-text stage. Data extraction focuses on surveillance structure, active and passive components integration, diagnostic methodologies, and reported constraints related to sensitivity, specificity, logistics, cost, and trade implications.

Insights:
Initial screening suggests considerable heterogeneity in surveillance approaches across different regions. Serological monitoring combined with confirmatory virological testing appears central to most systems, often supported by molecular diagnostics. Frequently reported challenges include interpretation of serological results in vaccinated populations, ensuring adequate sampling coverage, maintaining laboratory capacity, managing data integration, and addressing stakeholder and trade concerns.

Expected Contribution:
By synthesizing global experience, this review will provide an overview of surveillance strategies applicable to vaccinated poultry systems and identify key factors limiting surveillance efficacy. These findings are intended to inform policymakers and authorities in designing surveillance systems. These systems should ensure early

detection, transparency, and sustained confidence in avian influenza control programmes in the context of vaccination.

Keywords: Highly Pathogenic Avian Influenza (HPAI), surveillance, vaccination, systematic review.

References:

1. Alexander DJ. 2007. Vaccine. 25(30):5637–5644. https://doi.org/10.1016/j.vaccine.2006.10.051
2. Authority EF et al. 2023. EFSA J. 21(12):e8539. https://doi.org/10.2903/j.efsa.2023.8539
3. Swayne DE, Kapczynski D. 2008. Immunol Rev. 225(1):314–331. https://doi.org/10.1111/j.1600-065X.2008.00668.x
4. World Organisation for Animal Health (WOAH). 2023. https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/
5. Nielsen SS et al. 2024. EFSA J. 22(4):e8755. https://doi.org/10.2903/j.efsa.2024.8755