

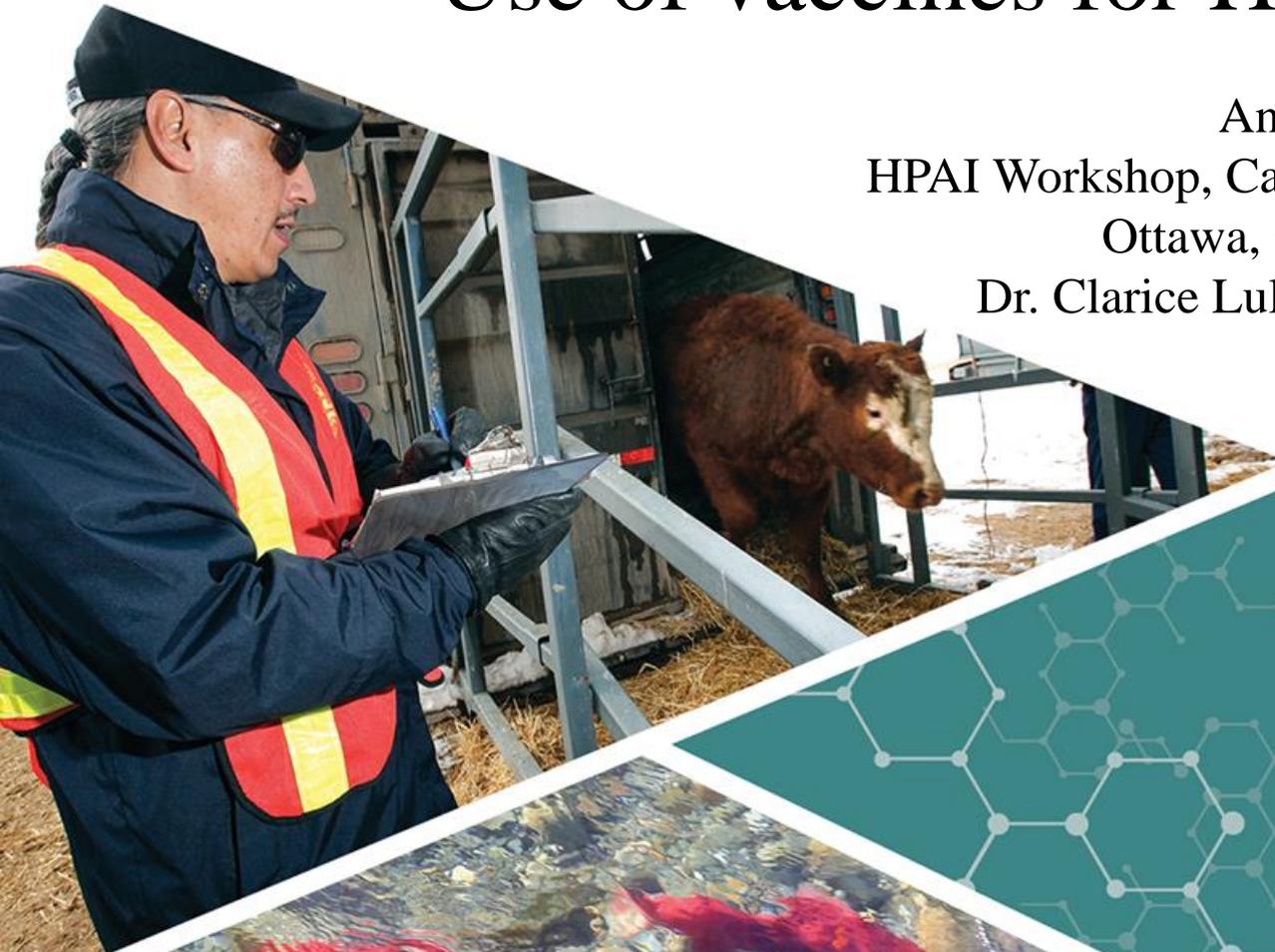


Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Use of vaccines for HPAI control

Animal Health Canada
HPAI Workshop, Canadian Perspectives
Ottawa, ON March 29, 2023
Dr. Clarice Lulai Angi DVM, MSc

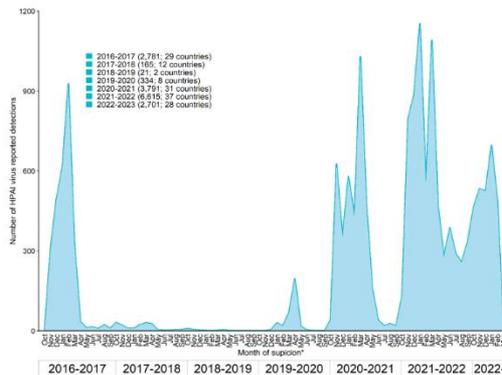


Objectives

To try to answer the following questions:

1. Why are we talking about vaccines now?
2. What are the challenges of vaccination for HPAI?
3. What is the CFIA doing about it?
4. Points for consideration

Why are we talking about vaccines now?



*When the date of suspicion is not available then the date of confirmation is used to assign the week of suspicion. United Kingdom data are from ADNS up to 31 December 2020. From 1 January 2021 onwards, the data source was the World Animal Health Information System (WOAH-WAHIS) for United Kingdom (excluding Northern Ireland), and ADNS/ADIS for the United Kingdom (Northern Ireland).
Source: ADIS and WOA (data extraction carried out on 1 March 2023).

Figure 1: Distribution of the number of HPAI virus detections in domestic and wild birds reported in Europe in the epidemiological years 2016–2017, 2017–2018, 2018–2019, 2019–2020, 2020–2021, and 2021–2022 by month of suspicion, from 1 October 2016 to 10 March 2023 (16,408)

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Avian influenza overview December 2022 – March 2023

European Food Safety Authority,
European Centre for Disease Prevention and Control,
European Union Reference Laboratory for Avian Influenza,
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Abstract

Between 3 December 2022 and 1 March 2023 highly pathogenic avian influenza (HPAI) A(H5N1) virus, clade 2.3.4.4b, was reported in Europe in domestic (522) and wild (1,138) birds over 24 countries. An unexpected number of HPAI virus detections in sea birds were observed, mainly in gull species and particularly in black-headed gulls (large mortality events were observed in France, Belgium, the Netherlands, and Italy). The close genetic relationship among viruses collected from black-headed gulls suggests a southward spread of the virus. Moreover, the genetic analyses indicate that the virus persisted in Europe in residential wild birds during and after the summer months. Although the virus retained a preferential binding for avian-like receptors, several mutations associated to increased zoonotic potential were detected. The risk of HPAI virus infection for poultry due to the virus circulating in black-headed gulls and other gull species might increase during the coming months as breeding bird colonies move inland with possible overlap with poultry

Outbreak evolution

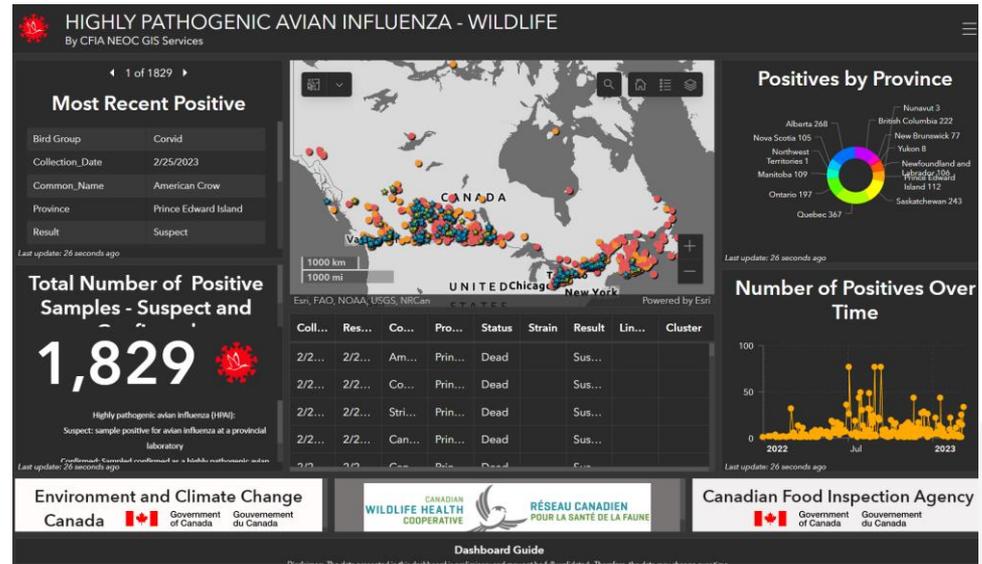
Select year:

DEAD BIRD SURVEY - 2014

Region	Tested	Matrix Positive	H5 Positive	H7 Positive	HPAI **
British Columbia	241	0	0	0	-
Alberta	319	1	1	0	-
Saskatchewan	23	1	0	0	-
Manitoba	0	0	0	0	-
Ontario	165	3	0	0	-
Quebec	647	3	0	0	-
New Brunswick	43	0	0	0	-
Nova Scotia	19	0	0	0	-
Prince Edward Island	87	0	0	0	-
Newfoundland and Labrador	0	0	0	0	-
Yukon	0	0	0	0	-
Northwest Territories	0	0	0	0	-
Nunavut	0	0	0	0	-
TOTAL	1544	8	1	0	-

* The CFIA has confirmed the presence of High Pathogenic Avian Influenza (HPAI), subtype H5N1, in two gulls.

http://www.cwhc-rcsf.ca/avian_influenza_testing_results.php



<https://cfia-ncr.maps.arcgis.com/apps/dashboards/89c779e98cdf492c899df23e1c38fdbc>

WAOH standards

- **Emergency vaccination** means a vaccination program applied in immediate response to an outbreak or increased risk of introduction or emergence of a disease (suppressive)
- **Systematic vaccination** means an ongoing routine vaccination program (protective)

WOAH standards

- The use of vaccination against avian influenza may be recommended *under specific conditions*;
- Vaccination *will not affect the high pathogenicity avian influenza status of a free country or zone* if **surveillance** supports the absence of infection.
- Vaccination can be used as an effective complementary control tool when a stamping-out policy alone is not sufficient.
- **In all vaccinated flocks tests should be performed to ensure the absence of virus circulation.** The tests should be repeated at a frequency that is proportionate to the risk in the country, zone or compartment.

What are the challenges of vaccination for HPAI?

- Vaccines must be well matched to the circulating strains to ensure protection of flocks
- Multiple doses are required to produce adequate immunity.
- Vaccines must be effective in the presence of maternal antibodies
- Barriers to implementation of vaccination have traditionally been concerns about:
 - a) trade;
 - b) silent infections;
 - c) antigenic drift (mutation risks)
- Adequate surveillance must be in place to ensure no viral circulation
- There are currently no approved vaccines in the market in Canada
- Current CFIA vaccination policy requires additional details

Vaccine characteristics

Surveillance

Vaccine platforms at NCFAD

- LaSota NDV-H5 H5N1 vaccine
 - HA gene of clade 2.3.4.4b virus inserted into LaSota backbone
 - Chicken experiment to begin in June 2023
- H5 virus like particles:
 - Currently at the stage of rescuing the virus and propagating it in insect cells (summer will conduct animal trial)
- Reverse genetically (RG) modified HPAI into LPAI
 - The principle: converting the cleavage site (few amino acids) of HPAI to resemble the cleavage site of LPAI, so HPAI behave as LPAI
 - Then the RG virus propagated in eggs in large amounts, followed by inactivation (inactivated vaccines) and use as killed vaccines.
 - NCFAD have the tools to make this rapidly

Maternal antibodies effects on vaccination

- Maternal antibodies impact live and live vector vaccines
- Maternal antibodies: no or little effect on non-replicating vaccines such as killed vaccines or virus like particles
- Herpes virus of turkey (HVT-H5) tolerate MA
- Repeated vaccinations
- First and second doses only a few days apart



Challenge: Addressing antigenic drift and silent infection concerns

- Monitor, monitor, monitor.
- AI vaccine stewardship:

Vaccine no substitute for biosecurity	Decision to use is the beginning not end
Appropriate matching to circulating strains	Use according to manufacturer's instructions
Monitor selected flocks	Monitor for antigenic changes
Import novel variants	Replace old vaccines
Ensure vaccinating crews not propagating infection	Regularly reassess needs
Farmers markets/ wet markets	Modify selling practices that facilitate transmission

Adapted from Dr. Les Sims presentation during the Technical Meeting on HPAI vaccination, Americas, WOA, March 03, 2023

Challenge: trade issues



- No valid scientific or legal reason why use of vaccine should affect trade as long as there is an appropriate surveillance system in place for detecting infection in vaccinated (and unvaccinated) flocks.
- Importing countries may choose not to follow WOAHA recommendations and :
 - Consider the country as not free of HPAI, and,
 - Prohibit import of products originating from vaccinated animals even if mitigation measures are taken (heat treatment).

Challenge: trade implications

- Mexico: H5N2 since 1994 and H7N3 since 2012 and two vaccines H5N1, Avimex and Boehringer; 170 million birds vaccinated; 5.9M culled due to HPAI;
- China: buffer areas since 2004 and H7N9 (LPAI) since 2016/17. Prevented major outbreaks but sporadic ones occur.
- Egypt: vaccinating since 2006 – vaccines adapted to local level strains;
- *EU Commission Regulation 2023/361* coming into force May 2023, lays down rules for vaccination against HPAI allowing for trade of poultry products derived from vaccinated birds and day old chicks within the Union
- France working on vaccine for ducks; Netherlands: egg layers; Italy: turkeys and Hungary: Pekin ducks.
- US: taking a wait and see approach about trade in vaccinated animals

Trade implications: USA

- Continuing to stress the message to poultry producers that biosecurity is the most important preventive measure which can be applied at the present time to protect flocks from HPAI;
- Beginning vaccine trials in April 2023 – results expected in June
- Depending on the trial results, vaccine production may commence later in 2023
- Time from trial to commercialization of vaccine uncertain at the moment

Challenge: what does adequate surveillance mean in practice?

- EU Regulation 2023/361 has provisions for preventive and emergency vaccination (emergency vaccination to kill and to live);
- Vaccinated animals are subject to movement controls;
- Enhanced surveillance:
 - Emergency vaccination: by-weekly to detect presence of virus, prevalence of 5% or lower, confidence level 95%;
 - Preventive vaccination: enhanced passive surveillance, DBS, clinical visits and by-weekly sampling to detect presence of virus at a prevalence of 5% or lower, confidence level 95%.

What is the CFIA doing?



- Working group has been formed to discuss policy options, surveillance systems, international trade, and practical vaccination issues internally and with provinces and industry
- Vaccination statement in HSP: lacking in detail
- Revising the policy in the face of the current outbreak, virus ecology and international developments
- Trade considerations: continue discussions with trading partners

What is the CFIA doing?

- Disease spread modelling to compare vaccination scenarios versus stamping-out only
 - Suppressive vs protective vaccination
 - Sizes of the vaccination zones (examples):
 - 1 km, 3 km, or 5 km in radius around IPs for SV
 - Ring vaccination with a 3-km inner radius and a 7-km outer radius for PV
 - Delay in initiation of a vaccination program following the first detection (1, 2 or 4 weeks for example)
 - Vaccination of all susceptible birds vs only long-lived birds for example

Points for consideration

- We need to be open to use of vaccination in the face of the current outbreak;
- A better understanding of all input and vaccine costs and benefits of vaccination versus not vaccinating flocks:
 - Vaccine
 - Labour
 - Surveillance
 - Potential loss of market
- Discuss acceptability of suppressive or preventive vaccination.
- Explore methods of delivery of vaccines including labour and surveillance;
- Canada needs to be prepared to negotiate certificates for continued trade when trading partners begin vaccination pilots and/or vaccine programs.

Conclusions

- International attention and momentum on using vaccines as a tool to control HPAI;
- There are challenges that we need to overcome:
 - Creating a vaccine policy
 - Finding a good candidate vaccine;
 - Designing an adequate surveillance system;
 - Determining costs and who assumes the risk
 - Liaising with trading partners to ensure trade can continue
- Above all, remain vigilant, continue applying strong biosecurity practices and reporting.

Questions?

