International Alliance for Biological Standardization

Vaccination and Surveillance for High Pathogenicity Avian Influenza in poultry: Current Situation and Perspectives

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Field Experience on HPAI Surveillance in Vaccinated Populations in Hong Kong

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Background of Implementing HPAI Vaccination in Hong Kong

- Currently, there are **29 licensed chicken farms** in Hong Kong
  - Holding capacity varying from 10,000 to 162,300 broiler chickens for each farm
  - Total maximum holding capacity: about 1,300,000 chickens
- Sporadic **H5 HPAI outbreaks** have occurred at the farm level since 1997
  - **Culling** of the live chickens on farm had been conducted as the major control measure for these outbreaks
- The **compulsory preventive HPAI vaccination campaign** fully implemented in 2003
  - Since then, only one H5 HPAI outbreak was reported in 2008, which was also the latest outbreak at the farm level

HPAI Outbreak at Farm Level (Month/Year)	Estimated No. of Chickens Culled
12/1997	1,300,000
5/2001	1,200,000
2/2002	900,000
12/2002	16,000
1/2003	10,000
12/2008	90,000

HPAI Vaccines Used in Hong Kong

Year of introduction	Vaccine introduced	Strains of seed viruses (clades)
2003	H5 Intervet Nobilis; monovalent	A/duck/Potsdam/1402-6/1986 (H5N2, European LPAIV)
2012	*H5 Re-5 / H5 Re-6; monovalent	H5 Re-5: A/duck/Anhui/1/2006 (H5N1, clade 2.3.4) H5 Re-6: A/duck/Guangdong/S1322/10 (H5N1, clade 2.3.2.1)
2016	*H5 Re-6 + Re-8; bivalent	H5 Re-6: A/duck/Guangdong/S1322/10 (H5N1, clade 2.3.2.1) H5 Re-8: A/chicken/Guizhou/4/2013 (H5N1, clade 2.3.4.4g)
2018	*H5 Re-8 + H7 Re-1; bivalent	H5 Re-8: A/chicken/Guizhou/4/2013 (H5N1, clade 2.3.4.4g) H7 Re-1: A/pigeon/Shanghai/S1069/2013 (H7N9)
2019	*H5 Re-11 + H7 Re-2; bivalent	H5 Re-11: A/duck/Guizhou/S4184/2017 (H5N6, clade 2.3.4.4h) H7 Re-2: A/chicken/Guangxi/SD098/2017 (H7N9)
2022	*H5 Re-13 + H5 Re-14 + H7 Re-4; trivalent	H5 Re-13: A/duck/Fujian/S1424/2020 (H5N6, clade 2.3.4.4h) H5 Re-14: A/whooper swan/Shanxi/4-1/2020 (H5N8, clade 2.3.4.4b) H7 Re-4: A/chicken/Yunnan/SD024/2021 (H7N9)

**Developed by the National Avian Influenza Reference Laboratory of Harbin Veterinary Research Institute*

2003

2012

2022

General HPAI Vaccination Strategy for Chicken Farm

◆ Compulsory H5/H7 vaccination for all chickens in each flock

- **First dose** of H5/H7 vaccination at 8 – 10 days old
- **Second dose** of H5/H7 vaccination 4 weeks after the first dose (i.e. at around 36 – 40 days old)
- For chickens aged 120 days old or more (e.g. breeders), a **booster dose** of H5/H7 vaccine is required, followed by further booster shots once every 6 months or whenever the antibody titre of vaccinated chickens in the same batch failed in routine serosurveillance

Surveillance Approach for Vaccinated Flocks in Chicken Farms

- Random sampling of **oropharyngeal and cloacal swabs from vaccinated chickens** (n = 30) of pre-sale chicken batch for **H5 & H7 AI PCR test**
- Random sampling of **blood samples from vaccinated chickens** (n = 30) for **AI vaccination efficacy evaluation (by H5 & H7 serological HI test)** on each chicken batch 4 weeks after second AI vaccination
- Random sampling of **blood samples from vaccinated breeders** (n = 30) batch for **H5 & H7 serological HI test** on a regular basis
- **Environmental sampling** on a regular basis for **AI virological testing**
- Routine **AI surveillance on dead chickens** found on farm during regular inspections

Market sale of the chickens will only be approved if –

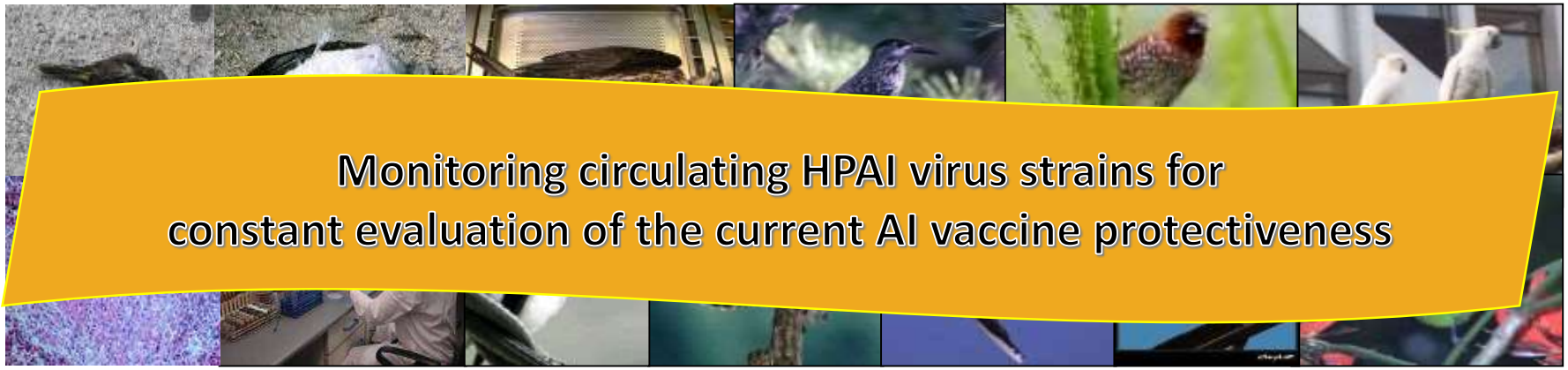
- ***≥ 70%** of blood samples from vaccinated chickens show **H5 and H7 HI titers ≥ 1:16** (revaccination would be required for the concerned batch of chickens if failed); and*
- ***Negative PCR results** for subtypes H5 and H7 AI viruses*

AI Surveillance Activities in Hong Kong

	2020		2021		2022		2023	
	Number of samples	Percentage	Number of samples	Percentage	Number of samples	Percentage	Number of samples	Percentage
Local Poultry Farms	15521	43.12%	15166	40.63%	14006	39.83%	15166	40.06%
Import Poultry	0	0%	0	0%	0	0.00%	0	0.00%
Poultry Markets	4485	12.46%	5074	13.59%	5211	14.82%	5074	14.43%
Other locations	601	1.67%	577	1.55%	520	1.48%	577	1.64%
Pet birds	3060	8.50%	3216	8.62%	3267	9.29%	3144	8.94%
Park birds	2553	7.09%	2467	6.61%	1718	4.89%	2467	7.01%
Wild birds	9778	27.16%	10828	29.00%	10828	29.00%	11431	32.50%
Total	35998	100.00%	33601	100.00%	35168	100.00%	37859	100.00%

Dead Bird AI Surveillance in Hong Kong

Year	2018	2019	2020	2021	2022	2023
No. of dead wild birds collected	10777	9142	9311	8818	8153	7748
No. of dead wild birds tested	4472	4012	3893	3624	4071	3627
No. of dead wild birds found with H5 or H7 virus	2	0	3	2	3	3



Major Concerns on Feasibility and Applicability in Other Places

- Frequent **official farm visits** are being conducted which may not be acceptable in other places with a higher number of farms
- The Hong Kong government **fully covers the cost** of the AI surveillance activities which may not be affordable in other places with a much larger poultry production scale
- The chickens produced from chicken farms in Hong Kong are **solely supplied for local consumption**
  - **International trade** is not a concern for HPAI vaccination in Hong Kong compared to other countries

Review on Sentinel Surveillance Approach in Hong Kong

- The AI surveillance and monitoring mechanism using **unvaccinated sentinel chicken** has been in place in local chicken farms since compulsory HPAI vaccination implemented
  - Primarily for the **detection of sustained silent infection** in vaccinated flocks if it were to occur

- The mechanism was adopted when vaccination was first introduced to Hong Kong, where there were **limited cost-effective options** available for surveillance and monitoring (esp. DIVA not applicable)
  - More surveillance options are available nowadays with **technology advancement**
  - Equivalent AI surveillance information could be obtained by **alternative AI surveillance approaches**

Review on Sentinel Surveillance Approach in Hong Kong

- With 20 years' experience of implementing AI vaccination in Hong Kong, it is considered that **silent infection is unlikely to occur in well vaccinated flocks**, with good antibody response against a well-matched vaccine antigen to the circulating field strains
  - The **limited shedding** in vaccinated chickens is very unlikely to result in sustained transmission
  - The presence of unvaccinated sentinel chickens on farm may on the contrary pose a **higher introduction and transmission risk** of HPAI
  - Experience learnt from the HPAI outbreak at the farm level in 2008

Review on Sentinel Surveillance Approach in Hong Kong

- Sentinel chickens were tested positive serologically in multiple occasions every year, leading to **suspension of farms** for thorough disease investigation of the flocks
  - **None** of the them has been detected as being **HPAI virus-positive** over the years
  - Likely by mixing up of vaccinated chicken with sentinel chicken, or mis-vaccination of sentinel chicken due to **farm management issues**
  - Possibly **cross reactivity on serology** due to coincidental use of other LPAI vaccines (e.g. H9 AI vaccine) or the presence of other LPAIVs (e.g. H3N8 or H9N2) infections on farms

Cessation of the sentinel surveillance approach for vaccinated flocks in local chicken farms since October 2022

Conclusion and Recommendations

- Based on over 20 years of experience in implementing mandatory HPAI vaccination campaign in Hong Kong, **vaccination is an effective measure** to **prevent and control HPAI outbreaks and transmission in poultry**
- With the constant mutation of HPAI viruses, there is **no single vaccine could be used against HPAI viruses forever**
  - **Constant review and update of HPAI vaccine** used on farm is a key element to a successful vaccination strategy
- **Active surveillance** is necessary to **evaluate vaccination efficacy** and to **demonstrate freedom of HPAI virus infection** in a vaccinated population
- The use of **sentinel chickens is NOT recommended** in HPAI surveillance based on the experience in Hong Kong
- Currently, there is **no exit strategy** and it is foreseen that HPAI vaccination would continue to be implemented in local chicken farms of Hong Kong in the near future.

Thank you
for your attention!