

Vaccine Usage to Control Highly Pathogenic Avian Influenza in Poultry and Other Domestic Birds: Setting the Scene

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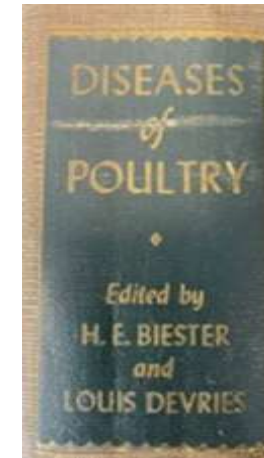
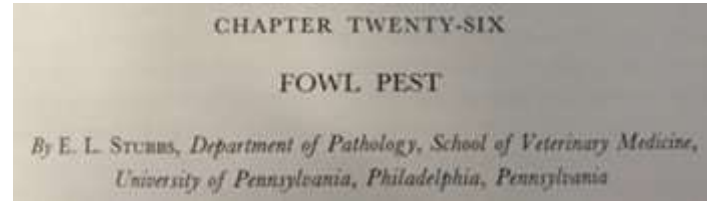
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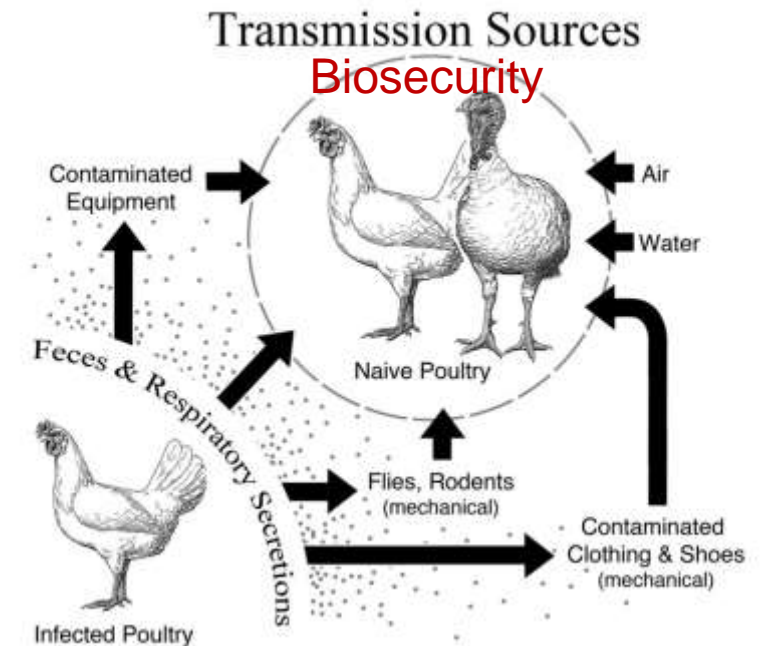
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High Pathogenicity Avian Influenza Control



- E.L. Stubbs - “Capable of causing such destruction of the poultry population as to be of economic importance in diminishing the food supply..... Dangerous character of the disease warranted the radical methods for complete eradication within a few months”
- Control since 1920’s: Stamping-out programs (diagnose, quarantine, depopulate & dispose, and clean & disinfect)
 - Infected flocks
 - Dangerous contacts or contiguous properties or zones (1-3 km)
- What are the preventative measures?
 - Biosecurity – to keep the virus out of naïve flocks and keep the virus in affected flocks; i.e. stop introduction and spread
 - Vaccines and Vaccination to prevent or increase resistance to HPAI infection if exposed



General Control of HPAI



- **HPAI: WOAHA consensus for severe transboundary animal diseases (e.g. HPAI) is elimination from poultry and stamping-out has been the preferred strategy**
- **H5Nx Gs/GD Eurasian, H7N9 Eurasian, and H7N3 N. American lineage HPAI viruses has challenged this single strategy**
 - **Many countries eliminated Gs/GD HPAI through stamping-out program, but some have had multiple re-introduction and elimination cycles (e.g. South Korea and Japan)**
 - **Other countries had delays in elimination associated with limited veterinary services, restricted finances, lack of logistics, poorly developed diagnostic systems, lack indemnities, etc., and the HPAI virus became entrenched (endemic) in their poultry**
 - **Some countries with endemic HPAI have undertaken routine (systematic) vaccination for food security reasons without expectation to elimination in immediate future**
 - **Other countries have done targeted/ring emergency vaccination programs to limit the virus, in order to allow stamping-out programs to catch-up and have led to elimination**

History: H5/H7 HPAI Vaccination Programs

- **15 countries vaccinated poultry against HPAI (2002-2010)**

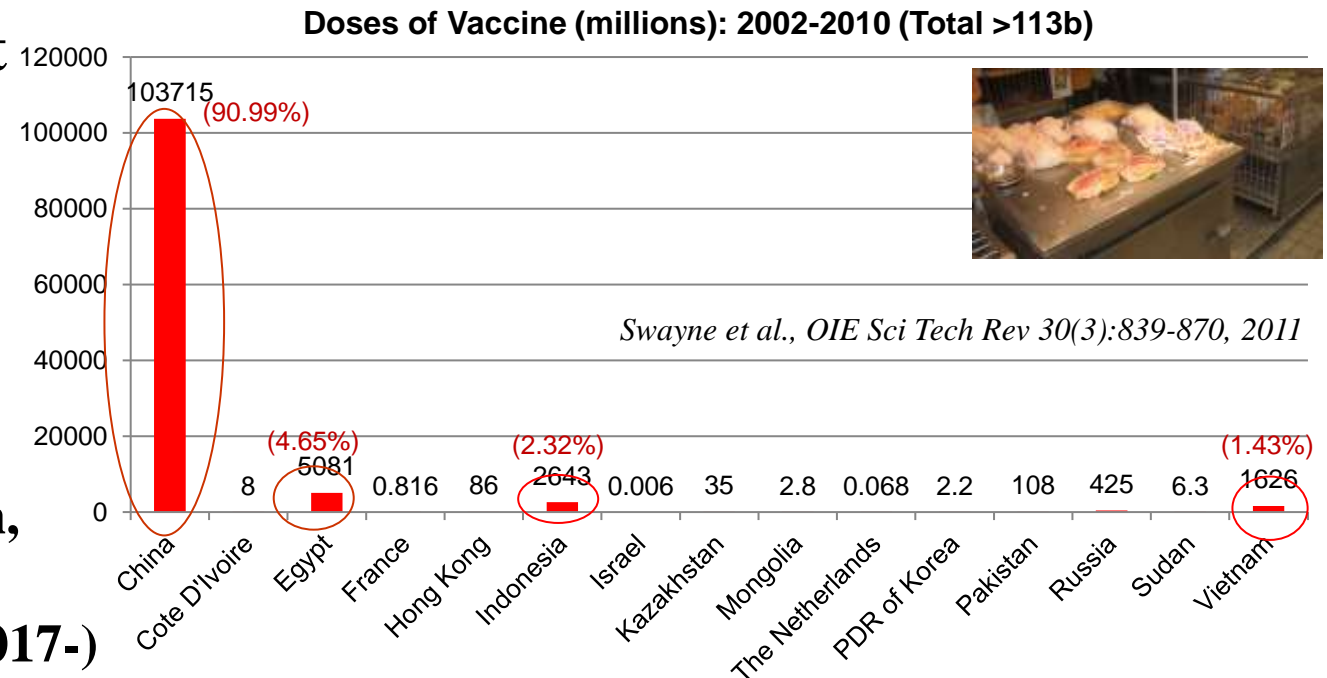
- **Preventive (<0.2%): Mongolia, Kazakhstan, France, The Netherlands**

- **Emergency (<0.8%): Cote d' Ivoire, Sudan, N. Korea, Israel, Russia, Pakistan**

- **Routine/systematic (>99%): China (including Hong Kong), Egypt, Indonesia and Vietnam, plus added Bangladesh (H5N1, 2011-), Mexico (H7N3, 2012-) and China (H7N9, 2017-)**

- **Based on WOAHA reporting, vaccination has been undertaken by 23 countries as emergency (preventative or immediate) or systematic (preventative or routine) measure since 2005 (include Armenia, Belarus, Bangladesh, China, Egypt, El Salvador, Germany, Guatemala, Hong Kong [SAR], Indonesia, Jordan, North Korea, Kuwait, Laos, Mexico, Niger, Nigeria, Pakistan, Peru, Russia, Sudan, Turkmenistan, and Vietnam)**

- **2021-2022: Approval vaccination in EU (with 5 countries considering implementation)**



Safe Trade of Poultry and Poultry Products

WOAH Code - Terrestrial Animal Health Code specifies:

- **The use of vaccination against avian influenza may be recommended under specific conditions**
- **Any vaccine used should comply with the standards described in the Manual**
- **Vaccination will not affect the HPAI status of a free country or zone if surveillance supports the absence of infection, in accordance with Terrestrial Code Article 10.4.28., in particular point 2.**
- **Vaccination can be used as an effective complementary control tool when a stamping-out policy alone is not sufficient**
- **Details: WOAH Code: Vaccination (Article 4.18.3)**



What Vaccination Can Do!

Increase resistance to AIV infection (higher exposure dose to infect)

Reduce AIV replication in respiratory & GI tract which reduces shedding

Prevent disease and death in poultry



Reduced environmental contamination

Reduced transmission to birds within premise

Reduce spread between barns and premises

Maintained livelihood of growers and food security of consumers

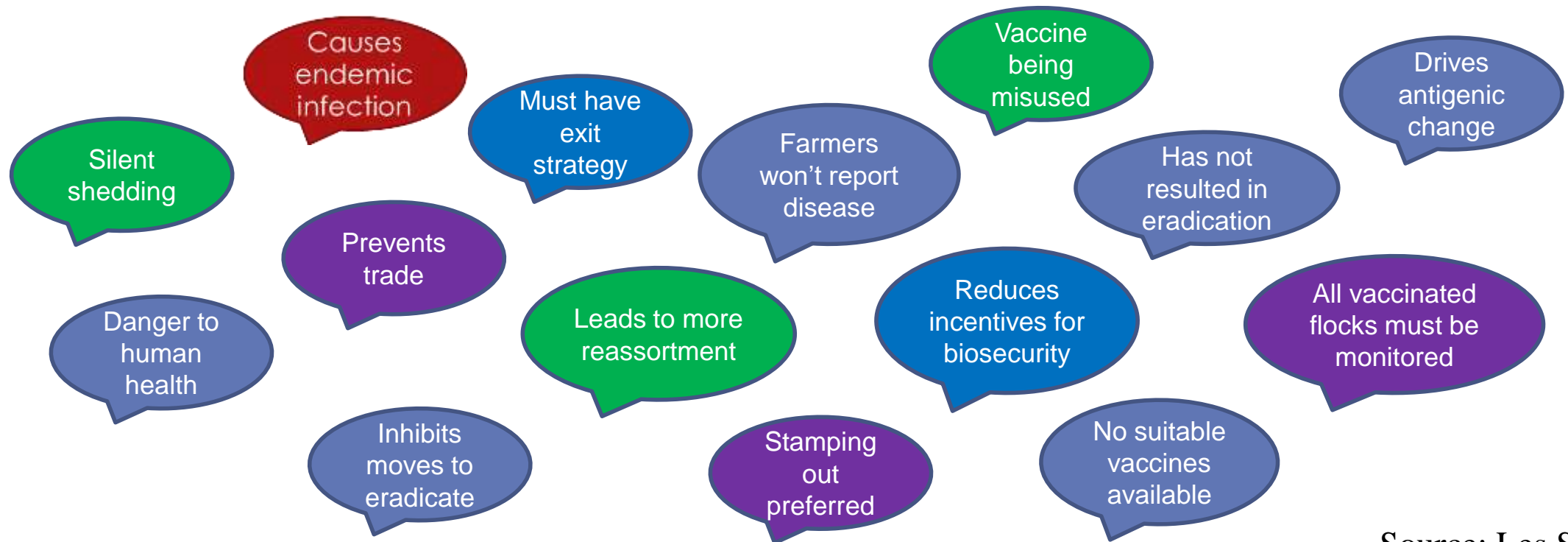
Improves animal welfare



Conclusion: Adds an additional layer of protection on top of other biosecurity measures, but does not replace biosecurity measures

Barriers to Vaccination

- Many countries have been reluctant to use vaccination even when it would almost certainly help to improve the situation in control and food security which includes some countries where H5 HPAI is endemic but there is still resistance to vaccination
- Some of the “reasons” given for rejecting use of HPAI vaccination – not all are valid and all can be overcome



“AI Vaccine Stewardship”

Some similarities to “Antimicrobial Stewardship”

1. Vaccines should not be used as a replacement/substitute for other methods of disease prevention but to add an additional layer of biosecurity/protection *
2. The decision to use vaccine is just the beginning of the process, not the end
3. Need to choose appropriate vaccines that provide protection against circulating strains
4. Use vaccines in accordance with manufacturer’s recommendation (dose and timing)
5. Monitor selected vaccinated flocks to ensure vaccine is producing the desired immune response, to plan timing of boosters (if required) and (if used) to monitor for infection **



*one exception is free-ranging ducks for which few biosecurity measures are feasible at the production level

**may be all flocks if elimination/demonstration of freedom in vaccinated flocks is the target

“AI Vaccine Stewardship”

6. Need to monitor viruses regularly for evidence of antigenic changes and update vaccines when required
7. Beware of import of novel antigenic variants (trade or wild birds)
8. Replace (deregister) vaccines that no longer afford protection from disease and virus shedding
9. Ensure vaccination is done in a manner that does not transmit the virus



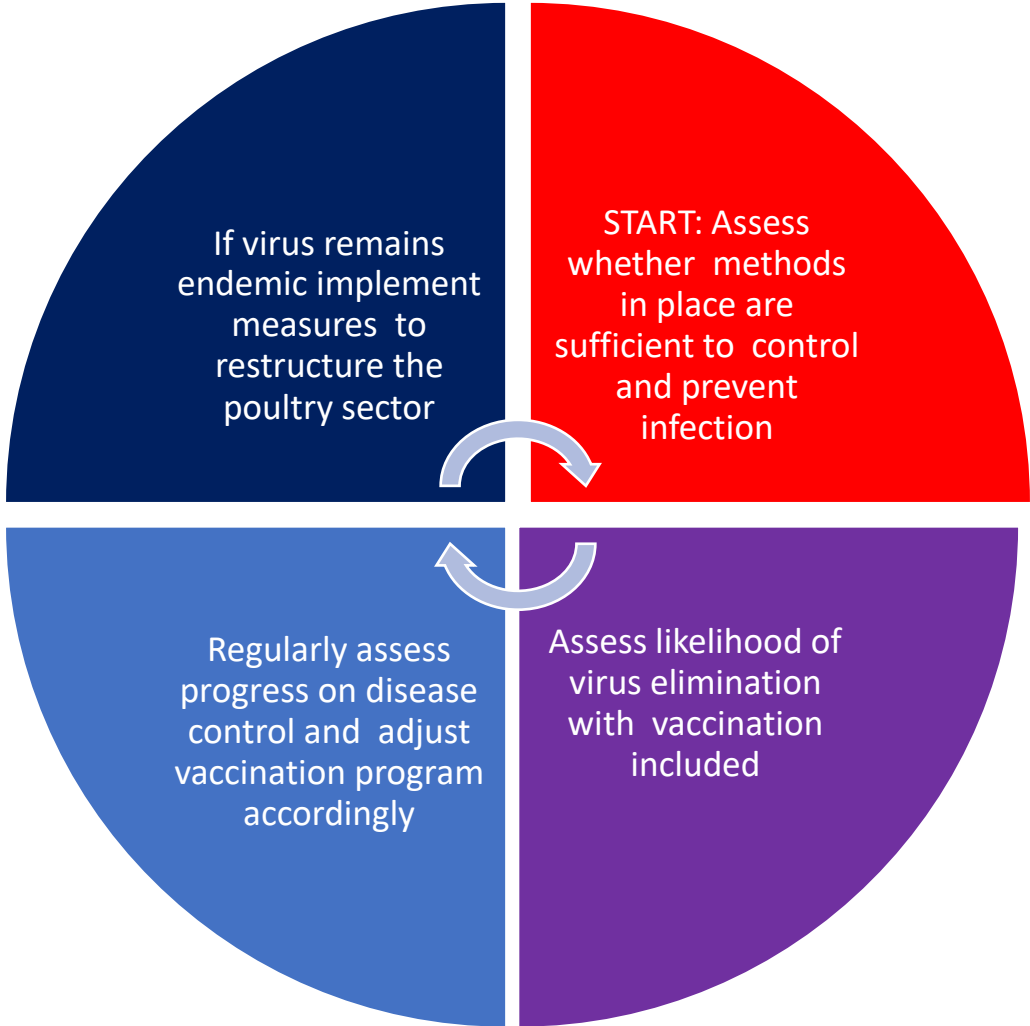
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“AI Vaccine Stewardship”


10. Regularly re-assess the need for and nature of vaccine programmes and modify programmes accordingly (see AI vaccination cycle)
11. Special attention should be paid to farms or markets where infection occurs or persists, despite appropriate usage of vaccines
12. Examine ways to modify production and selling practices that facilitate transmission and replication of the virus



The “AI Vaccination Cycle” in places where HPAI is occurring in poultry



The “Vaccination Cycle” in places where HPAI is occurring in poultry



Assess whether methods in place are sufficient to control and prevent infection

- When existing measures (e.g., stamping out and movement controls) are not sufficient to eliminate the virus, or are not sustainable, consider adding vaccination
- If used, determine which sectors would benefit most from vaccination, where to vaccinate, and with which vaccine
- Certain sectors/locations will not require vaccination
- Determine how to deliver vaccine to smaller flocks effectively, if included
- Ensure only suitable well-matched vaccines are registered and used

The “Vaccination Cycle” in places where HPAI is occurring in poultry

Assess likelihood
of virus
elimination from
poultry with
vaccination
included

- Is there a reasonable probability that vaccination plus biosecurity and targeted culling can halt transmission of/eliminate the virus?
- Assessment is based on
 - the nature of the poultry sector,
 - capacity to vaccinate
 - availability of appropriate vaccines
 - capacity to design and implement an appropriate surveillance system
- Factors that get in the way include:
 - large number of free-ranging domestic ducks
 - live bird markets not managed to prevent infection
 - complex chains from producer to sale
 - persistence of virus in wild bird populations
 - inappropriate usage of vaccines

The “Vaccination Cycle” in places where HPAI is occurring in poultry

Assess likelihood
of virus
elimination from
poultry with
vaccination

- If yes, shift to/retain a virus elimination policy
- Requires a surveillance system to detect all cases of infection in vaccinated flocks, with characterisation of viruses
- If no, adopt a suppression policy that acknowledges elimination is not possible in the short to medium term
- Adjust surveillance to monitor for disease outbreaks in vaccinated flocks and markets and to check for antigenic variants

The “Vaccination Cycle” in places where HPAI is occurring in poultry

Regularly assess progress of disease control and adjust vaccination program accordingly

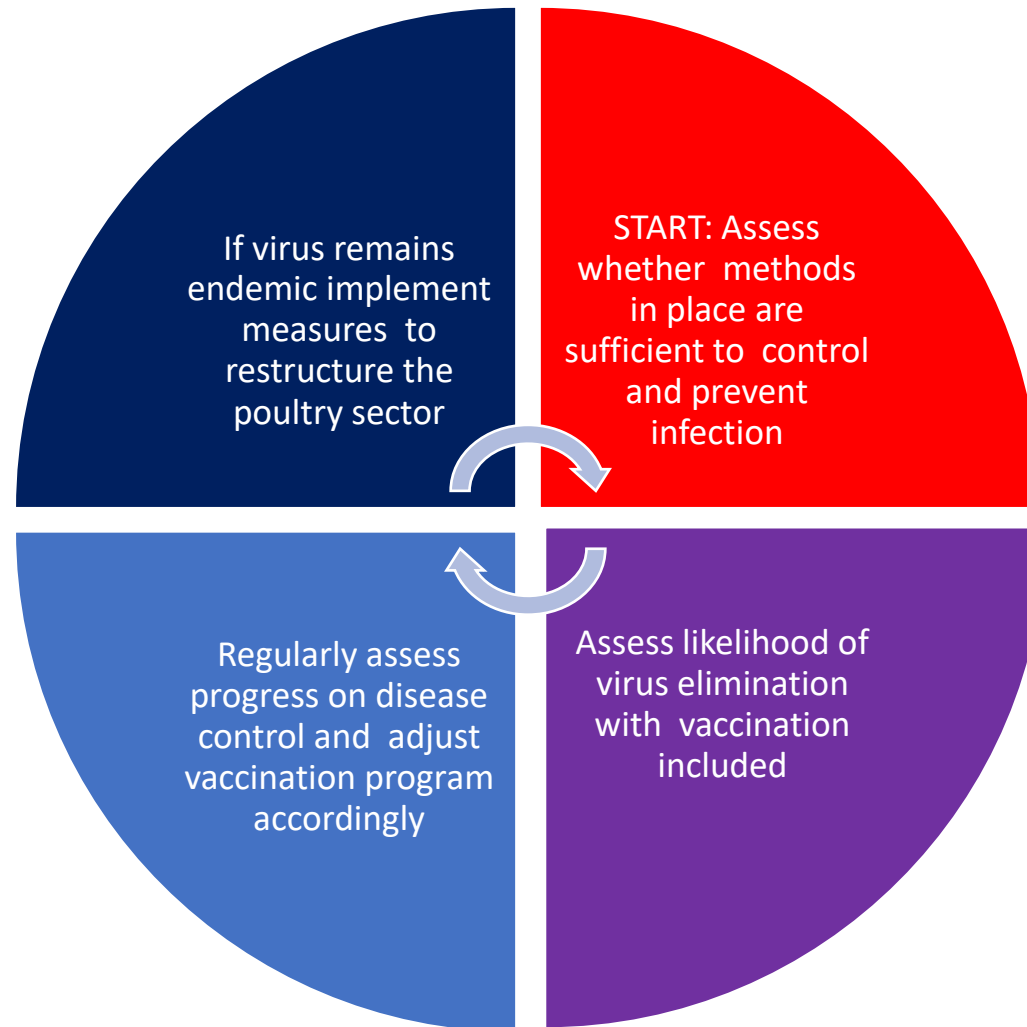
- 3 to 12 months later (and repeated)
- Assess the extent to which vaccination is helping to prevent infection and disease
- This requires an appropriate surveillance system for detecting infection
- This review might include decisions to:
 - cease vaccination if the virus is no longer circulating in poultry regionally and/or the risk from wild birds has disappeared
 - change vaccines/vaccine antigens
 - changes the scope of the programme
 - continue vaccination as before

The “Vaccination Cycle” in places where HPAI is occurring in poultry

If virus remains endemic, implement measures to restructure the poultry sector

- This might include:
 - changing to centralised slaughter of domestic ducks,
 - changes to live bird market management,
 - compulsory remedial actions/penalties for repeated infection on farms and markets, etc
- Must be based on capacity to implement changes and assessment of feasibility, in conjunction with stakeholders
- Maintain vaccination as part of the control strategy if virus remains endemic
- Public Health/One Health obligations need to be met – do not want another human pandemic or spillback to wild birds

The “AI Vaccination Cycle” should be continuous



Critical Questions for 2023 H5N1 2.3.4.4b in the LATAM

- **Will vaccines and vaccination gain wider acceptance as a control tool?**
 - Use of vaccines does not alter avian influenza status from a trade perspective (WOAH Terrestrial Code Article 10.4.1. Provision 6) if an appropriate surveillance system is in place
 - Additional measures are needed to prevent 2.3.4.4b HPAI, given the extent of infection in wild birds, the evidence of increased outbreaks and the large number of poultry that have been destroyed as a result of this disease
 - Vaccination can provide an extra layer of protection, reduce the quantities of circulating virus and the number of farms on which stamping-out is required
 - Stamping-out programs are complex, expensive and labor intensive. Can all countries manage such programs?



Conclusions

- **The change in behavior of the H5Nx Eurasian lineage HPAI viruses has resulted in the virus becoming endemic in some wild bird populations, continual threat to introduction in commercial and backyard poultry flocks**
- **We need to explore options to reduce the massive losses of birds and high cost to industry and government from outbreaks**
- **Uptake of vaccination has been slow with most having sole reliance on biosecurity and response to infections**
- **A change is occurring in thinking towards vaccination especially in places that have experienced repeated wild bird introductions and epidemics in poultry**
- **A number of issues have inhibited the use of vaccination in places with a zero tolerance for infection of which the most important are concerns about trade restrictions, silent infection, antigenic drift, complications to existing surveillance systems and fears that use of vaccination will result in endemic infection, but all are solvable**

Merci Beaucoup!

