Control and Management of Avian Influenza

Ian Brown
EU/OIE/FAO International Reference Laboratory for Avian Influenza
AHVLA-Weybridge
UK
Overview

• Background
• Stamping out
• Vaccination
• Measures and modes of spread
• Current control of H5N1
TWO PATHOTYPES OF INFLUENZA A IN POULTRY

Highly pathogenic
• severe disease
• systemic infection
• high mortality up to 100%
• to date only[but not all] viruses of H5 or H7 subtype

Low pathogenicity
• mild respiratory disease, depression, egg production problems
• infection restricted to respiratory/enteric tracts
• may exacerbate other infections/conditions
Avian influenza means an infection of poultry or captive birds caused by any influenza A virus:

a) of the subtypes H5 or H7; or

b) with an intravenous pathogenicity index in six week old chickens greater than 1.2

a) or b) referred to as Notifiable Avian Influenza (NAI)

Requires immediate implementation of control measures in most countries through national legislation
Control strategy for Highly Pathogenic Avian Influenza - main components -

• Early detection
• Restriction of suspect and infected premises
• Slaughter of infected and dangerous contact flocks
• Decontamination
• Movements controls
• Tracing and surveillance
• Public awareness
Disease Control Strategies

- National/Regional movement controls
- Infected area controls
- Infected premises and dangerous contact premises
- Wider culling strategies for HPAI
- Vaccination as a control measure
- Measures in protection and surveillance zones
- Tracing and surveillance
- Restocking & lifting of restrictions
Infected Area Controls

- Declaration of infected area
  - Protection zone (minimum 3km radius)
  - Surveillance zone (minimum 10 km radius)
- HPAI according to local legislation
- NAI-low pathogenicity viruses may carry some derogations
- Restricts movement of poultry, eggs, carcasses, manure/litter
Infected Premises and Dangerous Contact Premises

The national competent veterinary authority will usually be responsible for:

• slaughter of all poultry on premises
• compensation for slaughtered birds
  – Market value of non-diseased birds at time of slaughter
• removal of carcases and eggs for disposal
• Occupier of premises may be responsible for:
  – Cleansing and disinfection
  – Treatment of manure and used litter
Disease control measures in an infected area

Protection zone duration: at least 21 days after preliminary cleansing & disinfection (C&D) of infected premises (IP)

Surveillance zone duration: at least 30 days after preliminary C&D of IP
Protection Zone Measures

- Identification of all premises with poultry
- All poultry must be kept in living quarters
- Disinfection at entrances and exits
- Periodic inspections by veterinary officers
- No movement off premises of poultry, eggs, carcasses, manure or used litter
- Risk assessment to determine when licensed movements will be allowed
Surveillance Zone Measures

- Identification of all premises with poultry
- Poultry may be required to be kept in living quarters
- No movement off premises of poultry, eggs, carcases, manure or used litter
- Risk assessment to determine when licensed movements will be allowed
Epidemiological Tracing investigations

• Possible spread to/from infected premises
  – Flocks with any form of contact with infected premises
  – Infected poultry or carcases
  – Manure & excretions from infected birds

• Assessment of risk of exposure to virus
  – High risk = Dangerous Contact (pre-emptive slaughter)
  – Other contacts restricted & observed for 21 days
Surveillance activities

To detect infected flocks

– Inspection of Protection Zone premises (Patrols)
– Inspection of contact premises

• To provide evidence of freedom of disease
  – Statistical sampling
Surveillance activities in Protection zone

- Periodic visits
  - All premises with poultry
  - Inspections/examinations of poultry & records
  - Diagnostic samples where necessary

- Surveillance sampling/testing
  - Begin 21 days after last confirmed case
  - All premises with poultry
    - ie 20 blood samples per epidemiological unit (95/15)
    - ie 60 faecal samples per epidemiological unit (95/5)
Surveillance activities in Surveillance zone

• Periodic visits
  – All contact premises
  – Inspections/examinations of poultry & records
  – Diagnostic samples where necessary

• Surveillance sampling/testing
  – Begin 21 days after last confirmed case
  – Statistical sample of poultry flocks (95/1)
    + larger flocks
    + waterfowl flocks
Other Surveillance activities

• Caged birds
  – Notification and investigation of sickness, deaths

• Wild bird populations
  – Epidemiological evidence?
  • Laboratory testing of dead birds
  • Screening of waterfowl colonies
Lifting of area restrictions

- **Protection zone**
  - at least 21 days after preliminary C&D of IP

- **Surveillance zone**
  - at least 30 days after preliminary C&D of IP

- **Infected area**
  - Withdrawn after all surveillance testing completed
In influenza virus infections of domestic poultry there is good evidence implicating the following:

- farm owners
- caretakers
- farm staff
- trucks/drivers moving birds
- trucks/drivers moving eggs
- **trucks/drivers delivering food**
- artificial insemination crews
- thinning crews
- veterinarians
VACCINES
Transmission between flocks:

$R_0$: average number of secondary infections from one flock

- $R_0 > 1$
- $R_0 < 1$
Goals for Avian Influenza Vaccines

Provide Protection

1. Against clinical signs and death
2. Reduced shedding of field virus when infected
3. Prevention of contact transmission
4. Provide long protection from single vaccination
5. Protect against low or high exposure dose of field virus
6. Protect against a changing virus
7. Increases resistance to avian influenza virus infection
Avian influenza vaccination

Current vaccines result in:
• Protection against clinical signs
• Reduction in virus excretion
• Increase in virus dose needed to infect bird

BUT…………..
AI vaccination

- AI virus may infect and replicate in vaccinated birds without clinical signs
- As a corollary HPAI or NAI as defined by OIE may still be confirmed in such birds
- Infection with HPAI virus without clinical signs may lead to spread and an endemic situation
H5N1 vaccines

• Monovalent inactivated
  – Producers in China, Indonesia, Pakistan

• Monovalent reverse genetics
  – ie Gs/Guangdong/96(Re1) or AH (Re5) with PR8 backbones and modified HA gene

• Recombinant
  – Avian pox with Gs/Guangdong/96(Re1) HA and NA
  – Newcastle Disease virus and Bar Headed Goose/Qinghai/3/2005
  – Fowlpox with HA from Ty/Eire/83 (H5N8)

Quality and efficacy variable!
Current control strategies for H5N1 HPAI
Main constraints on control of HPAI H5N1 in the poultry sector

- **Structure of poultry sector**
  - as poultry density increases in developing countries there is an increased HPAI outbreak duration, time to eradication and number of outbreaks (Pavade et al OIE IN PRESS)

- **Quality of public and private veterinary services**

- **Level of commitment on part of poultry sector and governments to elimination of such viruses**

(FAO 2011: http://www.fao.org/docrep/014/i2252e/i2252e00.pdf)
Control strategies– H5N1

- **Stamping out: successful!**
  - South Korea, Japan, Malaysia, EU member states
- **Stamping out: reduced incidence**
  - Thailand, Cambodia, Laos, Nigeria, Bangladesh, Pakistan
- **Stamping out progressing to vaccination + stamping out**
  - Vietnam, China, Russia,
- **Vaccination plus limited stamping out**
  - Indonesia, Egypt

- ENDEMIC infection variably defined!
Facts about control of H5N1 HPAI via vaccination

• affecting poultry and/or wild birds in 63 countries
• 2002 to 2010
  – >113 billion doses of AI vaccine were used in at risk national poultry populations
  – >131 billion birds at 2-3 doses per bird in 15 countries for a vaccination coverage rate of 41.9%
  – global AI vaccine coverage rate of 10.6% for all poultry
• >99% of the vaccine used in China, Egypt, Indonesia and Vietnam versus H5N1
  – vaccination in these four countries occurred after H5N1 HPAI became enzootic in domestic poultry
• Vaccine usage prevented clinical disease and mortality in chickens, and maintained rural livelihoods and food security during HPAI outbreaks.

SOURCE: Swayne et al, OIE IN PRESS
Poultry sessions will include:
- Global reports on AI
- Surveillance for AI
- LPAI outbreaks
- Diagnostics
- Vaccines & vaccination
- Pathobiology
- Field epidemiology
- Field control
- Education & risk communication
- Zoonoses

Wild bird sessions will include:
- Surveillance
- Ecology
- Pathobiology
- H5N1 HPAI

Important dates
Abstract submission now open!
Registration opens: 30 September 2011
Abstract deadline: 1 November 2011

Co-chairs: Ian Brown (UK) | David Swayne (USA) | Thijs Kuiken (The Netherlands)
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