

Avian & Pandemic Flu: An Introduction

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Part II: Avian Influenza: A Veterinary Perspective

NC Center for Public Health Preparedness

Webinar Symposium Series on Avian & Pandemic Influenza



Avian Influenza: A Veterinary Perspective

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Learning Objectives

- Describe normal transmission of Influenza A
- Describe development of HPAI (vs. LPAI)
- Describe control measures
 - Surveillance
 - Enhanced biosecurity
 - Movement control
 - Destruction of contaminated birds/fomites
 - Role of vaccines/antivirals

Influenza Basics

- An orthomyxovirus
 - Single stranded RNA
 - Three types: A, B, C (Type A is most pathogenic)
 - Consists of eight genes
 - Neuraminidase (NA) and hemagglutinin (HA) are the proteins we are most concerned with (Only Influenza A is subclassified in this manner)

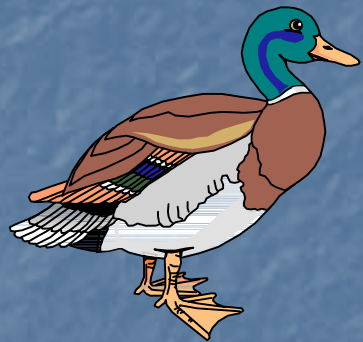
Influenza A virus

- Type A has potential to cause a pandemic
- Most likely to change/mutate
- Different strains might mix in the same host
- Results in a new subtype of virus
 - Direct interspecies jump
 - No human immunity
- Subtypes based on HA and NA proteins
 - 16 HA, 9 NA subtypes exist
 - H1N1, H1N2, H3N2 are circulating human varieties

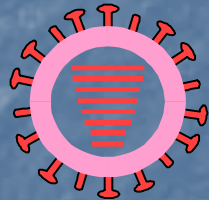
Influenza A

- Infects multiple species
 - Humans
 - Water fowl/domestic fowl (are primary reservoir)
 - Pigs (mixing vessels)
 - Other mammals affected by certain substrains (horses, dogs, tigers, etc)

Transmission of Influenza A

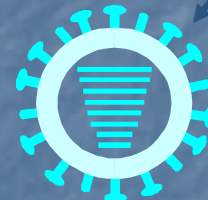


16 HAs
9 NAs

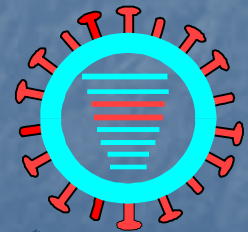
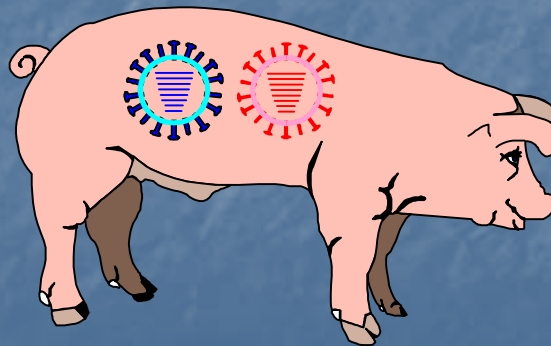
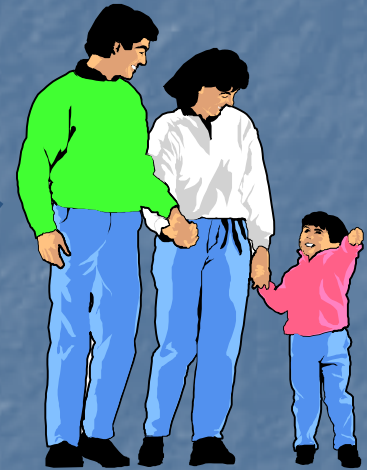


Non-human
virus

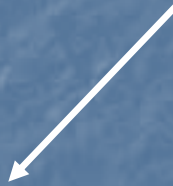
DIRECT



Human
virus



Reassortant
virus



Development of HPAI

- Low pathogenic AI strains that are most capable of mutating/causing epizootics
 - H5/H7
- Most H5/H7 are of the LPAI variety
 - Some human LPAI infections have been documented (conjunctivitis, "flu")
 - Only cause mild disease in poultry.... BUT
- H5/H7 experience highly lethal and rapid mutation (change into HPAI)
- Because of this, they can be difficult to control and require aggressive intervention

Signs of Infection with Influenza in Birds

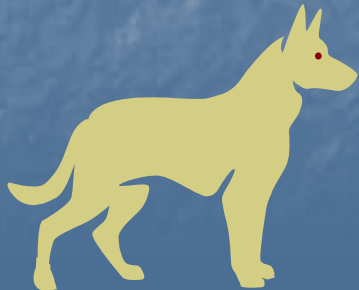
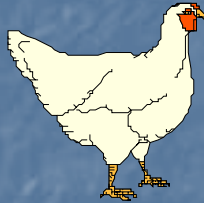
- Wild waterfowl, gulls, shorebirds are natural hosts – no symptoms usually
 - Remember that HPAI has no natural reservoir!
- Infection in non-host can result in either:
 - No outward disease (LPAI)
 - Mild infection (LPAI)
 - Ruffled feathers
 - Reduced egg production
 - Respiratory symptoms
 - Can be easy to miss!

Signs of Infection in Birds, cont

- More lethal infection (HPAI)
 - Difficult to miss – severe disease/sudden onset
 - Rapid contagion/mortality near 100% within 48 hours
 - Internal hemorrhaging of lungs and other organs (nickname “chicken Ebola”)
 - Other signs include facial edema, swollen and cyanotic combs and wattles, drastic decline in egg production
- Role of domestic ducks in spread of HPAI
 - NO SYMPTOMS!

Sources of Infection

- Domestic and wild animals
 - Ducks, geese, poultry sparrows, cats, dogs



- Improperly disposed carcasses



Sources of Infection

- Humans
 - Hands, hair, clothing, footwear (not documented)
- Contaminated equipment



Measures for Prevention, Control and Eradication of HPAI in Poultry

- Increased disease surveillance in most likely affected areas
- Increased biosecurity on poultry farms
- Control of movement of birds and fomites
- Rapid, humane destruction of infected/at risk poultry and proper disposal of carcasses

Disease Surveillance

- In areas where disease has been/could be
- Detect and investigate outbreaks
 - Education on symptoms (esp. rural farmers)
 - How to report/who to report to
 - Incentives for reporting

Disease Surveillance

- Enable animal health agents/rapid surveillance and response teams to:
 - investigate and record key information
 - get specimens
 - send specimens rapidly to a designated laboratory in a “reverse cold chain”



Taking samples

- You may be required to take samples!
- Proper technique is important:
 - Above all, avoid injury or distress to live animals, operators/attendants
 - Anesthesia/tranquilization may be required
 - Risk for zoonotic disease must always be kept in mind
 - Avoid environmental contamination thru fomites
 - Each country/lab has specific guidelines for submitting samples

Increasing Biosecurity

- Definition: All the measures taken
 - to keep disease from coming into a farm (Bioexclusion)
 - to prevent the transmission of a disease within an infected farm to other farm (Biocontainment)

Types of poultry-raising & their bio-security

- Sector 1
 - Backyard poultry
 - Birds/products consumed locally
- Sector 2
 - Low to minimal bio-security
 - Birds/products enter live bird markets
- Sector 3
 - Moderate to high bio-security
 - Birds/products often marketed commercially
- Sector 4
 - High level bio-security
 - Birds/products marketed commercially



Ensure Biosecurity/Bioexclusion

- Keep poultry indoors
 - **Separate from the outside world**
 - **Remove or disinfect all sources of infection**
- Separate new poultry for 2 weeks
- Prevent unknown birds from entering flock
- Control human traffic into the farm
- Use “all in – all out” production
- Clean and disinfect when “all out”
 - AI can remain viable in tissue, feces and water for a long period of time (days to weeks)

Enhanced Biosecurity (Biocontainment)/Movement control

- Movement control/depopulation
- Bird markets closed/disinfected
- Border patrols
- Testing of potentially infected birds

Destruction/disposal of birds in affected area

- Humane killing of birds
 - Carbon dioxide
 - Dislocate neck
- Disposal
 - Burn
 - Bury
 - Do NOT dump in local water sources – important to remind local farmers!
- Cleaning and disinfection
- Allow 21 days before getting more poultry



3/1/2006 Reuters. Karachi

When to Investigate

- Local/regional surveillance detects possibility of infection
- Lab test for confirmation
 - Virus isolation necessary to distinguish from other fatal poultry disease (fowl cholera, Newcastle disease, etc.)
- Use clinical signs for detection of HPAI
- Institute proper chain of reporting/disposal/testing of focus and surrounding area

What About Vaccines?

Vaccination/Antiviral drugs

- CONTROVERSIAL!
- For chickens
 - Inactivated whole AI virus
 - Effective against H5 subtype
 - Good resistance to infection
 - Reduced amount of virus in environment
 - Administered by injection
 - New recombinant fowlpox vaccine?
 - Antivirals for only for humans, not birds
 - Potential for resistance

Take Home Message

- Target high risk flocks
- Isolation from wild water birds essential
- Discussion of compensation



Helpful web sites

- Centers for Disease Control: www.cdc.gov
- World Health Organization:
www.who.int/en/
- World Organization for Animal Health:
www.oie.int
- UN Food and Agriculture Organization:
www.fao.org