Avian Influenza Preparedness in North Carolina

Marty Zaluski, DVM
Director, Division of Emergency Programs
NC Department of Agriculture & Consumer Services
GOALS

- Discuss scope of agriculture in NC
- Discuss current avian influenza situation
  - In USA
  - In Asia and Europe
- Review the fundamentals of influenza
  - Characteristics shared by human and avian viruses
  - Types of influenza
  - Avian influenza clinical signs and diagnosis
- Prevention and preparedness
Agribusiness Contributes $59 Billion to NC’s Economy

Source of NC Agricultural Receipts in 2003

- Meat Animals (Pork, Beef): 25%
- Poultry & Eggs: 31%
- Milk, Fish, Honey: 3%
- Tobacco: 9%
- Vegetables, Fruits and Nuts: 6%
- Oil Crops: 8%
- Cotton: 4%
- Other Crops (Greenhouse, Nursery): 14%
“It could be devastating”, said Kay _, _, who raises chickens on her Harnett County farm. “I don’t want to eat anything where I have to cook it to get the disease out of it. I can see why the consumers would be concerned. I mean, yuck.”
## Types of Influenza

<table>
<thead>
<tr>
<th>Human</th>
<th>Avian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal Influenza</td>
<td>Low Pathogenicity</td>
</tr>
<tr>
<td>36,000 deaths USA per year</td>
<td>Drop in production</td>
</tr>
<tr>
<td>~1,000 N.Carolinians/year</td>
<td>Any H including H5 or H7</td>
</tr>
<tr>
<td>Pandemic Influenza</td>
<td>Highly Pathogenic</td>
</tr>
<tr>
<td>550,000 deaths USA 1918</td>
<td>Dead birds</td>
</tr>
<tr>
<td></td>
<td>H5 or H7</td>
</tr>
<tr>
<td></td>
<td>1924 (LBM in NE), 1983 (PA), 2004 (TX)</td>
</tr>
<tr>
<td></td>
<td>Current: Asia, Europe, Africa</td>
</tr>
</tbody>
</table>
Avian Influenza Outbreaks

Source: BBC  http://news.bbc.co.uk/1/shared/spl/hi/world/05/bird_flu_map/html/1.stm; accessed: 02-19-05
### Countries with H5N1
#### Dec 2003 to April 2006

**Asia & the Pacific:**
- Afghanistan
- Cambodia*
- China*
- Hong Kong
- Indonesia*
- India
- Iraq*
- Iran
- Israel
- Jordan
- Japan
- Kazakhstan
- Korea
- Laos
- Malaysia
- Myanmar (Burma)
- Mongolia
- Pakistan
- Palestinian Terr.
- Philippines
- Thailand*
- Turkey*
- Russia
- Vietnam*

**Africa:**
- Burkina Faso
- Cameroon
- Egypt*
- Cote d’Ivoire
- Niger
- Nigeria

**Europe:**
- Albania
- Austria
- Azerbaijan*
- Bosnia and Herzegovina
- Bulgaria
- Czech Republic
- Croatia
- Cyprus
- Denmark
- France
- Germany
- Georgia

**Europe (continued)**
- Greece
- Hungary
- Italy
- Montenegro
- Poland
- Romania
- Serbia
- Slovenia
- Slovak Republic
- Sweden
- Switzerland
- Ukraine
- United Kingdom

Yellow = Feb 1, 2006 or later
(H5) = identified as H5 only
* = human cases

Updated April 20, 2006
Migratory Flyways

Migratory Flyways

Migratory Flyways

Important Bird Areas in North Carolina
Important Bird Areas and North Carolina Poultry Farms

Legend
- Important Bird Areas
- Poultry Farm
- Major Rivers
- County Boundary
- Major Water Features

Miles
0 20 40 80 120 160
Live Bird Market System

Production Farms

Wholesalers and Distributors

Markets
Northeastern LBM System

- At least 18 million birds annually
- 160 Markets
- PA is the biggest supplier = 400 monitored flocks
- 30 types of birds
H7N2 Outbreaks Linked to Live-bird Markets

- 1996-98: PA (21 flocks, 2.5 M birds)
- 2001: CT (1 flock, 16,000 birds)
- 2001-2002: PA (7 flocks)
- 2002: VA, WV, NC (210 flocks, 4.7 M birds)
- 2003: CT (3.9 million layers)
- 2004: DE, MD (200,000 birds)
## Avian Influenza Detection at NVSL 2005

<table>
<thead>
<tr>
<th>Serotypes</th>
<th>Commercial Flocks</th>
<th>Live Bird Market Samples</th>
<th>Wild Birds (flamingos, ducks, swan, loon, geese)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H6 + H9 mix, H4N6, H4N8, H4N2</td>
<td>H7N2</td>
<td>H10, H4N6, H11N3, H2N2, H2N3, H3N2,3,6 H6N2, H11N4,8</td>
<td>H1 or H3 (probably swine flu vaccinates)</td>
</tr>
<tr>
<td>H1 or H3 (probably swine flu vaccinates)</td>
<td>H5N2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H5N5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Types of Influenza

<table>
<thead>
<tr>
<th>Human</th>
<th>Avian</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seasonal Influenza</strong></td>
<td><strong>Low Pathogenicity</strong></td>
</tr>
<tr>
<td>36,000 deaths USA per year</td>
<td>Drop in production</td>
</tr>
<tr>
<td>~1,000 N.C. Carolinians/year</td>
<td>Any H including H5 or H7</td>
</tr>
<tr>
<td><strong>Pandemic Influenza</strong></td>
<td><strong>Highly Pathogenic</strong></td>
</tr>
<tr>
<td>550,000 deaths USA 1918</td>
<td>Dead birds</td>
</tr>
<tr>
<td></td>
<td>H5 or H7</td>
</tr>
<tr>
<td></td>
<td>1924 (LBM in NE), 1983 (PA),</td>
</tr>
<tr>
<td></td>
<td>2004 (TX)</td>
</tr>
<tr>
<td></td>
<td>Current: Asia, Europe, Africa</td>
</tr>
</tbody>
</table>
Types of Influenza Viruses

- **Influenza A**
  - epidemic or pandemic
  - animals and humans
  - divided into subtypes
    - based on surface proteins

- **Influenza B**
  - epidemic
  - humans (primarily)
  - not divided into subtypes

- **Influenza C**
  - humans
  - mild respiratory illness
Influenza A
Surface Proteins

- **Hemagglutinin**
  - Human H1-3
  - Avian H1-16
- **Neuraminidase**
  - Human N1or2
  - Avian N1-9
- **Examples of a subtypes**
  - H3N2, H5N1
Species Affected by Influenza

Genetic Reservoirs

Intermixing

Other Aquatic Birds?
V. Enhanced Surveillance of Wild Birds When HPAI Threatens NC Poultry Industry

North Carolina: 3rd largest poultry producing state

Battery Island, 10% of world population of White Ibises

Lake Mattamuskeet, winter home for 30,000 Tundra Swans
Probably NOT the Canada Goose
Highly pathogenic = dead birds
Low Path Avian Influenza

- Highly contagious among birds
- Water birds are the natural reservoir
  - Carry virus in intestines
  - Virus shed in feces and respiratory secretions
  - Usually do not get sick

Photo by Chan Robbins
How does LPAI affect poultry?

Chickens:

- May have no signs of disease
- Decreased egg production
- Poor egg shell quality
HPAI Preparedness

- Experience in livestock emergencies
  - 2002 H7N2 outbreak - 3 commercial premises
  - Hurricanes – Floyd killed almost 3 million birds
- NC High Path AI Plan
- Surveillance
  - 206K samples in last 12 months
  - 186K samples in 2004
- PH collaboration and other partnerships
- Training and Exercises
  - Depop training
  - Disposal / Euthanasia training
- MHTD Multi-Hazard Threat Database (GIS)
NC HPAI Plan

1. Introduction
2. Diagnostic Resources
3. Routine Surveillance
4. NCDA&CS Division Responsibilities
5. Enhanced Surveillance of Wild Birds
6. Response to HPAI
7. Vaccination
8. Biosecurity
9. Communication and Education
10. Appraisal and Indemnification
11. Euthanasia
12. Disposal
13. Disinfection for Quarantine Release
14. Appendices
APPENDICES

- Poultry Disease Advisory Committee Members
- Poultry Disease Emergency Committee
- Enhanced Surveillance of Wild Birds
- Interim Guidance for Implementation of CDC and OSHA Avian Influenza Recommendations
- Sample Collection for Avian Influenza Surveillance
- Intra-venous Inoculation for Determination of Pathogenicity of Avian Influenza Viruses
- Guidelines for In-House Composting of AI Carcasses
- Barrel Surveillance
- Poultry Industry Biosecurity Program: General Practices
- Biosecurity Measures for Farm Visitors
- EPA Approved Disinfectants with Efficacy Against Avian Influenza
- Sampling Poultry Compost Piles and the Environment for Avian Influenza
- Press Releases
- Indemnity
- Approved Municipal Solid Waste Landfill Sites
State Quarantine

- NC General Statute §106-401.1
  - SV may quarantine any poultry affected, or exposed or suspicious of having AI
  - No poultry, table or hatching eggs under state quarantine shall move without written permit
Disease Eradication Components

- Rapid diagnosis
- Quarantine of premises
- Prevention of movement of contaminated materials
- Stamping out of infected birds
- Increased surveillance
- Control may include:
  - Pre-emptive culling
  - Vaccination
Quarantine Zones

- **Hot Zone**
  - Premise to end of their driveway
- **Exclusion Zone**
  - Usually 2 miles
- **Control Zone**
  - Usually extends another 4 miles out for total of 6 miles
Considerations for Biosecurity: Spread of AI Virus

- Infected Domestic Birds
- Infected Wild Birds
- Feathers or dander carried by wind
- Insects
- Rodents
- Vehicles/Equipment
- People

Infected Premise
Quarantine Zones: Decontamination for Exit from Farms

- **Hot Zone**
  - Change of clothing and showers for personnel
  - Decontamination of equipment
  - Disinfection of *inside* and outside of all vehicles

- **Exclusion Zone**
  - Decontamination of shoes
  - Decontamination of equipment
  - Disinfection of undersides of all vehicles

- **Control Zone**
  - Same as for Exclusion Zone

State Veterinarian authority supported by NC General Statute §106-401.1
Epidemiologic Investigation

- All movements in and out of positive premises during previous 21 days
  - Birds
  - People
  - Equipment and Vehicles
- Concentrate first on information from previous 3-7 days
- Develop maps of infected and suspect premises
Surveillance

- **Hot Zone**: all flocks sampled first 24 hours
- **Exclusion Zone**: all flocks first 48 hours
- **Control Zone**: flocks within 48 hours of slaughter
- **Daily phone calls to check mortality**
- **Any farm with mortality > 3 birds per 1,000**
Surveillance
NC Animal Disease Diagnostic Laboratory System
Diagnosis

- Newcastle disease has same clinical signs
  - Need laboratory tests to differentiate

- Lab results available in same day in NC

- If H5 or H7:
  - Send to the National Veterinary Services Lab
    - Ames Iowa, not Plum Island!
    - gene sequencing and bird inoculation to determine pathogenicity
Surveillance

- All poultry submitted with respiratory disease
- Testing of all poultry on request
- Testing well above level required by the National Poultry Improvement Program
  - Requires testing of commercial flocks
  - At or before slaughter
- Testing a representative sample of all broilers going to processing
Surveillance Reporting

- By State Law: licensed veterinarians must report to State Veterinarian (SV) within 2 hours if disease is “reasonably suspected”
- For commercial companies it is the responsibility of the grower or service personnel to alert company representatives, they will call SV
- Clinical signs of HPAI and Exotic Newcastle Disease are similar: both are reportable
Training
Strike Teams/Depop Teams

- Education about AI
- Training on euthanasia and disposal
- Training on use of personal protective equipment (PPE)
- Physical examination
- Respirator fit testing
- Vaccination
- Anti-viral therapy when mobilized
Quarantine Release Requirements
Cleaning and Disinfection of Houses

- Rodent and insect control
- Removal of residual feed and litter
- Surfaces blown out with compressed air
- Cleaning of feeders and other equipment
- Disinfect with approved disinfectant
  - 1,000 gallons of diluted disinfectant/house
  - > 11,000 poultry houses in NC
H5N1 Avian Influenza
Risk Factors for Humans

- History of intimate contact with poultry
  - Plucking and preparing of diseased birds
  - Handling fighting cocks
  - Playing with sick poultry or poultry parts
  - Consumption of duck’s blood or undercooked poultry

WHO Consultation on Human Influenza A/H5, NEJM October 5, 2005
Food Safety FIREWALLS

- Intimate contact necessary
- NOT HERE
- Active surveillance
- Modern meat inspection program
- Destroyed by cooking
Take Home Messages: Challenges Ahead

- H5N1 HPAI likely to continue to spread globally
- Preserve industry in case of minor direct impact on agriculture and public health

Major NC Farm Commodities

<table>
<thead>
<tr>
<th>Rank</th>
<th>Item</th>
<th>2004 Cash Receipts (Million Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hogs</td>
<td>2,679</td>
</tr>
<tr>
<td>2</td>
<td>Broilers</td>
<td>2,042</td>
</tr>
<tr>
<td>3</td>
<td>Greenhouse/Nursery</td>
<td>832</td>
</tr>
<tr>
<td>4</td>
<td>Tobacco</td>
<td>620</td>
</tr>
<tr>
<td>5</td>
<td>Turkeys</td>
<td>489</td>
</tr>
<tr>
<td>6</td>
<td>Cotton</td>
<td>304</td>
</tr>
<tr>
<td>7</td>
<td>Soybeans</td>
<td>288</td>
</tr>
<tr>
<td>8</td>
<td>Cattle and Calves</td>
<td>258</td>
</tr>
<tr>
<td>9</td>
<td>Chicken Eggs</td>
<td>240</td>
</tr>
<tr>
<td>10</td>
<td>Corn</td>
<td>182</td>
</tr>
<tr>
<td>11</td>
<td>Milk</td>
<td>171</td>
</tr>
<tr>
<td>12</td>
<td>Christmas Trees &amp; Greenery</td>
<td>101</td>
</tr>
</tbody>
</table>
The End
Talking Points

- Pop Quiz
  - Do we have “bird flu”
  - Terminology

- Vaccination – only for breeders and zoo

- Discuss Host Adapted LOW PATH strains

- Why is H5N1 unique?
  - How many species does it infect (non-avian and avian)?

- Address backyard flocks

- Show diagram for recombination

- List HPAI outbreaks in the US

- Impact of AI in wild birds on NC commercial poultry

- Clearly delineate reasons for concern:
  - Rapid spread & pandemic concerns

- Draw clear distinction b/w Pandemic and HPAI
  - Different diseases
What... Me Worry?
Cleaning and Disinfection:
End of the Driveway
Training and Exercises
Personal Protective Equipment

- Nitrile gloves + cloth or heavy duty gloves
- Disposable coveralls
- Disposable boot covers or washable covers
- Safety goggles, face shield or full face respirator
- N95 or full face respirator
- Disposable hair bonnet

2 Gallons Diluted Disinfectant Per Person