Avian Influenza
Lessons Learned

Alice L. Johnson, DVM
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Avian Influenza

- Bird flu
- Fowl Plague
- Fowl Pest
- Brunswick Bird Plague
- Fowl Disease
Overview

- Avian Influenza 101
- History
- Cause
- Effect
Avian Influenza

- Orthomyxoviridae *Influenzavirus A*

- Disease characteristics
  - Asymptoms
  - Mild, moderate, severe respiratory signs
  - Low mortality
  - High mortality
Office of International des Epizooties (OIE)

- Reportable Diseases
  - Transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products.
  - Reports are submitted to the OIE as often as necessary to comply with Articles 1.1.3.2 and 1.1.3.3 of the *International Animal Health Code*. 
OIE List A Diseases

- Foot and mouth disease
- Swine vesicular disease
- Peste des petits ruminants
- Lumpy skin disease
- Bluetongue
- African horse sickness
- Classical swine fever
- Newcastle disease

- Vesicular stomatitis
- Rinderpest
- Contagious Bovine Pleuropneumonia
- Rift Valley fever
- Sheep pox and goat pox
- African swine fever
- Highly pathogenic avian influenza
Virus

- Subdivided based on surface proteins
  - Hemagglutinin (H)-15 types
  - Neuraminidase (N)-9 types

- Human illness generally associated with
  - H1, H2 and H3 and N1 and N2
1. A virus in which six, seven or eight of eight 4-8 ekk old susceptible chickens within 10 days following intravenous inoculation 0.2 ml

2. All H5 and H7 viruses require amino acid sequence of the connecting peptide of the haemagglutinin determined and is similar to that of HPAI.
Virus Transmission

- Initial Introduction
  - Domestic and confined poultry
  - Migratory waterfowl
  - Domestic pigs
  - Companion or pet birds
Virus Spread

- Limited airborne interflock dissemination
- Mechanical movement of fomites
  - Equipment
  - Vehicles
  - PEOPLE
    - Clothes
    - Shoes
<table>
<thead>
<tr>
<th>AI Virus</th>
<th>Subtype</th>
<th>Number Affected with High Mortality or Were Depopulated(^{10})</th>
<th>Specific References</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/chicken/Scotland/59</td>
<td>H5N1</td>
<td>2 flocks of chickens (<em>Gallus gallus domesticus</em>)—total number of birds affected not reported</td>
<td>(168; D. J. Alexander, personal communication, 2000)</td>
</tr>
<tr>
<td>A/tern/South Africa/61</td>
<td>H5N3</td>
<td>1300 common terns (<em>Sterna hirundo</em>)</td>
<td>(33)</td>
</tr>
<tr>
<td>A/turkey/England/63</td>
<td>H7N3</td>
<td>29,000 breeder turkeys (<em>Meleagris gallopavo</em>)</td>
<td>(254)</td>
</tr>
<tr>
<td>A/turkey/Ontario/7732/66</td>
<td>H5N9</td>
<td>8,100 breeder turkeys</td>
<td>(128)</td>
</tr>
<tr>
<td>A/chicken/Victoria/76</td>
<td>H7N7</td>
<td>25,000 laying chickens, 17,000 broilers, and 16,000 ducks (<em>Anas platyrhynchos</em>)</td>
<td>(235, 17)</td>
</tr>
<tr>
<td>A/chicken/Germany/79</td>
<td>H7N7</td>
<td>Unknown (formerly East Germany)</td>
<td>(10)</td>
</tr>
<tr>
<td>A/turkey/England/199/79</td>
<td>H7N7</td>
<td>3 commercial farms of turkeys—total number of birds affected not reported</td>
<td>(15, 3)</td>
</tr>
<tr>
<td>A/chicken/Pennsylvania/1370/83</td>
<td>H5N2</td>
<td>17 million birds in 452 flocks; most were chickens or turkeys, a few chukar partridges (<em>Alectoris chukar</em>) and guinea fowl (<em>Numida meleagris</em>)</td>
<td>(69, 65, 237)</td>
</tr>
<tr>
<td>A/turkey/Ireland/1378/83</td>
<td>H5N8</td>
<td>800 meat turkeys died on original farm; 8,640 turkeys, 28,020 chickens, and 270,000 ducks were depopulated on original and 2 adjacent farms</td>
<td>(141, 6)</td>
</tr>
<tr>
<td>A/chicken/Victoria/85</td>
<td>H7N7</td>
<td>24,000 broiler breeders, 27,000 laying chickens, 69,000 broilers, and 118,518 unspecified-type of chickens</td>
<td>(55, 22)</td>
</tr>
<tr>
<td>A/turkey/England/50-92/91</td>
<td>H5N1</td>
<td>8000 turkeys</td>
<td>(13)</td>
</tr>
<tr>
<td>A/chicken/Victoria/92</td>
<td>H7N3</td>
<td>12,700 broiler breeders, 5,700 ducks</td>
<td>(180, 255)</td>
</tr>
<tr>
<td>A/chicken/Queensland/95</td>
<td>H7N3</td>
<td>22,000 laying chickens</td>
<td>(255)</td>
</tr>
<tr>
<td>A/chicken/Puebla/8623-607/94</td>
<td>H5N2</td>
<td>Chickens(^{10})</td>
<td>(242, 65)</td>
</tr>
<tr>
<td>A/Queretaro/14S88-19/95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/chicken/Pakistan/447/95</td>
<td>H7N3</td>
<td>3.2 million broilers and broiler breeder chickens(^{10})</td>
<td>(153, 65)</td>
</tr>
<tr>
<td>A/chicken/Pakistan/1369-CR2/95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/chicken/Hong Kong/220/97</td>
<td>H5N1</td>
<td>1.4 million chickens and various lesser numbers of other domestic birds in contact with the chickens on farms and in LPM system</td>
<td>(187, 209)</td>
</tr>
<tr>
<td>A/chicken/New South Wales/1651/97</td>
<td>H7N4</td>
<td>128,000 broiler breeders, 33,000 broilers, 261 emu (<em>Dromatus novaehollandiae</em>)</td>
<td>(167)</td>
</tr>
<tr>
<td>A/chicken/Italy/330/97</td>
<td>H5N2</td>
<td>2116 chickens, 1501 turkeys, 731 guinea fowl, 2322 ducks, 204 quail (species unknown), 45 pigeons (<em>Columbia livia</em>), 45 geese (species unknown), and 1 pheasant (species unknown)</td>
<td>(47)</td>
</tr>
<tr>
<td>A/turkey/Italy/4580/99</td>
<td>H7N1</td>
<td>413 farms—8.1 million laying chickens; 2.7 million meat and breeder turkeys; 2.4 million broiler breeders and broilers; 247,000 guinea fowl; 260,000 quail, ducks, and pheasants; 1,737 backyard poultry and 387 ostriches(^{10})</td>
<td>(230; I. Capua, personal communication, 2000)</td>
</tr>
<tr>
<td>A/chicken/Hong Kong/2001</td>
<td>H5N1</td>
<td>1 million birds(^{10})</td>
<td>(L. Sims, personal communication, 2001)</td>
</tr>
</tbody>
</table>
Live Bird Markets (LBM)

- LBM pose a significant risk to introduction of both LPAI and HPAI
- LBM initial introduction in most all US outbreaks of both HPAI and LPAI
- 1993-2001-LPAI endemic in LBM
LBM Management

- Surveillance Testing
- Clean and Disinfect
- Indemnification
Control and Prevention

- BIO-SECURITY
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## Cost Of Avian Influenza for Select Outbreaks in the U.S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Outbreak</th>
<th>Involved</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924-1925</td>
<td>US HPAI</td>
<td>2718 slaughter plants</td>
<td>$ 10 M*</td>
</tr>
<tr>
<td>1983-1984</td>
<td>NE US HPAI</td>
<td>17 M poultry, 449 farms</td>
<td>$ 146 M* (for eradication and indemnity)</td>
</tr>
<tr>
<td>1978 – 1996</td>
<td>LPAI Minn.</td>
<td>Turkey</td>
<td>$ M*</td>
</tr>
<tr>
<td>1995</td>
<td>LPAI Utah</td>
<td>Turkey</td>
<td>$ 2 M*</td>
</tr>
<tr>
<td>2002</td>
<td>LPAI VI, NC, PA</td>
<td></td>
<td>$ 104 M</td>
</tr>
<tr>
<td>2004</td>
<td>AI B.C. (Fraser Valley)</td>
<td></td>
<td>$ 15 M (at $ 3 M per week)</td>
</tr>
</tbody>
</table>