Global Impacts of Avian Influenza Viruses

Biosafety and Biosecurity Concerns

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Interspecies Transmission of Influenza A Viruses

Diagram adapted from Avian Influenza, D. Swayne, editor
Low Pathogenic Avian Influenza
Highly Pathogenic Avian Influenza
Zoonotic Transmission

- Human infections with avian influenza viruses
  - H5N1
    - Hong Kong, 1997 (18 cases, 6 deaths)
    - World epizootic, 2003-current
  - H7N2
    - Virginia, 2002 (1 case) and New York, 2003 (1 case)
    - UK, 2007 (4 cases)
  - H7N3
    - Canada, 2004 (2 cases)
  - H7N7
    - UK, 1996 (1 case)
    - Netherlands, 2003 (89 cases, 1 death)
  - H9N2
    - China, 1999 (2 cases)
    - Hong Kong, 2003 (1 case) and 2007 (1 case)
    - China, 2008 (1 case)
## Confirmed Human Cases of AI H5N1 as of 20 January 2011

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
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<tbody>
<tr>
<td>Azerbaijan</td>
<td>8</td>
<td>5</td>
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<tr>
<td>Bangladesh</td>
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<tr>
<td>Cambodia</td>
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<td>8</td>
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<tr>
<td>China</td>
<td>40</td>
<td>26</td>
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<tr>
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<td>Egypt</td>
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<td>Indonesia</td>
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<td>Iraq</td>
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<td>Myanmar</td>
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<tr>
<td>Lao</td>
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<td>2</td>
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<tr>
<td>Nigeria</td>
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<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
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<td>Turkey</td>
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<td>4</td>
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<tr>
<td>Viet Nam</td>
<td>119</td>
<td>59</td>
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<tr>
<td><strong>Total</strong></td>
<td>518</td>
<td>306</td>
</tr>
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H5N1 Persistence and Spread

- Village and local commercial poultry production with poor biosecurity
- Extensive movement of poultry over small and large geographical areas
- Live animal markets
- Illegal smuggling
- Domestic waterfowl populations
- Wild birds
- Lack of needed veterinary infrastructure
Biosecurity

- Poor biosecurity
  - Sector 3 and 4 poultry production
    - Commercial production with low biosecurity
    - Village/backyard production
  - Frequent poultry movement
  - Complex movement systems to local markets, collecting points and slaughter points
  - Free-range flocks, contact with other poultry/ducks/birds
  - Lack of biosecurity measures
Human-Animal Interface and Public Health Concerns

- Loss of food for a population

- Human exposure
  - Slaughter / processing
  - Contact with sick / dead poultry
  - Consumption of raw food products (duck blood)

- Human cases
  - Difficult to diagnose cases in humans and animals in some countries (humans as sentinels)
  - Difficult to prevent animal contact in some countries
  - Villages rely on poultry production for income and to feed village
Laboratory Biosafety

- Many countries lack federal/national laboratory biosafety guidelines and audit system
- Infrastructure challenges make it difficult to maintain biosafety
- Lack of education for laboratory workers
- Few BSL3 facilities in developing countries
  - Difficult to build
  - Difficult to certify
Field Work

- Maintaining appropriate PPE can be challenging
  - May not be available
  - Cultural disinterest in use
  - Concerning to villagers / flock owners
  - Physically demanding - difficult to wear
  - Environmental conditions – high temperatures, rain, humidity
HPAI Response Efforts

- Environmental contamination

- Animal depopulation and carcass disposal
  - Requires methods for rapid, humane depopulation
  - Protect workers
  - Minimize further virus spread
  - Prevent environmental contamination
  - Environmentally sound
Any Questions?