Global Update
Avian Influenza

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The author has no commercial interests in any commercial products presented.
Sources of Information

- Food and Agriculture Organization
- World Organization for Animal Health
- European Union Reference Laboratory EU AI Laboratory Network
- GenBank
Avian Influenza in Africa

- H5 Goose/Guangdong Highly pathogenic avian influenza
  - Clade 2.2
  - Clade 2.3.2.1
  - Clade 2.3.4.4
- Other H5 and H7
- H9N2
  - G1 lineage
- Other
The Beginning, 1996

- Guangdong, China
- Geese with some mortality
- H5N1 AI virus – HP for chickens

1997, Hong Kong:
- 18 human cases, 6 deaths
- Depopulation of 1.4m poultry LPM and farms
Role of Free–Living Aquatic Birds of H5N1

- Until 2005, with one exception, HPAI was not thought to circulate in wild birds
- HPAI virus was thought to spill back from poultry to wild birds
- Major outbreaks in 2005 and 2006 occurred in waterfowl species with mortality
- Wild birds spread virus to poultry in Western Europe, the Middle East and Africa
- Fewer infections and disease in 2007
• 60 countries with cases in wild birds and/or poultry
• Over 250 million birds dead or culled (FAO)
Since 1996 – H5N1 hemagglutinin changes – e.g. DRIFT (similar to human seasonal flu)

Since 2008 – reassortment of NA genes (N5, N6, N8, N2, N3)
Three major wild bird related outbreaks have occurred with Goose/Guangdong lineage
  ◦ Clade 2.2  Asia, Europe, Africa
  ◦ Clade 2.3.2.1 Asia, Europe, Africa
  ◦ Clade 2.3.4.4 Asia, Europe, Africa, and N. America

Spread by infected poultry after initial wild bird introduction still most likely local transmission

Antigenic drift between and within clades is important consideration
Highly Pathogenic Avian Influenza Africa

- Goose/Guangdong H5 lineage is single largest outbreak with virus spreading to over 70 countries
  - H5N1 Clade 2.2 was first reported in 2006 with outbreaks in Benin, Burkina Faso, Cote d'Ivoire, Egypt, Ghana, Niger, and Nigeria (lineage endemic in Egypt)
  - H5N1 Clade 2.3.2.1c reported in 2015–2017 from Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Ivory Coast, Niger, Nigeria, Togo
  - H5N8 Clade 2.3.4.4b reported in 2017 from Cameroon, Democratic Republic of the Congo, Egypt, Nigeria, South Africa, Uganda, and Zimbabwe
H5N1 2017

clade 2.3.2.1 in sub-Saharan Africa and Clade 2.2 in Egypt
H5N8 clade 2.3.4.4 in 2017
Wild Bird Migratory Pathways
Other HPAI outbreaks Africa

- H5N2 (non–goose/Guangdong lineage) in Ostriches in South Africa 2015
- H7N1 in 2016 in Algeria
H9N2

- 3 poultry adapted lineages are generally recognized (G1, Y280 lineage, and Y439 lineages)
- G1 lineage is most widespread
- G1 lineage is highly poultry adapted and highly transmissable
- Vaccination commonly used for control
- No evidence of wild bird spread of the virus between countries
Countries with poultry adapted H9N2 Sequence in GenBank (2012-2017)
Europe Situation H5N8

➢ From the start of the 2016 HPAI H5 epizootic to 09/30/17 2,781 outbreaks of H5N8 Highly Pathogenic Avian Influenza have been reported in poultry (1,141), wild birds (1,576) and captive birds (64)

➢ Since June 2017
  ◦ Italy has reported 25 new outbreaks of H5N8 in poultry and two detections in wild birds, all in the northern provinces of Lombardy, Veneto and Emilia–Romagna.
  ◦ Belgium have reported two new outbreaks in poultry, and 10 new outbreaks in captive birds (backyard premises).
  ◦ One new case of H5N8 has been reported in poultry in France, near Belgium.
  ◦ Germany (n=3), Switzerland (n=7), Finland (n=1) and the United Kingdom (n=1) have reported detections in wild birds only.
H5N5 has not been detected since the last situation report. The last case of H5N5 HPAI was detected in the Netherlands on 22nd May 2017 in a wild bird.

From the start of the 2016 HPAI H5 epizootic on 19th October 2016 to 4th October 2017, 20 outbreaks of H5N5 HPAI have been reported in poultry (5), wild birds (14) and captive birds (1) from 11 European countries.
Incidence HPAI Europe
Table 1. Number of H5 HPAI outbreaks by country from 19th October 2016 to 4th October 2017.

<table>
<thead>
<tr>
<th>Country</th>
<th>Poultry</th>
<th>Wild Birds</th>
<th>Capt Birds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>485</td>
<td>51</td>
<td>3</td>
<td>539</td>
</tr>
<tr>
<td>Hungary</td>
<td>238</td>
<td>86</td>
<td>5</td>
<td>330</td>
</tr>
<tr>
<td>Germany</td>
<td>89</td>
<td>741</td>
<td>15</td>
<td>849</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>71</td>
<td>13</td>
<td>2</td>
<td>86</td>
</tr>
<tr>
<td>Poland</td>
<td>65</td>
<td>66</td>
<td>2</td>
<td>133</td>
</tr>
<tr>
<td>Romania</td>
<td>45</td>
<td>93</td>
<td>2</td>
<td>140</td>
</tr>
<tr>
<td>Italy</td>
<td>41</td>
<td>8</td>
<td>1</td>
<td>50</td>
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<tr>
<td>Czech Republic</td>
<td>38</td>
<td>39</td>
<td>1</td>
<td>78</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>12</td>
<td>23</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Croatia</td>
<td>9</td>
<td>12</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Netherlands</td>
<td>8</td>
<td>47</td>
<td>10</td>
<td>67</td>
</tr>
<tr>
<td>Slovakia</td>
<td>8</td>
<td>58</td>
<td>3</td>
<td>69</td>
</tr>
<tr>
<td>Republic of Serbia</td>
<td>4</td>
<td>20</td>
<td></td>
<td>24</td>
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<tr>
<td>Sweden</td>
<td>4</td>
<td>30</td>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>Austria</td>
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<td>55</td>
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<td>59</td>
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<tr>
<td>Belgium</td>
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<td>3</td>
<td>13</td>
<td>18</td>
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<tr>
<td>Denmark</td>
<td>1</td>
<td>49</td>
<td>1</td>
<td>51</td>
</tr>
<tr>
<td>Slovenia</td>
<td>41</td>
<td>3</td>
<td></td>
<td>44</td>
</tr>
<tr>
<td>Switzerland</td>
<td>94</td>
<td></td>
<td></td>
<td>94</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>1141</strong></td>
<td><strong>1576</strong></td>
<td><strong>64</strong></td>
<td><strong>2802</strong></td>
</tr>
</tbody>
</table>
H7N9 Chinese Lineage

- Country: China; three human cases originated in China and were reported in Malaysia (1) and Canada (2).
- Number of human cases: 1589 confirmed; 616 deaths (since February 2013).
- HPAI has emerged from LPAI strain
- Both LPAI and HPAI have caused human cases with mortality
- Antigenic drift is occurring with at least 2 different sublineages occurring
- Vaccination using RG strain has begun in China
- Incidence lower in summer, but still detectable
H7N9 in China
Incidence of Human Cases
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