Surveillance for Avian Influenza in the European Union during 2011 and Epidemiological Perspectives

EU Reference Laboratory for Avian Influenza, AHVLA-Weybridge, UK
Overview

• 2011 surveillance programme in poultry and wild birds

• Additional Epidemiological activities
  • Cross year analysis of poultry survey
  • Serological test performance analysis
  • Bioportal software tool
  • Poultry – wild bird influenza detection comparison
Annual Report on surveillance for avian influenza in poultry in Member States of the European Union in 2010

Annual Report on surveillance for avian influenza in wild birds in Member States of the European Union in 2010
Surveillance for AI in Poultry in EU

- Change in surveillance guidelines towards more risk-based surveillance
Poultry 2011 – Results

• 27 MS participated in the survey in 2011

• MS had the option of following the guidelines laid down in Commission Decision 2007/268/EC, or following the new guidelines laid down in Commission Decision 2010/367/EU

• Seven MS followed the new guidelines (ES, FR, LV, RO, SE, SK and UK)

• 30,061 poultry holdings were sampled (in 2010 29,484)
Poultry 2011 – Results

Number of holdings sampled 2011 and 2010
Surveillance for AI in Poultry in EU 2011 (2010 grey)

50 (48) H5 serpositive holdings:

• Breeder ducks: 24 (22)
• Breeder geese: 8 (8)
• Fattening ducks: 8 (4)
• Farmed game birds: 3 (12)
• ‘Others’: 2 (0)
• Backyard flocks: 2 (1)
• Laying hens: 2 (1)
• Fattening geese: 1 (0)
Surveillance for AI in Poultry in EU 2011 (2010 grey)

15 (11) H7 seropositive holdings

• Backyard flocks: 6 (3)
• ‘Others’: 4 (1)
• Laying hens: 2 (3)
• Free-range laying hens: 1 (1)
• Breeder ducks: 1 (0)
• Fattening geese: 1 (0)
• Farmed Game Birds: 0 (3)
Summary

Similar number of H5 seropositive holdings to previous years; similar distribution to 2010, with 3 additional countries (CZ, EL and FI) reporting positives; less in game birds

2/29 (7%) of H5 seropositive holdings were H5 virus positive on follow-up testing

Similar number of H7 seropositive holdings to 2010 - less in game birds, more in backyard flocks & others

0/5 of H7 seropositive holdings were H7 virus positive on follow-up testing
Surveillance for AI in wild birds in EU 2011

Total Number of Wild Birds Sampled in EU

- 2005: 40000
- 2006: 150000
- 2007: 70000
- 2008: 50000
- 2009: 50000
- 2010: 60000
- 2011: 40000

AHVLA
Animal Health and Veterinary Laboratories Agency
Surveillance for AI in wild birds in EU 2011

Number of birds sampled by MSs in 2010 - 2011
### The most frequently sampled species

<table>
<thead>
<tr>
<th>Species</th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anas platyrhynchos</td>
<td>11,342</td>
<td>18,258</td>
<td>16,481</td>
</tr>
<tr>
<td>Anser anser</td>
<td>2,156</td>
<td>4,124</td>
<td>2,951</td>
</tr>
<tr>
<td>Cygnus olor</td>
<td>1,020</td>
<td>1,684</td>
<td>2,027</td>
</tr>
<tr>
<td>Phasianus colchicus</td>
<td>850</td>
<td>968</td>
<td>1,303</td>
</tr>
<tr>
<td>Larus ridibundus</td>
<td>827</td>
<td>3,055</td>
<td>3,807</td>
</tr>
<tr>
<td>Branta canadensis</td>
<td>757</td>
<td>900</td>
<td>1,018</td>
</tr>
<tr>
<td>Anser albifrons</td>
<td>711</td>
<td>973</td>
<td>1,931</td>
</tr>
</tbody>
</table>
Surveillance for AI in wild birds in EU

2011

2010

2009
Epidemiological Perspectives

- Poultry surveillance across years 2004-2010
- HI-ELISA test performance
- Bioportal software tool
- Linking poultry and wild bird AI detections
Serological surveillance for avian influenza in poultry in the EU

Aims of this study:

• Contribute to understanding of infection patterns of avian flu in European poultry

• Contribute to planning of surveillance by Member States
  – “risk-based” surveillance 2010 legislation
Some variation in surveillance design among MS – e.g. risk-based
Conclusions

• Identified patterns in seropositive holdings among poultry categories
  – Strong association of H5 seropositive holdings with ducks and geese, particularly “breeder geese”
  – Association of H7 seropositive holdings was less marked

• Good evidence for association between outdoor keeping and H7 seropositive holdings in laying hens

• Evidence for association between number of goose holdings and H5 seropositive detections
Conclusions

• Further work required to investigate causal links and minimise potential biases
  – Variation among Member States surveillance programmes – e.g. some risk-based sampling
  – Variation in sampling frame among poultry types
  – Variation in management and biosecurity practices

• Investigate reasons for differences in epidemiology of H5 and H7
  – wild bird reservoir?
  – susceptibility of poultry types?

• Spatial analysis to investigate role of heterogeneity in testing intensity and poultry population in different areas
Epidemiological Follow-up data

Data submitted to EC as part of poultry survey following H5 or H7 seropositive detections
## Epidemiological Follow-up data

### Follow-up results from holdings that tested positive by serology

<table>
<thead>
<tr>
<th>Year</th>
<th>Negative</th>
<th>Positive</th>
<th>Not performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>93</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>2008</td>
<td>56</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>2009</td>
<td>46</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>2010</td>
<td>37</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>2011</td>
<td>31</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>263</td>
<td>67</td>
<td>112</td>
</tr>
</tbody>
</table>
Evaluation of the sensitivity and specificity of HI and ELISA for detection of antibodies to H5 and H7 avian influenza in poultry

EURL in collaboration with NRLs in Belgium, Netherlands and Germany
Alternative AI serosurveillance strategy

• Aim of this study was to estimate the sensitivity and specificity of HI and ELISA for detection of AI antibodies
  – Inform whether screening with ELISA is an efficient strategy

• Retest ELISA reactors by H5 and H7 HI

• This ELISA / HI strategy requires validation
  – Consider cost-effectiveness: Reduce costs of surveillance
HI - ELISA in Ducks and Geese

- Field sera from duck flocks
  - Belgium (37 flocks, 15 positive)
  - UK (17 flocks, 11 positive)

- Field sera from goose flocks
  - Belgium (8 flocks, 5 positive)
  - UK (8 flocks, 6 positive)
Conclusions

• Variable sensitivity of HI estimated from field data
  – Between 44-99% estimated from Bayesian model

• ELISA sensitivity more consistent
  – 86-99% estimated from Bayesian model
  – No significant difference found between ELISAs used in different labs

• High specificity for both HI and ELISA

• Results suggest that using ELISA as a screening test could be an efficient surveillance strategy
  – But would depend on non-H5/H7 AI prevalence
Bioportal Software Tool
Bioportal Software Tool

- Application for display and sharing of epidemiological data in transboundary or within country disease outbreaks
  - near real-time
  - spatial, temporal, phylogenetic

Determination of genetic relationship facilitates elucidation of direction of spread – geographical, bird species, poultry types
Romanian HPAI from 2005-10
Time-Space-Genomic Visualisation
H5 and H7 infections in poultry (via ADNS) and H5 and H7 detection in wild birds (via EU survey)

- Investigate associations and potential correlations – temporal, spatial, wild bird species, poultry type/husbandry

- Inform surveillance planning and control activities
Preliminary results Temporal pattern (H5/H7)

[Graph showing fluctuations in total poultry holdings and LPNAI positive incidences from 2006 to 2010, with peaks in certain months over the years.]
Acknowledgements:

Support and contribution from all participating NRLs and competent veterinary authorities in Member States
Thank you for your attention