Mexico H7N3 HPAI 2012-2013 Summary

Considerations for the US Poultry Producer
WSU Poultry Institute 2013

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Safeguarding Animal Health

Acknowledgments and Gratitude

• Angela Pelzel-McCluskey, DVM
  ➢ USDA, APHIS, Veterinary Services; Regional Epidemiologist

• Dr. Ernesto Soto
  ➢ AVI-MEX, S.A. de C.V.
HA cleaved by furin, PC6

Multiple basic amino acids

Viremia

Systemic infection

HA cleaved by trypsin

Respiratory / Intestinal replication

LP strains

Few basic amino acids

$B-X-X-R/\$ (B-X-X-R/)

Senne, USDA, NVSL

Influenza A Virus Hemagglutinin

Senne, USDA, NVSL

Minimum sequence for high pathogenicity

$\text{HA1} / \text{HA2}$

-4 -3 -2 -1 +1

$\text{BASIC} – \text{ANY} – \text{BASIC} – \text{ARG} / \text{GLY}$

N-terminus of HA2

C-terminus of HA1

Senne, USDA, NVSL
History and Background

- Last outbreak of HPAI in Mexico
  - 1995 H5N2
- Extensive vaccination for H5 since 1995
- Reported 2011 AI surveillance in Mexico:
  - 315,000 samples collected from commercial flocks, backyard, slaughter surveillance, and other avian sources
  - US surveillance for comparison
    - 2M birds per year under NPIP
    - 500K birds per year under LBMS
- State of Jalisco:
  - 55% of total egg production in Mexico (90 million laying hens)

Timeline of Outbreak

- June 19-20, 2012
  - Laboratory confirmation of H7 in Jalisco laying flock(s)
- June 23-25
  - H7N3 HPAI virus confirmed (IVPI and molecular)
  - 3 infected premises: commercial layers (1 million birds)
  - 500K birds clinical, 300K birds dead from disease, 60K birds depopulated or slaughtered
  - 10K control zone established
  - 85 farms sampled
Laboratory diagnosis

The Intravenous Pathogenicity Index Test (IVPI) *

\[
IVPI = \frac{\sum_{i=1}^{n} X_i \times W_i}{\sum_{i=1}^{n} X_i \times W_i + \sum_{i=1}^{n} Y_i \times W_i + \sum_{i=1}^{n} Z_i \times W_i + \sum_{i=1}^{n} W_i}
\]

<table>
<thead>
<tr>
<th>Clinical sign</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>D6</th>
<th>D7</th>
<th>D8</th>
<th>D9</th>
<th>D10</th>
<th>Total</th>
<th>Score</th>
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<tbody>
<tr>
<td>Normal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>Sick</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
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<tr>
<td>Paralyzed</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10.00</td>
<td>10</td>
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<tr>
<td>Dead</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>99.33</td>
<td>278</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>108.33</td>
<td>290</td>
</tr>
</tbody>
</table>

The index was calculated as the mean score per bird per observation. In the above result this would be 290/100 = 2.90. The classifying criteria for the isolated AI was highly pathogenic.

* Protocol armonizado entre Estados Unidos, Canadá y México

* Harmonized protocol among The United States of America, Canada and Mexico
Timeline of Outbreak - Jalisco

<table>
<thead>
<tr>
<th>Date (2012)</th>
<th># Premises Infected</th>
<th># Birds on Infected prems.</th>
<th># Birds Dead or Depopulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 23</td>
<td>3</td>
<td>1 million</td>
<td>360,000</td>
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<tr>
<td>June 29</td>
<td>10</td>
<td>1.7 million</td>
<td>870,000</td>
</tr>
<tr>
<td>July 3</td>
<td>24</td>
<td>2.5 million</td>
<td>987,000</td>
</tr>
<tr>
<td>July 9</td>
<td>31</td>
<td>3.5 million</td>
<td>2.5 million</td>
</tr>
<tr>
<td>August 3*</td>
<td>41</td>
<td>10.5 million</td>
<td>6 million</td>
</tr>
<tr>
<td>August 27</td>
<td>44</td>
<td>11.6 million</td>
<td>10.5 million</td>
</tr>
</tbody>
</table>

* Vaccination began 1st week of August
Control

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Vaccination and Surveillance

• H7 Vaccine
  - Vaccination program begun first week in August
  - Made from H7N3 LPAI seed strain; inactivated, emulsified vaccine produced in Mexico
  - Vaccination controlled by SENASICA, applied only in the quarantine zone to non-infected flocks, layers only, 2 dose series; sold to producers at $0.02/dose
  - First batch: 80 million doses; Second batch: 59 million doses (applied in September)

• Surveillance outside of the zone (all states)
  - 1,059 farms sampled representing 176 million birds
  - 70,981 samples collected – “serologic and virus NEG”
U.S./Mexico/Canada Review

- At November 2012 visit to Mexico
  - Last infected flock identified August 20th
  - Total of 657 farms sampled with 44 farms positive (92,800 samples collected)
  - 38 layer farms and 6 layer breeder farms infected
  - 22.3 million birds dead/depop (11 million died from outbreak, 11 million depopulated)
  - 128.5 million doses of vaccine used
  - 4 VI positives in “wild birds” – not migratory
  - 4 human cases (conjunctivitis): 2 with H7N3 isolated
  - Estimated economic impact: $638 million USD

Questions to Consider

- Timeline and apparent rate of spread
- Route of spread
- Control zone integrity
- Surveillance methods: control zone; rest of MX
- Diagnostic capacity and capabilities
- Disposition of birds – slaughter, render, depop
- Use of vaccination
- Virus source
- Exit strategy – all activities ceased Dec 31, 2012
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• Jan 3\textsuperscript{rd}: 2 infected flocks in Aguascalientes
  ➢ Near the previous zones
  ➢ Commercial layers; one clinical flock, second flock detected on active surveillance; depop 285K birds
• Jan 24\textsuperscript{th}: Producers assoc. in Jalisco reports new outbreak on previously vaccinated farm that had been vaccinated only one round instead of two
Update 2013

- Feb 12th: New outbreak in Guanajuato
  - Layer breeder hens with clinical signs
  - Feb 17th confirmed HPAI H7N3
  - 9 infected premises identified during epi investigation in Guanajuato (7 breeder farms, 2 layer farms)
  - 650K birds; 35K dead, 53K clinical
  - Depopulation of affected farms
  - Vaccination of breeders and layers begun in Guanajuato
  - Preliminary epi investigation indicates introduction “through fomites and biosecurity failures”

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Update 2013

• May 2013
  - January-May 2013: outbreaks in Aguascalientes (2), Jalisco (34), Guanajuato (33), Tlaxcala (1 backyard), and Puebla (1 layer)
  - Outbreaks in Jalisco and Guanajuato include layer, broiler, and backyard flocks
  - Vaccination being allowed in quarantined zones and on high-risk premises.
  - Vaccinated premises are to remain quarantined for life of vaccinated birds.

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Update 2013

• August 2013
  ➢ Since May 2013: outbreaks in Aguascalientes (2), Jalisco (5), Guanajuato (6), and Puebla (3)
  ➢ Layer, breeder, broiler, and backyard flocks reported infected
  ➢ Vaccination being allowed in quarantined zones and on high-risk premises.
  ➢ Movement control, depopulation, and vaccination ongoing

Risk to the U.S.

• No importation of poultry or poultry products
• Risk to border states
  ➢ Hatching egg movements from U.S. to Mexico and return of conveyances
  ➢ Illegal movements of non-commercial birds from Mexico (swaps, sales, game fowl)
• Risk to other states
  ➢ Movement of U.S. poultry workers/family/friends to and from Mexico
  ➢ Contact with backyard flocks exposed to people with recent travel history
Discussion: Mitigation Strategies

- **Easy:** Movement of U.S. products to Mexico and returning conveyances
  - Enhanced biosecurity and C&D procedures
- **Rather difficult:** Illegal movements of birds
  - Increased state/federal/public awareness & surveillance
  - Enhanced state/federal response to calls
- **Nearly impossible:** Movement of people
  - Worker re-education; biosecurity enforcement tactics; 72 hour no entry rule
  - Reinforcement of no contact with outside birds rule (by any conceivable method you can imagine)

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Take Home

- Appropriate diagnostics
- Surveillance
  - Testing consistent with control strategy
- Early detection and decisive action
- Biosecurity
- Appropriate use of vaccine
- Respect for LPAI
- It takes a village (not Congress)
Management in a bottle?

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Questions?

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Thank you!