Objectives

• Update previously collected information on layer farm management practices relevant to SE

• Estimate the prevalence of SE on layer farms

• Investigate risk factors for SE on layer farms
Methods

- Sample of farms with 3,000 or more laying hens in 19 States selected from FDA list of registered premises
Methods

• In-person interview

• Questionnaire addressed management practices relevant to SE: biosecurity, rodent control, molting, and vaccination

• Questions regarding pullet rearing, SE testing, and vaccinating were primarily answered by a company representative

• Questions relating to day-to-day layer management were primarily answered by farm personnel
Methods (cont’d)

• No biologic samples were collected. Producers were asked about testing for SE in the layer house environment from June 1, 2012 through May 31, 2013

• Data were weighted to reflect the population

• Confidential and voluntary
## Comparison of 1999 and 2013 NAHMS layer farm studies

<table>
<thead>
<tr>
<th></th>
<th>1999 study</th>
<th>2013 study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>List frame</strong></td>
<td>NASS</td>
<td>FDA</td>
</tr>
<tr>
<td><strong>Inference population</strong></td>
<td>Operations with 30,000 or more laying hens in 15 States</td>
<td>Farms with 3,000 or more laying hens in 19 States (subset of farms with 30,000 or more laying hens for comparison with 1999 study)</td>
</tr>
<tr>
<td><strong>Testing</strong></td>
<td>Swabs of layer-house environment collected one time by data collector for culture</td>
<td>Producer-reported test results for 1 year. Tests included culture, PCR, and other rapid tests</td>
</tr>
<tr>
<td><strong>Rodent assessment</strong></td>
<td>One-time data collector observation</td>
<td>Producer-reported typical level of problem for 1 year</td>
</tr>
</tbody>
</table>
Results

Percentage of farms by management practices

Study
- 1999 (30,000+)
- 2013 (30,000+)
- 2013 (<30,000)

Cage-free
Molt
Pre/Probiotic
Employee footbath
Results

Percentage of farms by egg-handling practices

- Hand gather
- Process onfarm
- Store eggs <50º F

Study:
- 1999 (30,000+)
- 2013 (30,000+)
- 2013 (<30,000)
Results

Percentage of farms by C&D procedures after every flock

*empty, wash and disinfect

Study
- 1999 (30,000+)
- 2013 (30,000+)
- 2013 (<30,000)
Results

Percentage of farms with moderate to high rodent problem

Percentage of farms by rodent-control practices
Results
Percentage of farms by SE control practices

- QA Test for SE in layer house
- Monitor pullets for SE
- Vx pullets

Study
- 1999 (30,000+)
- 2013 (30,000+)
- 2013 (<30,000)
## Results

Percentage of farms by SE vaccination protocol

<table>
<thead>
<tr>
<th>1&lt;sup&gt;st&lt;/sup&gt; vaccine</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; vaccine</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; vaccine</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; vaccine</th>
<th>Percent farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live spray</td>
<td>Live spray</td>
<td>Bacterin injection</td>
<td></td>
<td>39.0</td>
</tr>
<tr>
<td>Live spray</td>
<td>Live water</td>
<td>Bacterin injection</td>
<td></td>
<td>9.7</td>
</tr>
<tr>
<td>Live spray</td>
<td>Live spray</td>
<td>Live spray</td>
<td>Bacterin injection</td>
<td>8.4</td>
</tr>
<tr>
<td>Live spray</td>
<td>Live spray</td>
<td>Live spray</td>
<td></td>
<td>7.8</td>
</tr>
<tr>
<td>Any other combination</td>
<td></td>
<td></td>
<td></td>
<td>35.1</td>
</tr>
</tbody>
</table>

53.1 percent of farms administered the first vaccine in the hatchery

9.1 percent of farms vaccinated hens in lay
Results
Environmental testing

Percentage of houses positive for SE-1999

Layers 99

Percentage of flocks positive for SE-2013

Flock size
Results
Environmental testing

Percentage of flocks positive for SE, by Region
Risk Factor Analysis

Methods

• **Farm level**
  – Positive farm = at least one environmental test positive for SE between June 1, 2012 and May 31, 2013

• **Flock level**
  – Most recent positive flock versus most recent negative flock

• **Each variable screened individually**
  – Region as covariate

• Backward elimination logistic regression model
## Risk Factor Analysis

<table>
<thead>
<tr>
<th>Farm level Factor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Region</td>
<td>5.9</td>
</tr>
<tr>
<td>Rodent index 11 or higher</td>
<td>4.3</td>
</tr>
<tr>
<td>Routinely molt</td>
<td>3.9</td>
</tr>
<tr>
<td>Downtime (10 days or less)</td>
<td>3.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flock level Factor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Region</td>
<td>8.1</td>
</tr>
<tr>
<td>Flock vaccinated for <em>Salmonella</em> as pullets</td>
<td>0.09</td>
</tr>
<tr>
<td>Postmolt test</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Conclusions

• **Risk factors**
  – Molting
    • Fewer producers molt
  – Rodents
    • Producers report fewer problems with rodents

• **Protective factors**
  – Vaccinating
    • Nearly all producers vaccinate pullets

• **Environmental Prevalence**
  – 1999: 7.1% of houses (one time test)
  – 2013: 1.2% of flocks over one year
Questions?