Not Another Chick Outbreak!

An Investigation of Two *Salmonella* Outbreaks with Indistinguishable PFGE Patterns Occurring Simultaneously in Colorado in 2014

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Salmonellosis

- Bacterial infection
- Diarrhea, fever, and abdominal cramps
- Incubation: 12 hrs-7 days
- Illness duration: 4-7 days
A Plethora of Sources
Salmonella Cases Reported in Colorado in September, 2009-2014

Number of Cases

Year
2009: 63
2010: 45
2011: 30
2012: 45
2013: 53
2014: 80

September 5-year median: 45 cases
Uncommon PFGE Pattern Identified

- **September 2-17, 2014:**
  - 8 of 35 (23%) cases reported in CEDRS with *Salmonella Typhimurium* JPXX01.0286

- Pattern is uncommon in PulseNet
  - ~1 upload per week
Often a Poultry-Related Pattern

- Outbreaks of pattern 286 associated with live poultry
  - 359 cases nationwide in 2013
    - 54 cases in Colorado
  - 8 cases in Pueblo County in spring 2014
- Only 2 of 8 (25%) initial September 2014 cases were reporting live poultry exposure
Next Steps Identified

- Collected questionnaires from counties
  - High ground beef consumption among non-Pueblo cases
  - Live poultry exposure in Pueblo-area cases
- Hypothesis: two unique clusters
- Lab initiated multiple locus variable number tandem repeat analysis (MLVA) on isolates
Case:

- Culture-confirmed *Salmonella* Typhimurium, PFGE pattern JPXX01.0286
- Illness onset between August 30-October 4, 2014
- No live poultry exposure reported
- Resided outside of Pueblo County
## Case Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Cluster A (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset Date Range</td>
<td>Aug 30 - Oct 4, 2014</td>
</tr>
<tr>
<td>Number (%) Male</td>
<td>9 (67%)</td>
</tr>
<tr>
<td>Median Age (Range)</td>
<td>27 years (4 months - 80 years)</td>
</tr>
</tbody>
</table>
Cluster A Investigation

- 11 of 12 (92%) cases interviewed with National Hypothesis Generating Questionnaire (NHGQ)

- Exposures of note:
  - 10/11 (91%) reported ground beef consumption
  - 10/11 (91%) shopped at Grocery Chain A
  - 8/11 (73%) purchased ground beef at Grocery Chain A
  - 8/11 (73%) had pet dogs
Case-Control Study Conducted

- Students from CSPH with CoE interview training helped with interviews
- Neighborhood-based, using white pages
- Matched on age group and gender
- Interview focused on ground beef, where purchased, pet dogs, and live poultry
- 10 interviewers made 560 calls
- Enrolled 16 controls, 11 cases
## Ground Beef Associated with Illness

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Number (%) Cases</th>
<th>Number (%) Controls</th>
<th>Odds Ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consuming any ground beef</td>
<td>11 (92%)</td>
<td>8 (50%)</td>
<td>11.0</td>
<td>&lt; 0.04</td>
</tr>
<tr>
<td>Purchasing Chain A ground beef</td>
<td>8 (73%)</td>
<td>5 (31%)</td>
<td>5.9</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Laboratory Results Crucial

- 12 of 12 (100%) cases associated with ground beef cluster had matching MLVA pattern 1

- Ground beef purchased by CDPHE from 2 different Chain A stores tested negative
Collaboration with Federal Partners

- CDC initiated nationwide investigation
  - Also 2 clusters

- Collaborated with USDA Food Safety Inspection Service (FSIS) to conduct traceback efforts

- Traceback efforts unsuccessful
Cluster B Cases

Case definition:

- Culture-confirmed *Salmonella* Typhimurium, PFGE pattern JPXX01.0286
- Illness onset between August 5-October 6, 2014
- Reported live poultry exposure
- Resided in Pueblo County
# Case Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Cluster A (n=12)</th>
<th>Cluster B (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (%) Male</td>
<td>9 (67%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>Median Age (Range)</td>
<td>27 years (4 months - 80 years)</td>
<td>9.5 years (5 months - 51 years)</td>
</tr>
<tr>
<td>Number of Counties</td>
<td>8 (none in Pueblo)</td>
<td>1 (all Pueblo)</td>
</tr>
</tbody>
</table>
Cluster B Investigation

- Cases interviewed with supplemental poultry questionnaire
- 5/6 (83%) purchased poultry or animal-related supplies at Agricultural Store B
- Agricultural Store B also implicated in spring 2014 outbreak
Two MLVA Patterns Identified

- 6/6 (100%) cases had closely related MLVA patterns 2 or 3
- Patterns distinct from ground beef cluster
Local EH Investigation

- Pueblo County Epi and EH staff collected environmental samples at Agricultural Supply Store B

- 2 environmental specimens positive for S. Typhimurium 286, MLVA Pattern 3
Two-Cluster Epi Curve

Number of Cases

Date of Illness Onset

8/4/14, 8/8/14, 8/12/14, 8/16/14, 8/20/14, 8/24/14, 8/28/14, 9/1/14, 9/5/14, 9/9/14, 9/13/14, 9/17/14, 9/21/14, 9/25/14, 9/29/14, 10/3/14, 10/7/14

- Poultry Cluster
- Ground Beef Cluster
Three Disciplines’ Involvement is Crucial

- **Epi:** Rapid and thorough interviewing of cases and case-control study

- **Lab:** Rapid serotyping, PFGE and MLVA results

- **EH:** Inspection of Agricultural Store B
Acknowledgements

- LPHAs
  - Boulder County
  - Broomfield County
  - Denver County
  - El Paso County
  - Pueblo County
  - Routt County
  - Tri-County

- CDPHE Epi Staff
- Colorado CoE
- CSPH students
- CDPHE Laboratory Staff
- CDC
- USDA FSIS
Questions?