Root Cause and Controls Needed to Prevent Recurring Salmonella Outbreaks from the Delmarva Region (Delaware, Maryland, and Virginia)

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## 2014 Food Safety Progress Report

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Healthy People 2020 Target Rate</th>
<th>2014 Rate</th>
<th>Change Compared with 2006-2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Campylobacter</em></td>
<td>![8.5]</td>
<td>13.45</td>
<td>13% increase</td>
</tr>
<tr>
<td><em>E. coli O157</em></td>
<td>![0.6]</td>
<td>0.92</td>
<td>32% decrease</td>
</tr>
<tr>
<td><em>Listeria</em></td>
<td>![0.2]</td>
<td>0.24</td>
<td>No change</td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>![11.4]</td>
<td>15.45</td>
<td>No change</td>
</tr>
<tr>
<td><em>Vibrio</em></td>
<td>![0.2]</td>
<td>0.45</td>
<td>52% increase</td>
</tr>
<tr>
<td><em>Yersinia</em></td>
<td>![0.3]</td>
<td>0.28</td>
<td>22% decrease</td>
</tr>
</tbody>
</table>

*Culture-confirmed infections per 100,000 population

1. 2006-2008 were the baseline years used to establish Healthy People 2020 targets
2. Shiga toxin-producing *Escherichia coli* O157
Produce Rule

FDA estimates will avert 331,964 illnesses per year
S. Newport

- Increased markedly since 1995
- 3rd most common serotype
- Common in Delmarva (Delaware, Maryland, Virginia) Peninsula
### History of Tomato *Salmonella* Outbreaks in the U.S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Serotype</th>
<th># of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>S. Baildon</td>
<td>86</td>
</tr>
<tr>
<td>2000</td>
<td>S. Thompson</td>
<td>29</td>
</tr>
<tr>
<td>2002</td>
<td>S. Newport*</td>
<td>512</td>
</tr>
<tr>
<td></td>
<td>S. Newport</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>S. Javiana</td>
<td>90</td>
</tr>
<tr>
<td>2004</td>
<td>S. Javiana</td>
<td>471</td>
</tr>
<tr>
<td></td>
<td>S. Braenderup</td>
<td>123</td>
</tr>
<tr>
<td>2005</td>
<td>S. Newport*</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>S. Braenderup</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>S. Enteritidis</td>
<td>77</td>
</tr>
<tr>
<td>2006</td>
<td>S. Newport*</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>S. Typhimurium</td>
<td>186</td>
</tr>
<tr>
<td>2007</td>
<td>S. Newport*</td>
<td>57</td>
</tr>
<tr>
<td>2008</td>
<td>S. Saintpaul (tomatoes?/peppers)</td>
<td>1442</td>
</tr>
<tr>
<td>2010</td>
<td>S. Newport (suspected)**</td>
<td>46</td>
</tr>
</tbody>
</table>

*Same PFGE pattern
FDA data

All S. Newport
PFGE pattern 61

Source of tomatoes was Eastern Shore, VA

Source: Seth Levine, VA Dept. of Health. From annual PulseNet meeting, Sept. 2011
Delmarva Research

- 2005 outbreak traceback found pond used to irrigate tomato fields contained implicated strain of S. Newport
  - Geese and turtles observed in ponds

- Wildlife investigated as potential source
  - S. Newport isolated from 1 avian sample and 11 environmental samples
  - Suggests birds and water may be source of S. Newport strain affecting Eastern Shore
43.2% of surface water/sediment Salmonella positive

“S. Newport contaminated irrigation water was able to move directly into tomato roots, stems, and fruits”

“Salmonella has been shown to survive for at least 4 weeks in chicken litter amended soils”
Delmarva Sampling Found
21 serovars, 39 PFGE Patterns

- Not just S. Newport 61, 11, 30, Javiana 4
- Senftenberg and Montevideo (found in tomatoes)
- Braenderup
- 4,5,12:i:-
- Mbandaka, Thompson, Infantis, Pomona, Tennesee, Worthington…, Typhimurium…
- “majority of the isolates are clinically relevant”
- 2015 Chipotle Newport outbreak (11, 30)
Number of persons (N = 275) infected with the outbreak strain of *Salmonella* Newport, United States, May 20–September 30, 2014
S. Newport 61 Outbreak

- 29 states with illnesses
  - Every state from Maine to Florida
- May to September, and
- Outbreaks since 2002 indicate:
  - Widespread prolonged contamination
**Delmarva Peninsula**

- Bordered by Chesapeake Bay and Atlantic Ocean
- Farming is main industry
  - Large quantities of tomatoes and other produce
  - Numerous chicken farms
Delmarva 2014

- Annual broiler/roaster/Cornish production: 569,000,000
  - Total pounds: 3,742,500,000
  - Number of houses: 4,761
  - Growers: 1,564
  - Wholesale value: $3,176,000,000
Delmarva Outbreaks

- Prior outbreaks linked most strongly to tomatoes
- June-September 2014 outbreak
  - Cluster of cases all ate cucumbers from same MD farm
2014 After Action

- Cucumber farm reportedly met Good Agricultural Practices (GAP) standards in spreading uncomposted chicken litter in March
  - (120 days prior to harvest)
  - Raises question as to adequacy of standards
  - Reportedly was not irrigating with surface water
Next Steps

- Action needed!
- Identify and address root causes
- Investigate role surface water, waterfowl, poultry play in recurring Salmonella (and Campy?) illnesses
- Address issues related to contaminated water and manure
  - Illnesses increase in dry weather with increased irrigation?
What Will be Done to Keep Illness from Happening Again?

- Minimum of safe water and composted/safe manure
  - If still happens…
- Should ready-to-eat produce be grown?
Insanity: doing the same thing over and over again and expecting different results.

Albert Einstein
Drive Corrective Action

- In 2015, RI tested 52 produce samples from Delmarva
  - 12 samples associated with one case
  - Buyers switched suppliers?
  - If not testing, may receive suspect products
FIGURE 2. Number of persons (N = 275) infected with the outbreak strain of *Salmonella* Newport, by estimated date of illness onset — United States, May 20–September 30, 2014
Goals

- Drive correction of environmental hazards leading to outbreaks.
- Determine if Good Agricultural Standards (GAP) are sufficient to protect public health
  - Cucumbers from a Gap certified farm were reportedly implicated in 2014 outbreak
Goals

Since poultry waste is a major likely source of produce contamination in the Delmarva area, determine whether produce is also causing illness due to other common pathogens associated with poultry such as Salmonella Typhimurium in addition to S. Newport and Javiana.
Tactics
Testing Delmarva Produce for Salmonella and Campylobacter

- Sample source of produce for past Salmonella Newport and Javiana cases
- For 2016 cases, immediately sample produce from case home and place of purchase
- Sample distributors purchasing produce from Delmarva
Tactics

- Use USDA produce sampling guidelines for sample size and handling
- Obtain invoice and other source info at time of sampling
- Take pictures of boxes and other source containers upon sampling
Tactics

- If positive samples are obtained, immediately notify all states involved, FDA, CDC, and USDA and recall product
- Conduct traceback
- Increase sampling from a positive farm – determine if GAP certified
- Determine if there are PFGE matching illnesses
- Request Whole Genome Sequencing
Drive Corrective Action

- Produce Marketing Association asked Virginia Tech and Univ. of Delaware Cooperative Extension to notify farmers of sampling and motivate Good Agricultural Practices
- Sysco, Hospitality Assoc., Dave’s, Big Y recommended GAP plus testing for suppliers
Drive Corrective Action

Presentations to:
- Nation’s Restaurant News and major food service chains
- National Council of Chain Restaurants

Newsletter to RI food establishments concerning produce purchasing specs
Delmarva Action Plan

- Increased water sampling
- Product sampling
- Education of growers and packers
- Research with universities
Other Controls Needed

- Industry purchase requirements
  - GAP, Produce Rule, plus Testing
  - Unsafe surface water should not be used for tomatoes (cucumbers?)
  - States need to immediately investigate, traceback, sample, mandate corrective action
    - Delmarva
    - Mexican produce
Questions?