FSIS Update:
Office of Public Health Science

NCC Technical and Regulatory Committee Meeting
January 30, 2018

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Deputy Assistant Administrator, Office of Public Health Science
USDA/Food Safety and Inspection Service
Food Safety and Inspection Service:

**Topics**

- FSIS outbreak investigations
- Latest in antimicrobial resistance
- Update on other chicken parts sampling
- Laboratory methods changes
- Status of Accredited Laboratory Program
Food Safety and Inspection Service:
FSIS: A Public Health Regulatory Agency

Ensure meat, poultry, and processed egg products are safe, wholesome, and correctly labeled and packaged.

Goal 1
Prevent Foodborne Illness and Protect Public Health

Goal 2
Modernize Inspection Systems, Policies, and the Use of Scientific Approaches

Goal 3
Achieve Operational Excellence
Food Safety and Inspection Service:
**FY 2012–2017 Illness Investigations**

**FY 2012–2017 Clusters Investigated by Pathogen (N=120)**

- Campylobacter
- E. coli
- Listeria
- Multipathogen
- Salmonella
- Other

Fiscal Year

- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
Food Safety and Inspection Service:
**FY 2017 Illness Investigations**

FY 2017 Illness Investigations by Pathogen (N=8)

- *Salmonella*, 75.0%
- *Listeria*, 12.5%
- *E. coli*, 12.5%
### Food Safety and Inspection Service:  
**Chicken-Associated Investigations*, FY 2015–2017**

<table>
<thead>
<tr>
<th></th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><em>Number of investigated outbreaks with evidence of potential link</em> to FSIS-regulated product</em>*</td>
<td>20</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Outbreaks (% of total) with evidence of potential link to chicken</td>
<td>8 (40%)</td>
<td>7 (39%)</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>RTE</td>
<td>0 (0%)</td>
<td>1 (14%)**</td>
<td>1 (50%)**</td>
</tr>
<tr>
<td>Raw</td>
<td>8 (100%)</td>
<td>7 (100%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td><strong>Total number of illnesses from outbreaks with evidence of potential link to chicken</strong></td>
<td>352</td>
<td>336</td>
<td>59</td>
</tr>
<tr>
<td><strong>Chicken-associated outbreaks (% of total) resulting in FSIS recall</strong></td>
<td>3 (38%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><strong>Salmonella serotype responsible for most outbreaks</strong></td>
<td>I 4,[5],12:i:- and Enteritidis</td>
<td>I 4,[5],12:i:- and Enteritidis</td>
<td></td>
</tr>
</tbody>
</table>

*Includes outbreaks definitely, likely/presumptive, and possibly associated with FSIS-regulated product  
**1 outbreak in FY2016 and 1 outbreak in FY2017 involved both RTE and raw poultry*
Federal agencies begin using WGS to study and investigate foodborne *Listeria* illnesses

**2015**

Routine use in surveillance of *Listeria*, *Campylobacter*, STEC, and *Salmonella*

**2016**

PulseNet supports analysis of *Salmonella* WGS data to investigate outbreaks

**2018**

WGS replaces PFGE for subtyping *Lm* at FSIS
How WGS has Impacted Outbreak Investigations

- Grouped isolates with different PFGE patterns into single cluster
- Determined the source of older unsolved illnesses/clusters
- Refined outbreak case definitions by excluding unrelated isolates
- Linked sporadic illnesses to contaminated food
- Identified outbreaks following product testing
- Helped in understanding the ecology of pathogen reservoirs
How WGS has Impacted Outbreak Investigations

- Grouped isolates with different PFGE patterns into a single cluster
- Determined the source of older unsolved illnesses/clusters
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Food Safety and Inspection Service:

2017 *Salmonella* Enteriditis Investigation

- 53 illnesses in 25 states; not uncommon PFGE pattern
- Available epidemiologic data limited to a single-state subcluster linked to a catered event
  - Attendees consumed chicken traced to a federal establishment
  - Historic isolate from establishment matched clinical PFGE pattern
- No known links between subcluster cases and other illnesses
- **Question**: Were all these illnesses part of an outbreak?
Food Safety and Inspection Service:

**Using WGS to Exclude Unrelated Cases**

- Clinical isolates in subcluster found related to each other by WGS
  - 0 SNP differences (0-1 alleles)
  - However, these isolates were not closely related to the historic product isolate (10-17 SNP differences)

- Other clinical isolates found unrelated to subcluster isolates

- WGS helped inform decision not to conduct additional case-patient interviews because evidence did not support existence of a larger outbreak associated with chicken
Source: CDC
Antimicrobial Resistance

- NARMS public meeting highlights
- AMR findings in poultry
• Overall, isolates of Salmonella have become more susceptible since NARMS began, and resistance to multiple drugs has declined

• Low levels of resistance to critically important antibiotics ceftriaxone and ciprofloxacin

• Apparent differences between cecal and HACCP findings

• Overall, US doing well in managing AMR: For the first time, we have been able to compare critically important antimicrobials tested in NARMS - third-generation cephalosporins, ciprofloxacin, and nalidixic acid – to Salmonella data from European Union (EU) countries. In the United States, resistance to third-generation cephalosporins, ciprofloxacin, and nalidixic acid compares very favorably to the EU findings.
• **Public Comments Highlights:**
  - Publication of summary data by agencies should be within the calendar year after data is collected
  - All three Agencies should harmonize formatting and presenting data
  - Representativeness of cecal data and conclusions based on a nation wide data collection program need to be discussed further

• **Next Steps:**
  - NARMS is considering to broaden collaboration with other programs and intends to take a One Health approach by considering animal pathogens, on-farm testing, companion animals, and an environmental component
  - NARMS will focus on developing the next Strategic Plan considering the recent recommendations from the Science Board and the input from this Public Meeting
## NARMS at FSIS: Sampling and Results – *Salmonella*

### Chickens

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Samples</td>
<td>No. Isolates</td>
<td>Percent Positive</td>
<td>No. Samples</td>
</tr>
<tr>
<td>HACCP</td>
<td>10,446</td>
<td>936</td>
<td>9.0%</td>
<td>11,453</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cecal</td>
<td>575</td>
<td>103</td>
<td>17.9%</td>
<td>553</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Preliminary 2017 Data*
Food Safety and Inspection Service

Multi-Drug Resistance (MDR) in *Salmonella* from Chickens

**Percent of *Salmonella* isolates MDR - resistant to ≥ 3 antimicrobial classes**

- **Cecal Chicken – MDR Serotypes**
  - Infantis: 37%
  - Kentucky: 6%
  - Typhimurium: 26%
  - Heidelberg: 22%
  - Enteritidis: 2%
  - Rough_O::r:1,5: 5%
  - Others: 2%

- **HACCP Chicken – MDR Serotypes**
  - Infantis: 34%
  - Kentucky: 14%
  - Typhimurium: 3%
  - Heidelberg: 1%
  - Enteritidis: 1%
  - Rough_O::r:1,5: 1%
  - Others: 1%

*Preliminary 2017 Data*
Food Safety and Inspection Service

*Salmonella* Infantis in Chickens

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**Percent of Chicken Isolates**

<table>
<thead>
<tr>
<th>Year</th>
<th>HACCP</th>
<th>Cecal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>1999</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>2000</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>2001</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>2002</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>2003</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>2004</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>2006</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>2007</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>3</td>
<td>0</td>
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<tr>
<td>2010</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>2012</td>
<td>31</td>
<td>1</td>
</tr>
<tr>
<td>2013</td>
<td>35</td>
<td>2</td>
</tr>
<tr>
<td>2014</td>
<td>43</td>
<td>2</td>
</tr>
<tr>
<td>2015</td>
<td>58</td>
<td>2</td>
</tr>
<tr>
<td>2016</td>
<td>112</td>
<td>62</td>
</tr>
<tr>
<td>2017*</td>
<td>301</td>
<td>193</td>
</tr>
</tbody>
</table>

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*Preliminary 2017 Data*
Food Safety and Inspection Service

*Salmonella* Infantis in Chickens – Distribution by Sample Type/Project Code

![Graph showing distribution of *Salmonella* Infantis in Chickens by sample type and project code from 1997 to 2017.]

*Ground Chicken (HC01_GC) R*
*NRTE-Exploratory (NRTE_EXP_CH) R*
*Comminuted (HC_CH_COM01) A*
*Carcass Rinse (HC11_BR) R*
*Carcass Rinse (HC_CH_CARC01) A*
*Parts (HC_CPT_LBW01) A*

*Preliminary 2017 Data | R=Retired Project Code | A: Active Project code*
Food Safety and Inspection Service
Multi-Drug Resistance (MDR) in *Salmonella* from Chickens

**MDR – Which antimicrobial drugs are involved?**

- **Azithromycin**: 1%
- **Trimethoprim/Sulfa**: 28%
- **Ciprofloxacin**: 41%
- **Streptomycin**: 41%
- **Sulfisoxazole**: 42%
- **Ceftriaxone**: 71%
- **Ampicillin**: 77%
- **Tetracycline**: 84%

**Extreme Drug Resistance (XDR) 2014-2017**

- Four isolates from HACCP (1 Thompson, 1 Typhimurium, 2 Kentucky)
- None from Cecal

*Includes those classified as intermediate*
Food Safety and Inspection Service

*Campylobacter in Chickens*

Campylobacter Species Distribution - Chickens

Cecal

- **Jejuni**: 12%
- **Coli**: 88%

HACCP

- **Jejuni**: 31%
- **Coli**: 69%

*Preliminary 2017 Data*
**Food Safety and Inspection Service**

**MDR Campylobacter coli from Chickens**

**Percent of C. Coli isolates MDR - resistant to > 3 antimicrobial classes**

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cecal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. MDR</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Total No.</td>
<td>70</td>
<td>53</td>
<td>59</td>
<td>197</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>HACCP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. MDR</td>
<td>6</td>
<td>27</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Total No.</td>
<td>574</td>
<td>751</td>
<td>923</td>
<td>450</td>
</tr>
</tbody>
</table>

MDR in *C. Jejuni* was <2% for in both Cecal and HACCP

*Preliminary 2017 Data*
Food Safety and Inspection Service:

Update on Other Chicken Parts Sampling
Food Safety and Inspection Service:  
**FSIS Notice 72-16 (Sep 21, 2016)**

- Sampling implemented on November 1, 2016
- Included sampling of necks, giblets, & quarters and halves
- Two Project Codes using one PHIS product group to schedule samples
  - EXP_CPT_OT01: Uses 50 ml of rinsate for a specified number of parts (necks, hearts, giblets, and livers)
  - EXP_CPT_QH01: Uses 400 ml of rinsate for a specified of parts (quarters and halves)
### Table 1. Number of Quarter and Half Carcasses to Collect for EXP_CPT_QH01 (for all live bird weights)

<table>
<thead>
<tr>
<th>Type of Raw Chicken Part</th>
<th>Number of Raw Chicken Parts to Collect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half Carcasses</td>
<td>2</td>
</tr>
<tr>
<td>Quarter Carcasses</td>
<td>4</td>
</tr>
</tbody>
</table>

### Table 2. Number of Necks, Livers, Hearts, and Gizzards to Collect for EXP_CPT_OT01

<table>
<thead>
<tr>
<th>Type of Raw Chicken Part</th>
<th>Number of Raw Chicken Parts to Collect, by Average Live Bird Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 4 lb</td>
</tr>
<tr>
<td>Hearts</td>
<td>52</td>
</tr>
<tr>
<td>Livers</td>
<td>12</td>
</tr>
<tr>
<td>Gizzards</td>
<td>40</td>
</tr>
<tr>
<td>Necks</td>
<td>3</td>
</tr>
</tbody>
</table>
A total of 317 eligible product samples have been collected under this project code. This includes 22 discards.

*Data pulled from FSIS data warehouse on 12/18/17*
A total of 124 eligible products have been collected under this project code. This includes 7 discards.

- **Half-Carcass**: 83, 67%
- **Quarter-Carcass**: 41, 33%

*Data pulled from FSIS data warehouse on 12/18/17*
Food Safety and Inspection Service:

*Salmonella Results for Necks and Giblets*

*Data pulled from FSIS data warehouse on 12/18/17*
Food Safety and Inspection Service:
Campylobacter Results for Necks and Giblets

*Data pulled from FSIS data warehouse on 12/18/17*
Food Safety and Inspection Service: *Salmonella Results for Halves and Quarters*

*Data pulled from FSIS data warehouse on 12/18/17*
Food Safety and Inspection Service:

**Campylobacter Results for Halves and Quarters**

*Data pulled from FSIS data warehouse on 12/18/17*
Food Safety and Inspection Service:

Lab Method Changes and Accredited Lab Program
Food Safety and Inspection Service:
**Poultry-Related Method Changes in FY17**

**Microbiology**
- No new method updates applicable to poultry
- In Dec 2017, the Microbiology Laboratory Guidebook (MLG) was revised to include the recipe for neutralizing Broth Peptone Water (nBPW)

**Chemistry**
- No new method updates applicable to poultry
- Pesticide screening method extended to processed egg products
Food Safety and Inspection Service:

**Latest on Accredited Laboratory Program (ALP)**

- Currently, non-FSIS laboratory can be accredited for analysis of food chemistry (fat, protein, etc.) and select chemical residues

- Under consideration:
  - Change statistical methods used in measuring chemical lab performance
  - Expansion of program to include pathogen testing

- Modernizing ALP is aimed at increasing efficiencies
Closing Thoughts

• Technological advances are expanding FSIS’ insight into foodborne illness and antimicrobial resistance

• Data from other chicken parts sampling highlight potential gaps in pathogen reduction

• FSIS’ laboratories and associated programs are a major focus of Agency modernization efforts
Food Safety and Inspection Service:

Questions?

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