An FSIS Update on the Prevention and Control of Foodborne Salmonella

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Providence, RI
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Food Safety and Inspection Service:
Outline

• FSIS Mission
• Salmonella outbreak investigations associated with FSIS-regulated products
• Current strategies for prevention and control
• Innovative processes and tools
• Improving outbreak response

Food Safety and Inspection Service:
FSIS Mission
The Food Safety and Inspection Service (FSIS) is the public health agency in the USDA responsible for ensuring that nation’s commercial supply of meat, poultry, and egg products is safe, wholesome, correctly labeled and packaged.

FSIS employs approximately 10,000 total personnel; over 7,500 are field personnel at 6,000 establishments

FSIS oversees production of approximately 100 billion pounds of meat, poultry, and pasteurized egg products.

8,000 inspectors in-plant daily focused on inspection tasks designed to ensure meat and poultry products are safe and wholesome
– Salmonella is the primary organism used to verify process control

FSIS develops microbiological performance standards
– Designated by product class
– Based on findings from nationwide microbiological baseline studies
– New performance standards are aligned with Healthy People 2020 goals

Food Safety and Inspection Service:
Office of Field Operations (OFO) Districts

FSIS’s In-Establishment Experts

Food Safety and Inspection Service:
Office of Public Health Science

OPHS provides scientific leadership to support science-based food safety programs and policies to reduce foodborne illness

Food Safety and Inspection Service:
OIEA Compliance and Investigations Division (CID)

• Over 183 personnel across 4 regions
• Offices throughout the country
• Primary focus outside FSIS-inspected establishments

FSIS’s In-commerce Experts

Food Safety and Inspection Service:
Environmental Assessment and Traceback/Trace-forward

FSIS’s Compliance and Investigations Division partners with state/local partners to:
• Trace origin of implicated product using shopper cards, receipts, credit card purchases, store invoices, and retail grinding logs
• Determine the movement and amount of implicated product in commerce using records at the producing establishment or other sources
• Conduct environmental assessments at facilities that process and receive FSIS-regulated product

Contact information available at: http://www.fsis.usda.gov/districtoffices

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**Salmonella reduction is a challenging endeavor**

<table>
<thead>
<tr>
<th>Serotype</th>
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<th>Percent of clusters</th>
<th>Number of illnesses</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Typhimurium</td>
<td>12</td>
<td>15.4</td>
<td>318</td>
<td>9.0</td>
</tr>
<tr>
<td>Enteritidis</td>
<td>10</td>
<td>16.1</td>
<td>368</td>
<td>10.5</td>
</tr>
<tr>
<td>Heidelberg</td>
<td>8</td>
<td>12.9</td>
<td>1,236</td>
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<td>62*</td>
<td>100</td>
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*Not included is one cluster which featured co-infection with S. Enteritidis and Campylobacter jejuni.

### Food Safety and Inspection Service: Outbreak Investigations

- Multifaceted, multidisciplinary undertaking
- Require collaboration among Local, State and Federal Partners of various disciplines
- “Three-Legged Stool” of investigations
  1. Epidemiology: Who, what, when, where, and how
  2. Laboratory: Food, environmental, and clinical samples
  3. Environmental Health
- Traceback, traceforward
- Product and environmental sampling
- Facility assessments (FSA, IIT, etc.)

**S. Heidelberg Facts**

- One of approximately 2,500 distinct serotypes of Salmonella enterica
- Major cause of foodborne illness in North America
  - Among top 5 commonly isolated Salmonella serotypes in the United States
  - In recent years, S. Heidelberg has been the cause of high-profile outbreaks linked to FSIS-regulated products
- Has a close association with poultry and shell eggs

**Food Safety and Inspection Service: Salmonella Infections**

Association with chicken poses unique investigation challenges
- Chicken consumption is very common, thus differences between cases and non-cases can be difficult to detect epidemiologically
- Traceback of chicken often impeded by discarded packaging
- Salmonella Heidelberg has recently emerged as the most common serotype in FSIS-reported outbreaks
- Historically, S. Typhimurium has been most common, followed by S. Enteritidis
- During FY 2013-2015, 28% outbreaks of Salmonella involved S. Heidelberg

**Food Safety and Inspection Service: Salmonella Clusters Reported to FSIS, FY2007—2013**

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**Food Safety and Inspection Service: Outbreak Investigations**

- In collaboration with public health partners, FSIS collects and evaluates epidemiological, microbiological, and traceback evidence
- Four objectives of an investigation include:
  - Implicating the food vehicle associated with illnesses
  - Identifying the production establishment(s) of origin
  - Initiating control actions
  - Identifying root causes

**Outbreak Investigations**

Since 2012, Salmonella-related illness clusters have comprised the largest proportion of outbreaks involving FSIS-regulated commodities

**Food Safety and Inspection Service: Salmonella Enterica Outbreaks Reported to FSIS, FY2007-2015**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Number of Outbreaks</th>
<th>Percent of Outbreaks</th>
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<tbody>
<tr>
<td>FY 2007</td>
<td>165</td>
<td>26.8</td>
</tr>
<tr>
<td>FY 2008</td>
<td>212</td>
<td>34.2</td>
</tr>
<tr>
<td>FY 2009</td>
<td>146</td>
<td>23.3</td>
</tr>
<tr>
<td>FY 2010</td>
<td>190</td>
<td>30.1</td>
</tr>
<tr>
<td>FY 2011</td>
<td>194</td>
<td>30.6</td>
</tr>
<tr>
<td>FY 2012</td>
<td>193</td>
<td>30.5</td>
</tr>
<tr>
<td>FY 2013</td>
<td>190</td>
<td>30.5</td>
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<td>FY 2014</td>
<td>184</td>
<td>29.4</td>
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<tr>
<td>FY 2015</td>
<td>193</td>
<td>30.5</td>
</tr>
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<td>TOTAL</td>
<td>1,183</td>
<td>100%</td>
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**Food Safety and Inspection Service: S. Heidelberg in Animals**

- Largest outbreak attributed to FSIS-regulated product
- 634 persons infected with 7 outbreak strains of S. Heidelberg in 29 states and Puerto Rico
- Onset dates ranged from March 1, 2013 to July 11, 2014
- Traceback linked illnesses to multiple establishments under a single corporation

**Source:** CDC (http://www.cdc.gov/salmonella/pdf/heidelberg-508c.pdf)
To gather additional microbiological evidence to assist in determining outbreak source, FSIS conducted intensified sampling at multiple establishments. Establishments were sampled in four phases, generating more than 3,000 samples. To most closely approximate possible consumer exposure, many samples were chicken parts in final packaging. Intensified sampling during outbreak found high positive rates, particularly in chicken parts. Called into question whether FSIS' verification sampling scheme could adequately monitor process control.

Two illness clusters were identified by the Minnesota Department of Health in June 2015. Each cluster was associated with consumption of frozen, raw, stuffed and breaded chicken products. From 1998-2015, this type of product has been associated with nine salmonellosis clusters.

Intensified sampling was conducted in both establishments following the outbreaks:
- Environmental samples
- Comminuted chicken
- Finished products

Salmonella found in product samples from each establishment. Outbreak strain from Investigation A found in samples from Est. A, resulting in a recall expansion.

Previous FSIS efforts:
- Required relabeling, e.g., from “Ready to heat” to “Ready to cook” or “Raw”
- Required manufacturers to validate cooking instructions
- Removed microwave cooking instructions

FSIS Salmonella Action Plan—update

Develop and implement strategic efforts to prevent and control Salmonella outbreaks.

2014: FSIS targeted Food Safety Assessments towards comminuted poultry establishments to increase understanding of interventions in use.

2014: FSIS conducted sampling to estimate prevalence of Salmonella in raw chicken parts and comminuted poultry; used data to set new or revised performance standards for these product categories.

<table>
<thead>
<tr>
<th>Product</th>
<th>Salmonella</th>
<th>Campylobacter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Broiler carcasses</td>
<td>7.5</td>
<td>10.4</td>
<td>9.8</td>
<td>15.7</td>
</tr>
<tr>
<td>Turkey carcasses</td>
<td>1.7</td>
<td>0.79</td>
<td>7.1</td>
<td>5.4</td>
</tr>
<tr>
<td>Comminuted chicken</td>
<td>*49</td>
<td>*3.4</td>
<td>25.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Comminuted Turkey</td>
<td>*19.9</td>
<td>*1.2</td>
<td>13.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Chicken parts</td>
<td>*28</td>
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* volume-weighted percent positive
* based on 8 months of data

FSIS Actions To Combat Salmonella

Outline: Current FSIS Strategies for Salmonella Prevention and Control

- Salmonella Action Plan
- Compliance Guidelines for industry
- Targeted Food Safety Assessments
- New/revised Salmonella Performance Standards
- New Poultry Inspection System (NPIS)
- Consumer outreach, web postings

2012: FSIS publicly identified Salmonella Heidelberg (and S. Hadar) survival as a research priority
2013: FSIS published the Salmonella Action Plan
2014: FSIS drafted a revised compliance guidance document on the control of Salmonella and Campylobacter in poultry that incorporates pre-harvest strategies.

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Food Safety and Inspection Service: Looking Ahead—New Salmonella Performance Standards

- FSIS is drafting responses to comments requested in 80 FR 3940 (published Jan 2015) and will consider changes on the proposed performance standards in chicken parts, comminuted chicken and turkey:
  - The comment period for 80 FR 3940 was extended to May 26, 2015 (80 FR 12618; published Mar 10, 2015)
  - The poultry performance standards for chicken parts and comminuted chicken and turkey are expected to be finalized by end of CY15

- 2014: FSIS conducted Salmonella-focused consumer outreach through a two-part webinar series and a blog post on FoodSafety.gov
- 2015: FSIS proposed in the Federal Register Notice plans to list chicken slaughter plants by performance category on FSIS’ website to further incentivize improved process control by industry
- Implementation of the New Poultry Inspection System (NPIS) will modernize regulation of poultry slaughter
  - This system allows for FSIS inspectors to focus less on routine quality assurance tasks and instead focus more on strategies that are proven to strengthen food safety

Food Safety and Inspection Service: FSIS Actions To Combat Salmonella

- New FSIS Salmonella Sampling Programs
  - Continuous sampling for Salmonella with a ‘moving window’ methodology for accessing process control by industry
  - Further characterization of Salmonella isolates in real time
  - Pulsed-field gel electrophoresis (PFGE), Antimicrobial resistance testing (AST), Whole Genome Sequencing (WGS)

Food Safety and Inspection Service: New FSIS Salmonella Sampling Programs

- New regulatory and exploratory sampling programs
  - Salmonella in Not-Ready-to-Eat Comminuted Poultry (2013)
  - Salmonella in raw chicken parts (2015)
  - Salmonella in raw pork products (2015)
- NARMS cecal sampling (2014)
- Special Intensified testing and outbreak analyses

Food Safety and Inspection Service: FSIS Raw Pork Products Exploratory Sampling Program

- Exploratory sampling began in May 2015
- Will test for the presence of Salmonella, Campylobacter, STEC, Toxoplasma gondii, MRSA, Yersinia enterocolitica and indicator organisms
- Products sampled include intact and non-intact pork cuts, other non-intact pork, and comminuted pork
- Future analysis of this data will help FSIS better understand public health risks and prevent illness related to pork products

Food Safety and Inspection Service: Continuous Sampling for Salmonella

- May 2015: FSIS began implementation of continuous HACCP sampling to improve verification of process control in establishments
  - Includes chicken parts and comminuted poultry for the first time under routine sampling, using new performance standards
  - Historically, verification testing in poultry has been based only on whole bird carcass rinses and ground poultry samples
  - Will allow the agency to measure prevalence industry-wide

Food Safety and Inspection Service: NARMS Salmonella HACCP and Cecal isolates

- 1996: FSIS takes over culture, subtyping, and AST for HACCP isolates
- 1997: NARMS antimicrobial susceptibility testing (AST) and PFGE on HACCP isolates conducted by USDA/ARS
- 2012: FSIS takes over PFGE and AST for HACCP isolates
- 2013: FSIS takes over culture, subtyping, and AST for Cecal Sampling program
FSIS has begun using Whole Genome Sequencing (WGS) as a tool for decision-making since 2014. WGS represents a new opportunity to advance our understanding of Salmonella.

FSIS anticipates that WGS will eventually replace PFGE, serotyping, and other testing (e.g., antimicrobial susceptibility) with capability to rapidly characterize a strain's subtype, virulence and resistance potential.

**Whole Genome Sequencing (WGS)**

- By sequencing the genome we will be able to characterize foodborne pathogens in a more timely manner making laboratory surveillance more efficient and useful.
- FSIS is currently running WGS on all Listeria and E. coli (O157 and STEC). For Salmonella and Campylobacter, WGS is done per special request.
- FSIS is working towards WGS analyses being available and performed in all FSIS Field Service Labs.
- Best case scenario is for FSIS to phase in NARMS Salmonella WGS in FY16 and PulseNet Salmonella WGS in FY17.

**Challenge**

- Records may be inadequate for effective traceback and trace-forward activities.
- Shopper card information is critical but difficult to obtain.
- Gathering the evidence needed within a critical time period before the “trail becomes cold.”

**Goals**

- Rapid traceback allows for quick and accurate removal of product from commerce to prevent further illnesses.
- Shorten the time between outbreak detection, resolution, and recovery prevents illness.

**Food Safety and Inspection Service**

**Improving Foodborne Illness Response**

**Update on Retail Grinding Logs**

- Thorough recordkeeping by industry is needed for effective traceback.
- Retail grinding logs are especially essential in tracing ground product to its origin.
- In July 2014, FSIS proposed a new rule requiring retail grinders to keep records on suppliers, dates and times of grinding, amounts used, lot numbers, and clean-up times.
- Rule is now in final development.

**Lessons Learned from Outbreak Investigations**

- Strong relationships with Federal, State, and local public health partners are essential.
- Epidemiological evidence in combination with laboratory findings is key to ensure well-informed assessment.
- Early detection and actionable traceback information essential for targeted and effective interventions.
- Early consultation with industry can be key to identify contaminated product and solutions.
- Consumer education, communication, and outreach is important to reduce foodborne illness.

**Food Safety and Inspection Service**

**Questions and Discussion**

Thank you!

**One Team, One Purpose — Protecting Public Health and Preventing Foodborne Illness**

Food Safety and Inspection Service
United States Department of Agriculture

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