

One Team, One Purpose



**Food Safety and Inspection Service**  
Protecting Public Health and Preventing Foodborne Illness



Food Safety and Inspection Service

An FSIS Update on the Prevention and Control of Foodborne *Salmonella*

Karen Becker, DVM, MPH, DACVPM  
Director, Applied Epidemiology Staff  
USDA/Food Safety and Inspection Service  
USAHA *Salmonella* Committee  
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.

Food Safety and Inspection Service  
Background: Verification Activities

- 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



- Alameda CA
- Atlanta GA
- Chicago IL
- Dallas TX
- Denver CO
- Des Moines IA
- Jackson MS
- Philadelphia PA
- Raleigh NC
- Springdale AR

**FSIS's In-Establishment Experts**

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

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**

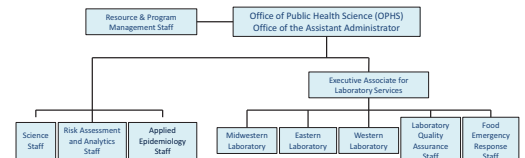
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Food Safety and Inspection Service:  
Environmental Assessment and Traceback/Trace-forward

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

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:  
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.)



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Food Safety and Inspection Service:  
FSIS' Healthy People 2020 Targets for Salmonella

Salmonella reduction is a challenging endeavor

Report/Link Period	Baseline 2007-2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Objective: Total illnesses	425,993	415,586	405,178	394,770	384,362	373,955	363,547	353,139	342,731	
Measure: Total illnesses	436,401	416,792	491,353	479,621	427,171	386,265				
Objective: Salmonella illnesses	404,556	395,148	385,740	376,331	366,923	357,515	348,107	338,698	329,290	
Measure: Salmonella illness	413,965	398,212	472,591	458,359	393,381	360,747				

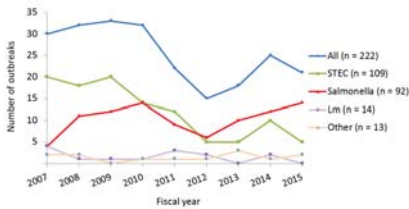
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Food Safety and Inspection Service:  
Outbreak Investigations

- 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



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



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

Food Safety and Inspection Service:  
Salmonella Investigations



- 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*

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

Serotype	Number of clusters	Percent of clusters	Number of illnesses	Percent of illnesses
Typhimurium	12	19.4	318	9.0
Enteritidis	10	16.1	368	10.5
Heidelberg	8	12.9	1,236	35.2
Newport	8	12.9	320	9.1
Other serotypes (16)	24	38.7	1274	36.2
TOTAL	62*	100	3,516	100

\* Not included is one cluster which featured co-infection with *S. Enteritidis* and *Campylobacter jejuni*

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Food Safety and Inspection Service:  
*S. Heidelberg* Facts

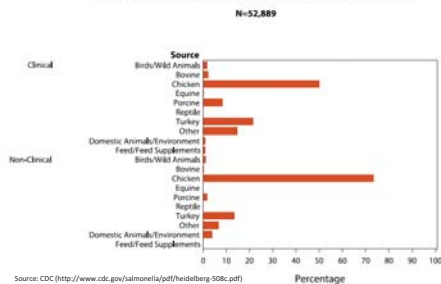
- One of approximately 2500 distinct serotypes of *Salmonella enterica*
- Major cause of foodborne illness in North America
  - Among top 5 commonly isolated *Salmonella* serotypes in the United States
  - In recent years, *S. Heidelberg* has been the cause of high-profile outbreaks linked to FSIS-regulated products
- Has a close association with poultry and shell eggs



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Food Safety and Inspection Service:  
*S. Heidelberg* in Animals

Figure 8 - Percentage of non-human isolates, by type and source, reported by the National Veterinary Services Laboratories, USDA-FSIS, 1968-2011



Source: CDC ([http://www.cdc.gov/salmonella/pdf/heidelberg\\_508c.pdf](http://www.cdc.gov/salmonella/pdf/heidelberg_508c.pdf))

Food Safety and Inspection Service:  
2013-2014 *Salmonella* Heidelberg Outbreak

- 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



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Food Safety and Inspection Service:  
Intensified Sampling during the *S. Heidelberg* investigation

- 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

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Food Safety and Inspection Service:  
Minnesota *Salmonella* Enteritidis Investigations, 2015

- Two illness clusters identified by the Minnesota Department of Health in June 2015
- Each cluster 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



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Food Safety and Inspection Service:  
Minnesota *Salmonella* Enteritidis Investigations, 2015

- 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

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Food Safety and Inspection Service  
Partially-cooked Stuffed Chicken

- 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



Food Safety and Inspection Service  
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

Food Safety and Inspection Service  
FSIS Actions To Combat *Salmonella*

- 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  
FSIS *Salmonella* Action Plan—update

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



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Food Safety and Inspection Service:  
FSIS Actions To Combat *Salmonella*

- 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

Food Safety and Inspection Service:  
Proposed *Salmonella* and *Campylobacter* Performance Standards

Product	Salmonella percent positive	Campylobacter percent positive	Maximum acceptable percent positive		Performance standard (# of allowable positive samples)	
			Salmonella	Campylobacter	Salmonella	Campylobacter
Broiler carcasses	7.5	10.4	9.8	15.7	5 of 51	8 of 51
Turkey carcasses	1.7	0.79	7.1	5.4	4 of 56	3 of 56
Comminuted chicken	**49	**3.4	25.0	1.9	13 of 52	1 of 52
Comminuted Turkey	**19.9	**1.2	13.5	1.9	7 of 52	1 of 52
Chicken parts	**28	**15.5	15.4	7.7	8 of 52	4 of 52

\* volume-weighted percent positive  
\* based on 8 months of data

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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

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Food Safety and Inspection Service:  
FSIS Actions To Combat *Salmonella*

- 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

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Food Safety and Inspection Service:  
Outline: Innovative Processes and Tools

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

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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
  - S. Heidelberg, S. Enteritidis, S. I 4[5]12:l:- investigations

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

Phase	Number of Samples	Establishments	Products	Sampling Method
Phase 1	100 samples	100 establishments	Intact and non-intact pork cuts	Targeted sampling
Phase 2	1000 samples	1000 establishments	Intact and non-intact pork cuts	Continuous random sampling

Food Safety and Inspection Service:  
FSIS Raw Pork Product Exploratory Sampling

- Exploratory sampling began in May 2015
- Will test for the presence of *Salmonella*, *Campylobacter*, STECS, *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

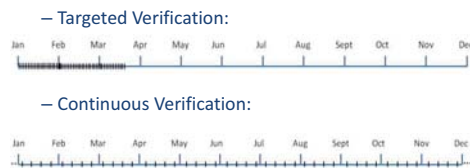
Food Safety and Inspection Service:  
Continuous Sampling for *Salmonella*

[http://www.foodsafetynews.com/files/2015/02/continuous\\_sampling\\_06062015.pdf](http://www.foodsafetynews.com/files/2015/02/continuous_sampling_06062015.pdf)

- 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

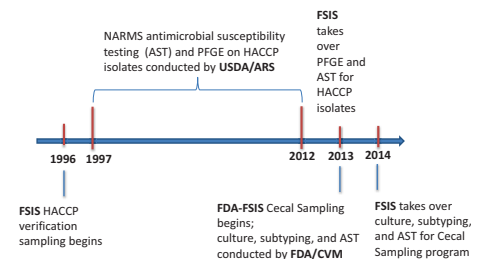
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Food Safety and Inspection Service:  
Continuous Random Verification Sampling



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



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Food Safety and Inspection Service:  
Whole Genome Sequencing (WGS)

- FSIS has begun using 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

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Food Safety and Inspection Service:  
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

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Food Safety and Inspection Service  
Improving Foodborne Illness Response

- 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

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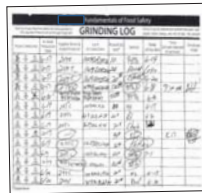
Food Safety and Inspection Service  
Improving Access to Purchase Information

- Purchase information supports traceback during foodborne illness outbreak investigations
- Working with industry to modify rules that delay the retrieval of shopper card information for traceback
  - Notary requirements
  - Case-patient signatures
- Ensure consumers are aware how shopper card information is used to protect public health

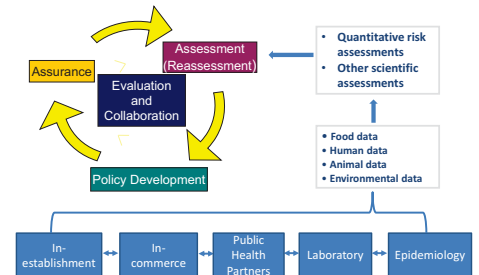
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Food Safety and Inspection Service:  
Update on Retail Grinding Logs

- 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



Food Safety and Inspection Service:  
FSIS Application of Public Health Model



Food Safety and Inspection Service:  
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

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Food Safety and Inspection Service:

Thank you!

One Team, One Purpose -- Protecting Public Health and Preventing Foodborne Illness

Food Safety and Inspection Service  
United States Department of Agriculture  
[www.fsis.usda.gov](http://www.fsis.usda.gov)  
[Karen.becker@fsis.usda.gov](mailto:Karen.becker@fsis.usda.gov)  
202-690-6045

Food Safety and Inspection Service  
Questions and Discussion



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