REPORT OF THE COMMITTEE ON SALMONELLA

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The Committee met on October 21, 2014 at the Sheraton Hotel in Kansas City, Missouri, from 8:00 to 12:00pm. There were 22 members and 29 guests present. After the Chair opened the meeting and welcomed the attendees, he reminded those present to sign the attendance sheets. Members of the committee should check to see that their contact information was correct and if they were not members they were to sign the blank sheets and they could indicate if they would like to become a member of the committee. The Chair briefly overviewed the requirements of becoming a member and that only members could propose resolutions, recommendations and vote. However, everyone was encouraged to participate in the discussion.

The Chair reviewed the previous year's Resolution and the response by USDA. July, 2014, USDA/FSIS denied the Center for Science in the Public Interest (CSPI) petition (http://www.fsis.usda.gov/wps/wcm/connect/73037007-59d6-4b47-87b7-2748edaa1d3e/FSIS-response-CSPI-073114.pdf?MOD=AJPERES), which was the desire of the Resolution. However, on October 1, 2014 CSPI submitted a revised petition to FSIS (http://cspinet.org/new/pdf/oct-14-abr-petition.pdf).

Multistrain Salmonella Outbreaks

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Fewer producers of food having a wider distribution have resulted in changes in the characteristics of foodborne outbreaks. These outbreaks are often caused by industrial contamination events. A few illnesses in each of many jurisdictions have necessitated detection by national laboratory-based surveillance. When bacteria are isolated from ill individuals, these laboratories create DNA fingerprints using pulsed-field gel electrophoresis (PFGE) and the pattern is uploaded into a national data base called PulseNet. The idea is that bacteria with the same fingerprint are more likely to come from a common source. PulseNet monitors the database for collections, or clusters, of similar patterns uploaded in the past 2-4 months. These patterns are visually compared in order to identify indistinguishable patterns. When a cluster of indistinguishable patterns is identified, PulseNet notifies foodborne epidemiologists and an outbreak investigation begins.

How does CDC know when different "fingerprints" come from the same source? They look at 3 primary types of evidence:

1. Epidemiologic: Do ill persons eat food items more frequently than we would expect?
2. Traceback: Do food reported by ill persons come from a common source?
3. Microbiologic: Is the outbreak strain found in the food or production environment?

Evidence in two of the three criteria is generally sufficient for action. There are 3 characteristics of multistrain Salmonella outbreaks:

1. Multiple serotypes or PFE patterns are identified, but have commonalities between human isolates, meat, product, or animal isolates, and environmental samples.
2. Patients have similar epidemiology
3. Patients report the same exposure

The table below lists the multistrain outbreaks since 2011.

Year	Serotype(s)	# PFGE patterns	Vehicle
2011	Heidelberg	2	Ground turkey
2011	Altona, Johannesburg	12	Live poultry
2012	Infantis, Newport, Lille	7	Live poultry
2012	Bareilly, Nchanga	2	Ground tuna
2013	Montivideo, Mbandaka	2	Tahini paste
2013	Infantis, Lille, Newport, Mbandaka	6	Live poultry
2013	Heidelberg	7	Chicken
2014	Newport, Hartford, Oranienburg	4	Sprouted chia powder
2014	Infantis, Newport, Hadar	5	Live poultry

A. Outbreak of Salmonella Heidelberg (July 2013 – July 2014)

On June 17, 2013 PulseNet detected a cluster of Salmonella Heidelberg illnesses with a rare PFGE pattern. After hypothesis-generating interviews of ill persons, 88% of ill persons reported eating chicken and 67% reported eating Company A brand chicken. The same rare PFGE pattern in a chicken breast sample from Company A was identified through routine pathogen testing of retail meat in California.

During July and August, PulseNet detected 6 additional clusters of Heidelberg illnesses with a similar geographic distribution. A high proportion of ill persons reported having eaten chicken, specifically Company A brand. Testing identified outbreak strains in leftover Company A chicken collected from 2 ill person's homes. Therefore the 7 PFGE patterns were combined into a single investigation,

USDA/FSIS in September 2013 conducted testing at 3 Company A facilities. Five of seven outbreak patterns were identified in 2 of the facilities and four of seven patterns were identified in the other facility. During the first week of October over 25 ill persons with a single outbreak strain reported eating rotisserie chickens purchased from the same location of a national warehouse store chain. The chickens were sourced from Company A. California public health officials collected leftovers from the homes of 2 ill persons and identified one of the outbreak strains in both samples

Therefore as of October 2013 a summary of the findings included:

<u>Epidemiologic</u>

- 80% chicken (105/132)
- 79% Company A brand (48/61)
- Illness clusters in CA

- Whole chickens and parts reported

Traceback
- Products traced back to three Company A facilities
- Illnesses could not be linked to one specific product or production period

Microbiologic
- Outbreak strains identified in
  - Patients
  - Leftover food
  - Retail chicken samples from Company A
- Outbreak strains identified by FSIS at the three Company A facilities

On October 7, 2013 USDA/FSIS issued a Public Health Alert and delivered a Notice of Intended Enforcement to Company A. On October 12 and 17 the national warehouse store chain recalled approximately 100,000 pounds of ready-to-eat chicken products.

B. Outbreak due to Salmonella Infantis, Newport, and Hadar (Feb – Oct, 2014)
In April, PulseNet detected 2 clusters of Salmonella Infantis and 1 cluster of Salmonella Newport. Interviews were conducted with ill persons in all clusters with similar temporal and geographic distribution of illnesses. Exposure to live poultry was frequently reported and the poultry was sourced from a single mail-order hatchery (Hatchery A).

In May, PulseNet detected additional Salmonella Infantis cluster and a cluster of Salmonella Hadar illnesses. The temporal and geographic distribution of illnesses were similar to the prior cases. Exposure to live poultry was frequently reported and the poultry was sourced from Hatchery A. Therefore all 5 PFGE patterns were combined into a single jinvestigation.

NVSL Salmonella Update

Brenda Morningstar-Shaw
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***Salmonella* serotypes isolated from animals in the United States: January 1-December 31, 2013**

B.R. Morningstar-Shaw, TA Mackie, DA Barker, CD Brillhart, EA Palmer

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The Diagnostic Bacteriology Laboratory within the National Veterinary Services Laboratories (NVSL) routinely serotype *Salmonella* isolates submitted by private, state, and federal laboratories as well as veterinarians, researchers and other animal health officials. Most submissions were from diagnostic laboratories across the U.S. This report summarizes *Salmonella* serotyping submissions to NVSL from January 1 through December 31, 2013. *Salmonella* isolates are identified as clinical (clinical signs of salmonellosis from primary or secondary infection) or non-clinical (herd and flock monitoring programs, environmental sources, food). Serotyping data from isolates submitted for research purposes are not included in the source specific summaries. Based on information provided by the submitter the isolates were divided into animal source categories for analysis. The animal sources include Avian (avian of unknown origin, condor, crow, finch, hawk, goose, sparrow, partridge, parrot, parakeet, pheasant, pigeon quail, duck, and owl), Cattle, Chicken, Dog/Cat, Horse (horse, donkey, mule), Other Domestic (alpaca, ferret, goat, sheep, guinea pig, llama, mink), Pigs, Reptiles/Amphibians (iguana, lizard, reptile, snake, turtle, tortoise, amphibian, frog, alligator, crocodile), Turkey, Wild/Zoo (antelope, deer, fish, marine

mammals, opossum, rabbit, raccoon, rodent, camel, monkey, lemur, tiger, zebra, rhinoceros, wallaby, cervid, cheetah, coyote, gazelle, jaguar, leopard, lion, warthog), and Other (environment, unknown).

Salmonella serotyping at the NVSL is an ISO 17025 accredited test Salmonellae are typed using polyvalent and single factor antisera to determine the O and H antigens. Approximately 60% of the sera used at the NVSL is produced in house as previously described. (Ewing) The remaining antisera are purchased from commercial vendors. All sera are subject to extensive quality control testing prior to use. *Salmonella* antigenic formulae are determined as previously described (Ewing) and interpreted via the White-Kauffmann-Le Minor scheme (Grimont). The subspecies designation precedes the antigenic formula for those serotypes other than subspecies I.

In 2013, 15,209 submissions were received for *Salmonella* serotyping. *Salmonella* isolates were divided into clinical isolates (5516), non-clinical isolates (6753), research isolates (2725) and "other" (215). Isolates that were submitted for *S*. Enteritidis or *S*. Heidelberg rule-out testing are included in the clinical and non-clinical counts. The sources of clinical and non-clinical *Salmonella* isolates are shown in Table 1. There were 304 different serotypes identified in 2013. Table 2 lists the 10 most common serotypes when all animal sources were combined. The most common isolates from chickens, turkeys, pigs, cattle, and horses are listed in Tables 3-7.

The NVSL provided a *Salmonella* Group D proficiency test to assess the ability of laboratories to isolate *Salmonella* from environmental samples and determine the serogroup (specifically group D) of any *Salmonella* isolated. The samples consisted of drag swabs spiked with *Salmonella* and/or common contaminants. The 2013 test included *Salmonella* serotypes Enteritidis, Javiana, Saintpaul, Anatum, Oranienburg, Heidelberg, Ouakam, Virchow, 9,12:non-motile, and an *sdf* negative Enteritidis. Contaminant bacteria included *Enterobacter cloacae*, *Escherichia coli*, *Citrobacter freundii*, *Pseudomonas aeruginosa*, and *Providencia* sp. The test consisted of 10 samples which were shipped to laboratories overnight on ice packs. Laboratories were instructed to use their current protocols to test and were asked to report the results within 3 weeks. The NVSL randomly retained 8% of the test kits and tested them blindly for QA purposes. The results of the proficiency test are shown in Table 8.
Additionally, the NVSL offered a *Salmonella* serotyping proficiency test to allow laboratories to assess their ability to serogroup or serotype *Salmonella*. The panel consisted of 10 pure *Salmonella* isolates, including *Salmonella* serotypes Heidelberg, Senftenberg, Enteritidis, Kentucky, Mbandaka, Anatum, Give, Typhimurium, Berta and Agona. Participants were given the option to perform serogrouping, partial serotyping, or full serotyping of the isolates and were graded based on appropriate identification to the level of typing they performed. The NVSL randomly retained 19% of the test kits and tested them blindly for QA purposes. The results of the proficiency test are shown in Table 9.

Table 1: Sources of submissions to the NVSL for *Salmonella* serotyping in 2013

Source	**No. Clinical Submissions**	**No. Non-Clinical Submissions**
Cattle	1,504	248
Chicken	182	3,730
Horse	376	121
Swine	2,356	30
Turkey	420	958
All others	1,751	1,723
Total	6,589	6,810

Table 2: Most common serotypes in 2013: All sources

Clinical		**Non-Clinical**	
Serotype	**No. Isolates**	**Serotype**	**No. Isolates**
Typhimurium	921	Senftenberg	895
4,(5),12:i:-	464	Kentucky	716

Dublin	324	Heidelberg	662
Derby	321	Enteritidis	591
Agona	301	Mbandaka	568
Cerro	266	Typhimurium	331
Senftenberg	209	Braenderup	185
Montevideo	196	Anatum	166
Heidelberg	188	Agona	136
Newport	174	Hadar	136
All others	3,225	All others	2,424
Total	**6,589**	**Total**	**6,810**

Table 3: Most common serotypes in 2013: Chickens

Clinical		**Non-Clinical**	
Serotype	**No. Isolates**	**Serotype**	**No. Isolates**
Enteritidis	71	Senftenberg	570
Kentucky	21	Kentucky	505
Typhimurium	15	Mbandaka	429
Heidelberg	9	Heidelberg	371
Mbandaka	8	Enteritidis	329
All others	58	Typhimurium	201
		Infantis	74
		Cerro	67
		Newport	65
		Montevideo	62
		All others	1,057
Total	**182**	**Total**	**3,730**

Table 4: Most common serotypes in 2013: Turkeys

Clinical		**Non-Clinical**	
Serotype	**No. Isolates**	**Serotype**	**No. Isolates**
Senftenberg	135	Senftenberg	228
Albany	58	Hadar	115
Bredeney	32	Anatum	109
Montevideo	32	Albany	78
Ouakam	29	Muenster	73
Heidelberg	28	Agona	70
All others	106	Cerro	29
		Saintpaul	26
		Kentucky	19
		4,(5),12:-	18
		All others	193
Total	**420**	**Total**	**958**

Table 5: Most common serotypes in 2013: Pigs

All Sources	
Serotype	**No. Isolates**
Typhimurium	568
4,(5),12:i:-	359
Derby	315
Agona	210
Infantis	123

Heidelberg	79
Senftenberg	61
Worthington	56
Johannesburg	54
Anatum	49
All others	512
Total	**2,386**

Table 6: Most common serotypes in 2013: Cattle

All Sources	
Serotype	**No. Isolates**
Dublin	324
Cerro	287
Typhimurium	237
Montevideo	147
4,(5),12:i:-	78
Newport	74
Heidelberg	65
Anatum	59
Muenster	46
Meleagridis	41
All others	394
Total	**1,752**

Table 7: Most common serotypes in 2013: Horses

All Sources	
Serotype	**No. Isolates**
Typhimurium	81
Anatum	67
Newport	59
Agona	52
Javiana	21
Braenderup	21
4,(5),12:i:-	18
Muenster	13
Meleagridis	12
Ohio	10
All others	143
Total	**497**

Table 8: Summary of NVSL *Salmonella* Group D proficiency test

	2009	**2010**	**2011**	**2012**	**2013**
Participants	40	55	70	73	61
Mean Score	93%	92%	97%	92%	94%
Score Range	100-44%	100-44%	100-85%	100%-29%	100-68%
Below Passing	4	3	0	N/A*	N/A**

Because of the change in grading method, a pass/fail designation was not assigned.
*2012 Seven individuals scored less than 80%
**2013 Four laboratories scored less that 80%

Table 9: Summary of NVSL *Salmonella* Serotyping proficiency test

	Serogrouping 2012	Serotyping 2012	Serogrouping 2013	Serotyping 2013
Participants	22	13	18	14
Mean Score	98%	92%	98%	98.50%
Score Range	100-90%	100-70%	100-90%	100-90%

Ewing, WH. 1986. Edward and Ewing's Identification of Enterobacteriaceae. 4th edition. Elsevier Science Publishing Co., Inc., New York, U.S.

Grimont, PAD, Weill, FX. 2007. Antigenic Formulae of the *Salmonella* Serovars. 9th edition. WHO Collaborating Centre for Reference and Research on *Salmonella*. Paris, France.

Salmonella enteric serotypes: Antimicrobial resistance trends from the NARMS Program

Heather Harbottle PhD
FDA/NARMS

The National Antimicrobial Resistance Monitoring System (NARMS) is a national public health surveillance program that monitors the susceptibility of enteric bacteria to antimicrobial agents of medical importance in order to help assess the impact of veterinary antimicrobial use on human health. The program is comprised of three Arms - the Human Arm at CDC, the Animal Arm at USDA, and the Retail Arm at the FDA/CVM. All three Arms report resistance trends in non-Typhoidal Salmonella, Campylobacter, E. coli, and Enterococcus species. CDC collects clinical isolates from all 50 states. FDA works with FoodNet and State Public Health Labs to collect retail meat samples from grocery stores in 14 states. Each state lab purchases 10 packages each of chicken breasts, pork chops, ground turkey, and ground beef per month.

All 14 states culture for Salmonella and Campylobacter and four states (GA, OR, TN, MD) culture for E. coli and Enterococcus. The Animal Arm has historically been comprised of HACCP samples collected by USDA-Food Safety Inspection Service (FSIS) from animals at slaughter. Beginning in 2013, the Animal Arm of NARMS is adding an "in-plant" sampling program whereby cecal sampling will be conducted. Cecal samples better reflect animal status and are less confounded by plant events. A randomized, nationally representative testing of slaughterhouses was designed.

An "on-farm" pilot sampling program has been initiated by NARMS and is led by USDA-Agricultural Research Service (ARS) in partnership with universities and industry. The goals of this program include evaluating the logistical challenges and the potential value in adding a pre-harvest component to NARMS, examining the differences in resistance on farm and at slaughter, and exploring this data collection program as point for obtaining antimicrobial drug use information.

The data presented in this presentation is from the 2011 Executive Report. A major revamp of the report is underway, in response to criticisms and requests from stakeholders. The online 2011 Executive Report features an interactive data display where users can customize the graphical representation of the data for particular years, drugs, or sources. It is located at the following website:

http://www.fda.gov/AnimalVeterinary/SafetyHealth/AntimicrobialResistance/NationalAntimicrobialResistanceMonitoringSystem/ucm416741.htm

In 2011, 3,725 non-Typhoidal Salmonella isolates were tested consisting of 2,344 from humans, 357 from retail meats and 1,024 from healthy food animals at slaughter. Animal isolates consisted of 491 from chicken, 103 from turkeys, 340 from cattle, and 90 from swine. In retail meats, Salmonella was isolated from 12% of ground turkey, 12% of retail chicken, 2% of pork chops and 1% of ground beef samples.

The Highest levels of resistance in Human isolates were resistant to tetracycline, streptomycin and

ampicillin. The highest levels of resistance in animal and retail chicken, turkey, cattle, and swine were to tetracycline, sulfa drugs, ampicillin and streptomycin.

Ceftriaxone is considered a critically important drug for treating severe Salmonella infections. A closely related cephalosporin antibiotic, ceftiofur, is licensed for use in food animal production. Historically, the same molecular mechanism has been responsible for resistance to both ceftriaxone and ceftiofur in NARMS isolates. Retail ground turkey isolates resistant to ceftriaxone increased from 5% in 2008 to 22% in 2011. Resistance in isolates from Cattle increased from 59% in 2009 to 77% in 2011 among isolates of serotype Newport. The Continued rise in ceftriaxone resistance led to the April 2012 cephalosporin order of prohibition which prohibits certain unapproved uses of cephalosporin drugs in cattle, swine, chickens and turkeys.

Multi drug resistance (MDR) increased from 30% to 50% in 2011in ground turkey and increased from 28% to 45% in 2011, after peaking at 49% in 2009 in retail chicken. MDR declined in human isolates from 12.1% in 2003-2007 to 9.1% in 2011. Slaughtered Chicken (8%) and slaughtered swine (16%) isolates have declined in 2011 to the lowest levels since testing began. MDR resistance among retail beef and slaughtered turkeys also has declined when compared with the 5 year average. When the 2011 resistance levels from retail turkey and retail chicken are compared to the 5 year baseline, this increase appears to be the largest among the 9 sources tested in NARMS.

MDR in serotype I4,[5],12:i:-increased from 6% in 2007 to 27% in 2011 in human isolates and increased from 7% in 2008 to 33% in 2011 in chickens at slaughter. MDR in serotype Heidelberg increased from 13% in 2006 to 34% in 2010, declining slightly to 30% in 2011 in human isolates. MDR increased from 40% in 2006 to 93% in 2011 in ground turkey and increased from 44% in 2006 to 60% in 2011 in turkeys at slaughter.

Summary

- No resistance was detected in 85% of non-Typhoidal Salmonella isolates from humans in 2011.
- Highest prevalence of resistant Salmonella was identified in retail chicken, retail turkey, and retail pork, followed by poultry at slaughter.
- Ceftriaxone resistance increased in retail turkey and slaughtered cattle isolates.
- Tetracycline resistance in Salmonella serotypes remained at the highest level from all animal sources, followed by streptomycin, ampicillin, and sulfadrugs.
- Ciprofloxacin and nalidixic acid resistance remained less than 3% from all sources.
- MDR to 3 and 4 classes of antimicrobials in Salmonella isolates from retail poultry meats increased.
- MDR in serotype I 4,[5],12:i:- isolates from humans continued to increase; a similar trend was observed among isolates from chickens at slaughter.
- MDR in serotype Heidelberg isolates increased from turkeys (60%) retail turkeys (93%), and remained around 30% in human isolates.
- New testing methods for the Animal Arm component of NARMS will provide more informative data regarding antimicrobial resistance in foodborne pathogens on farm.
- New interactive graphs and a revamped Executive Report will provide more customizable data analyses and more timely reports.
- New whole-genome sequencing data from NARMS isolates will provide improved identification of resistance genes and mobile elements.

FSIS Initiatives to Reduce Human Exposure to Salmonella

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Salmonella/Campylobacter Policy Lead
USDA-FSIS-OPPD-PDS

The following preliminary data from Comminuted Chicken and Turkey samples served as a basis for developing performance standards.

Samples	% Salmonella		
	NRTE Comminuted Chicken		NRTE Comminuted Turkey
Ground	41%		21%
Other	42%		21%
Mechanically separated	82%		52%

Similarly, the Chicken Parts National Prevalence study found the following:

Chicken Part by Type	Number of Samples	Number of Salmonella Positives	Percent Salmonella Positives
A – Breast	776	210	27.06%
B - Neck	22	12	54.55%
C - Leg	584	141	24.14%
D - Wing	321	107	33.33%
E - Half Carcass	149	33	22.15%
F - Quarter Carcass	330	68	20.61%
G - Giblets	57	23	40.35%
H - Other	248	59	23.79%
Type not provided	9	4	44.44%
Totals	2,496	657	

The Performance Standards for the comminuted chicken and Turkey and for chicken parts are currently in rule making and should be published in the next few months.

CVM Salmonella Surveillance Update
Dan McChesney
FDA/CVM

The objective of the Feed Contaminants Program include:

- Survey industry to identify potential problem areas and to ensure compliance
- Provide direction for FDA's sampling program to help detect and control the presence of deleterious chemicals and microorganisms in food for animals. http://www.fda.gov/downloads/AnimalVeterinary/GuidanceComplianceEnforcement/ComplianceEnforcement/UCM113409.pdf

Salmonella Surveillance objectives:

- Determine the prevalence of *Salmonella*
  - Determine the serovar, genetic fingerprint, and antimicrobial susceptibilities of each isolate
- Take action to ensure violative products removed from commence (i.e., recall)
- Sample type
  - Pet food
  - Pet treat
  - Nutritional supplement for pet
  - Complete animal feed
  - Ingredient

- Sample size

  Aseptically collect ten representative sub-samples from each lot, ~200 g per sub sample

Findings of Salmonella Surveillance: Food for Animals

Year	Tested (n)	Positive (n)	Prevalence (%)
2002-2006	869	157	18.1
2007-2009	1189	100	8.4
2010	**584**	**30**	**5.1**
2011	**684**	**51**	**7.4**
2012	**685**	**30**	**4.4**
2010-2012	**1953**	**111**	**5.7**

Sample Type	Prevalence (%)		
	2002-2006	2007-2009	2010-2012
Pet Food	13.0	9.8	**1.7**
Pet Treat	12.3	4.8	**3.5**
Supplement for Pet	18.8	7.1	**1.3**
Animal Feed	9.4	5.6	**6.3**
Plant Based Iingredients	11.0	10.6	**8.8**
Animal Based Ingredients	66.1	41.3	**48.3**

Committee Business:
A proposed Resolution was submitted by Dr. Ed Mallinson (not present) on the Development of practical measures to increase air flow in a broiler house to reduce the presence/level of Salmonella. After discussion the Resolution was not approved.

OTHER NOTES:
Dr. Denise Brinson, although was not on the agenda, submitted the NPIP update as a part of this report.

NATIONAL POULTRY IMPROVEMENT PLAN

National Plan Status Report
Dr. Denise L. Brinson
Senior Coordinator
National Poultry Improvement Plan
USDA, APHIS, VS, SPRS

Pullorum-Typhoid Status:

There were no isolations of *Salmonella* pullorum in commercial poultry in FY2011, FY2012, FY2013, or FY2014. There were no isolations of *Salmonella* pullorum in backyard birds in FY2013 or FY2014. There have been no isolations of Salmonella *gallinarum* since 1987 in any type poultry in the US.

Hatchery Participation in the National Poultry Improvement Plan Testing Year FY2014	
Egg and Meat-Type Chickens: Participating	**225**
Turkeys: Participating	**37**
Waterfowl, Exhibition Poultry and Game Birds: Participating	**734**

Egg-Type Chicken Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year FY2014	
U.S. Pullorum-Typhoid Clean Flocks	**237**
Birds in Flocks	**6,233,761**
Birds Tested	**51,103**

Meat-Type Chicken Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year FY2014	
U.S. Pullorum-Typhoid Clean Flocks	**3,192**
Birds in Flocks	**72,671,121**
Birds Tested	**224,154**

Turkey Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year FY2014	
U.S. Pullorum-Typhoid Clean Flocks:	**492**
Birds in Flocks	**4,886,147**
Birds Tested	**20,048**

Waterfowl, Exhibition Poultry, and Game Birds Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year FY2014	
U. S. Pullorum-Typhoid Clean Flocks	**5,601**
Birds in Flocks	**1,574,450**
Birds Tested	**326,128**

U.S. *Salmonella enteritidis* Clean Egg-Type Breeding Chickens
No. of flocks and birds in flocks by State with *Salmonella* enteritidis isolates, 1990-2014

Arkansas	**Environmental**	**Dead Germ**	**Birds**
Flocks	1		2
Birds in Flocks	6,000		15,000
Georgia			
Flocks	4	2	
Birds in Flocks	50,400	46000	
Illinois			
Flocks	3	2	1
Birds in Flocks	3,900	3700	1200
Indiana			
Flocks	15	2	1
Birds in Flocks	158,345	27,479	15,092
Kentucky			
Flocks	1		
Birds in Flocks	6,625		
Ohio			
Flocks	17		9
Birds in Flocks	192,700		91,600
Oregon			
Flocks	2		
Birds in Flocks	19,516		
Pennsylvania			
Flocks	16		6
Birds in Flocks	166,385		78,450
Texas			
Flocks	1		
Birds in Flocks	10,000		

Phage Type 13	**Environmental**	**Dead Germ**
Flocks	11	2
Birds in Flocks	152,000	3,700
Phage type 13A		
Flocks	5	2
Birds in Flocks	54,321	27,479
Phage type 2		
Flocks	2	
Birds in Flocks	28,900	
Phage type 23		
Flocks	21	
Birds in Flocks	16,000	
Phage type 28		
Flocks	2	2
Birds in Flocks	15,000	46,000
Phage type 34		
Flocks	2	
Birds in Flocks	12,500	
Phage type RNDC		
Flocks	1	
Birds in Flocks	7,000	
Phage type-Untypable		
Flocks	2	
Birds in Flocks	24,000	
Phage type 8		
Flocks	21	
Birds in Flocks	237,701	

Egg-type Chicken breeding flocks with isolates of *Salmonella enteritidis* by phage type and by year 1989-2014		
Year	**No. Flocks**	**Phage Type**
1989	1	13A
1990	11	13A, 13, 8, 28
1991	12	13A, 13, 8
1992	10	Untypable,13A,8,28,34
1993	5	Untypable, 8, 2
1994	3	13A, 8
1995	2	13A, 28
1996	5	Untypable, RNDC, 13A,8,2
1997	2	8
1998	2	8
1999	1	13
2000	4	13, 8
2001	1	13
2002	0	
2003	0	
2004	0	
2005	1	13
2006	1	34
2007	4	13, 8
2008	3	8
2009	0	
2010	3	8(2), 13
2011	0	
2012	0	
2013	0	
2014	1	NA

U.S. *Salmonella* enteritidis Clean Egg-Type Breeding Chickens No. of flocks and birds in the flocks with *Salmonella* enteritidis isolates, 1990-2014			
	Environmental	**Dead Germ**	**Bird**
Flocks	72	6	19
Birds in Flocks	726,871	77,179	201,342