



Serotypes Profile of *Salmonella* Isolates from Meat and Poultry Products January 1998 through December 2014

Summary

The Food Safety and Inspection Service (FSIS) conducts nontyphoidal¹ *Salmonella* serotype testing on isolates recovered from raw meat and poultry products subject to sampling under the Pathogen Reduction Hazard Analysis and Critical Control Point (PR/HACCP) verification testing program. The results presented here provide an estimate of relative serotype distributions for each product class during the 16-year period following implementation of the PR/HACCP program (1998-2014). All data sets are reported by calendar year (CY).

Introduction

Salmonella is the leading cause of bacterial foodborne illness in the United States and causes an estimated 1.2 million illnesses, 19,000 hospitalizations and 380 deaths, each year (4). Attribution data from 2014, estimates that 360,000 (30%) of foodborne illnesses are attributed to FSIS-regulated products which is a 9.3% decrease when compared to 2010 (16,22). The Centers for Disease Control and Prevention (CDC) reports that the severity of disease depends on a variety of factors including host-specific and pathogen-specific factors including the serotype designation (6). Although there are more than 2,500 *Salmonella* serotypes, it is estimated that less than 100 of them cause human illness (6).

FSIS is committed to implementing, revising and enforcing programs that align with FSIS' strategic goals and Healthy People 2020 Goals to reduce *Salmonella* illnesses attributable to FSIS-regulated products (16,17,18). To this end, FSIS reviews serotype data generated through PR/HACCP sampling to monitor trends of isolates identified in various products to proactively guide decisions affecting food safety and public health.

PR/HACCP program

In the early- to mid-1990s, FSIS conducted nationwide microbiological [baseline studies](#) to estimate the prevalence and levels of bacteria of public health concern in specific food commodities (7,8). In July 1996, FSIS published the [\(PR/HACCP\) Systems, Final Rule](#), based on these baseline studies which established pathogen reduction performance standards for *Salmonella* for establishments that slaughter selected classes of food animals or produce raw ground products including carcasses of cow/bulls, steers/heifers, market hogs², broilers (young chicken), ground beef, ground chicken, and ground turkey (7). In June 2006, FSIS implemented *Salmonella* performance standards for turkey carcasses (13). In 2011, FSIS implemented performance standards for *Campylobacter* and more stringent standards for *Salmonella* in poultry carcasses (chicken/turkey) (14,15).

¹ Nontyphoidal refers to all serotypes of *Salmonella* except for Typhi, Paratyphi A, Paratyphi B (tartrate negative) and Paratyphi C.

² FSIS suspended scheduling cows/bulls from sampling in 2011 and market hogs and steer/heifers in 2012 because of the low number of positive samples.



The *Salmonella* performance standards provide a measure by which industry and FSIS inspection personnel can evaluate whether the food safety system at a particular establishment is effectively controlling *Salmonella*. Under a performance standard, each establishment is subjected to a series of sampling events. The number of samples and allowable positives in a set of samples (sample set) vary by product class and pathogen (7,8). The Agency believes that a reduction in human illness should result from the implementation and enforcement of performance standards because a smaller proportion of raw meat and poultry products will likely be contaminated with *Salmonella* than would be the case without standards (11).

Serotyping

Serotyping is a process by which the types of *Salmonella* can be differentiated based on their surface antigens (1). The serotypes are based on standard nomenclature according to the Kaufmann-White scheme maintained by the World Health Organization (WHO) (21).

FSIS inspection personnel collect and submit product samples to one of three FSIS Field Service Laboratories (FSLs) in Athens, GA; Alameda, CA; or St. Louis, MO for *Salmonella* analysis. Prior to 2012, isolates of *Salmonella*-positive samples were sent to the National Veterinary Services Laboratory (NVSL) for serotyping. Since 2012, the *Salmonella* isolates have been serotyped by the Outbreaks Section of the Eastern Laboratory (OSEL) at the FSL in Athens, GA, using a molecular serotyping method developed by the CDC (1). Any sample that cannot be serotyped using this method is sent to the USDA Animal and Plant Health Inspection Service's (APHIS) National Veterinary Services Laboratories (NVSL) in Ames, Iowa, for traditional serotyping methodology (antisera agglutination).

FSIS PR/HACCP *Salmonella* Data Collection

Prior to 2006, there were two phases of the PR/HACCP for *Salmonella* in raw products: non-targeted and targeted testing. FSIS collected non-targeted or "A" set samples at establishments randomly selected from the population of eligible establishments with a goal of scheduling every eligible establishment at least once a year. Additional sampling represented sets (referred to as "B", "C", and "D") collected from establishments targeted for follow-up testing following a failed set (7,8,9).

From June 2006 until the end of 2014, FSIS has scheduled establishments based on criteria that are risk-based rather than random (7,8). The new scheduling criteria focused on establishments with the most *Salmonella*-positive samples, including serotypes most frequently associated with human salmonellosis within each product class. (7,8,9,10). As a result of this change in sampling, results from establishments prior to June 2006 cannot be compared to those reported following the new schedule.

This report includes aggregate data based on large numbers of test results. Although these data provide insight into *Salmonella* contamination in products sampled under the program, FSIS verification sampling is not designed to estimate national prevalence of *Salmonella* by class of products. A true estimate of prevalence can only be derived from randomly selected samples in a nationwide baseline study designed specifically to determine prevalence (8).



Future Direction of PR/HACCP Sampling

In January 2015, FSIS announced changes to its current set-based model of sampling to be able to estimate the prevalence of *Salmonella* in FSIS products and monitor trends. The Agency has implemented routine sampling and a method called the “moving window” to assess process control (15). A moving window is one in which FSIS evaluates a set time period, 52-weeks, in a single establishment to assess process control. Routine sampling and the moving window together allows FSIS to distinguish between compliant and non-compliant establishments while collecting prevalence data. Routine sampling began with young chicken and young turkey carcasses in May, 2015 (20).

Tables and Figures

Each table presented in this report identifies the ten most common *Salmonella* serotypes isolated annually per specific product class (1998-2014). When more than one serotype ranks in tenth place, each serotype in tenth place is listed (Table 1-8). The 10 most common serotypes isolated from a specified product class during a given year are identified by name while less commonly identified serotypes are included in the "other serotypes" category. When FSIS could not identify a specific serotype or identified an isolate as monophasic³ or nonmotile⁴, the isolate was entered as “Unidentified” in the tables. Isolates that FSIS was unable to serotype are listed in the tables as “Not typed.” Each table includes the number of isolates of each serotype and category, the percent of total serotyped isolates, and the percent of total samples collected.

Highlights of PR/HACCP *Salmonella* serotype data, CY-2014

In 2014, FSIS sampled across three *Salmonella* risk-based sampling projects including: young chicken (broiler) carcass (HC11_BR), young turkey carcass (HC11_TU), and ground beef (HCO1_GB). Among the 18055 samples collected, 472/18055 (2.6%) of the isolates were positively identified and serotyped. Among serotyped results, young chicken carcass represented the abundance of positives 324/472 (68.6%), followed by ground beef 116/472 (24.6%) and turkey carcass 32/472 (6.8%).

The top 10 *Salmonella* serotypes identified from PR/HACCP testing in 2014 are listed in Table 1a. FSIS uses this ranking along with the ranking of product specific serotype results to monitor industry’s compliance with regulatory standards, inform future performance standards and compare with complementary active (i.e. The Foodborne Diseases Active Surveillance Network (FoodNet)) and passive (CDC’s Public Health Laboratory Information System (PHLIS)) *Salmonella* surveillance data that estimate the burden of salmonellosis in the U.S. (3,4,5). Because human salmonellosis cases are commonly attributable to non-FSIS regulated foods and non-food sources, FSIS works closely with its public health partners to identify the proportion of human salmonellosis attributable to FSIS regulated products.

³ Monophasic means that the *Salmonella* will produce only one kind of flagellin based on its genetic make-up.

⁴ Non-motile means that there is no genetic code in the *Salmonella* for the development of a functional flagellin.



Table 1a.

Top 10 <i>Salmonella</i> serotypes (CY-2014) *FSIS PR/HACCP		
Serotype	Number of Isolates	Percent of Total Positive
Kentucky	205	43
Enteritidis	45	9.5
Montevideo	29	6.1
Typhimurium	28	5.9
Infantis	23	4.8
Dublin	16	3.4
Heidelberg	12	2.5
Reading	12	2.5
Cerro	12	2.5
Newport	10	2.3
Muenchen	10	2.3
Anatum	6	1.3
Agona	6	1.3
Total (includes all serotyped isolates)	472	

*Commodities Include: Young Chicken (Broiler), Young Turkey and Ground Beef.

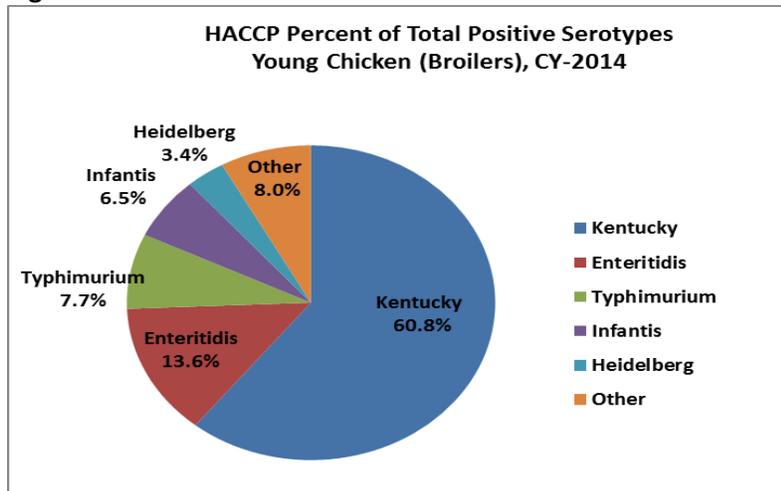
Young Chicken Carcass (Broiler):

In 2014, 8,816 young chicken carcass samples were analyzed under the PR/HACCP program (Table 1). *Salmonella* was isolated from 3.7% (325/8816) of these samples. Of the positive broiler samples, 60.8% (197/325) were positive for *S. Kentucky* followed by *Salmonella* Enteritidis 13.6% (44/324) (Figure 1).

Young chicken carcasses are regarded as the product class with the greatest potential to cause exposure of the public to *Salmonella* (18). For this reason, FSIS continues to direct its resources toward implementing and revising performance standards to reduce the load of *Salmonella* in chicken carcasses. Since 1998, *Salmonella* Kentucky has ranked as the most common serotype identified among PR/HACCP young chicken isolates. *Salmonella* Kentucky, from chicken carcasses, however, is not among the serotypes commonly associated with human illness in the U.S.

Salmonella Enteritidis was the second most common serotype identified in young chicken carcasses and is currently the most common serotype associated with human illness (3,12). It also ranks as the second most common cultured confirmed isolate from PHLIS (3,5). Eggs are reported to be the most common food commodity associated with *S. Enteritidis* outbreaks (23). There has been a steady decline in the PR/HACCP percent positive results for *S. Enteritidis* in young chicken since 2010 (14.8% to 9.4%).

Figure 1.



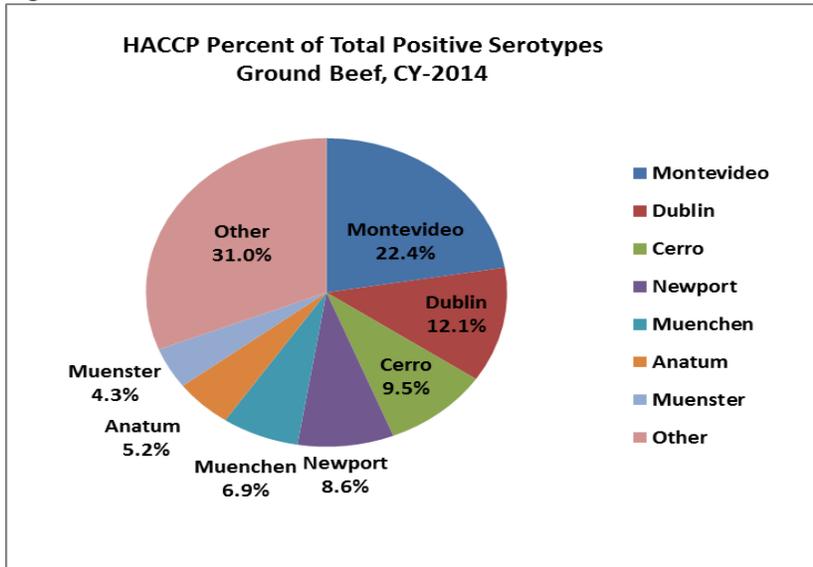
Ground Beef

In 2014, 7,320 ground beef samples were analyzed under the PR/HACCP program (Table 5). *Salmonella* was isolated from 1.6% (116/7,320) of these samples which is a decrease since 2011. Of the ground beef positive samples, 22.4% (26/116) were positive for *Salmonella* Montevideo followed by *Salmonella* Dublin (12.1%) 14/116 (Figure 2). Since 1998, *S. Montevideo* has ranked as the most common serotype identified among PR/HACCP ground beef isolates. *S. Montevideo*, from ground beef, however, is not among the serotypes commonly associated with human illness in the U.S. (3,4,5,24).

Salmonella Dublin was identified as the second most common serotype among ground beef samples, in 2014. *S. Dublin* is reported to cause more severe illness than any other non-typhoidal *Salmonella*, although it is an uncommon cause of human illness (1,3,4,5).

Salmonella Dublin is a host adapted serotype found in cattle and occasionally in swine, sheep and horses that rarely infects humans (1). In a study by Jones et al., comparing the severity of illness outcomes caused by different serotypes, *Salmonella* Dublin was found to cause highest rate of hospitalization (67%), invasive infection (64%) and deaths (3%) when compared to other serotypes analyzed in the study. In cattle herds, *S. Dublin* can cause high fever, respiratory illness (especially in calves) abortions and death (26). Compounding the ability of *S. Dublin* to cause severe disease in both humans and animals is its increasing levels of resistance to ceftriaxone (i.e., 0-92% in humans and 0-85% in animals) the primary treatment over the last 15 years (25). Also, salmonellosis caused by *S. Dublin* is frequently multi-drug resistant leading to poorer clinical outcomes (24,25). *Salmonella* Dublin was first identified in FSIS PR/HACCP ground beef samples in 2003. Since 2003, among positive ground beef samples, *S. Dublin* has ranged between 5%-13%. A few positive isolates have also been noted, historically, in steer/heifer and cow/bull carcasses.

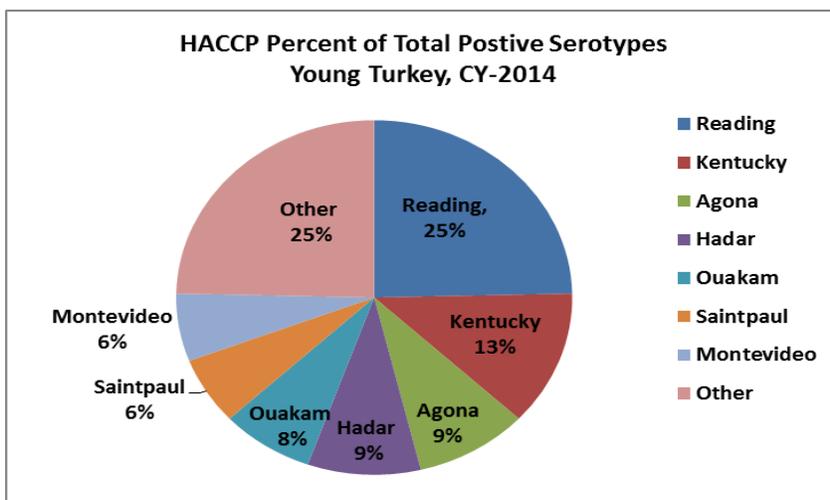
Figure 2.



Young Turkey Carcass

In 2014, 1,919 young turkey samples were analyzed under the PR/HACCP program (Table 8). *Salmonella* was isolated from 1.7% (32/1919) of these samples which is a decrease from 2013. Of the young turkey positive samples, 25.0% (8/32) were positive for *S. Reading* (Figure 3). Since 2012, *Salmonella Reading* has ranked among the top three serotypes identified among PR/HACCP isolates. *S. Reading* has not been considered a major contributor to human salmonellosis from turkey products in the U.S. (3,4,5).

Figure 3.





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Tables

Table 1
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	139	26.68	2.46
Heidelberg	92	17.66	1.63
Typhimurium var. Copenhagen	41	7.87	0.72
Typhimurium	40	7.68	0.71
Hadar	33	6.33	0.58
Schwarzengrund	21	4.03	0.37
Montevideo	16	3.07	0.28
Enteritidis	14	2.69	0.25
Thompson	14	2.69	0.25
Infantis	7	1.34	0.12
Istanbul	7	1.34	0.12
^a Other serotypes	58	11.13	1.02
^b Unidentified isolates	39	7.49	0.69
Total serotyped isolates	521	85.0	9.21
Not typed	92	15	1.63
Total positive	613	100	10.83
Total number of analyzed samples	5,659		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	188	25.72	2.78
Heidelberg	138	18.88	2.04
Hadar	83	11.35	1.23
Typhimurium var. Copenhagen	52	7.11	0.77
Typhimurium	41	5.61	0.61
Thompson	30	4.10	0.44
Litchfield	16	2.19	0.24
Infantis	15	2.05	0.22
Schwarzengrund	12	1.64	0.18
Istanbul	11	1.50	0.16
^a Other serotypes	102	13.95	1.51
^b Unidentified isolates	43	5.88	0.64
Total serotyped isolates	731	94.7	10.80
Not typed	41	5.31	0.61
*Total positive	772	100	11.41
Total number of analyzed samples	6,768		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	219	25.49	2.18
Heidelberg	198	23.05	1.97
Typhimurium var. Copenhagen	57	6.64	0.57
Typhimurium	55	6.40	0.55
Hadar	42	4.89	0.42
Montevideo	37	4.31	0.37
Thompson	27	3.14	0.27
Schwarzengrund	25	2.91	0.25
Enteritidis	23	2.68	0.23
Berta	18	2.10	0.18
^a Other serotypes	112	13.04	1.11
^b Unidentified isolates	46	5.36	0.46
Total serotyped isolates	859	94	8.54
Not typed	55	6.0	0.55
Total positive	914	100	9.09
Total number of analyzed samples	10,057		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	352	33.59	3.93
Heidelberg	260	24.81	2.90
Typhimurium	67	6.39	0.75
Typhimurium var. Copenhagen	35	3.34	0.39
Montevideo	32	3.05	0.36
Schwarzengrund	32	3.05	0.36
Hadar	31	2.96	0.35
Thompson	26	2.48	0.29
Enteritidis	17	1.62	0.19
Berta	13	1.24	0.15
^a Other serotypes	121	11.55	1.35
^b Unidentified isolates	62	5.92	0.69
Total serotyped isolates	1048	98.4	11.70
Not typed	17	1.6	0.19
*Total positive	1065	100	11.89
Total number of analyzed samples	8,955		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	382	36.28	4.16
Heidelberg	262	24.88	2.85
Typhimurium var. Copenhagen	67	6.36	0.73
Hadar	46	4.37	0.50
Typhimurium	46	4.37	0.50
Enteritidis	33	3.13	0.36
Thompson	23	2.18	0.25
Montevideo	20	1.90	0.22
Schwarzengrund	18	1.71	0.20
Infantis	14	1.33	0.15
Mbandaka	14	1.33	0.15
^a Other serotypes	70	6.65	0.76
^b Unidentified isolates	58	5.51	0.63
Total serotyped isolates	1053	99.4	11.47
Not typed	6	0.57	0.07
*Total positive	1059	100	11.53
Total number of analyzed samples	9,183		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	297	35.96	4.59
Heidelberg	164	19.85	2.54
Typhimurium var. Copenhagen	79	9.56	1.22
Typhimurium	50	6.05	0.77
Enteritidis	29	3.51	0.45
Infantis	20	2.42	0.31
Thompson	17	2.06	0.26
Montevideo	17	2.06	0.26
Hadar	15	1.82	0.23
Mbandaka	15	1.82	0.23
^a Other serotypes	79	9.56	1.22
^b Unidentified isolates	44	5.33	0.68
Total serotyped isolates	826	99.8	12.77
Not typed	2	.24	0.03
*Total positive	828	100	12.80
Total number of analyzed samples	6,468		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	409	42.74	5.78
Heidelberg	145	15.15	2.05
Typhimurium var. Copenhagen	84	8.78	1.19
Enteritidis	58	6.06	0.82
Typhimurium	50	5.22	0.71
^c 4,[5],12:i:-	29	3.03	0.41
Schwarzengrund	27	2.82	0.38
Montevideo	20	2.09	0.28
Mbandaka	15	1.57	0.21
Infantis	12	1.25	0.17
^a Other serotypes	105	10.97	1.48
^b Unidentified isolates	3	0.31	0.04
Total serotyped isolates	957	100	13.53
Not typed	-	-	-
*Total positive	957	100	13.53
Total number of analyzed samples	7,072		



Table 1—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	703	45.18	7.33
Heidelberg	226	14.52	2.36
Typhimurium	147	9.45	1.53
Enteritidis	120	7.71	1.25
^c 4,[5],12:i:-	87	5.58	0.90
Montevideo	54	3.47	0.56
Schwarzengrund	44	2.83	0.46
Thompson	18	1.16	0.19
Hadar	16	1.03	0.17
Mbandaka	16	1.03	0.17
^a Other serotypes	121	7.78	1.26
^b Unidentified isolates	4	0.26	0.04
Total serotyped isolates	1556	99.8	16.22
Not typed	3	0.2	0.03
Total positive	1559	100	16.25
Total number of analyzed samples	9,592		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	570	48.97	5.58
Enteritidis	159	13.66	1.56
Heidelberg	132	11.34	1.29
Typhimurium	94	8.08	0.92
^c 4,[5]12:i:-	70	6.01	0.68
Montevideo	19	1.63	0.19
Schwarzengrund	15	1.29	0.15
Infantis	12	1.03	0.12
Mbandaka	12	1.03	0.12
^a Other serotypes	75	6.44	0.73
^b Unidentified	6	0.52	0.06
Total serotyped isolates	1164	100	11.41
Not typed	-	-	-
Total positive	1164	-	11.41
Total number of analyzed samples	10,206		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	379	47.14	4.03
Heidelberg	108	13.43	1.15
Enteritidis	87	10.82	0.92
Typhimurium	72	8.96	0.77
^c I 4,[5],12:i:-	37	4.6	0.39
Montevideo	18	2.24	0.19
Berta	12	1.49	0.13
Infantis	12	1.49	0.13
Mbandaka	9	1.12	0.10
^a Other serotypes	67	8.33	0.71
^b Unidentified	3	0.37	0.03
Total serotyped isolates	804	100	8.55
Not typed	-	-	-
Total positive	804	100	8.55
Total number of analyzed samples	9,408		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	179	36.83	2.72
Enteritidis	89	18.31	1.35
Heidelberg	63	12.96	0.96
Typhimurium	56	11.52	0.85
^c I 4,[5],12:i:-	16	3.29	0.24
Infantis	10	2.06	0.15
Montevideo	10	2.06	0.15
Schwarzengrund	7	1.44	0.11
Senftenberg	5	1.03	0.08
Thompson	5	1.03	0.08
^a Other serotypes	41	8.44	0.62
^b Unidentified	5	1.03	0.08
Total serotyped isolates	486	100	7.39
Not typed	-	-	-
Total positive	486	100	7.39
Total number of analyzed samples	6,574		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	183	39.61	2.84
Enteritidis	96	20.78	1.49
Heidelberg	65	14.07	1.01
Typhimurium	30	6.49	0.47
^c 8,20:-:z6	11	2.38	0.17
^c 14,[5],12:i:-	10	2.16	0.16
Montevideo	8	1.73	0.12
Schwarzengrund	6	1.30	0.09
Senftenberg	6	1.30	0.09
Worthington	6	1.30	0.09
^a Other serotypes	36	7.79	0.56
^b Unidentified	4	0.87	0.06
Total serotyped isolates	461	99.78	7.16
Not typed	1	0.22	0.02
*Total positive	462	100	7.18
Total number of analyzed samples	6,439		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	208	45.41	3.05
Enteritidis	124	27.07	1.82
Typhimurium	41	8.95	0.60
Heidelberg	16	3.49	0.23
^c I 4,[5],12:i:-	10	2.18	0.15
Johannesburg	6	1.31	0.09
Schwarzengrund	5	1.09	0.07
Senftenberg	5	1.09	0.07
Berta	4	0.87	0.06
Braenderup	4	0.87	0.06
Thompson	4	0.87	0.06
^a Other serotypes	24	5.24	0.35
^b Unidentified	5	1.09	0.07
Total serotyped isolates	456	0.99	6.68
Not typed	2	0.44	0.03
*Total positive	458	100	6.71
Total number of analyzed samples	6,828		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	169	51.84	3.33
Enteritidis	75	23.01	1.48
Typhimurium	21	6.44	0.41
Infantis	12	3.68	0.24
Heidelberg	9	2.76	0.18
Johannesburg	5	1.53	0.10
^c I 4,[5],12:i:-	5	1.53	0.10
^c 8,20:-:z6	3	0.92	0.06
Mbandaka	3	0.92	0.06
Berta	2	0.61	0.04
Braenderup	2	0.61	0.04
Brandenburg	2	0.61	0.04
Litchfield	2	0.61	0.04
Senftenberg	2	0.61	0.04
Thompson	2	0.61	0.04
^a Other serotypes	7	2.15	0.14
^b Unidentified	5	1.53	0.10
Total serotyped isolates	326	100	6.42
Not typed	-	-	-
*Total positive	326	100	6.42
Total number of analyzed samples	5076		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	228	48.41	2.09
Enteritidis	92	19.53	0.84
Typhimurium	41	8.70	0.38
Thompson	21	4.46	0.19
Infantis	19	4.03	0.17
Heidelberg	16	3.40	0.15
ϕI 4,[5],12:i:-	14	2.97	0.13
Schwarzengrund	8	1.70	0.07
Montevideo	5	1.06	0.05
Hadar	4	0.85	0.04
Mbandaka	4	0.85	0.04
Other serotypes	19	4.03	0.17
Unidentified isolates	0	0.00	0.00
Total serotyped isolates	471	100	4.31
Not typed	-	-	-
*Total positive isolates	471	100	4.31
Total number of analyzed samples	10933		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2013	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	219	50.34	1.97
Enteritidis	58	13.33	0.52
Typhimurium	45	10.34	0.40
Infantis	23	5.29	0.21
Schwarzengrund	21	4.83	0.19
Heidelberg	18	4.14	0.16
^c I 4,[5],12:i:-	17	3.91	0.15
Thompson	13	2.99	0.12
Montevideo	3	0.69	0.03
Newport	2	0.46	0.02
Muenchen	2	0.46	0.02
Mbandaka	2	0.46	0.02
Litchfield	2	0.46	0.02
^a Other serotypes	10	2.30	0.03
^b Unidentified isolates	1	0.23	.01
Total serotyped isolates	435	100	3.91
Not typed	-	-	-
*Total positive isolates	435	100	3.91
Total number of analyzed samples	11123		



Table 1 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Chicken (Broilers)
(1998–2005 'A' Set Samples; 2006–2014 All Samples)

Serotypes 2014	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	197	60.80	2.23
Enteritidis	44	13.58	0.50
Typhimurium	25	7.72	0.28
Infantis	21	6.48	0.24
Heidelberg	11	3.40	0.12
I 4,[5],12:i:-	6	1.85	0.07
Schwarzengrund	5	1.54	0.06
Mbandaka	4	1.23	0.05
Thompson	4	1.23	0.05
Hartford	2	0.62	0.02
Braenderup	1	0.31	0.01
Hadar	1	0.31	0.01
Montevideo	1	0.31	0.01
Muenchen	1	0.31	0.01
Johannesburg	1	0.31	0.01
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	325	100	3.68
Not typed	-	-	-
*Total positive isolates	325	100	3.68
Total number of analyzed samples	8816		

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.



Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.

Table 2
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	13	20.63	0.94
Typhimurium var. Copenhagen	10	15.87	0.72
Agona	5	7.94	0.36
Schwarzengrund	4	6.35	0.29
Heidelberg	3	4.76	0.22
London	3	4.76	0.22
Muenchen	3	4.76	0.22
Brandenburg	2	3.17	0.14
Hadar	2	3.17	0.14
Infantis	2	3.17	0.14
Typhimurium	2	3.17	0.14
Worthington	2	3.17	0.14
^a Other serotypes	11	17.46	0.79
^b Unidentified isolates	1	1.59	0.07
Total serotyped isolates	63	.78	4.53
Not typed	18	22.2	1.29
Total positive	81	100	5.83
Total number of analyzed samples	1,390		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	40	28.99	2.08
Typhimurium var. Copenhagen	11	7.97	0.57
Heidelberg	8	5.80	0.42
Anatum	7	5.07	0.36
Infantis	7	5.07	0.36
Johannesburg	7	5.07	0.36
Uganda	7	5.07	0.36
Agona	5	3.62	0.26
Manhattan	5	3.62	0.26
Reading	5	3.62	0.26
^a Other serotypes	33	23.91	1.72
^b Unidentified isolates	3	1.59	0.16
Total serotyped isolates	138	73.0	7.18
Not typed	51	27.0	2.65
Total positive	189	100	9.83
Total number of analyzed samples	1,923		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	66	22.60	1.28
Typhimurium var. Copenhagen	47	16.10	0.91
Johannesburg	24	8.22	0.46
Infantis	20	6.85	0.39
Heidelberg	17	5.82	0.33
Anatum	10	3.42	0.19
Typhimurium	9	3.08	0.17
Minnesota	8	2.74	0.15
Brandenburg	7	2.40	0.14
Manhattan	7	2.40	0.14
Reading	7	2.40	0.14
Saintpaul	7	2.40	0.14
Senftenberg	7	2.40	0.14
^a Other serotypes	51	17.47	0.99
^b Unidentified isolates	5	1.71	0.10
Total serotyped isolates	292	90.4	5.65
Not typed	31	9.6	0.60
Total positive	323	100	6.25
Total number of analyzed samples	5,170		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	101	33.01	1.25
Infantis	26	8.50	0.32
Anatum	22	7.19	0.27
Typhimurium var. Copenhagen	21	6.86	0.26
Saintpaul	14	4.58	0.17
Heidelberg	13	4.25	0.16
Reading	13	4.25	0.16
Johannesburg	11	3.59	0.14
Uganda	10	3.27	0.12
Typhimurium	9	2.94	0.11
^a Other serotypes	63	20.59	0.78
^b Unidentified isolates	3	0.98	0.04
Total serotyped isolates	306	99.7	3.78
Not typed	1	0.33	0.01
Total positive	307	100	3.79
Total number of analyzed samples	8,090		



Table 2—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	72	30.38	0.96
Typhimurium var. Copenhagen	31	13.08	0.41
Infantis	14	5.91	0.19
Saintpaul	14	5.91	0.19
Anatum	13	5.49	0.17
Reading	8	3.38	0.11
Heidelberg	7	2.95	0.09
Johannesburg	7	2.95	0.09
Typhimurium	7	2.95	0.09
Uganda	7	2.95	0.09
^a Other serotypes	57	24.05	0.76
^b Unidentified isolates	-	-	-
Total serotyped isolates	237	100	3.17
Not typed	-	-	-
Total positive	237	100	3.17
Total number of analyzed samples	7,479		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	26	17.22	0.44
Typhimurium var. Copenhagen	16	10.60	0.27
Infantis	11	7.28	0.19
Heidelberg	10	6.62	0.17
Saintpaul	8	5.30	0.14
Anatum	8	5.30	0.14
Johannesburg	7	4.64	0.12
Typhimurium	6	3.97	0.10
Reading	5	3.31	0.08
Uganda	4	2.65	0.07
Adelaide	4	2.65	0.07
Brandenburg	4	2.65	0.07
^a Other serotypes	38	25.17	0.64
^b Unidentified isolates	4	2.65	0.07
Total serotyped isolates	151	100	2.55
Not typed	-	-	-
Total positive	151	100	2.55
Total number of analyzed samples	5,924		



Table 2—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	70	28.34	0.89
Typhimurium var. Copenhagen	42	17.00	0.53
Anatum	27	10.93	0.34
Infantis	19	7.69	0.24
Adelaide	10	4.05	0.13
Johannesburg	9	3.64	0.11
Reading	8	3.24	0.10
Mbandaka	6	2.43	0.08
Muenchen	5	2.02	0.06
Agona	4	1.62	0.05
Brandenburg	4	1.62	0.05
Choleraesuis var. Kunzendorf	4	1.62	0.05
Hadar	4	1.62	0.05
Heidelberg	4	1.62	0.05
Typhimurium	4	1.62	0.05
^a Other serotypes	24	9.72	0.31
^b Unidentified isolates	3	1.21	0.04
Total serotyped isolates	247	100	3.14
Not typed	-	-	-
Total positive	247	100	3.14
Total number of analyzed samples	7,860		



Table 2—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	73	29.80	1.10
Typhimurium	33	13.47	0.50
Infantis	22	8.98	0.33
Anatum	13	5.31	0.20
Saintpaul	11	4.49	0.17
Reading	10	4.08	0.15
Johannesburg	9	3.67	0.14
London	9	3.67	0.14
Adelaide	8	3.27	0.12
Heidelberg	6	2.45	0.09
^a Other serotypes	50	20.41	0.75
^b Unidentified isolates	1	0.41	0.02
Total serotyped isolates	245	99.6	3.69
Not typed	1	0.4	0.02
Total positive	246	100	3.70
Total number of analyzed samples	6,648		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	54	18.49	0.75
Anatum	63	21.58	0.87
Johannesburg	28	9.59	0.39
Typhimurium	24	8.22	0.33
Infantis	16	5.48	0.22
Saintpaul	16	5.48	0.22
Heidelberg	13	4.45	0.18
Agona	10	3.42	0.14
Hadar	10	3.42	0.14
Manhattan	7	2.40	0.10
^a Other serotypes	50	17.12	0.69
^b Unidentified	1	0.34	0.01
Total serotyped isolates	292	100	4.03
Not typed	-	-	-
Total positive	292	100	4.03
Total number of analyzed samples	7,242		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
^c Typhimurium	42	20.69	0.57
Derby	27	13.30	0.37
Johannesburg	20	9.85	0.27
Infantis	17	8.37	0.23
Anatum	13	6.40	0.18
Saintpaul	13	6.40	0.18
Adelaide	10	4.93	0.14
London	10	4.93	0.14
Agona	8	3.94	0.11
Hadar	8	3.94	0.11
^a Other serotypes	32	15.76	0.44
^b Unidentified	3	1.48	0.04
Total serotyped isolates	203	100	2.78
Not typed	-	-	-
Total positive	203	100	2.78
Total number of analyzed samples	7,308		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	23	21.10	0.54
Infantis	14	12.84	0.33
Typhimurium	11	10.09	0.26
Saintpaul	7	6.42	0.16
Agona	6	5.50	0.14
Anatum	6	5.50	0.14
London	6	5.50	0.14
Johannesburg	5	4.59	0.12
Ohio	4	3.67	0.09
Hadar	3	2.75	0.07
^a Other serotypes	24	22.02	0.57
^b Unidentified	-	-	-
Total serotyped isolates	109	100	2.57
Not typed	-	-	-
Total positive	109	100	2.57
Total number of analyzed samples	4,244		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	21	19.44	0.44
^c Typhimurium	18	16.67	0.38
Johannesburg	10	9.26	0.21
Infantis	8	7.41	0.17
Anatum	6	5.56	0.13
Adelaide	5	4.63	0.11
Agona	5	4.63	0.11
Bredeney	4	3.70	0.08
Heidelberg	4	3.70	0.08
Saintpaul	4	3.70	0.08
^a Other serotypes	23	21.30	0.48
^b Unidentified	-	-	-
Total serotyped isolates	108	100	2.28
Not typed	-	-	-
*Total positive	108	100	2.28
Total number of analyzed samples	4,747		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
*Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	17	16.83	0.40
^c Typhimurium	13	12.87	0.31
Saintpaul	11	10.89	0.26
Infantis	8	7.92	0.19
Adelaide	7	6.93	0.17
Johannesburg	7	6.93	0.17
London	6	5.94	0.14
Heidelberg	5	4.95	0.12
Agona	4	3.96	0.09
Anatum	3	2.97	0.07
Cerro	3	2.97	0.07
Choleraesuis	3	2.97	0.07
^a Other serotypes	11	10.89	0.26
^b Unidentified	3	2.97	0.07
Total serotyped isolates	101	100	2.39
Not typed	-	-	-
*Total positive	101	100	2.39
Total number of analyzed samples	4,224		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Adelaide	13	18.84	0.53
Johannesburg	12	17.39	0.49
Derby	10	14.49	0.41
Infantis	9	13.04	0.36
Anatum	9	13.04	0.36
^c Typhimurium	5	7.25	0.20
Ohio	4	5.80	0.16
Uganda	3	4.35	0.12
Agona	2	2.90	0.08
Muenchen	2	2.90	0.08
^a Other serotypes	13	15.66	0.53
^b Unidentified	1	1.20	0.04
Total serotyped isolates	83	100	3.36
Not typed	-	-	-
*Total positive	83	100	3.36
Total number of analyzed samples	2,468		



Table 2 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Market Hogs
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
St. Paul	1	100	1.28
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	1	100	1.28
Not typed	-	-	-
*Total positive	1	100	1.28
Total number of analyzed samples	78		

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.

****Sampling sets scheduling suspended for this product class in 2012.**

Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.



Table 3
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	1	50.00	0.56
Muenchen	1	50.00	0.56
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	2	100	1.12
Not typed	-	-	-
*Total positive	2	100	1.12
Total number of analyzed samples	179		



Table 3
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
****Cows/Bulls**
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	4	14.29	0.26
Muenster	4	14.29	0.26
Montevideo	3	10.71	0.20
Typhimurium	3	10.71	0.20
Typhimurium var. Copenhagen	2	7.14	0.13
Anatum	1	3.57	0.07
Berta	1	3.57	0.07
Derby	1	3.57	0.07
Give	1	3.57	0.07
Litchfield	1	3.57	0.07
London	1	3.57	0.07
Mbandaka	1	3.57	0.07
Meleagridis	1	3.57	0.07
Newport	1	3.57	0.07
^a Other serotypes	-	-	-
^b Unidentified isolates	3	10.71	0.20
Total serotyped isolates	28	84.8	1.84
Not typed	5	15.2	0.33
*Total positive	33	100	2.17
Total number of analyzed samples	1,521		



Table 3—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Newport	6	15.00	0.30
Muenster	5	12.50	0.25
Montevideo	4	10.00	0.20
Typhimurium	4	10.00	0.20
Kentucky	3	7.50	0.15
Meleagridis	3	7.50	0.15
Typhimurium var. Copenhagen	3	7.50	0.15
Albany	1	2.50	0.05
Cerro	1	2.50	0.05
Derby	1	2.50	0.05
Dublin	1	2.50	0.05
Fresno	1	2.50	0.05
Infantis	1	2.50	0.05
London	1	2.50	0.05
Mbandaka	1	2.50	0.05
Muenchen	1	2.50	0.05
Reading	1	2.50	0.05
Schwarzengrund	1	2.50	0.05
^a Other serotypes	-	-	-
^b Unidentified isolates	1	2.50	0.05
Total serotyped isolates	40	93.0	2.01
Not typed	3	6.97	0.15
*Total positive	43	100	2.16
Total number of analyzed samples	1,995		



Table 3—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	7	13.46	0.32
Anatum	5	9.62	0.23
Kentucky	5	9.62	0.23
Typhimurium	4	7.69	0.18
Dublin	3	5.77	0.14
Newport	3	5.77	0.14
Albany	2	3.85	0.09
Heidelberg	2	3.85	0.09
Mbandaka	2	3.85	0.09
Meleagridis	2	3.85	0.09
Newbrunswick (Give var. 15+)	2	3.85	0.09
Reading	2	3.85	0.09
Typhimurium var. Copenhagen	2	3.85	0.09
^a Other serotypes	10	19.23	0.46
^b Unidentified isolates	1	1.92	0.05
Total serotyped isolates	52	98.1	2.39
Not typed	1	1.89	0.05
*Total positive	53	100	2.44
Total number of analyzed samples	2,176		



Table 3—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.

****Cows/Bulls**

(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Newport	18	24.66	0.41
Muenster	8	10.96	0.18
Agona	5	6.85	0.11
Kentucky	5	6.85	0.11
Typhimurium	5	6.85	0.11
Infantis	4	5.48	0.09
Montevideo	4	5.48	0.09
Derby	3	4.11	0.07
Mbandaka	3	4.11	0.07
Reading	3	4.11	0.07
^a Other serotypes	14	19.18	0.32
^b Unidentified isolates	1	1.37	0.02
Total serotyped isolates	73	100	1.65
Not typed	-	-	-
*Total positive	73	100	1.65
Total number of analyzed samples	4,414		



Table 3—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Muenster	7	18.42	0.27
Newport	5	13.16	0.19
Typhimurium var. Copenhagen	5	13.16	0.19
Typhimurium	3	7.89	0.12
Cerro	3	7.89	0.12
Agona	2	5.26	0.08
Derby	2	5.26	0.08
Give	2	5.26	0.08
Meleagridis	2	5.26	0.08
Anatum	1	2.63	0.04
Cubana	1	2.63	0.04
Havana	1	2.63	0.04
Infantis	1	2.63	0.04
Montevideo	1	2.63	0.04
Newbrunswick	1	2.63	0.04
Soerenga	1	2.63	0.04
^a Other serotypes	6	15.79	0.23
^b Unidentified isolates	-	-	-
Total serotyped isolates	38	100	1.46
Not typed	-	-	-
*Total positive	38	100	1.46
Total number of analyzed samples	2,599		



Table 3—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Cerro	2	8.33	0.06
Derby	2	8.33	0.06
Dublin	2	8.33	0.06
Muenster	2	8.33	0.06
Newport	2	8.33	0.06
Typhimurium	2	8.33	0.06
Agona	1	4.17	0.03
Anatum	1	4.17	0.03
Brandenburg	1	4.17	0.03
Infantis	1	4.17	0.03
Johannesburg	1	4.17	0.03
Livingston	1	4.17	0.03
London	1	4.17	0.03
Meleagridis	1	4.17	0.03
Montevideo	1	4.17	0.03
Muenchen	1	4.17	0.03
Typhimurium var. Copenhagen	1	4.17	0.03
^a Other serotypes	-	-	-
^b Unidentified isolates	1	4.17	0.03
Total serotyped isolates	24	100	0.76
Not typed	-	-	-
*Total positive	24	100	0.76
Total number of analyzed samples	3,175		



Table 3—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	3	11.54	0.15
Typhimurium	3	11.54	0.15
Agona	2	7.69	0.10
Anatum	2	7.69	0.10
Cerro	2	7.69	0.10
Infantis	2	7.69	0.10
Kentucky	2	7.69	0.10
Muenster	2	7.69	0.10
Bareilly	1	3.85	0.05
Bovismorbificans	1	3.85	0.05
Derby	1	3.85	0.05
Dublin	1	3.85	0.05
Hadar	1	3.85	0.05
Meleagridis	1	3.85	0.05
Newport	1	3.85	0.05
Panama	1	3.85	0.05
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	26	100	1.33
Not typed	-	-	-
*Total positive	26	100	1.33
Total number of analyzed samples	1,949		



Table 3 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	4	21.05	0.18
Montevideo	3	15.79	0.13
Agona	2	10.53	0.09
Muenster	2	10.53	0.09
Cerro	1	5.26	0.04
Dublin	1	5.26	0.04
Enteritidis	1	5.26	0.04
Heidelberg	1	5.26	0.04
Mbandaka	1	5.26	0.04
Meleagridis	1	5.26	0.04
Muenchen	1	5.26	0.04
Newport	1	5.26	0.04
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	19	100	0.85
Not typed	-	-	-
*Total positive	19	100	0.85
Total number of analyzed samples	2,246		



Table 3 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Anatum	7	16.67	0.18
Newport	7	16.67	0.18
Cerro	5	11.90	0.13
Montevideo	4	9.52	0.10
Muenster	4	9.52	0.10
Infantis	2	4.76	0.05
Typhimurium	2	4.76	0.05
^c 3.10:e,h:-	1	2.38	0.03
^c 6,7:z10:-	1	2.38	0.03
Enteritidis	1	2.38	0.03
Gaminara	1	2.38	0.03
Kentucky	1	2.38	0.03
Mbandaka	1	2.38	0.03
Meleagridis	1	2.38	0.03
Miami	1	2.38	0.03
Muenchen	1	2.38	0.03
Saintpaul	1	2.38	0.03
^a Other serotypes	1	2.38	0.03
^b Unidentified isolates	1	2.38	0.03
Total serotyped isolates	42	100	1.07
Not typed	-	-	-
*Total positive	42	100	1.07
Total number of analyzed samples	3,918		



Table 3 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Agona	2	16.67	0.09
Cerro	2	16.67	0.09
Montevideo	2	16.67	0.09
Anatum var. 15+	1	8.33	0.04
Hadar	1	8.33	0.04
Kentucky	1	8.33	0.04
London	1	8.33	0.04
Muenster	1	8.33	0.04
Newport	1	8.33	0.04
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	12	100	0.52
Not typed	-	-	-
*Total positive	12	100	0.52
Total number of analyzed samples	2,301		



Table 3 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	3	25.00	0.15
Give	2	16.67	0.10
Newport	2	16.67	0.10
^c 6,7:k:-	1	8.33	0.05
Agona	1	8.33	0.05
Kentucky	1	8.33	0.05
Mbandaka	1	8.33	0.05
Uganda	1	8.33	0.05
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	12	100	0.59
Not typed	-	-	-
*Total positive	12	100	0.59
Total number of analyzed samples	2,036		

Table 3 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	4	44.44	0.23
Bredeney	1	11.11	0.06
Hadar	1	11.11	0.06
Meleagridis	1	11.11	0.06
Senftenberg	1	11.11	0.06
Typhimurium 5-	1	11.11	0.06
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	9	100	0.51
Not typed	-	-	-
*Total positive	9	100	0.51
Total number of analyzed samples	1,764		



Table 3 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Cows/Bulls
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Meleagridis	3	42.86	0.34
Anatum Var. 15+	1	14.29	0.11
Kentucky	1	14.29	0.11
Montevideo	1	14.29	0.11
Norwich	1	14.29	0.11
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	7	100	0.79
Not typed	-	-	-
*Total positive	7	100	0.79
Total number of analyzed samples		882	

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.

****Sample sets scheduling suspended for this product class in 2011.**

Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.



Table 4
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
*Total positive	-	-	-
Total number of analyzed samples	214		

Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	1	50.00	0.13
Panama	1	50.00	0.13
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	2	100	0.26
Not typed	-	-	-
*Total positive	2	100	0.26
Total number of analyzed samples	782		



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	2	50.00	0.18
Minnesota	1	25.00	0.09
Typhimurium var. Copenhagen	1	25.00	0.09
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	4	100	0.37
Not typed	-	-	-
*Total positive	4	100	0.37
Total number of analyzed samples	1,092		

Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	4	36.36	0.24
Dublin	2	18.18	0.12
Cerro	1	9.09	0.06
Heidelberg	1	9.09	0.06
Kentucky	1	9.09	0.06
Montevideo	1	9.09	0.06
Saintpaul	1	9.09	0.06
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	11	100	0.65
Not typed	-	0	0
Total positive	11	100	0.65
Total number of analyzed samples	1,695		



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Reading	3	21.43	0.07
Agona	2	14.29	0.04
Kentucky	2	14.29	0.04
Braenderup	1	7.14	0.02
Derby	1	7.14	0.02
Heidelberg	1	7.14	0.02
Montevideo	1	7.14	0.02
Muenster	1	7.14	0.02
Sandiego	1	7.14	0.02
^a Other serotypes	-	-	-
^b Unidentified isolates	1	7.14	0.02
Total serotyped isolates	14	100	0.31
Not typed	-	-	-
Total positive	14	100	0.31
Total number of analyzed samples	4,572		



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	3	15.79	0.07
Kentucky	2	10.53	0.04
Montevideo	2	10.53	0.04
Anatum	2	10.53	0.04
Oranienburg	2	10.53	0.04
Heidelberg	1	5.26	0.02
Bovismorbificans	1	5.26	0.02
Dublin	1	5.26	0.02
Mbandaka	1	5.26	0.02
Muenchen	1	5.26	0.02
Newport	1	5.26	0.02
Ohio	1	5.26	0.02
Uganda	1	5.26	0.02
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	19	100	0.42
Not typed	-	0	-
Total positive	19	100	0.42
Total number of analyzed samples		4,480	



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	4	33.33	0.09
^c 6,8:-:1,2	1	8.33	0.02
Anatum	1	8.33	0.02
Dublin	1	8.33	0.02
Indiana	1	8.33	0.02
Infantis	1	8.33	0.02
Newport	1	8.33	0.02
Senftenberg	1	8.33	0.02
Typhimurium	1	8.33	0.02
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	12	100	0.28
Not typed	-	-	-
Total positive	12	100	0.28
Total number of analyzed samples	4,227		



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Dublin	2	16.67	0.10
Muenchen	2	16.67	0.10
Paratyphi B var. L-tartrate+	2	16.67	0.10
Poona	2	16.67	0.10
Gaminara	1	8.33	0.05
Havana	1	8.33	0.05
Muenster	1	8.33	0.05
Newport	1	8.33	0.05
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	12	100	0.57
Not typed	-	-	-
Total positive	12	100	0.57
Total number of analyzed samples	2,090		



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Newport	2	20.00	0.05
Adelaide	1	10.00	0.03
Anatum var. 15+,34+	1	10.00	0.03
Bere	1	10.00	0.03
Montevideo	1	10.00	0.03
Muenster	1	10.00	0.03
Reading	1	10.00	0.03
Saintpaul	1	10.00	0.03
Typhimurium	1	10.00	0.03
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	10	100	0.27
Not typed	-	-	-
Total positive	10	100	0.27
Total number of analyzed samples	3,674		



Table 4
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Dublin	2	22.22	0.05
Anatum	1	11.11	0.02
Give var. 15+	1	11.11	0.02
Infantis	1	11.11	0.02
Kentucky	1	11.11	0.02
Montevideo	1	11.11	0.02
Newport	1	11.11	0.02
^a Other serotypes	-	11.11	0.02
^b Unidentified isolates	1	11.11	0.02
Total serotyped isolates	9	100	0.20
Not typed	-	-	-
Total positive	9	100	0.20
Total number of analyzed samples			
		4,406	

Table 4 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Dublin	2	22.22	0.04
Typhimurium	2	22.22	0.04
Anatum	1	11.11	0.02
Mbandaka	1	11.11	0.02
Montevideo	1	11.11	0.02
Newport	1	11.11	0.02
^a Other serotypes	-	-	-
^b Unidentified isolates	1	11.11	0.02
Total serotyped isolates	9	100	0.18
Not typed	-	-	-
Total positive	9	100	0.18
Total number of analyzed samples			
		4,965	



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Bareilly	1	10.00	0.02
Give	1	10.00	0.02
^c III_61:-:1,5,7	1	10.00	0.02
Montevideo	1	10.00	0.02
Muenchen	1	10.00	0.02
Muenster	1	10.00	0.02
Poona	1	10.00	0.02
Typhimurium	1	10.00	0.02
^a Other serotypes	-	-	-
^b Unidentified isolates	2	20.00	0.04
Total serotyped isolates	10	100	0.20
Not typed	-	-	-
Total positive	10	100	0.20
Total number of analyzed samples			
		4,939	

Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Anatum	3	50.00	0.06
Adelaide	1	16.67	0.02
Derby	1	16.67	0.02
Montevideo	1	16.67	0.02
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	6	100	0.12
Not typed	-	-	-
Total positive	6	100	0.12
Total number of analyzed samples			
		4,918	



Table 4—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Agona	2	16.67	0.07
Infantis	2	16.67	0.07
Uganda_var._15+	2	16.67	0.07
Anatum	1	8.33	0.03
Dublin	1	8.33	0.03
Kiambu	1	8.33	0.03
Minnesota	1	8.33	0.03
Muenster	1	8.33	0.03
Newport	1	8.33	0.03
^a Other serotypes	-	-	-
^b Unidentified isolates	1	7.69	0.03
Total serotyped isolates	13	100	0.45
Not typed	-	-	-
Total positive	13	100	0.45
Total number of analyzed samples	2,893		



Table 4 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
**Steers/Heifers
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
^c 4,[5],12:i:-	1	33.33	0.37
Hadar	1	33.33	0.37
Dublin	1	33.33	0.37
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	3	100	1.12
Not typed	-	-	-
Total positive	3	100	1.12
Total number of analyzed samples	269		

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.

****Sample sets scheduling suspended for this product class in 2012.**

Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.



Table 5
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Anatum	13	18.06	1.00
Montevideo	9	12.50	0.69
Meleagridis	7	9.72	0.54
Muenster	7	9.72	0.54
Hadar	4	5.56	0.31
Typhimurium var. Copenhagen	4	5.56	0.31
Infantis	3	4.17	0.23
Kentucky	3	4.17	0.23
Newport	3	4.17	0.23
Reading	3	4.17	0.23
^a Other serotypes	15	20.83	1.16
^b Unidentified isolates	1	1.39	0.08
Total serotyped isolates	72	86.7	5.56
Not typed	11	13.3	0.85
*Total positive	83	100	6.40
Total number of analyzed samples	1,296		



Table 5-Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	148	22.77	0.90
Anatum	70	10.77	0.43
Muenster	46	7.08	0.28
Typhimurium	36	5.54	0.22
Cerro	32	4.92	0.20
Kentucky	31	4.77	0.19
Mbandaka	28	4.31	0.17
Typhimurium var. Copenhagen	28	4.31	0.17
Meleagridis	23	3.54	0.14
Newport	21	3.23	0.13
^a Other serotypes	180	27.69	1.10
^b Unidentified isolates	7	1.08	0.04
Total serotyped isolates	650	91.5	3.97
Not typed	60	8.5	0.37
*Total positive	710	100	4.34
Total number of analyzed samples	16,375		



Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	131	12.72	0.40
Senftenberg	102	9.90	0.31
Newport	85	8.25	0.26
Typhimurium var. Copenhagen	80	7.77	0.24
Anatum	70	6.80	0.21
Typhimurium	65	6.31	0.20
Cerro	52	5.05	0.16
Muenster	46	4.47	0.14
Mbandaka	45	4.37	0.14
Kentucky	44	4.27	0.13
^a Other serotypes	287	27.86	0.87
^b Unidentified isolates	23	2.23	0.07
Total serotyped isolates	1030	95.4	3.14
Not typed	50	4.63	0.15
*Total positive	1080	100	3.29
Total number of analyzed samples	32,844		



Table 5-Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	94	14.05	0.39
Newport	73	10.91	0.30
Anatum	62	9.27	0.26
Muenster	52	7.77	0.21
Kentucky	46	6.88	0.19
Typhimurium	37	5.53	0.15
Mbandaka	36	5.38	0.15
Cerro	26	3.89	0.11
Typhimurium var. Copenhagen	25	3.74	0.10
Reading	17	2.54	0.07
^a Other serotypes	185	27.65	0.76
^b Unidentified isolates	16	2.39	0.07
Total serotyped isolates	669	97.5	2.76
Not typed	17	2.48	0.07
*Total positive	686	100	2.83
Total number of analyzed samples	24,243		



Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	89	11.32	0.29
Newport	84	10.69	0.27
Anatum	77	9.80	0.25
Muenster	65	8.27	0.21
Agona	52	6.62	0.17
Typhimurium var. Copenhagen	51	6.49	0.16
Kentucky	38	4.83	0.12
Mbandaka	36	4.58	0.12
Typhimurium	32	4.07	0.10
Cerro	30	3.82	0.10
^a Other serotypes	221	28.12	0.71
^b Unidentified isolates	11	1.40	0.04
Total serotyped isolates	786	99.5	2.54
Not typed	4	0.51	0.01
*Total positive	790	100	2.55
Total number of analyzed samples	30,933		

Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Newport	54	11.02	0.19
Montevideo	49	10.00	0.17
Anatum	45	9.18	0.15
Agona	29	5.92	0.10
Typhimurium var. Copenhagen	27	5.51	0.09
Typhimurium	27	5.51	0.09
Dublin	26	5.31	0.09
Muenster	24	4.90	0.08
Kentucky	23	4.69	0.08
Mbandaka	22	4.49	0.08
^a Other serotypes	154	31.43	0.53



Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
^b Unidentified isolates	10	2.04	0.03
Total serotyped isolates	490	100	1.68
Not typed	-	-	-
*Total positive	490	100	1.68
Total number of analyzed samples	29,097		

Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	71	14.06	0.23
Anatum	55	10.89	0.18
Muenster	47	9.31	0.15
Newport	38	7.52	0.12
Agona	36	7.13	0.12
Dublin	25	4.95	0.08
Kentucky	21	4.16	0.07
Typhimurium	21	4.16	0.07
Typhimurium var. Copenhagen	18	3.56	0.06
Mbandaka	17	3.37	0.05
^a Other serotypes	154	30.50	0.50
^b Unidentified isolates	2	0.40	0.01
Total serotyped isolates	505	100	1.63
Not typed	-	-	-
*Total positive	505	100	1.63
Total number of analyzed samples	30,984		



Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	30	13.89	0.15
Typhimurium	20	9.26	0.10
Anatum	20	9.26	0.10
Muenster	17	7.87	0.09
Newport	14	6.48	0.07
Mbandaka	12	5.56	0.06
Dublin	9	4.17	0.05
Reading	9	4.17	0.05
Cerro	8	3.70	0.04
Agona	7	3.24	0.04
Give	7	3.24	0.04
Meleagridis	7	3.24	0.04
^a Other serotypes	53	24.54	0.27
^b Unidentified isolates	3	1.39	0.02
Total serotyped isolates	216	99.5	1.12
Not typed	1	0.46	0.01
*Total positive	217	100	1.12
Total number of analyzed samples	19,365		



Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	59	16.86	0.33
Muenster	34	9.71	0.19
Anatum	27	7.71	0.15
Newport	24	6.86	0.13
Cerro	22	6.29	0.12
Typhimurium	21	6.00	0.12
Dublin	18	5.14	0.10
Reading	18	5.14	0.10
Mbandaka	14	4.00	0.08
Infantis	13	3.71	0.07
^a Other serotypes	99	28.29	0.55
^b Unidentified	1	0.29	0.01
Total serotyped isolates	350	100	1.96
Not typed	-	-	-
*Total positive	350	100	1.96
Total number of analyzed samples	17,849		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	86	23.43	0.63
Dublin	36	9.81	0.26
Muenster	28	7.63	0.20
Mbandaka	23	6.27	0.17
Newport	22	5.99	0.16
Typhimurium	19	5.18	0.14
Cerro	18	4.90	0.13
Meleagridis	16	4.36	0.12
Agona	15	4.09	0.11
Anatum	14	3.81	0.10
Infantis	10	2.72	0.07
Kentucky	10	2.72	0.07
^a Other serotypes	65	17.71	0.47
^b Unidentified	5	1.36	0.04
Total serotyped isolates	367	100	2.68
Not typed	-	-	-
*Total positive	367	100	2.68
Total number of analyzed samples	13,695		



Table 5—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	100	24.51	0.60
Dublin	50	12.25	0.30
Anatum	31	7.60	0.18
Newport	30	7.35	0.18
Typhimurium	27	6.62	0.16
Cerro	21	5.15	0.13
Kentucky	18	4.41	0.11
Mbandaka	17	4.17	0.10
Meleagridis	17	4.17	0.10
Muenster	16	3.92	0.10
^a Other serotypes	79	19.36	0.47
^b Unidentified	2	0.49	0.01
Total serotyped isolates	408	100	2.43
Not typed	-	-	-
*Total positive	408	100	2.43
Total number of analyzed samples	16,765		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	51	31.10	0.60
Dublin	21	12.80	0.25
Newport	15	9.15	0.18
Typhimurium	14	8.54	0.16
Cerro	8	4.88	0.09
Kentucky	8	4.88	0.09
Meleagridis	8	4.88	0.09
Anatum	5	3.05	0.06
Muenchen	5	3.05	0.06
^a Other serotypes	19	11.59	0.22
^b Unidentified	4	2.44	0.05
Total serotyped isolates	164	100	1.92
Not typed	-	-	-
*Total positive	164	100	1.92
Total number of analyzed samples	8,541		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	52	25.62	0.56
Dublin	38	18.72	0.41
Typhimurium	12	5.91	0.13
Anatum	11	5.42	0.12
Cerro	9	4.43	0.10
Kentucky	9	4.43	0.10
Agona	7	3.45	0.08
Mbandaka	6	2.96	0.06
Meleagridis	5	2.46	0.05
Newport	5	2.46	0.05
^a Other serotypes	42	20.69	0.45
^b Unidentified	6	2.96	0.06
Total serotyped isolates	202	99.5	2.18
Not typed	1	0.49	0.01
*Total positive	203	100	2.19
Total number of analyzed samples	9,257		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	99	39.60	0.71
Dublin	35	14.00	0.25
Muenster	22	8.80	0.16
Kentucky	17	6.80	0.12
Anatum	16	6.40	0.12
Cerro	14	5.60	0.10
Infantis	14	5.60	0.10
Newport	12	4.80	0.09
Meleagridis	11	4.40	0.08
Typhimurium	10	4.00	0.07
^a Other serotypes	72	22.02	0.52
^b Unidentified	5	1.53	0.04
Total serotyped isolates	327	100	2.36
Not typed	-	-	-
*Total positive	327	100	2.36
Total number of analyzed samples	13,884		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	81	39.71	0.32
Dublin	29	14.22	0.11
Typhimurium	16	7.84	0.06
Anatum	15	7.35	0.06
Muenchen	13	6.37	0.05
Cerro	13	6.37	0.05
Meleagridis	12	5.88	0.05
Kentucky	12	5.88	0.05
Muenster	7	3.43	0.03
Newport	6	2.94	0.02
^a Other serotypes	65	23.81	0.25
^b Unidentified	4	1.47	0.02
Total serotyped isolates	273	100	1.07
Not typed	-	-	-
*Total positive	273	100	1.07
Total number of analyzed samples	14,665		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2013	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	86	31.05	0.50
Typhimurium	19	6.86	0.11
Meleagridis	18	6.50	0.10
Dublin	18	6.50	0.10
Newport	13	4.69	0.08
Muenchen	12	4.33	0.07
Kentucky	12	4.33	0.07
Cerro	11	3.97	0.06
Anatum	9	3.25	0.05
6,7:G,M,S:E,N,Z15	7	2.53	0.04
Infantis	7	2.53	0.04
Reading	5	1.81	0.03
Panama	5	1.81	0.03
Give	5	1.81	0.03
Mbandaka	5	1.81	0.03
^c 14,[5],12:i:-	5	1.81	0.03
Agona	4	1.44	0.02
Muenster	4	1.44	0.02
^a Other serotypes	32	11.55	0.10
^b Unidentified	2	0.72	0.01
Total serotyped isolates	277	100	.88
Not typed	-	-	-
*Total positive	277	100	.88
Total number of analyzed samples	17,161		



Table 5 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Beef
(1998–2005 'A' Set Samples; 2006–2014 All Samples)

Serotypes 2014	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	26	22	25.00
Dublin	14	12	13.46
Cerro	11	9	10.58
Newport	10	9	9.62
Muenchen	8	7	7.69
Anatum	6	5	5.77
Muenster	5	4	4.81
Reading	4	3	3.85
l 4,[5],12:i:-	4	3	3.85
Kentucky	4	3	3.85
Agona	3	3	2.88
6,7:g,m,s:e,n,z15	3	3	2.88
Typhimurium	2	2	1.92
Meleagridis	2	2	1.92
Kiambu	2	2	1.92
^a Other serotypes	12	10.4	0.16
^b Unidentified	-	-	-
Total serotyped isolates	116	100	1.58
Not typed	-	-	-
*Total positive	116	100	1.58
Total number of analyzed samples		7320	

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as l 4, [5],12:i:-, and included them in the unidentified isolates category.

Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.



Table 6
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Thompson	1	100.00	4.17
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	1	100	4.17
Not typed	-	-	-
*Total positive	1	100	4.17
Total number of analyzed samples	24		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	12	27.27	4.04
Heidelberg	7	15.91	2.36
Typhimurium var. Copenhagen	6	13.64	2.02
Typhimurium	5	11.36	1.68
Istanbul	2	4.55	0.67
Reading	2	4.55	0.67
Enteritidis	1	2.27	0.34
Infantis	1	2.27	0.34
Litchfield	1	2.27	0.34
Newington	1	2.27	0.34
Schwarzengrund	1	2.27	0.34
Thompson	1	2.27	0.34
^a Other serotypes	-	-	-
^b Unidentified isolates	4	9.09	1.35
Total serotyped isolates	44	91.7	14.81
Not typed	4	8.33	1.35
*Total positive	48	100	16.16
Total number of analyzed samples	297		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	13	26.53	3.14
Heidelberg	9	18.37	2.17
Typhimurium var. Copenhagen	6	12.24	1.45
Hadar	3	6.12	0.72
Typhimurium	3	6.12	0.72
Infantis	2	4.08	0.48
Newport	2	4.08	0.48
Thompson	2	4.08	0.48
Berta	1	2.04	0.24
Enteritidis	1	2.04	0.24
Reading	1	2.04	0.24
Schwarzengrund	1	2.04	0.24
^a Other serotypes	-	-	-
^b Unidentified isolates	5	10.20	1.21
Total serotyped isolates	49	86.0	11.84
Not typed	8	14.0	1.93
*Total positive	57	100	13.77
Total number of analyzed samples	414		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	13	26.00	4.96
Schwarzengrund	10	20.00	3.82
Kentucky	9	18.00	3.44
Typhimurium	5	10.00	1.91
Hadar	2	4.00	0.76
Thompson	2	4.00	0.76
Brandenburg	1	2.00	0.38
Johannesburg	1	2.00	0.38
Ohio	1	2.00	0.38
Typhimurium var. Copenhagen	1	2.00	0.38
^a Other serotypes	-	-	-
^b Unidentified isolates	5	10.00	1.91
Total serotyped isolates	50	98.0	19.08
Not typed	1	1.96	0.38
*Total positive	51	100	19.47
Total number of analyzed samples	262		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	37	29.60	8.62
Kentucky	20	16.00	4.66
Typhimurium var. Copenhagen	12	9.60	2.80
Typhimurium	10	8.00	2.33
Enteritidis	6	4.80	1.40
Montevideo	6	4.80	1.40
Hadar	4	3.20	0.93
Schwarzengrund	4	3.20	0.93
Infantis	3	2.40	0.70
Thompson	3	2.40	0.70
^a Other serotypes	9	7.20	2.10
^b Unidentified isolates	11	8.80	2.56
Total serotyped isolates	125	100	29.14
Not typed	-	-	-
*Total positive	125	100	29.14
Total number of analyzed samples	429		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	29	27.62	9.80
Heidelberg	27	25.71	9.12
Kentucky	21	20.00	7.09
Thompson	6	5.71	2.03
Infantis	4	3.81	1.35
Montevideo	2	1.90	0.68
Istanbul	2	1.90	0.68
Haardt	2	1.90	0.68
Oranienburg	2	1.90	0.68
Typhimurium var. Copenhagen	1	0.95	0.34
Typhimurium	1	0.95	0.34
Arizona	1	0.95	0.34
Bredeney	1	0.95	0.34
Mbandaka	1	0.95	0.34
Taksony	1	0.95	0.34
^a Other serotypes	-	-	-
^b Unidentified isolates	4	3.81	1.35
Total serotyped isolates	105	100	35.47
Not typed	-	-	-
*Total positive	105	100	35.47
Total number of analyzed samples	296		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	50	50.51	12.89
Enteritidis	7	7.07	1.80
Typhimurium	7	7.07	1.80
Heidelberg	6	6.06	1.55
Montevideo	5	5.05	1.29
Schwarzengrund	5	5.05	1.29
Thompson	4	4.04	1.03
^c I4,[5],12:i:-	3	1.01	0.26
Infantis	2	2.02	0.52
^c 6,7:k:-	1	1.01	0.26
Agona	1	1.01	0.26
Braenderup	1	1.01	0.26
Hadar	1	1.01	0.26
Havana	1	1.01	0.26
Mbandaka	1	1.01	0.26
Oranienburg	1	1.01	0.26
Senftenberg	1	1.01	0.26
Typhimurium var. Copenhagen	1	1.01	0.26
Uganda	1	1.01	0.26
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	99	100	25.52
Not typed	-	-	-
*Total positive	99	100	25.52
Total number of analyzed samples	388		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Enteritidis	15	31.91	10.34
Kentucky	15	31.91	10.34
Heidelberg	6	12.77	4.14
Typhimurium	3	6.38	2.07
^c 4,[5],12:i:-	1	2.13	0.69
Alachua	1	2.13	0.69
Hadar	1	2.13	0.69
Kiambu	1	2.13	0.69
Muenster	1	2.13	0.69
Schwarzengrund	1	2.13	0.69
Senftenberg	1	2.13	0.69
Thompson	1	2.13	0.69
^a Other serotypes	-	-	-
^b Unidentified isolates	-	-	-
Total serotyped isolates	47	100	32.41
Not typed	-	-	-
*Total positive	47	100	32.41
Total number of analyzed samples	145		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	42	42.00	18.92
Heidelberg	16	16.00	7.21
Enteritidis	16	16.00	7.21
^c 4,[5],12:i:-	4	4.00	1.80
Typhimurium	4	4.00	1.80
Berta	3	3.00	1.35
Infantis	3	3.00	1.35
Schwarzengrund	3	3.00	1.35
^c 8,(20):z6	1	1.00	0.45
Anatum	1	1.00	0.45
Hadar	1	1.00	0.45
Mbandaka	1	1.00	0.45
Montevideo	1	1.00	0.45
Thompson	1	1.00	0.45
^a Other serotypes	2	2.00	0.90
^b Unidentified	3	3.00	1.35
Total serotyped isolates	100	100	45.05
Not typed	-	-	-
*Total positive	100	100	45.05
Total number of analyzed samples	222		



Table 6—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Enteritidis	34	25.56	6.72
Kentucky	33	24.81	6.52
Heidelberg	27	20.30	5.34
^c 4,[5],12:i:-	9	6.76	1.77
Typhimurium	8	6.02	1.58
Infantis	3	2.26	0.59
Thompson	3	2.26	0.59
Minnesota	2	1.50	0.40
Schwarzengrund	2	1.50	0.40
^a Other serotypes	10	7.52	1.98
^b Unidentified	2	1.50	0.40
Total serotyped isolates	133	100	26.28
Not typed	-	-	-
*Total positive	133	100	26.28
Total number of analyzed samples	506		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	30	28.57	7.28
Heidelberg	26	24.76	6.31
Enteritidis	21	20.00	5.10
Typhimurium	12	11.43	2.91
^c 4,5,12:i:-	4	3.08	0.97
Infantis	2	1.90	0.49
Montevideo	2	1.90	0.49
^c 6,7:-:1,5	1	0.95	0.24
^c 8,20:-:z6	1	0.95	0.24
Berta	1	0.95	0.24
Blockley	1	0.95	0.24
Braenderup	1	0.95	0.24
Hartford	1	0.95	0.24
Kralingen	1	0.95	0.24
Oranienburg	1	0.95	0.24
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	105	100	25.49
Not typed	-	-	-
*Total positive	105	100	25.49
Total number of analyzed samples	412		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	21	30.88	5.61
Enteritidis	20	29.41	5.35
Heidelberg	7	10.29	1.87
^d Typhimurium	6	7.35	1.34
^c 4,[5],12:i:-	5	7.35	1.34
^c 8,20:-:z6	2	2.94	0.53
Braenderup	2	2.94	0.53
Blockley	1	1.47	0.27
Cerro	1	1.47	0.27
Infantis	1	1.47	0.27
Montevideo	1	1.47	0.27
Schwarzengrund	1	1.47	0.27
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	68	100	18.18
Not typed	-	-	-
*Total positive	68	100	18.18
Total number of analyzed samples	374		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	28	35.00	6.57
Enteritidis	24	30.00	5.63
Heidelberg	8	10.00	1.88
^d Typhimurium	6	7.50	1.41
^c 4,5,12:i:-	5	6.25	1.17
Berta	2	2.50	0.47
^c 8,20:-:z6	1	1.25	0.23
Hadar	1	1.25	0.23
Infantis	1	1.25	0.23
Montevideo	1	1.25	0.23
Newport	1	1.25	0.23
Ohio	1	1.25	0.23
Thompson	1	1.25	0.23
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	80	100	18.78
Not typed	-	-	-
*Total positive	80	100	18.78
Total number of analyzed samples	426		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Enteritidis	57	36.54	10.84
Kentucky	48	30.77	9.13
Heidelberg	18	11.54	3.42
Typhimurium	10	6.41	1.90
Braenderup	5	3.21	0.95
Infantis	4	2.56	0.76
Mbandaka	4	2.56	0.76
^c 8,20:-:z6	2	1.28	0.38
^c 3,10:e,h:-	1	0.64	0.19
^c 4, [5],12:l:-	1	0.64	0.19
^c 8,20:l:-	1	0.64	0.19
Johannesburg	1	0.64	0.19
Lille	1	0.64	0.19
Newport	1	0.64	0.19
Roodepoort	1	0.64	0.19
^a Other serotypes	-	-	-
^b Unidentified	3	1.27	0.38
Total serotyped isolates	158	100	30.04
Not typed	-	-	-
*Total positive	158	100	30.04
Total number of analyzed samples	526		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Enteritidis	111	30.58	8.07
Kentucky	70	19.28	5.09
Typhimurium	64	17.63	4.65
Heidelberg	62	17.08	4.51
Schwarzengrund	18	4.96	1.31
Infantis	12	3.31	0.87
Thompson	9	2.48	0.65
^c 4,[5],12:i:-	9	2.48	0.65
Montevideo	4	1.10	0.29
Mbandaka	4	1.10	0.29
^a Other serotypes	22	5.68	1.60
^b Unidentified	2	0.52	0.15
Total serotyped isolates	387	100	28.13
Not typed	-	-	-
*Total positive	387	100	28.13
Total number of analyzed samples	1,376		



Table 6 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Chicken
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2013	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Enteritidis	22	27.16	0.07
Kentucky	17	20.99	0.05
Infantis	13	16.05	0.04
Heidelberg	10	12.35	0.03
Typhimurium	8	9.88	0.03
^c I 4,[5],12:i:-	4	4.94	0.01
Braenderup	2	2.47	0.01
Blockley	1	1.23	0.00
Uganda	1	1.23	0.00
Liverpool	1	1.23	0.00
Thompson	1	1.23	0.00
^a Other serotypes	1	1.23	0.22
^b Unidentified	-	-	-
Total serotyped isolates	81	100	17.88
Not typed	-	-	-
*Total positive	81	100	17.88
Total number of analyzed samples	453		

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.

Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.



Table 7
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1998	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	36	19.15	6.09
Heidelberg	35	18.62	5.92
Senftenberg	21	11.17	3.55
Reading	17	9.04	2.88
Schwarzengrund	17	9.04	2.88
Muenster	7	3.72	1.18
Saintpaul	7	3.72	1.18
Anatum	5	2.66	0.85
Kentucky	5	2.66	0.85
Typhimurium	5	2.66	0.85
^a Other serotypes	32	17.02	5.41
^b Unidentified isolates	1	0.53	0.17
Total serotyped isolates	188	87.0	31.81
Not typed	28	13.0	4.74
*Total positive	216	100	36.55
Total number of analyzed samples	591		



Table 7-Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 1999	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	72	22.15	6.86
Heidelberg	61	18.77	5.81
Senftenberg	27	8.31	2.57
Reading	26	8.00	2.48
Muenster	18	5.54	1.71
Agona	16	4.92	1.52
Saintpaul	13	4.00	1.24
Schwarzengrund	12	3.69	1.14
Typhimurium var. Copenhagen	12	3.69	1.14
Typhimurium	7	2.15	0.67
^a Other serotypes	54	16.62	5.14
^b Unidentified isolates	7	2.15	0.67
Total serotyped isolates	325	97.9	30.95
Not typed	7	21.1	0.67
*Total positive	332	100	31.62
Total number of analyzed samples	1,050		



Table 7—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2000	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	80	21.33	5.16
Hadar	57	15.20	3.68
Agona	35	9.33	2.26
Senftenberg	31	8.27	2.00
Schwarzengrund	29	7.73	1.87
Reading	22	5.87	1.42
Saintpaul	18	4.80	1.16
Muenster	12	3.20	0.77
Brandenburg	10	2.67	0.64
Arizona	8	2.13	0.52
Muenchen	8	2.13	0.52
^a Other serotypes	61	16.27	3.93
^b Unidentified isolates	4	1.07	0.26
Total serotyped isolates	375	93.98	24.18
Not typed	24	6.02	1.55
*Total positive	399	100	25.73
Total number of analyzed samples	1,551		



Table 7
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2001	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	33	24.81	6.35
Senftenberg	18	13.53	3.46
Hadar	14	10.53	2.69
Arizona	10	7.52	1.92
Reading	10	7.52	1.92
Agona	8	6.02	1.54
Newport	7	5.26	1.35
Saintpaul	5	3.76	0.96
Schwarzengrund	4	3.01	0.77
Derby	3	2.26	0.58
Typhimurium	3	2.26	0.58
Worthington	3	2.26	0.58
^a Other serotypes	15	11.28	2.88
^b Unidentified isolates	-	-	-
Total serotyped isolates	133	97.9	25.58
Not typed	3	2.21	0.58
*Total positive	136	100	26.15
Total number of analyzed samples	520		



Table 7—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2002	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	37	19.27	3.44
Reading	24	12.50	2.23
Hadar	23	11.98	2.14
Saintpaul	14	7.29	1.30
Senftenberg	14	7.29	1.30
Arizona	10	5.21	0.93
Newport	10	5.21	0.93
Schwarzengrund	9	4.69	0.84
Uganda	8	4.17	0.74
Typhimurium	5	2.60	0.47
^a Other serotypes	30	15.63	2.79
^b Unidentified isolates	8	4.17	0.74
Total serotyped isolates	192	100	17.86
Not typed	-	-	-
*Total positive	192	100	17.86
Total number of analyzed samples	1,075		



Table 7
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2003	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	55	21.57	5.48
Hadar	44	17.25	4.38
Arizona	31	12.16	3.09
Reading	28	10.98	2.79
Saintpaul	19	7.45	1.89
Newport	18	7.06	1.79
Senftenberg	11	4.31	1.10
Kentucky	9	3.53	0.90
Schwarzengrund	6	2.35	0.60
Typhimurium	5	1.96	0.50
^a Other serotypes	24	9.41	2.39
^b Unidentified isolates	5	1.96	0.50
Total serotyped isolates	255	100	25.40
Not typed	-	-	-
*Total positive	255	100	25.40
Total number of analyzed samples	1,004		



Table 7—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2004	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	38	18.27	3.64
Hadar	27	12.98	2.59
Reading	16	7.69	1.53
Derby	15	7.21	1.44
Saintpaul	15	7.21	1.44
Senftenberg	10	4.81	0.96
^c Illa 18:z4,z23:-	9	4.33	0.86
Typhimurium	9	4.33	0.86
Schwarzengrund	8	3.85	0.77
Kentucky	6	2.88	0.57
Newport	6	2.88	0.57
^a Other serotypes	47	22.60	4.50
^b Unidentified isolates	2	0.96	0.19
Total serotyped isolates	208	100	19.92
Not typed	-	-	-
*Total positive	208	100	19.92
Total number of analyzed samples	1,044		



Table 7—Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2005	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	44	20.47	4.76
Saintpaul	27	12.56	2.92
Heidelberg	25	11.63	2.70
Reading	18	8.37	1.95
Schwarzengrund	12	5.58	1.30
^c IIIa 18:z4,z23:-	11	5.12	1.19
Senftenberg	8	3.72	0.86
Agona	7	3.26	0.76
Albany	6	2.79	0.65
Typhimurium	6	2.79	0.65
^a Other serotypes	40	18.60	4.32
^b Unidentified isolates	2	0.93	0.22
Total serotyped isolates	215	100	23.24
Not typed	-	-	-
*Total positive	215	100	23.24
Total number of analyzed samples	925		



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	31	34.44	6.98
Saintpaul	8	8.89	1.80
Heidelberg	7	7.78	1.58
Agona	5	5.56	1.13
Anatum	4	4.44	0.90
Kentucky	4	4.44	0.90
Muenchen	4	4.44	0.90
Derby	3	3.33	0.68
Senftenberg	3	3.33	0.68
Typhimurium	3	3.33	0.68
Worthington	3	3.33	0.68
^a Other serotypes	14	15.56	3.15
^b Unidentified	1	1.11	0.23
Total serotyped isolates	90	100	20.27
Not typed	-	-	-
*Total positive	90	100	20.27
Total number of analyzed samples	444		



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	62	43.36	7.56
Heidelberg	17	11.89	2.07
Saintpaul	13	9.09	1.59
Agona	11	7.69	1.34
Newport	8	5.59	0.98
Reading	6	4.20	0.73
Anatum	2	1.40	0.24
London	2	1.40	0.24
Minnesota	2	1.40	0.24
Muenchen	2	1.40	0.24
Schwarzengrund	2	1.40	0.24
Typhimurium	2	1.40	0.24
Uganda	2	1.40	0.24
^a Other serotypes	12	8.39	1.46
^b Unidentified	-	-	-
Total serotyped isolates	143	100	17.44
Not typed	-	-	-
*Total positive	143	100	17.44
Total number of analyzed samples		820	



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	35	25.93	4.00
Saintpaul	15	11.11	1.71
^c III 18:z4,z23:-	14	10.37	1.60
Schwarzengrund	8	5.93	0.91
Newport	7	5.19	0.80
Heidelberg	6	4.44	0.68
Senftenberg	6	4.44	0.68
Agona	5	3.70	0.57
Muenchen	5	3.70	0.57
Worthington	5	3.70	0.57
^a Other serotypes	28	20.74	3.20
^b Unidentified	1	0.74	0.11
Total serotyped isolates	135	100	15.41
Not typed	-	-	-
*Total positive	135	100	15.41
Total number of analyzed samples	876		



Table 7
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Saintpaul	17	26.15	2.80
Hadar	14	21.54	2.30
Agona	5	7.69	0.82
Schwarzengrund	5	7.69	0.82
Senftenberg	5	7.69	0.82
Albany	3	4.62	0.49
^c III 18:z4,z23:-	3	4.62	0.49
Derby	2	3.08	0.33
Heidelberg	2	3.08	0.33
Newport	2	3.08	0.33
^a Other serotypes	6	9.23	0.99
^b Unidentified	1	1.54	0.16
Total serotyped isolates	65	100	10.69
Not typed	-	-	-
*Total positive	65	100	10.69
Total number of analyzed samples	608		



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	15	16.85	1.72
Saintpaul	15	16.85	1.72
Heidelberg	9	10.11	1.03
^c III 18:z4,z23:-	9	7.89	0.80
Albany	8	8.99	0.92
Schwarzengrund	6	6.74	0.69
Senftenberg	6	6.74	0.69
Anatum	4	4.49	0.46
Newport	3	3.37	0.34
Montevideo	2	2.25	0.23
Reading	2	2.25	0.23
Typhimurium	2	2.25	0.23
^a Other serotypes	8	8.99	0.92
^b Unidentified	-	-	-
Total serotyped isolates	89	100	10.19
Not typed	-	-	-
*Total positive	89	100	10.19
Total number of analyzed samples	873		



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
^c III 18:z4,z23:-	13	23.21	2.4
Hadar	9	16.1	1.7
Muenchen	9	16.1	1.7
Schwarzengrund	7	12.5	1.3
Heidelberg	3	5.4	0.6
Newport	3	5.4	0.6
Reading	3	5.4	0.6
Saintpaul	3	5.4	0.6
Berta	2	3.6	0.4
Kentucky	2	3.6	0.4
Worthington	2	3.6	0.4
^a Other serotypes	10	15.15	1.86
^b Unidentified	-	-	-
Total serotyped isolates	66	100	12.24
Not typed	-	-	-
*Total positive	66	100	12.24
Total number of analyzed samples	539		



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
III_18:z4,z23:-	13	23.21	1.1
Hadar	9	16.1	0.8
Muenchen	9	16.1	0.8
Schwarzengrund	7	12.5	0.6
Heidelberg	3	5.4	0.3
Newport	3	5.4	0.3
Reading	3	5.4	0.3
Saintpaul	3	5.4	0.3
Berta	2	3.6	0.2
Kentucky	2	3.6	0.2
Worthington	2	3.6	0.2
^a Other serotypes	10	15.15	0.87
^b Unidentified	-	-	-
Total serotyped isolates	66	100	5.71
Not typed	-	-	-
*Total positive	66	100	5.71
Total number of analyzed samples		1,155	



Table 7 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Ground Turkey
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2013	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Muenchen	3	9.09	1.4
^c I 4,[5],12:i:-	3	9.1	1.4
Newport	3	9.1	1.4
Reading	3	9.1	1.4
Berta	3	9.1	1.4
Albany	2	6.1	0.9
Senftenberg	2	6.1	0.9
Agona	2	6.1	0.9
Hadar	2	6.1	0.9
lii_18:Z4,Z23:-	2	6.1	0.9
Typhimurium	1	3.0	0.5
Schwarzengrund	1	3.0	0.5
Saintpaul	1	3.0	0.5
Ohio	1	3.0	0.5
Derby	1	3.0	0.5
Ouakam	1	3.0	0.5
Heidelberg	1	3.0	0.5
Dublin	1	3.0	0.5
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	33	100	15.21
Not typed	-	-	-
*Total positive	33	100	15.21
Total number of analyzed samples		217	

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.



Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.

Table 8
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2006	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	65	32.83	2.33
Heidelberg	33	16.67	1.18
Reading	13	6.57	0.47
Schwarzengrund	13	6.57	0.47
Saintpaul	10	5.05	0.36
Agona	8	4.04	0.29
Senftenberg	8	4.04	0.29
Anatum	5	2.53	0.18
Derby	4	2.02	0.14
Muenster	4	2.02	0.14
^a Other serotypes	31	15.66	1.11
^b Unidentified	4	2.02	0.14
Total serotyped isolates	198	100	7.11
Not typed	-	-	-
Total positive	198	100	7.11
Total number of analyzed samples	2,785		



Table 8-Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2007	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	54	50.00	3.10
Senftenberg	9	8.33	0.52
Saintpaul	8	7.41	0.46
Heidelberg	6	5.56	0.34
Newport	5	4.63	0.29
Agona	3	2.78	0.17
Berta	3	2.78	0.17
Montevideo	3	2.78	0.17
Mbandaka	2	1.85	0.11
Muenchen	2	1.85	0.11
Reading	2	1.85	0.11
Schwarzengrund	2	1.85	0.11
Typhimurium	2	1.85	0.11
^a Other serotypes	6	5.56	0.34
^b Unidentified	1	0.93	0.06
Total serotyped isolates	108	100	6.19
Not typed	-	-	-
Total positive	108	100	6.19
Total number of analyzed samples	1,744		



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2008	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	3	37.50	2.33
Agona	1	12.50	0.78
Berta	1	12.50	0.78
Newport	1	12.50	0.78
Schwarzengrund	1	12.50	0.78
^a Other serotypes	-	-	-
^b Unidentified	1	12.50	0.78
Total serotyped isolates	8	100	6.20
Not typed	-	-	-
*Total positive	8	100	6.20
Total number of analyzed samples	129		



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2009	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	18	33.33	1.25
Agona	9	16.67	0.63
Albany	3	5.56	0.21
Muenchen	3	5.56	0.21
Senftenberg	3	5.56	0.21
Derby	2	3.70	0.14
Heidelberg	2	3.70	0.14
Kentucky	2	3.70	0.14
Typhimurium	2	3.70	0.14
^c 4, [5],12:l:-	1	1.85	0.07
^c 8,20:-:z6	1	1.85	0.07
Anatum	1	1.85	0.07
Infantis	1	1.85	0.07
Johannesburg	1	1.85	0.07
Mbandaka	1	1.85	0.07
Montevideo	1	1.85	0.07
Newport	1	1.85	0.07
Saintpaul	1	1.85	0.07
Schwarzengrund	1	1.85	0.07
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	54	100	3.77
Not typed	-	-	-
Total positive	54	100	3.77
Total number of analyzed samples		1,432	



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2010	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	15	22.73	1.04
Muenchen	9	13.64	0.62
Saintpaul	6	9.09	0.42
Heidelberg	5	7.58	0.35
Schwarzengrund	5	7.58	0.35
Agona	4	6.06	0.28
Brandenburg	3	4.55	0.21
Anatum	2	3.03	0.14
Berta	2	3.03	0.14
Newport	2	3.03	0.14
Typhimurium var. 5-	2	3.03	0.14
^a Other serotypes	9	13.64	0.62
^b Unidentified	1	1.52	0.07
Total serotyped isolates	65	98.4	4.50
Not typed	1	1.5	0.07
*Total positive	66	100	4.57
Total number of analyzed samples	1,444		



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2011	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	10	27.03	0.62
Albany	3	8.11	0.19
Berta	3	8.11	0.19
Saintpaul	3	8.11	0.19
Schwarzengrund	3	8.11	0.19
Agona	2	5.41	0.12
Heidelberg	2	5.41	0.12
Montevideo	2	5.41	0.12
^c 4, [5],12:I:-	1	2.70	0.06
Brandenburg	1	2.70	0.06
Cubana	1	2.70	0.06
Dublin	1	2.70	0.06
Newport	1	2.70	0.06
Orion var.15+	1	2.70	0.06
Reading	1	2.70	0.06
Typhimurium	1	2.70	0.06
Uganda	1	2.70	0.06
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	37	100	2.31
Not typed	-	-	-
*Total positive	37	100	2.31
Total number of analyzed samples		1,605	



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2012 All Samples)

Serotypes 2012	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Heidelberg	9	27.03	0.41
Senftenberg	6	8.11	0.27
Reading	4	8.11	0.18
Albany	4	8.11	0.18
Hadar	4	8.11	0.18
Agona	4	5.41	0.18
Saintpaul	3	5.41	0.14
Schwarzengrund	3	5.41	0.14
Muenchen	3	2.70	0.14
Montevideo	2	2.70	0.09
Havana	1	2.70	0.05
Typhimurium	1	2.70	0.05
Enteritidis	1	2.70	0.05
Anatum	1	2.70	0.05
Ouakam	1	2.70	0.05
Litchfield	1	2.70	0.05
Heidelberg	9	2.70	0.41
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	48	100	2.20
Not typed	-	-	-
*Total positive	48	100	2.20
Total number of analyzed samples	2,183		



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2013 All Samples)

Serotypes 2013	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	10	18.18	0.41
Reading	7	12.73	0.29
Muenchen	5	9.09	0.21
Heidelberg	5	9.09	0.21
Typhimurium	4	7.27	0.17
Worthington	3	5.45	0.12
Berta	3	5.45	0.12
^c 4,[5],12:i:-	3	5.45	0.12
Albany	3	5.45	0.12
Senftenberg	2	3.64	0.08
Enteritidis	2	3.64	0.08
Anatum	2	3.64	0.08
Saintpaul	2	3.64	0.08
Schwarzengrund	1	1.82	0.04
Derby	1	1.82	0.04
Agona	1	1.82	0.04
Newport	1	1.82	0.04
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	55	100	2.28
Not typed	-	-	-
*Total positive	55	100	2.28
Total number of analyzed samples	453		



Table 8 - Continued
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Calendar Year.
Young Turkeys (Turkey Carcasses)
(1998–2005 'A' Set Samples; 2006–2014 All Samples)

Serotypes 2014	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Reading	8	25.00	0.42
Kentucky	4	12.50	0.21
Agona	3	9.38	0.16
Hadar	3	9.38	0.16
Ouakam	2	6.25	0.10
Saintpaul	2	6.25	0.10
Montevideo	2	6.25	0.10
Typhimurium	1	3.13	0.05
Derby	1	3.13	0.05
Paratyphi A	1	3.13	0.05
Enteritidis	1	3.13	0.05
Indiana	1	3.13	0.05
Muenchen	1	3.13	0.05
Heidelberg	1	3.13	0.05
I 4,[5],12:i:-	1	3.13	0.05
^a Other serotypes	-	-	-
^b Unidentified	-	-	-
Total serotyped isolates	32	100	1.67
Not typed	-	-	-
*Total positive	32	100	1.67
Total number of analyzed samples			1919

****Note: Sampling for young turkey began in 2006.**

*The percentages listed for total positive isolates may not equal the sum of the data in the Percent of Analyzed Samples column due to rounding.

^aThe ten most commonly isolated serotypes during a listed year are identified by name while less commonly identified serotypes are included in the “other serotypes” category. When there is more than one serotype in tenth place, all serotypes in tenth place are listed.

^bThe “unidentified” designation includes isolates for which a single specific serotype could not be determined including rough, and/or nonmotile.

^cPrior to 2004, FSIS classified serotypes identified solely by antigenic formulas as monophasic, such as I 4, [5],12:i:-, and included them in the unidentified isolates category.



Of note: The figures display the percent of the isolates identified out of total isolates serotyped for each product class. The y axis, the serotype percentage, varies from graph to graph because the percent of different serotypes varies by commodity and year.
