United States Department of Agriculture

Food Safety And Inspection Service

Salmonella Serotype Quarterly Results from Meat and Poultry Products

July–December 2010

Background

The Food Safety and Inspection Service (FSIS) Pathogen Reduction; Hazard Analysis and Critical Control Point (PR/HACCP) Systems, Final Rule sets *Salmonella* performance standards for establishments that slaughter or produce selected classes of food animals or raw ground products (Federal Register, 1996). Nationwide microbiological baseline studies prior to 1996 established the PR/HACCP performance standards for carcasses of cows/bulls, steers/heifers, market hogs, broilers, ground beef, ground chicken, and ground turkey. In June 2006, FSIS began sampling turkey carcasses for *Salmonella*. Guidance on standards for turkey carcasses is available in the Federal Register (2005).

Prior to 2006, the FSIS regulatory program for *Salmonella* in raw products consisted of two phases: non-targeted and targeted testing. Non-targeted or "A" set sample collection occurred randomly at selected establishments with a goal of scheduling every eligible establishment at least once a year. Other codes (e.g., "B", "C", and "D") represented sample sets collected from establishments targeted for additional testing following an "A" set failure.

FSIS replaced the targeted/non-targeted approach with risk-based scheduling in 2006. In June 2006, FSIS developed new criteria for scheduling establishments for sampling. This new process focused FSIS resources on establishments with the most *Salmonella* positive samples (FSIS, 2006), especially serotypes most frequently associated with human salmonellosis as defined by the Centers for Disease Control and Prevention (2009). Using this method, establishments are no longer selected at random. One of the goals of the revised risk-based program is to identify the source of serotypes of the greatest human health concern and to report those findings directly to establishments. Through this process, FSIS identifies all pathogens of public health concern using subtype (serotype and PFGE pattern) and drug resistance profiles.

The Agency provided individual test results to establishments before completion of a set (Federal Register, 2006; Federal Register, 2008). In February 2006, FSIS began reporting quarterly results from *Salmonella* verification testing. The quarterly results for 2010 are provided below.
www.fsis.usda.gov/PDF/Q1_2010_Salmonella_Testing.pdf;
www.fsis.usda.gov/PDF/Q2_2010_Salmonella_Testing.pdf;
www.fsis.usda.gov/PDF/Q3_2010_Salmonella_Testing.pdf; and
www.fsis.usda.gov/PDF/Q4_2010_Salmonella_Testing.pdf

Results

This report includes serotype data from the targeted, non-targeted, and risk-based sample sets. The data includes two quarters of *Salmonella* serotype data for 2010—July 1 through December 30, 2010. Tables 1–16 provides the number of isolates of each serotype, the percent of isolates out of total positive, and the percent of isolates of total samples collected.

Each table in this report identifies the 10 most commonly isolated serotypes by name for each product class during each quarter. 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. In addition, the tables include entries classified as "unidentified" isolates, which consists of a single, specific serotype that could not be determined.

Figures 1–11 provide the percent of isolates identified out of the top 10 serotypes associated with human illness (CDC, 2009) for each product class by quarter from July 2005 to present. The graphs represent data collected from July 2005 to present. The Y-axis in Figures 1–11 represents the serotype percentage. The scale of this axis varies from graph to graph to accommodate annual variability and variation in isolate percent between different commodity groups.

Limitations

The changes made in the 2006 verification program will limit historical data comparisons. There is caution in drawing some conclusions due to the inability to adjust for the difference in data collection resulting from verification changes.

References

CDC. 2010. Preliminary FoodNet Data on the Incidence of Infection with Pathogens Transmitted Commonly through Food – 10 States, 2009. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5914a2.htm. Accessed on 19 April 2011.

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Federal Register. 2005. Generic *E. coli* and *Salmonella* Baseline Results. Available at: http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/02-046N.pdf. Accessed on 19 April 2011.

Federal Register. 2006. *Salmonella* Verification Sample Results Reporting: Agency Policy and Use in Public Health Protection. Available at: http://www.fsis.usda.gov/Frame/FrameRedirect.asp?main=http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/04-026N.htm. Accessed on 19 April 2011.

Federal Register. 2008. Salmonella Verification Sampling Program: Response to Comments and New Agency Policies. Available at: http://www.fsis.usda.gov/Frame/FrameRedirect.asp?main=http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/2006-0034.htm. Accessed on 19 April 2011.

FSIS. 2006. Scheduling Criteria for *Salmonella* Sets in Raw Classes of Product. Available at: http://www.fsis.usda.gov/pdf/scheduling_criteria_salmonella_sets.pdf. Accessed on 19 April 2011.

Table 1
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Broilers
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	63	56.25	4.15
Enteritidis	32	28.57	2.11
Berta	3	2.68	0.20
Braenderup	3	2.68	0.20
Typhimurium	3	2.68	0.20
Uganda	2	1.79	0.13
4,5,12:i:-	1	0.89	0.07
Albany	1	0.89	0.07
Johannesburg	1	0.89	0.07
Montevideo	1	0.89	0.07
Schwarzengrund	1	0.89	0.07
Thompson	1	0.89	0.07
Other serotypes	0	0.00	0.00
[a]Total positive	112		7.37
Total number of analyzed samples	1,519		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding

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Table 2
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Market Hogs
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
London	5	20.00	0.45
Saintpaul	4	16.00	0.36
Infantis	3	12.00	0.27
Agona	2	8.00	0.18
Choleraesuis	2	8.00	0.18
Derby	2	8.00	0.18
Cerro	1	4.00	0.09
Heidelberg	1	4.00	0.09
Johannesburg	1	4.00	0.09
Kiambu	1	4.00	0.09
Typhimurium	1	4.00	0.09
Typhimurium 5-	1	4.00	0.09
Uganda	1	4.00	0.09
Other serotypes	0	0.00	0.00
Total positive	25		2.25
Total number of analyzed samples	1,111		

Table 3
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Cows/Bulls
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	2	100.00	0.32
Other serotypes	0	0.00	0.00
Total positive	2		0.32
Total number of analyzed samples	624		

Table 4
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Steers/Heifers
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Adelaide	1	50.00	0.07
Anatum	1	50.00	0.07
Other serotypes	0	0.00	0.00
Total positive	2		0.14
Total number of analyzed samples	1,410		

Table 5
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Ground Beef
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Montevideo	20	38.46	1.01
Give	3	5.77	0.15
Infantis	3	5.77	0.15
Kentucky	3	5.77	0.15
Mbandaka	3	5.77	0.15
Anatum	2	3.85	0.10
Cerro	2	3.85	0.10
Dublin	2	3.85	0.10
Reading	2	3.85	0.10
Schwarzengrund	2	3.85	0.10
Other serotypes	10	19.23	0.51
[a]Total positive	52		2.63
Total number of analyzed samples	1,974		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding

Table 6
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Ground Chicken
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	9	47.37	10.00
Enteritidis	6	31.58	6.67
4,5,12:i:-	1	5.26	1.11
Heidelberg	1	5.26	1.11
Typhimurium	1	5.26	1.11
Typhimurium 5-	1	5.26	1.11
Other serotypes	0	0.00	0.00
Total positive	19		21.11
Total number of analyzed samples	90		

Table 7
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Ground Turkey
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Saintpaul	9	25.71	4.15
Heidelberg	8	22.86	3.69
Albany	5	14.29	2.30
Anatum	2	5.71	0.92
Hadar	2	5.71	0.92
Schwarzengrund	2	5.71	0.92
Senftenber	2	5.71	0.92
III_18:z4,z23	1	2.86	0.46
Montevideo	1	2.86	0.46
Newport	1	2.86	0.46
Typhimurium	1	2.86	0.46
Tennessee	1	2.86	0.46
Other serotypes	0	0.00	0.00
[a]Total positive	35		16.13
Total number of analyzed samples	217		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

Table 8
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Turkeys
All Samples—3rd Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Muenchen	6	21.43	1.90
Hadar	5	17.86	1.58
Schwarzengrund	3	10.71	0.95
Agona	2	7.14	0.63
Heidelberg	2	7.14	0.63
Saintpaul	2	7.14	0.63
4,5,12:i:-	1	3.57	0.32
Brandenburg	1	3.57	0.32
Livingstone	1	3.57	0.32
Montevideo	1	3.57	0.32
Newport	1	3.57	0.32
Senftenber	1	3.57	0.32
Typhimurium	1	3.57	0.32
Other serotypes	0	0.00	0.00
Unidentified	1	3.57	0.32
[a]Total positive	28		8.86
Total number of analyzed samples	316		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

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Table 9
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Broilers
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Kentucky	53	48.62	4.60
Enteritidis	35	32.11	3.04
Johannesburg	6	5.50	0.52
Typhimurium 5-	5	4.59	0.43
Typhimurium	3	2.75	0.26
4,5,12:i:-	1	0.92	0.09
Anatum var 15+	1	0.92	0.09
Braenderup	1	0.92	0.09
Infantis	1	0.92	0.09
Senftenber	1	0.92	0.09
Other serotypes	0	0.00	0.00
Unidentified	2	1.83	0.17
[a]Total positive	109		9.46
Total number of analyzed samples	1,152		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

Table 10
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Market Hogs
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Derby	4	25.00	0.53
Adelaide	2	12.50	0.26
Infantis	2	12.50	0.26
Typhimurium 5-	2	12.50	0.26
Agona	1	6.25	0.13
Berta	1	6.25	0.13
Johannesburg	1	6.25	0.13
Mbandaka	1	6.25	0.13
Rissen	1	6.25	0.13
Other serotypes	0	0.00	0.00
Unidentified	1	6.25	0.13
[a]Total positive	16		2.10
Total number of analyzed samples	761		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

Table 11
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Cows/Bulls
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	1	100.00	0.35
Other serotypes	0	0.00	0.00
Total positive	1		0.35
Total number of analyzed samples	287		

Table 12
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Steers/Heifers
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
	0	0.00	0.00
Other serotypes	0	0.00	0.00
Total positive	0	0.00	0.00
Total number of analyzed samples	1,372		

Table 13
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Ground Beef
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Dublin	11	23.40	0.64
Montevideo	11	23.40	0.64
Agona	3	6.38	0.18
Cerro	3	6.38	0.18
Muenster	3	6.38	0.18
Anatum	2	4.26	0.12
Kentucky	2	4.26	0.12
Lille	2	4.26	0.12
Meleagridis	2	4.26	0.12
Newport	2	4.26	0.12
Other serotypes	5	10.64	0.29
Unidentified	1	2.13	0.06
[a]Total positive	47		2.75
Total number of analyzed samples	1,709		

[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

Table 14
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Ground Chicken
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Enteritidis	14	37.84	8.64
Kentucky	10	27.03	6.17
Heidelberg	7	18.92	4.32
Typhimurium 5-	2	5.41	1.23
Hadar	1	2.70	0.62
Infantis	1	2.70	0.62
Montevideo	1	2.70	0.62
Thompson	1	2.70	0.62
Other serotypes	0	0.00	0.00
Total positive	37		22.84
Total number of analyzed samples	162		

Table 15
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Ground Turkey
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	5	20.00	1.80
Saintpaul	5	20.00	1.80
Schwarzengrund	3	12.00	1.08
Albany	2	8.00	0.72
Newport	2	8.00	0.72
Senftenber	2	8.00	0.72
Agona	1	4.00	0.36
Anatum	1	4.00	0.36
Derby	1	4.00	0.36
Enteritidis	1	4.00	0.36
Muenster	1	4.00	0.36
Typhimurium	1	4.00	0.36
Other serotypes	0	0.00	0.00
[a]Total positive	25		8.99
Total number of analyzed samples	278		

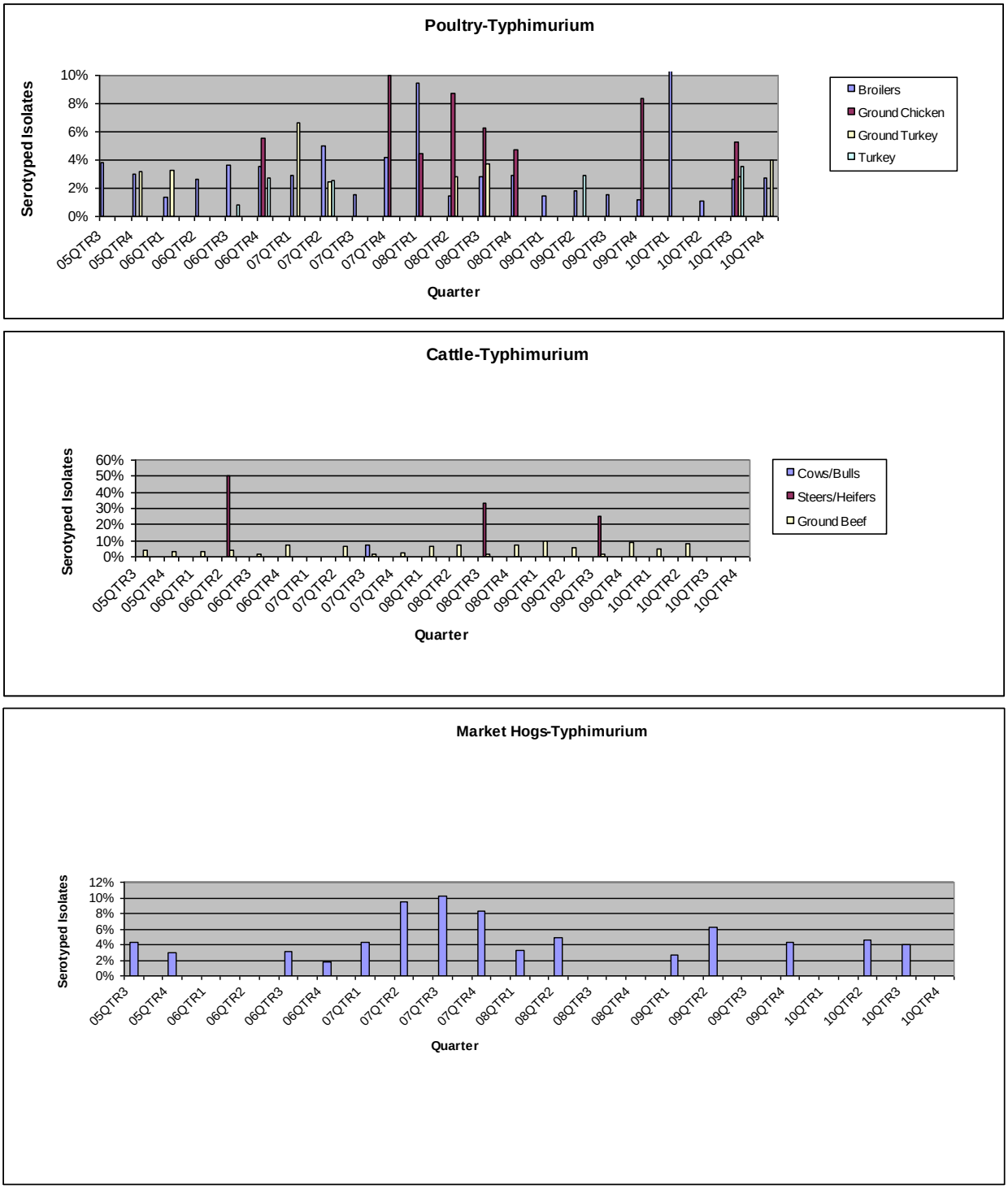
[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

Table 16
Profile of Serotypes from Analyzed PR/HACCP Verification Samples by Quarter.
Turkeys
All Samples—4th Quarter 2010

Serotypes	Number of Isolates	Percent of Total Positive	Percent of Analyzed Samples
Hadar	4	30.77	1.29
Muenchen	2	15.38	0.65
4,12:e,h:-	1	7.69	0.32
Agona	1	7.69	0.32
Anatum	1	7.69	0.32
Heidelberg	1	7.69	0.32
Reading	1	7.69	0.32
Saintpaul	1	7.69	0.32
Uganda	1	7.69	0.32
Other serotypes	0	0.00	0.00
[a]Total positive	13		4.19
Total number of analyzed samples	310		

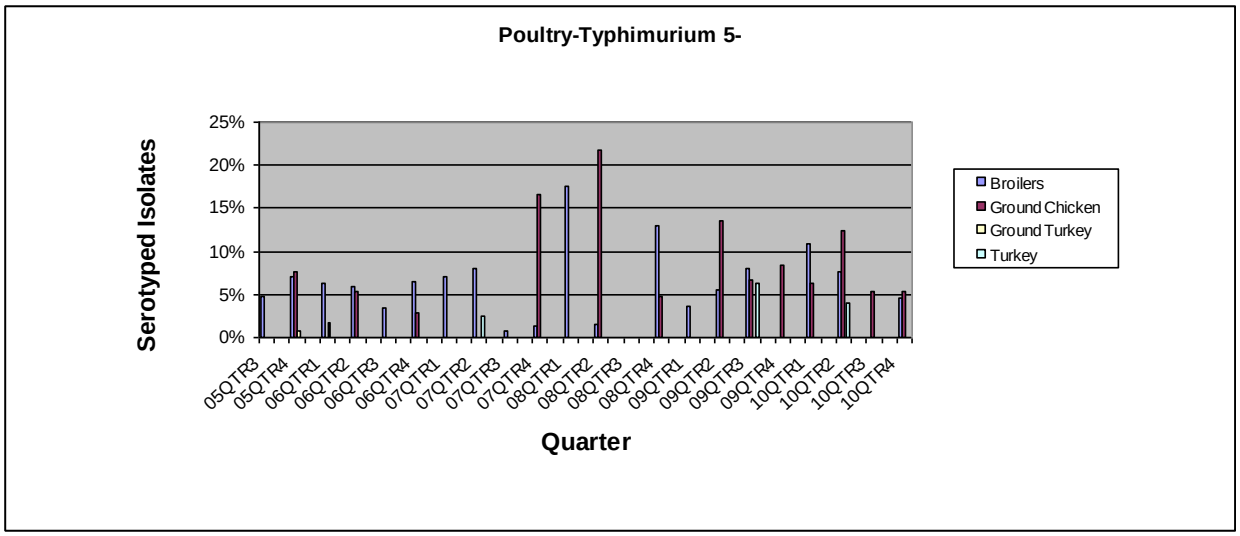
[a] The percentages listed for total positive isolates may not equal the sum of percent analyzed samples due to rounding.

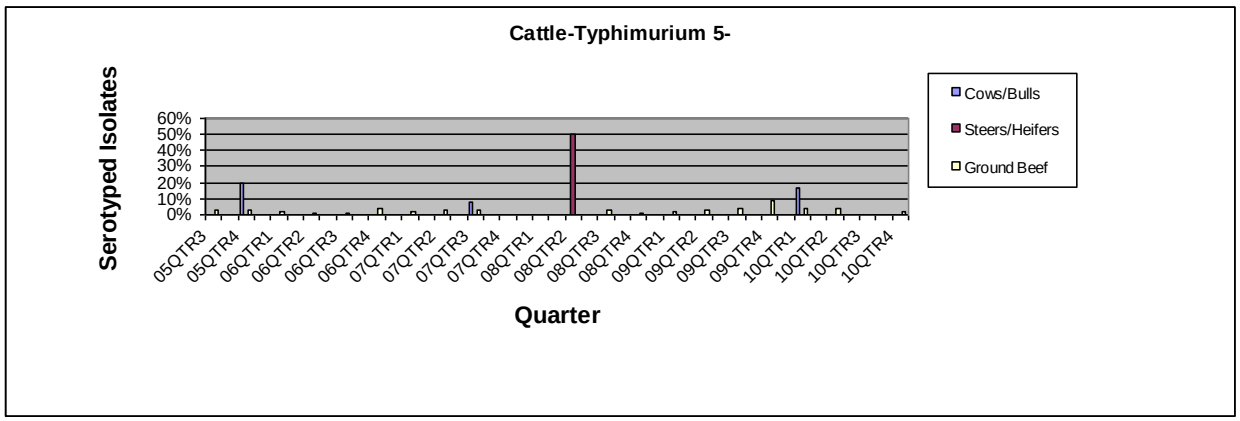
Figure 1
Quarterly Percent of Typhimurium Isolates by Product Class, 2005–2010*
All Samples

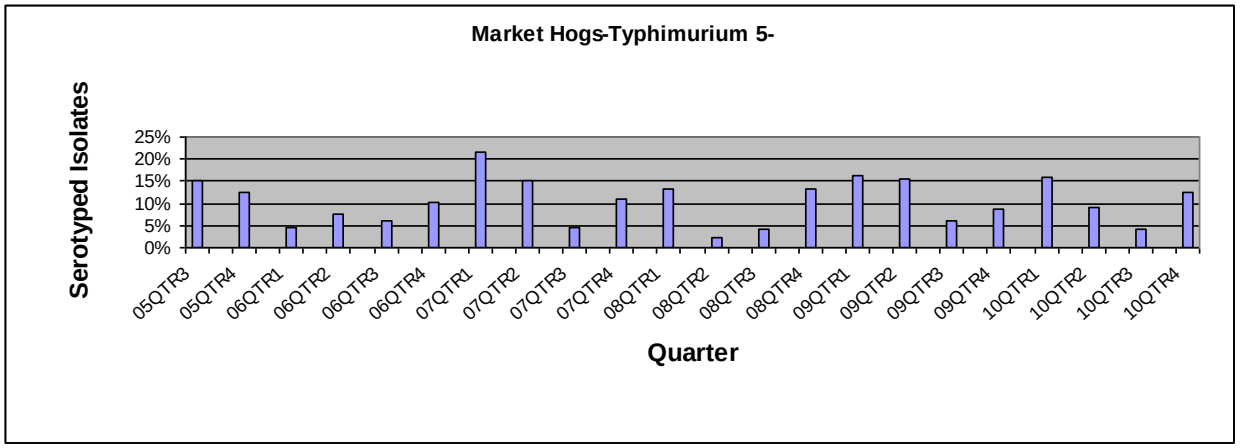


*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Figure 2
Quarterly Percent of Typhimurium 5-** Isolates by Product Class, 2005–2010*
All Samples

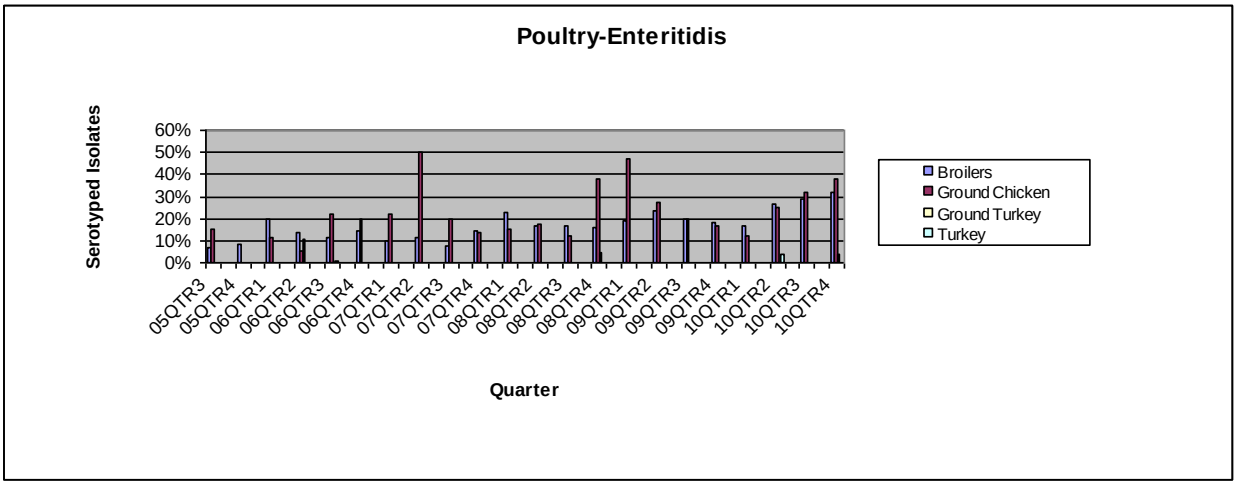


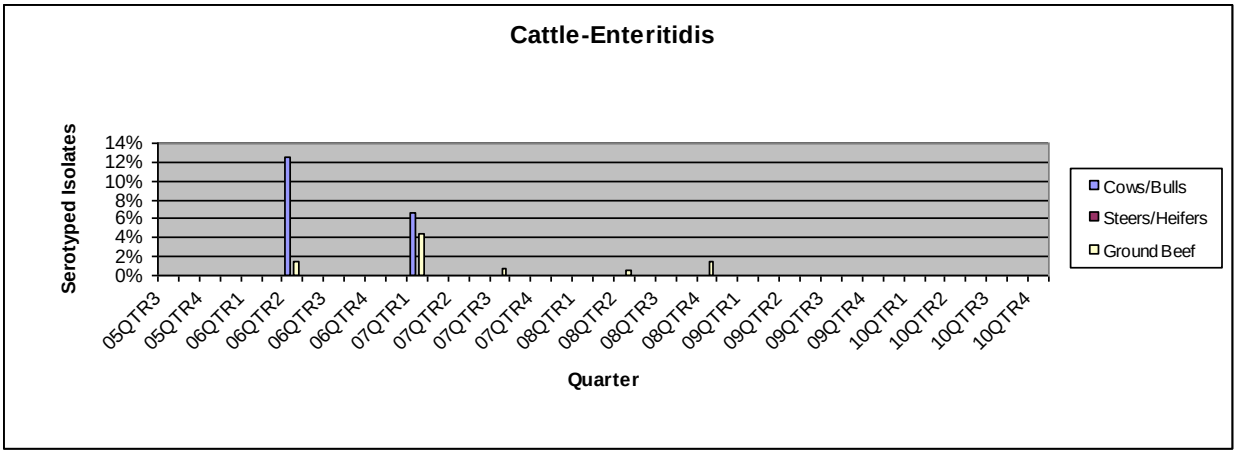


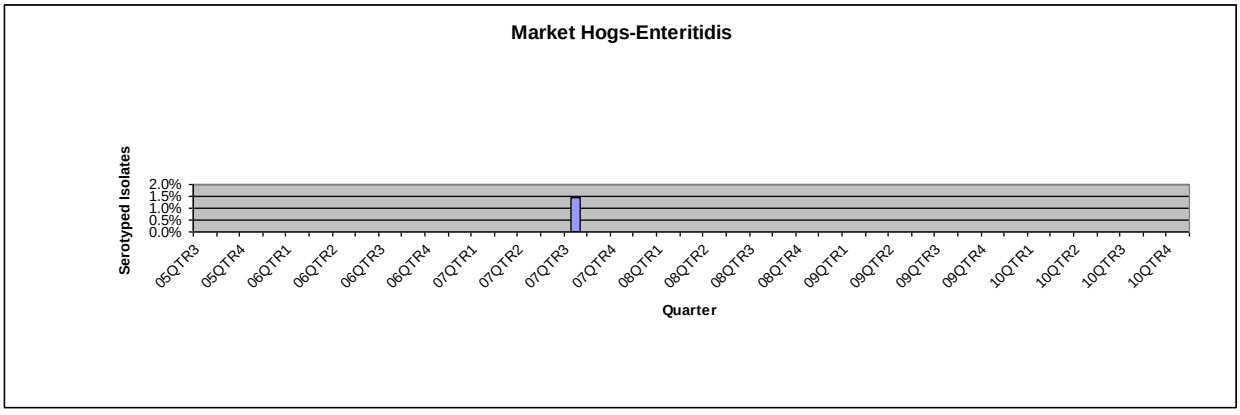


*Please note that the y-axis percent varies from graph to graph.
**Formerly Typhimurium var. Copenhagen
Source: USDA, FSIS, PR/HACCP

Figure 3
Quarterly Percent of Enteritidis Isolates by Product Class, 2005–2010*
All Samples

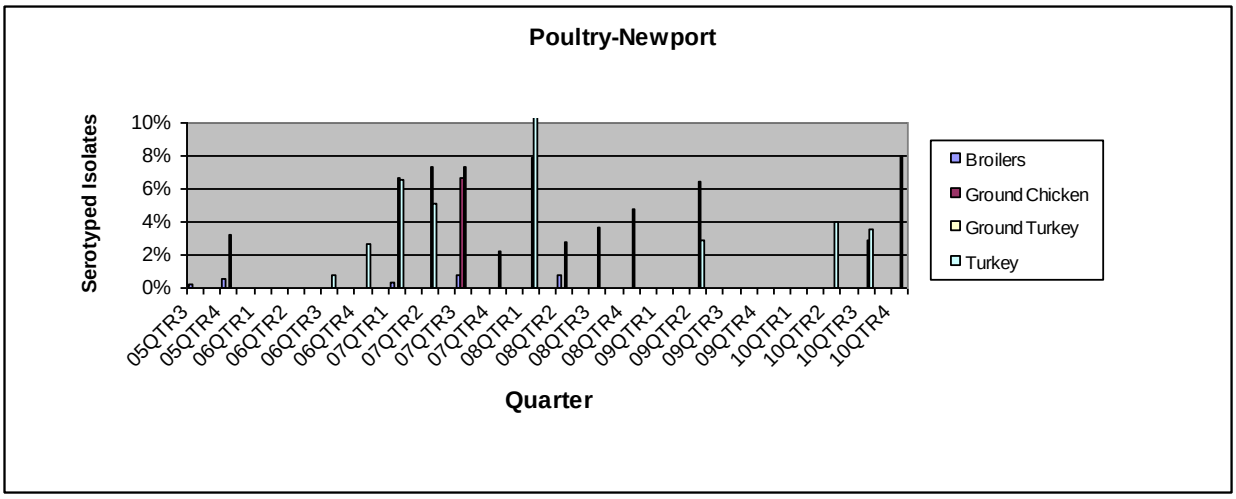


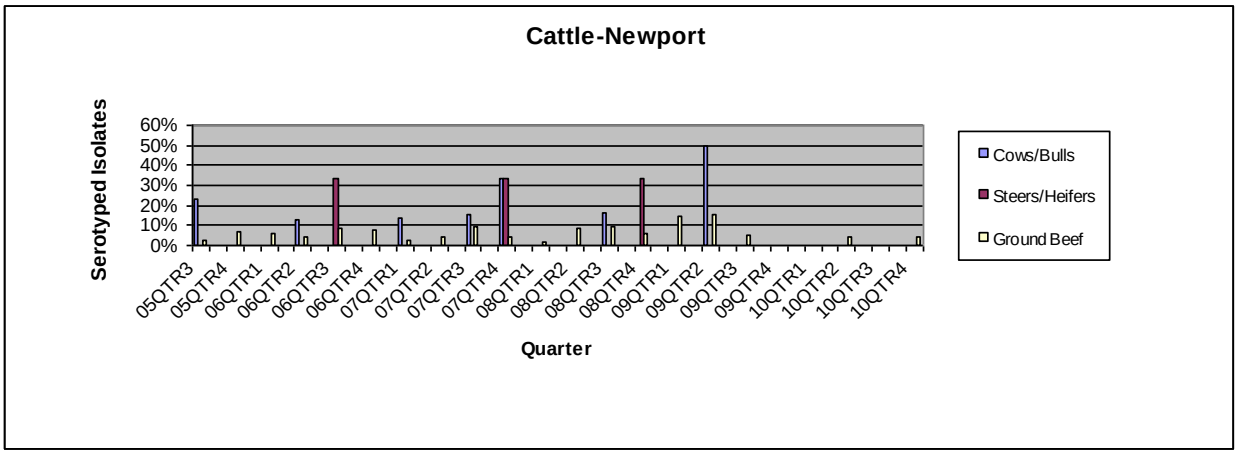


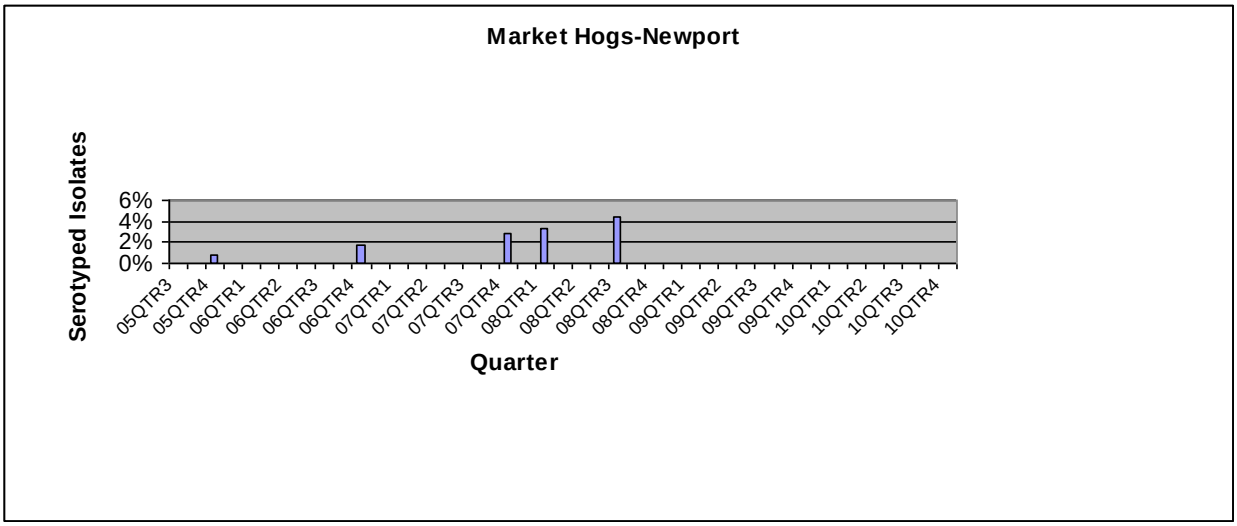


*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Figure 4
Quarterly Percent of Newport Isolates by Product Class, 2005–2010*
All Samples

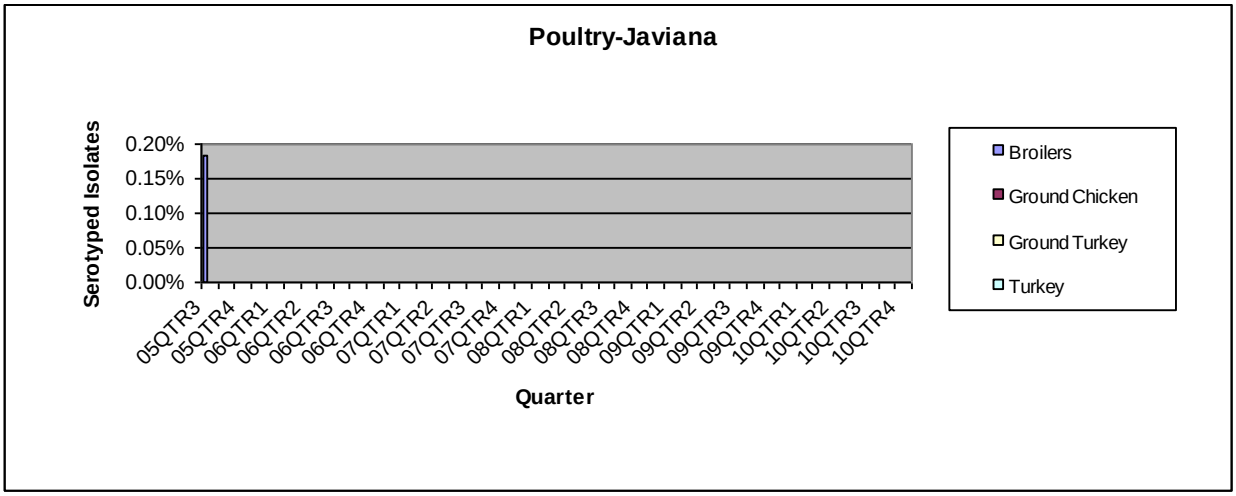


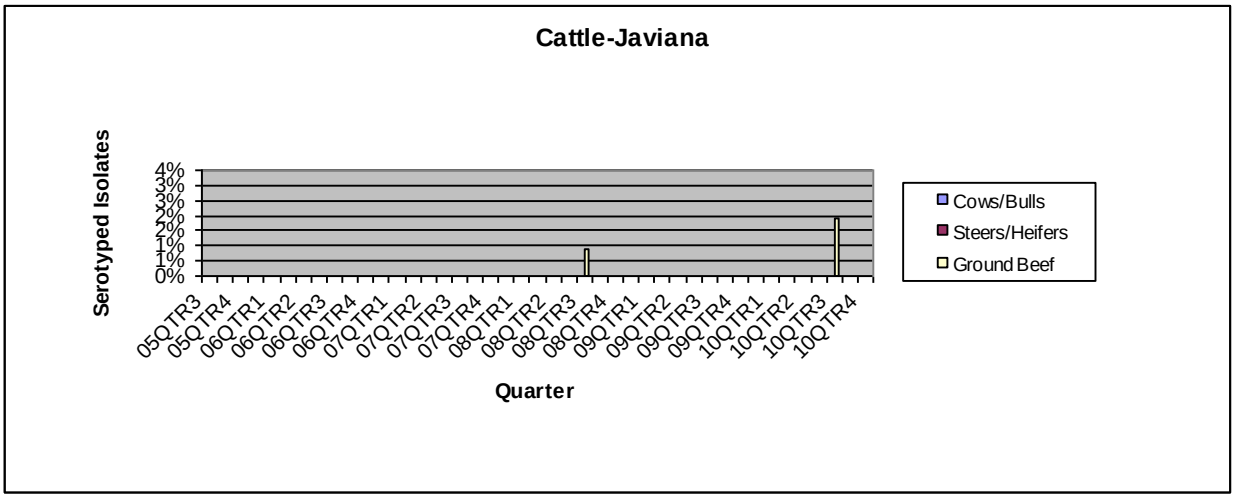


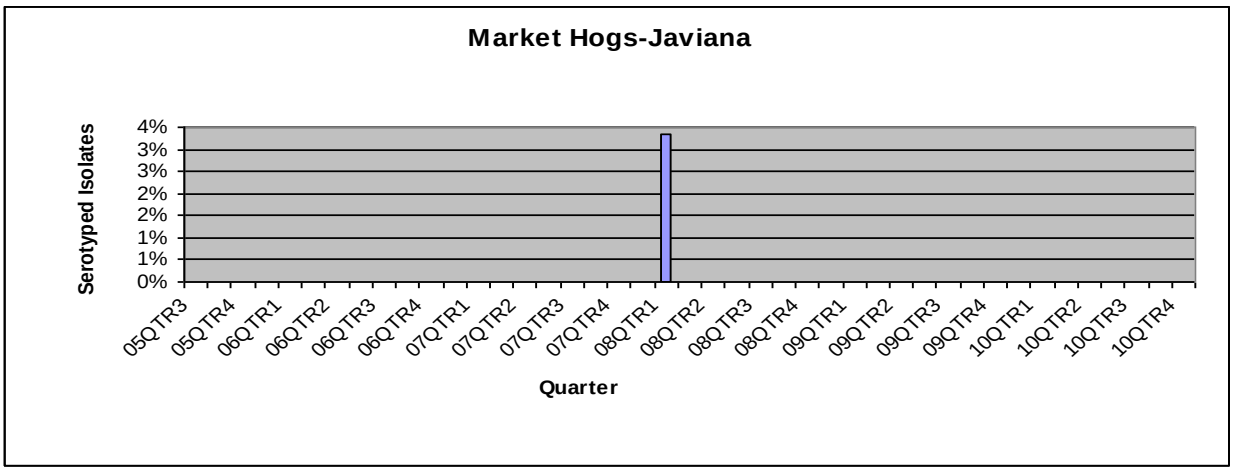


*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Figure 5
Quarterly Percent of Javiana Isolates by Product Class, 2005–2010*
All Samples

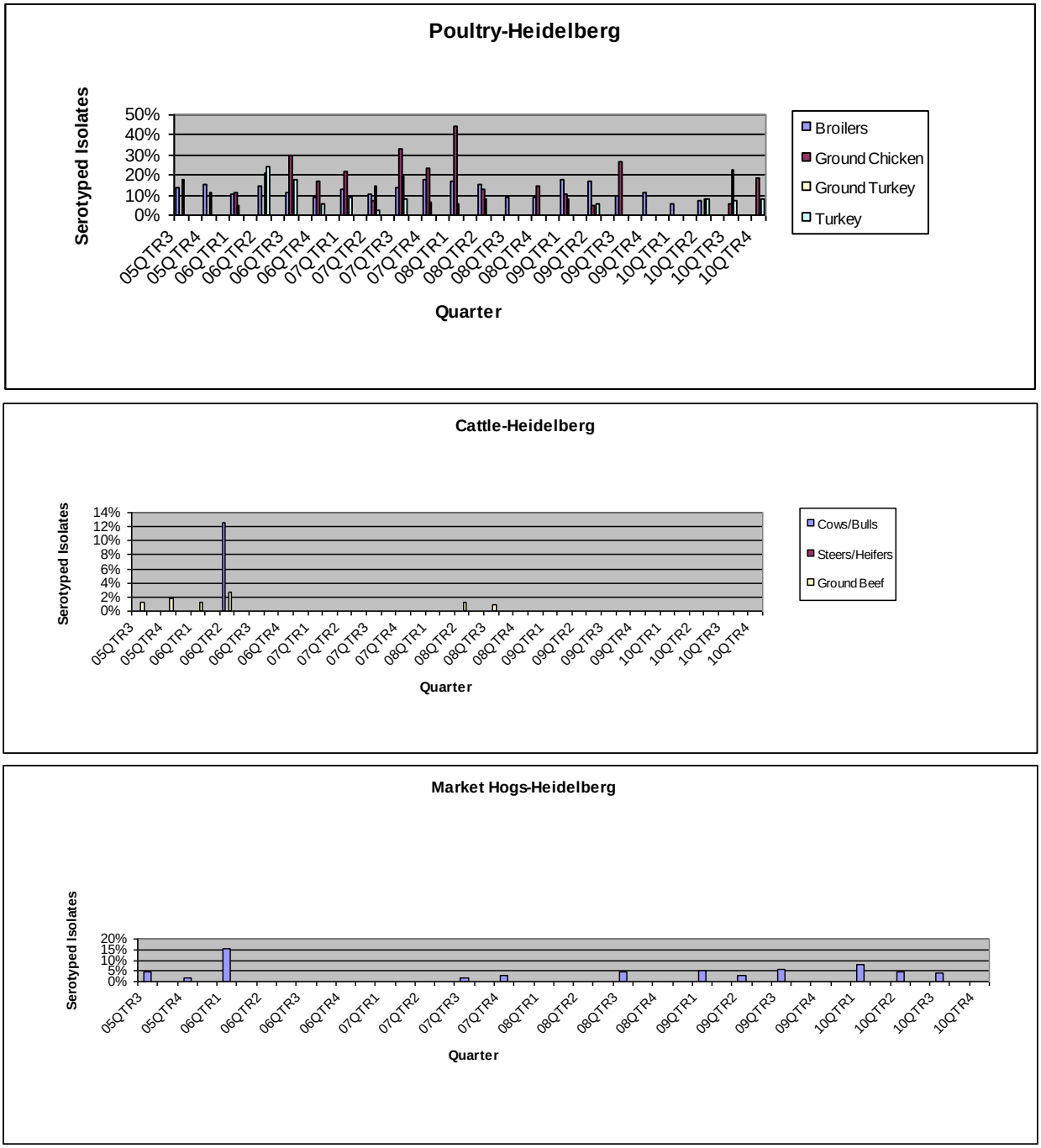






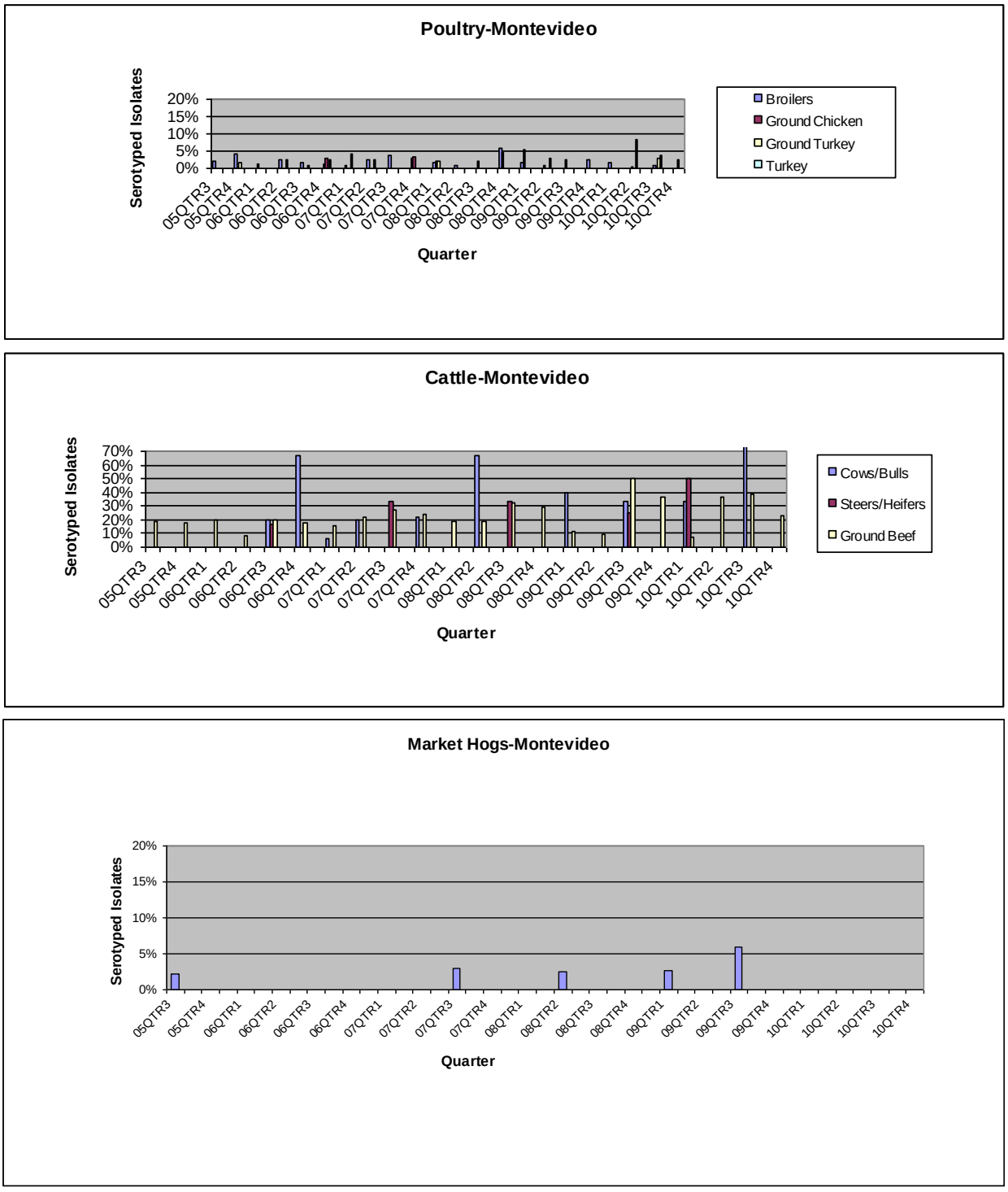
*Please note that the y-axis percent varies from graph to graph
Source: USDA, FSIS, PR/HACCP

Figure 6
Quarterly Percent of Heidelberg Isolates by Product Class, 2005–2010*
All Samples



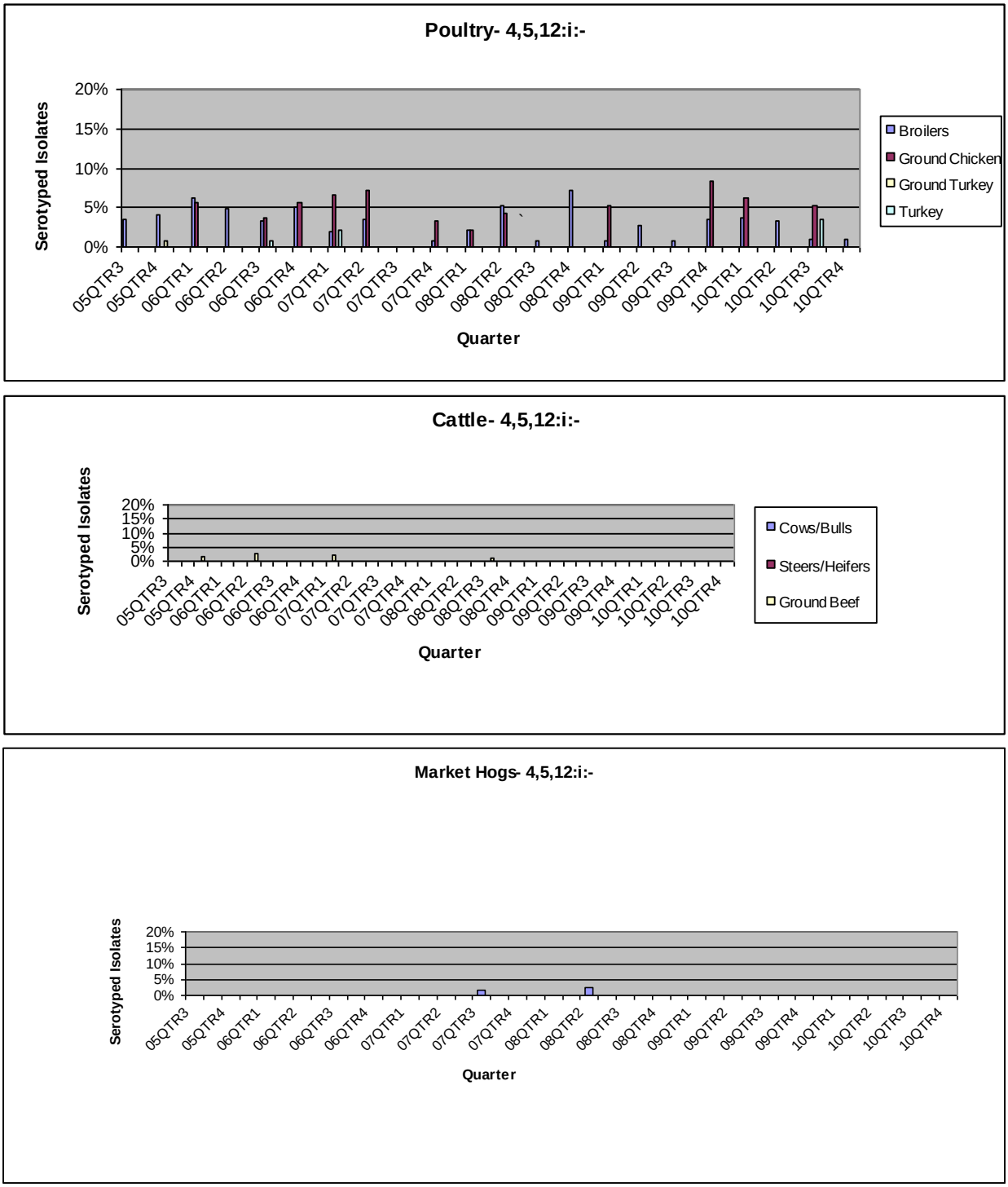
*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Figure 7
Quarterly Percent of Montevideo Isolates by Product Class, 2005–2010*
All Samples



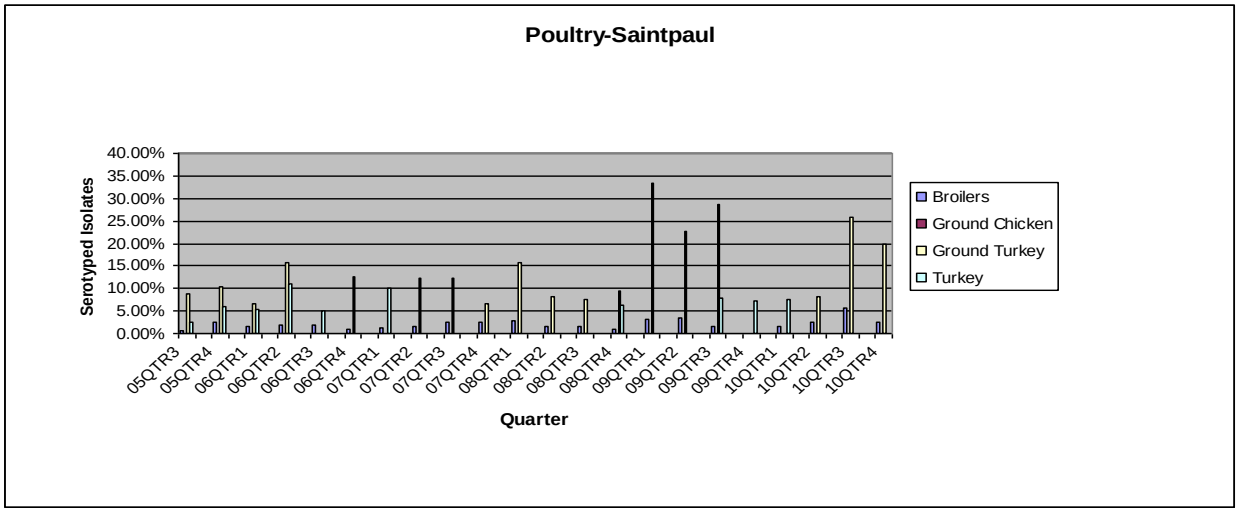
*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

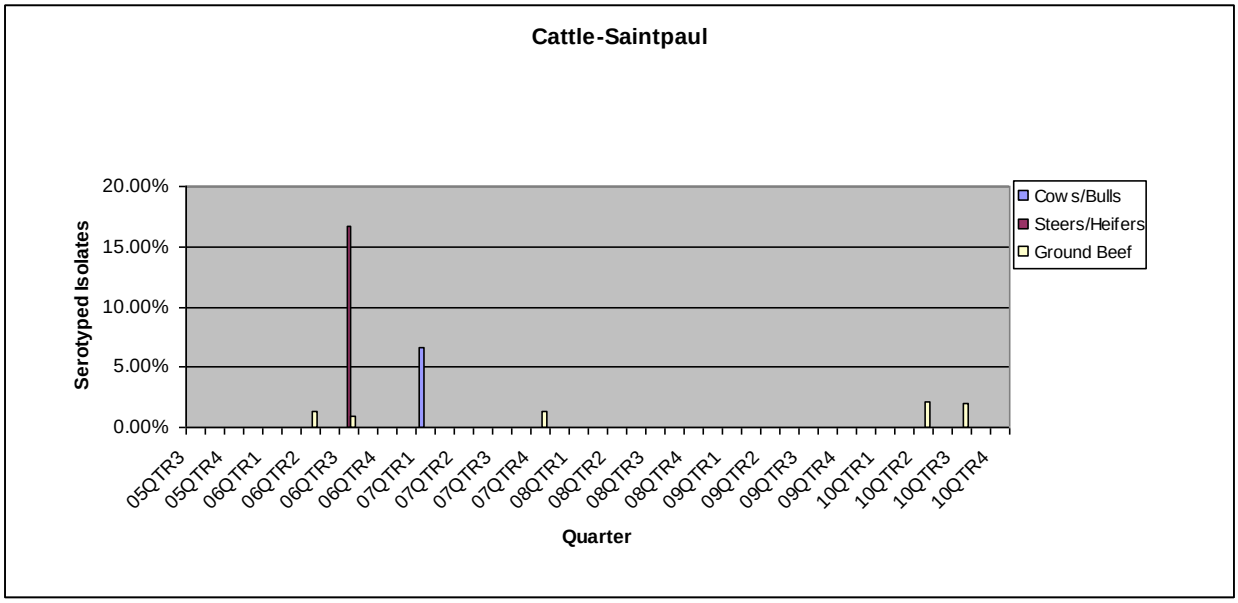
Figure 8
Quarterly Percent of 4,5,12:1- Isolates by Product Class, 2005–2010*
All Samples

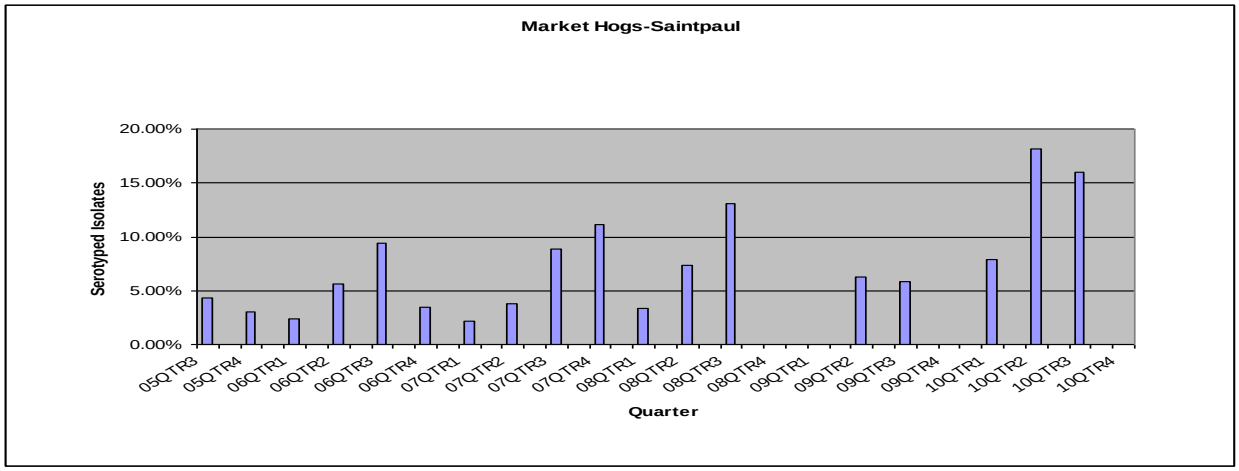


*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Figure 9
Quarterly Percent of Saintpaul Isolates by Product Class, 2005–2010*
All Samples

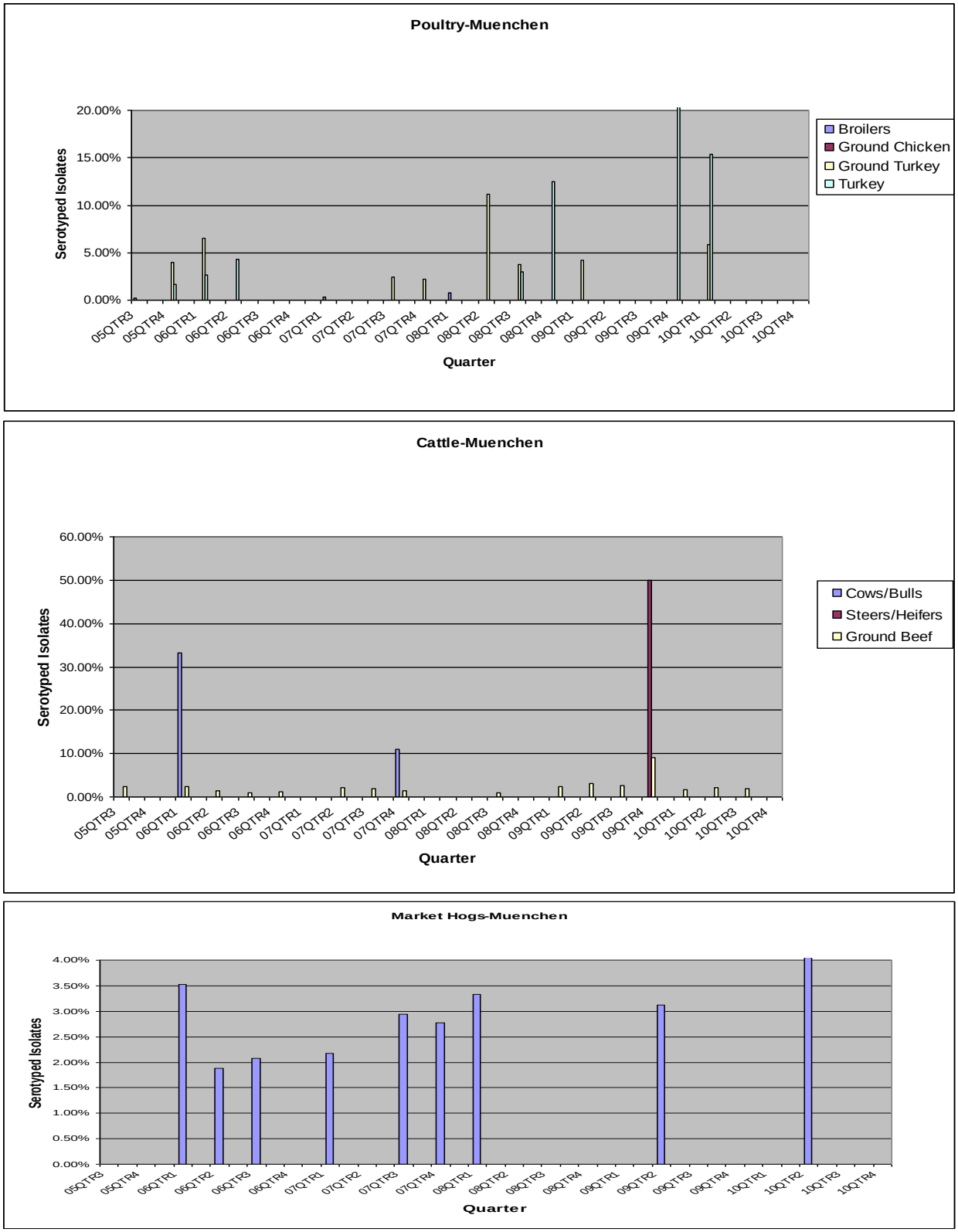






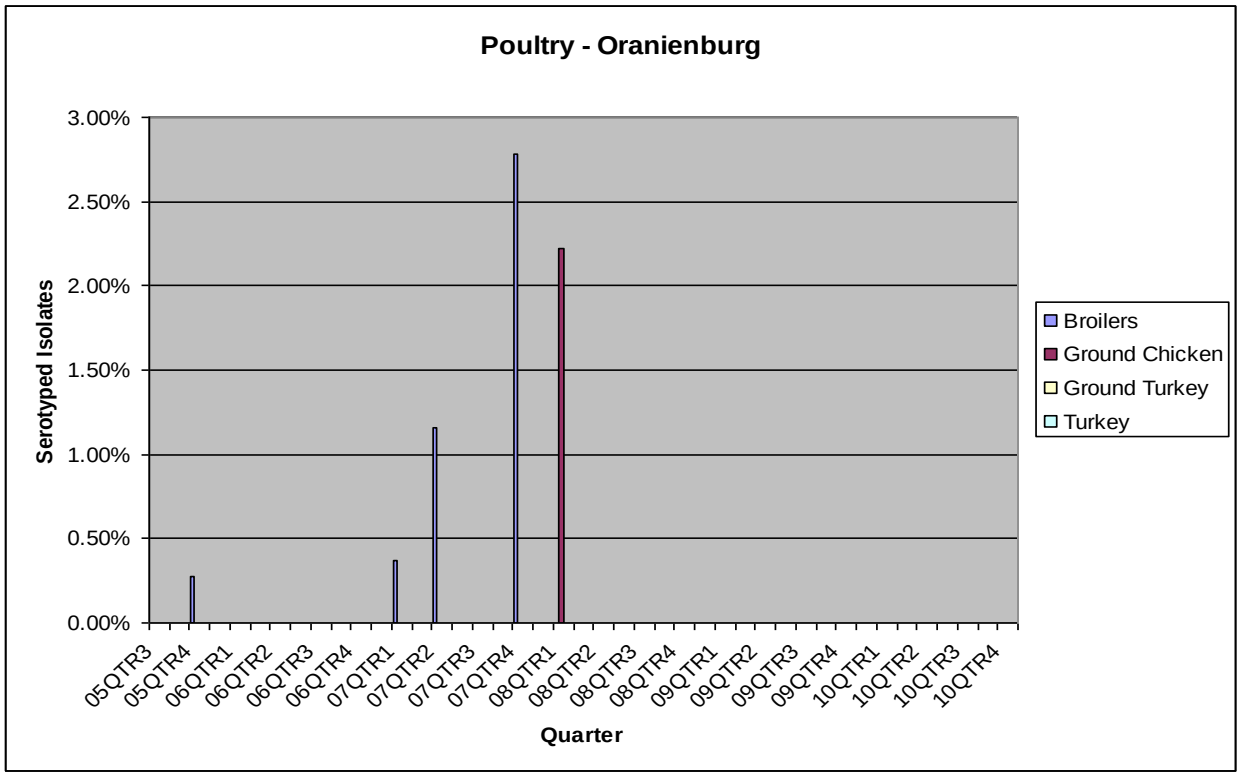
*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

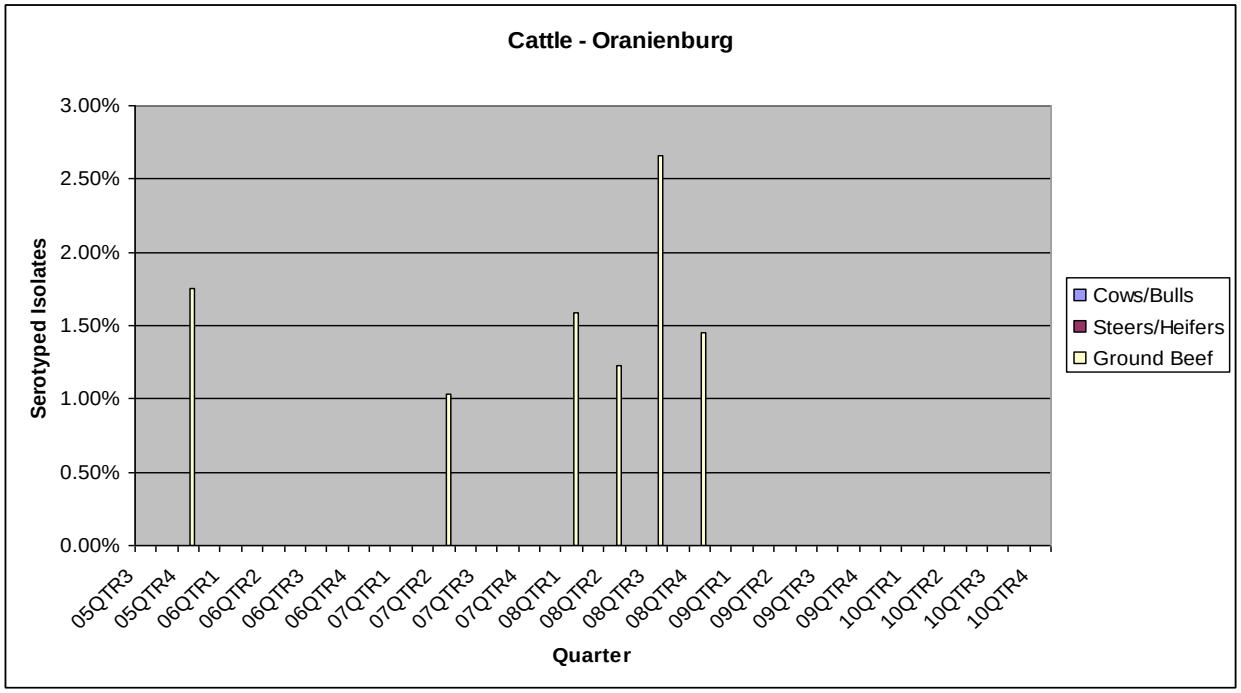
Figure 10
Quarterly Percent of Muenchen Isolates by Product Class, 2005–2010*
All Samples



*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Figure 11
Quarterly Percent of Oranienburg Isolates by Product Class, 2005–2010*
All Samples





*Please note that the y-axis percent varies from graph to graph.
Source: USDA, FSIS, PR/HACCP

Market Hogs – Oranienburg: PR/HACCP has never reported a positive case since 1998.