



United States
Department of
Agriculture

Food Safety
And Inspection
Service

Third and Fourth Quarter Results for Serotyping of Salmonellae from Meat and Poultry Products

July – December 2007

Background

The Food Safety and Inspection Service (FSIS) issued the *Pathogen Reduction; Hazard Analysis and Critical Control Point (PR/HACCP) Systems, Final Rule* on July 25, 1996: Federal Register, Vol. 61, No. 144, pp. 38805-38989 (<http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/93-016F.pdf>). The PR/HACCP rule sets *Salmonella* performance standards for establishments that slaughter or produce selected classes of food animals or raw ground products. Under PR/HACCP, performance standards were established for carcasses of cows/bulls, steers/heifers, market hogs, broilers, ground beef, ground chicken, and ground turkey based on nationwide microbiological baseline studies conducted before the rule was implemented. In June 2006, FSIS began sampling turkey carcasses for *Salmonella*. Guidance on turkey carcass levels can be found in the Federal Register, Vol.70, No. 32, pp.8058-8060 (<http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/02-046N.pdf>).

Prior to 2006, there were two phases of the FSIS regulatory program for *Salmonella* in raw products: non-targeted and targeted testing. Non-targeted or "A" set samples were collected at establishments randomly selected from the population of eligible establishments with a goal of scheduling every eligible establishment at least once a year. Other codes (such as "B", "C", and "D") represented sample sets collected from establishments targeted for follow-up testing following a failed set. FSIS replaced the targeted/non-targeted approach with risk-based scheduling in 2006. The serotype data here are from all sample sets.

In February 2006, FSIS announced in the Federal Register, Vol. 71, No. 38, pp. 9772-9777, (<http://www.fsis.usda.gov/Frame/FrameRedirect.asp?main=http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/04-026N.htm>) that quarterly results from *Salmonella* verification testing would be posted and that the Agency would provide individual test results to establishments before completion of a set. The Agency has published quarterly *Salmonella* results since 2006 (http://www.fsis.usda.gov/Science/Q3_2007_Salmonella_Testing/index.asp; http://www.fsis.usda.gov/Science/Q4_2007_Salmonella_Testing/index.asp).

In June 2006, FSIS developed new criteria for scheduling establishments (http://www.fsis.usda.gov/pdf/scheduling_criteria_salmonella_sets.pdf), that are risk-based and designed to focus FSIS resources on establishments that have the most samples positive for *Salmonella* and the greatest number of samples with serotypes most frequently associated with human salmonellosis as defined by the Centers for Disease Control and Prevention (CDC) (<http://www.cdc.gov/ncidod/dbmd/phlisdata/salmonella.htm>). Establishments are no longer randomly selected under the new criteria. The collection of serotype data is not designed for trend analysis. 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 as they become available. FSIS also now ensures that all pathogens of public health concern are identified regarding both their subtype (serotype and PFGE pattern) and their drug resistance profiles.



Results

The number of isolates of each serotype, the percent of isolates out of total positive, and the percent of isolates of total samples collected are displayed in Tables 1-8 (July through September of the 3rd Quarter) and Tables 9-16 (October through December of the 4th Quarter).

The ten most commonly isolated serotypes for each product class during each quarter are identified by name. 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.

The tables include entries classified as “unidentified” isolates. A single, specific serotype could not be determined for these isolates.

Tables 8 and 16 show serotype data for turkey carcasses. Turkey carcass testing began in the 2nd quarter of 2006.

Figures 1-8 display the percent of isolates identified out of total isolates serotyped for each product class by quarter from July 2005 forward for the top eight serotypes associated with human illness in 2006 (for consistency in the graphs, data collected prior to the 2006 revisions was updated to include results from all sets)

(http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5614a4.htm?s_cid=mm5614a4_e).

For Figures 1-8, the y-axis, representing the serotype percentage, varies from graph to graph because the incidence of different serotypes by commodity varies greatly and year-to-year variations in percentages are difficult to discern on one scale of high value.

Limitations

FSIS can not determine how the revised *Salmonella* testing program affects the distribution of serotypes from positive samples. Thus, comparisons of results from 2006 onward to previous years are inappropriate. Similarly, the changes to the verification program prevent valid comparisons of testing results over time (e.g., quarter-to quarter or year-to-year trends). For such comparisons, the results of upcoming nationwide [baseline studies](#) can be used to provide valid estimates of the prevalence of certain pathogens of public health concern and permit valid statistical comparisons to be made over time. A 12-month Young Chicken (Broiler) and Turkey Baseline Studies are currently in progress, and additional baseline studies are under development.

Salmonella verification testing is conducted to establish regulatory compliance (http://www.fsis.usda.gov/Science/Scheduling_Criteria_Salmonella_Sets/index.asp), not to establish prevalence of either *Salmonella* or specific serotypes of *Salmonella*. Data reported here are not intended to be reflective of national trends in prevalence of serotypes.



Table 1
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Broilers
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Kentucky	73	56.15	5.97
Heidelberg	18	13.85	1.47
Enteritidis	10	7.69	0.82
4,5,12:i:-	5	3.85	0.41
Montevideo	5	3.85	0.41
Mbandaka	3	2.31	0.25
4,12;i:-	2	1.54	0.16
6,7:k:-	2	1.54	0.16
8,20:i:-	2	1.54	0.16
Molade	2	1.54	0.16
Typhimurium	2	1.54	0.16
Other serotypes	4	3.08	0.33
Unidentified	2	1.54	0.16
^a Total positive	130		10.63
Total number of analyzed samples	1223		

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



Table 2
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Market Hogs
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Infantis	8	11.76	0.35
Adelaide	7	10.29	0.31
Typhimurium	7	10.29	0.31
Agona	6	8.82	0.26
Saint-Paul	6	8.82	0.26
Derby	5	7.35	0.22
Johannesburg	5	7.35	0.22
Typhimurium (var.Copenhagen)	3	4.41	0.13
Anatum var. 15+	2	2.94	0.09
Hadar	2	2.94	0.09
Mbandaka	2	2.94	0.09
Montevideo	2	2.94	0.09
Muenchen	2	2.94	0.09
Other serotypes	11	16.18	0.48
^a Total positive	68		2.97
Total number of analyzed samples	2291		

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



Table 3
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Cows/Bulls
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Anatum	2	15.38	0.20
Muenster	2	15.38	0.20
Newport	2	15.38	0.20
6,7:z10:-	1	7.69	0.10
Gaminara	1	7.69	0.10
Mbandaka	1	7.69	0.10
Infantis	1	7.69	0.10
Miami	1	7.69	0.10
Typhimurium	1	7.69	0.10
Typhimurium (var.Copenhagen)	1	7.69	0.10
Other serotypes	0	0	0
^a Total positive	13		1.32
Total number of analyzed samples	985		

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



Table 4
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Steers/Heifers
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Give var. 15+	1	33.33	0.08
Infantis	1	33.33	0.08
Montevideo	1	33.33	0.08
Other serotypes	0	0	0
Total positive	3		0.24
Total number of analyzed samples	1246		



Table 5
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Ground Beef
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Montevideo	40	26.85	1.11
Newport	14	9.40	0.39
Mbandaka	11	7.38	0.31
Muenster	11	7.38	0.31
Agona	8	5.37	0.22
Anatum	8	5.37	0.22
Cerro	7	4.70	0.19
Dublin	6	4.03	0.17
Infantis	5	3.36	0.14
Typhimurium (var. Copenhagen)	5	3.36	0.14
Other serotypes	32	21.48	0.89
Unidentified	2	1.34	0.06
^a Total positive	149		4.14
Total number of analyzed samples	3598		

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



Table 6
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Ground Chicken
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Heidelberg	5	33.33	9.43
Enteritidis	3	20.00	5.66
4,12:i:-	2	13.33	3.77
Kentucky	2	13.33	3.77
Agona	1	6.67	1.89
Braenderup	1	6.67	1.89
Newport	1	6.67	1.89
Other serotypes	0		
Total positive	15		28.30
Total number of analyzed samples	53		



Table 7
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Ground Turkey
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Hadar	12	29.27	4.78
Heidelberg	8	19.51	3.19
Saint-Paul	5	12.20	1.99
Newport	3	7.32	1.20
Agona	2	4.88	0.80
London	2	4.88	0.80
Minnesota	2	4.88	0.80
Albany	1	2.44	0.40
Cubana	1	2.44	0.40
Johannesburg	1	2.44	0.40
Muenchen	1	2.44	0.40
Reading	1	2.44	0.40
Schwarzengrund	1	2.44	0.40
Uganda	1	2.44	0.40
Other serotypes	0		
^a Total positive	41		16.33
Total number of analyzed samples	251		

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



Table 8
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Turkeys
All Samples – 3rd Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Hadar	5	38.46	3.62
Senftenberg	4	30.77	2.90
Mbandaka	2	15.38	1.45
Heidelberg	1	7.69	0.72
Kentucky	1	7.69	0.72
Other serotypes	0		
^a Total positive	13		9.42
Total number of analyzed samples	138		

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



Table 9
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Broilers
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Kentucky	51	35.42	3.01
Heidelberg	26	18.06	1.53
Enteritidis	21	14.58	1.24
Berta	7	4.86	0.41
Typhimurium	6	4.17	0.35
Montevideo	4	2.78	0.24
Oranienburg	4	2.78	0.24
Braenderup	3	2.08	0.18
Mbandaka	3	2.08	0.18
Infantis	2	1.39	0.12
Thompson	2	1.39	0.12
Typhimurium (var.Copenhagen)	2	1.39	0.12
Other serotypes	12	8.83	0.71
Unidentified	1	0.69	0.06
^a Total positive	144		8.49
Total number of analyzed samples	1697		

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



Table 10
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Market Hogs
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Derby	5	13.89	0.38
Johannesburg	5	13.89	0.38
Saint-Paul	4	11.11	0.31
Typhimurium (var.Copenhagen)	4	11.11	0.31
Infantis	3	8.33	0.23
Typhimurium	3	8.33	0.23
Adelaide	2	5.56	0.15
III61:-:1,5	1	2.78	0.08
Agona	1	2.78	0.08
Anatum	1	2.78	0.08
Anatum var. 15+	1	2.78	0.08
Heidelberg	1	2.78	0.08
Kentucky	1	2.78	0.08
London	1	2.78	0.08
Muenchen	1	2.78	0.08
Newport	1	2.78	0.08
Uganda	1	2.78	0.08
Other serotypes	0	0	0
^a Total positive	36		2.75
Total number of analyzed samples	1308		

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



Table 11
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Cows/Bulls
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Newport	3	33.33	0.34
Montevideo	2	22.22	0.23
Muenster	2	22.22	0.23
Anatum	1	11.11	0.11
Muenchen	1	11.11	0.11
Other serotypes	0	0	0
Total positive	9		1.02
Total number of analyzed samples	880		



Table 12
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Steers/Heifers
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Anatum	1	33.33	0.11
Dublin	1	33.33	0.11
Newport	1	33.33	0.11
Other serotypes	0	0	0
^a Total positive	3		0.34
Total number of analyzed samples	882		

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



Table 13
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Ground Beef
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Montevideo	18	24.00	0.71
Dublin	16	21.33	0.63
Muenster	6	8.00	0.24
Agona	4	5.33	0.16
Cerro	4	5.33	0.16
Mbandaka	3	4.00	0.12
Meleagridis	3	4.00	0.12
Newport	3	4.00	0.12
Anatum	2	2.67	0.08
Infantis	2	2.67	0.08
Lille	2	2.67	0.08
Typhimurium	2	2.67	0.08
Other serotypes	8	10.67	0.31
Unidentified	2	2.67	0.08
^a Total positive	75		2.94
Total number of analyzed samples	2551		

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



Table 14
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Ground Chicken
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Heidelberg	7	23.33	4.49
Kentucky	7	23.33	4.49
Typhimurium (var.Copenhagen)	5	16.67	3.21
Enteritidis	4	13.33	2.56
Typhimurium	3	10.00	1.92
4,5,12,:i:-	1	3.33	0.64
Minnesota	1	3.33	0.64
Montevideo	1	3.33	0.64
Thompson	1	3.33	0.64
Other serotypes	0	0	0
Total positive	30		19.23
Total number of analyzed samples	156		



Table 15
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Ground Turkey
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Hadar	31	67.39	14.22
Agona	3	6.52	1.38
Heidelberg	3	6.52	1.38
Saint-Paul	3	6.52	1.38
6,8:z10:-	1	2.17	0.46
Derby	1	2.17	0.46
Muenchen	1	2.17	0.46
Newport	1	2.17	0.46
Reading	1	2.17	0.46
Worthington	1	2.17	0.46
Other serotypes	0	0	0
^a Total positive	46		21.10
Total number of analyzed samples	218		

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



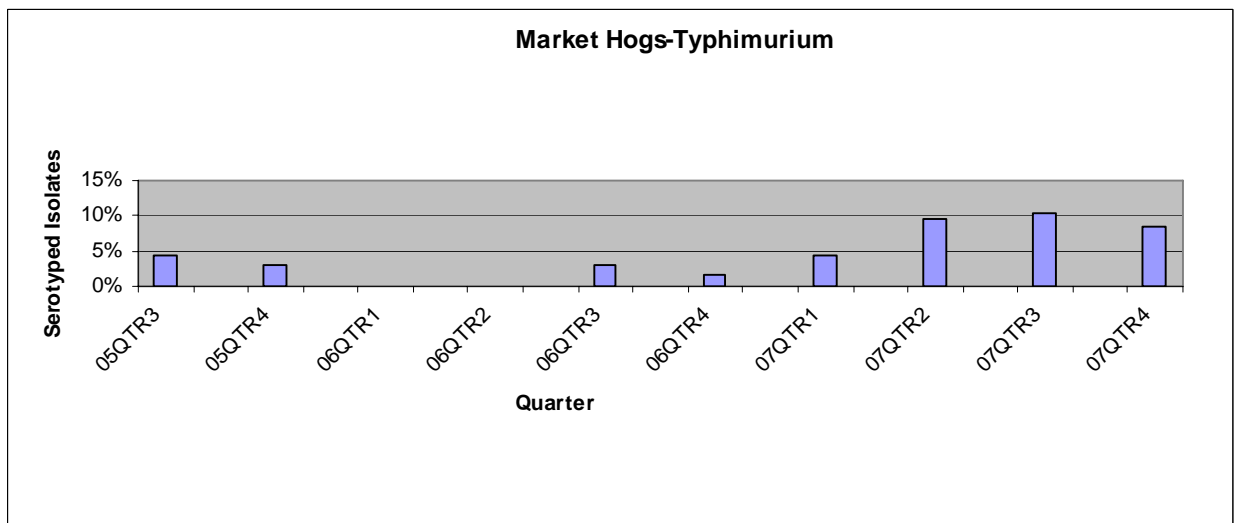
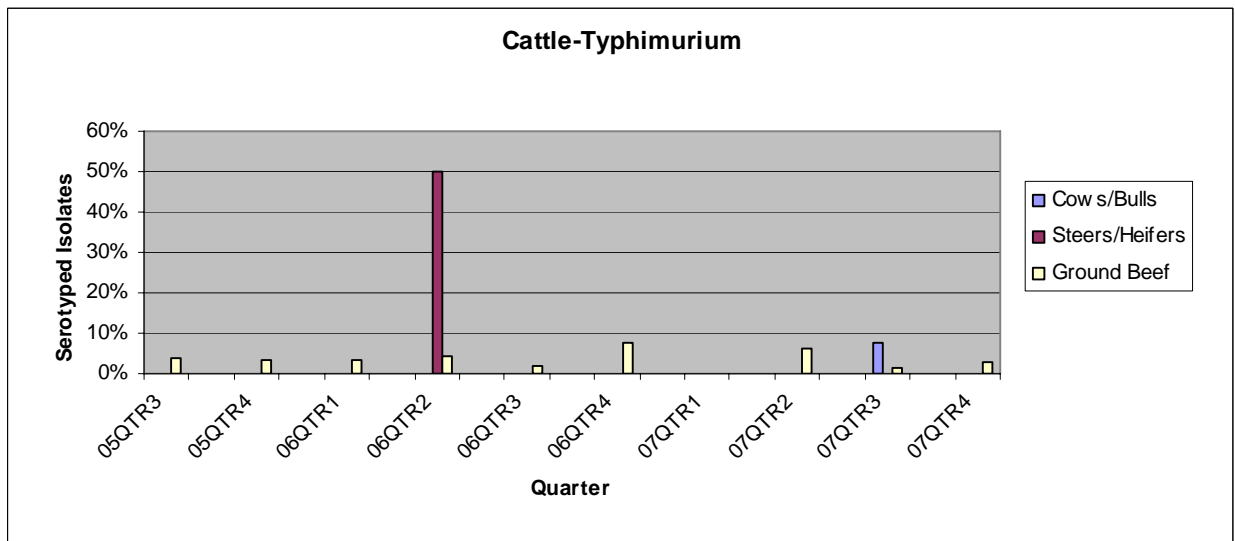
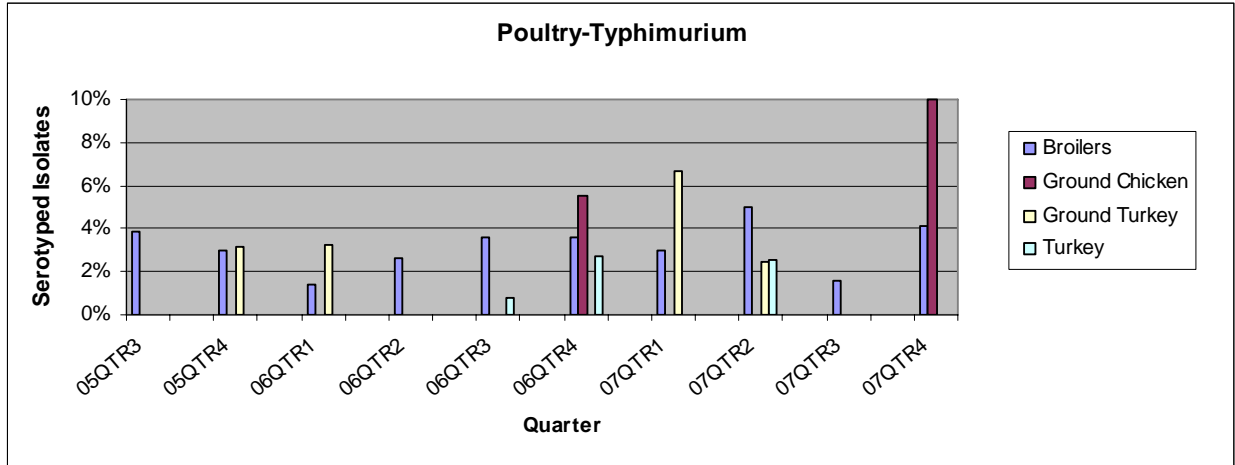
Table 16
Serotypes Profile of Analyzed PR/HACCP Verification Samples by Quarter.
Turkeys
All Samples – 4th Quarter 2007

Serotypes	# Isolates	% of Total Positive	% Analyzed Samples
Hadar	4	40.00	2.34
Senftenberg	3	30.00	1.75
Agona	1	10.00	0.58
Albany	1	10.00	0.58
Saint-Paul	1	10.00	0.58
Other serotypes	0	0	0
Total positive	10		5.85
Total number of analyzed samples	171		

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



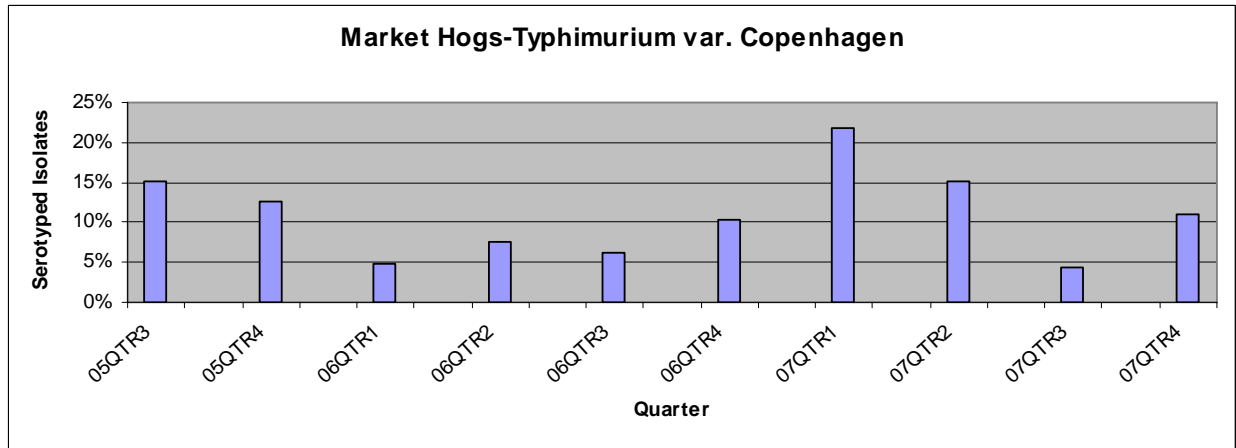
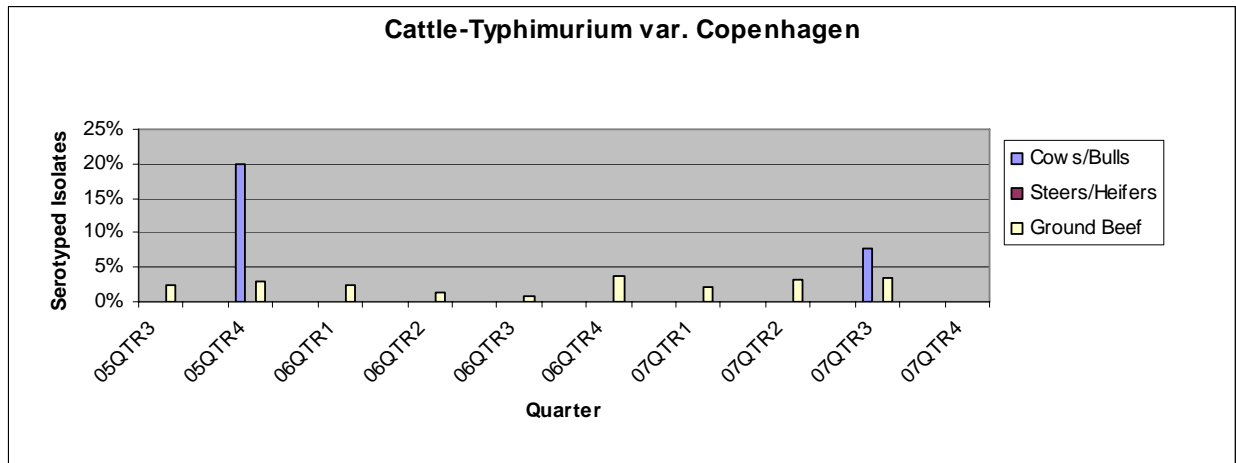
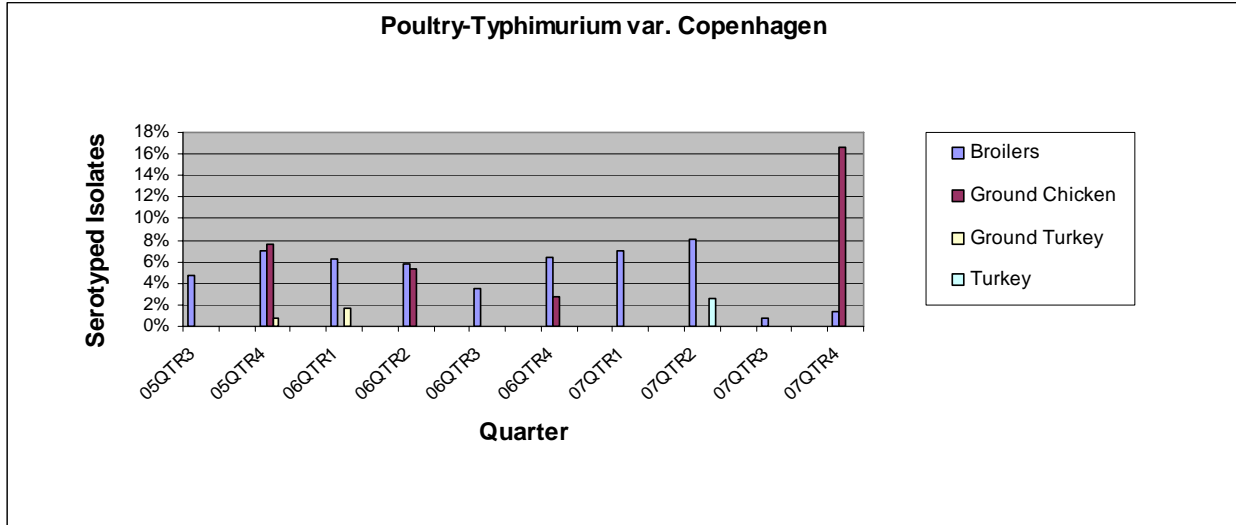
Figure 1
Typhimurium – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



*Please note that the y-axis % varies from graph to graph.



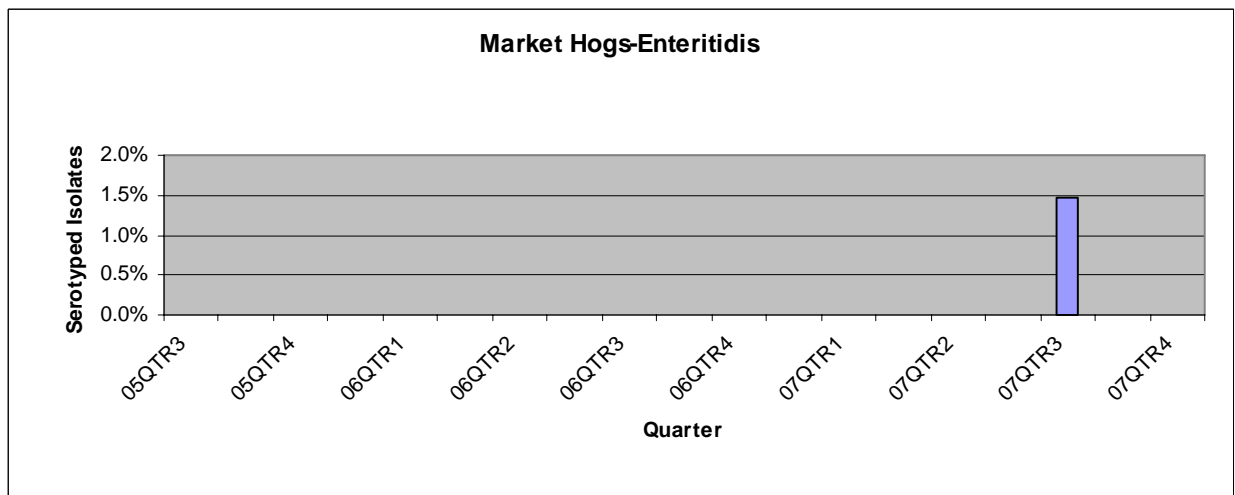
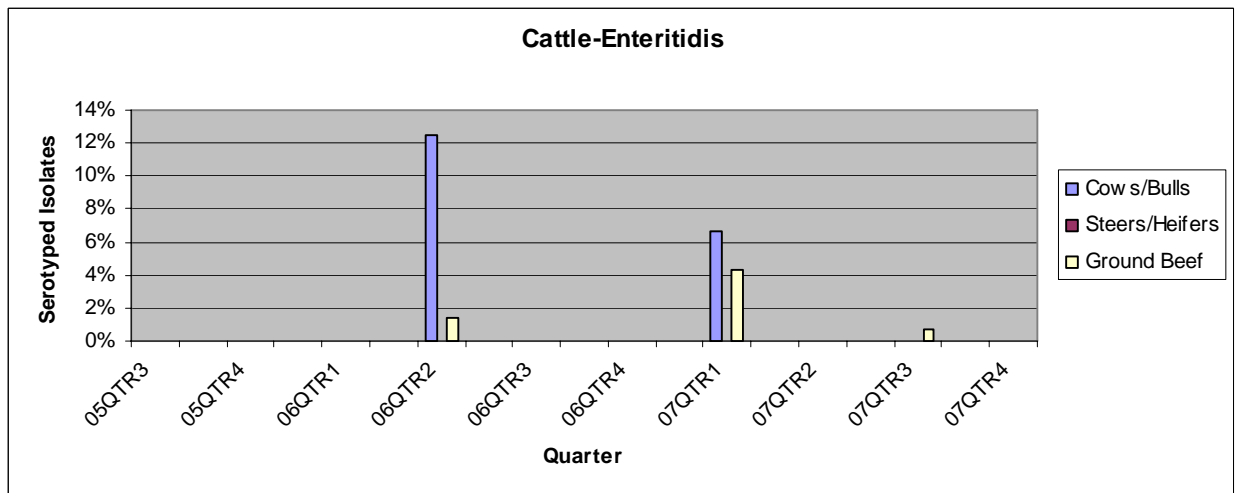
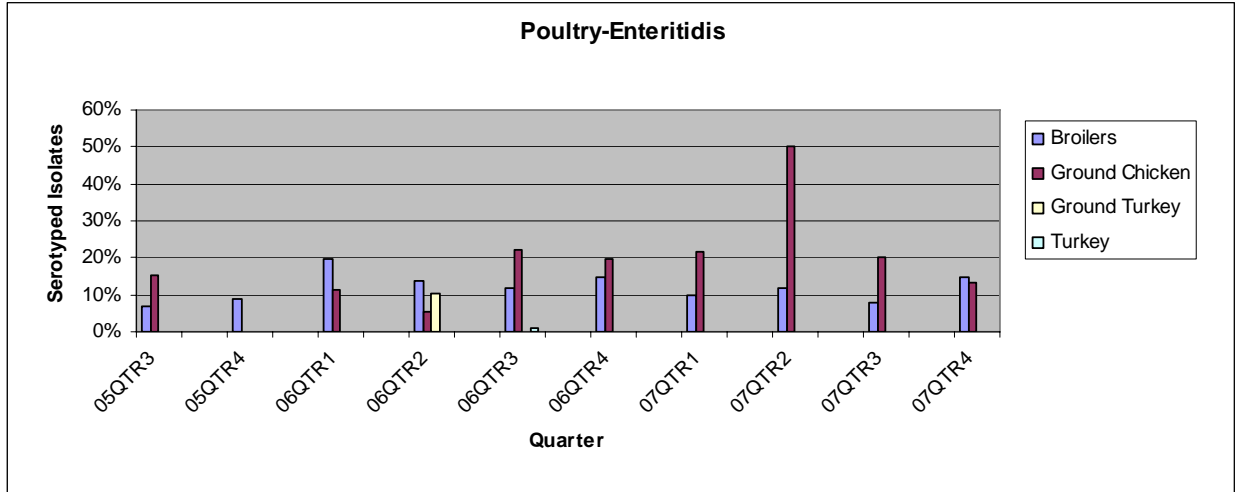
Figure 2
Typhimurium var. Copenhagen – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



*Please note that the y-axis % varies from graph to graph.



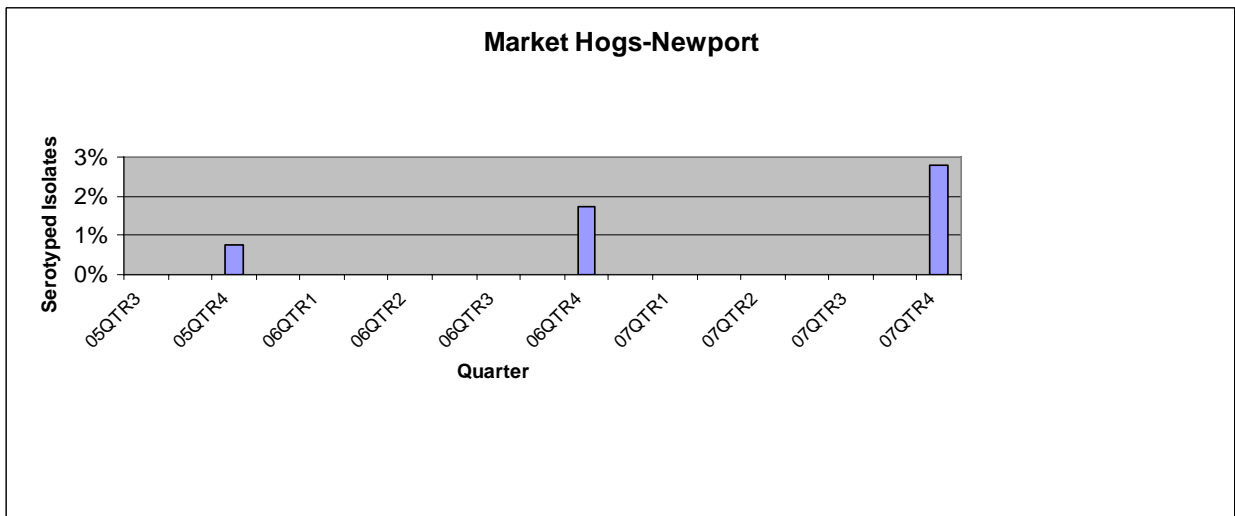
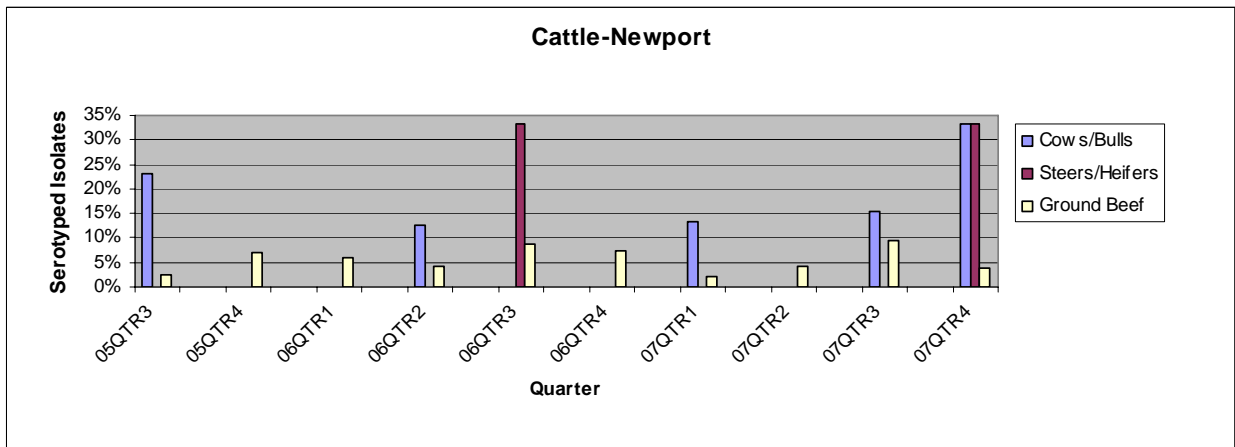
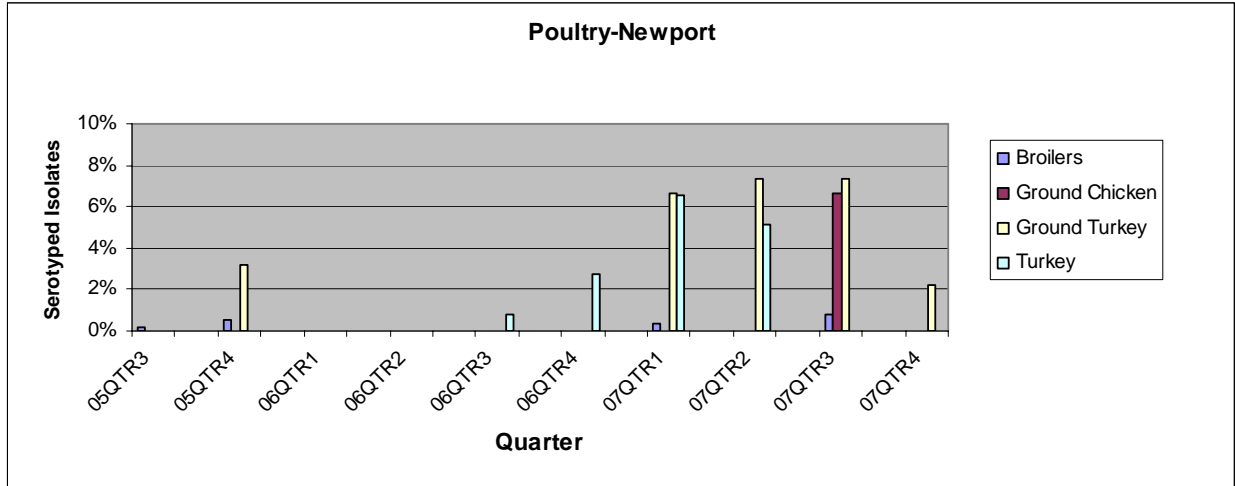
Figure 3
Enteritidis – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



*Please note that the y-axis % varies from graph to graph.



Figure 4
Newport – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



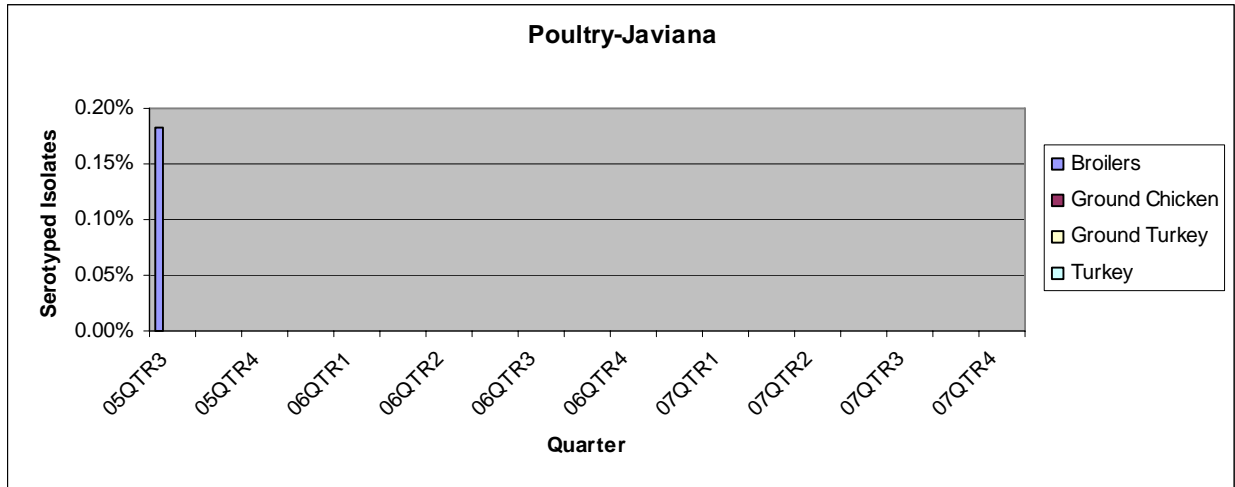
*Please note that the y-axis % varies from graph to graph.



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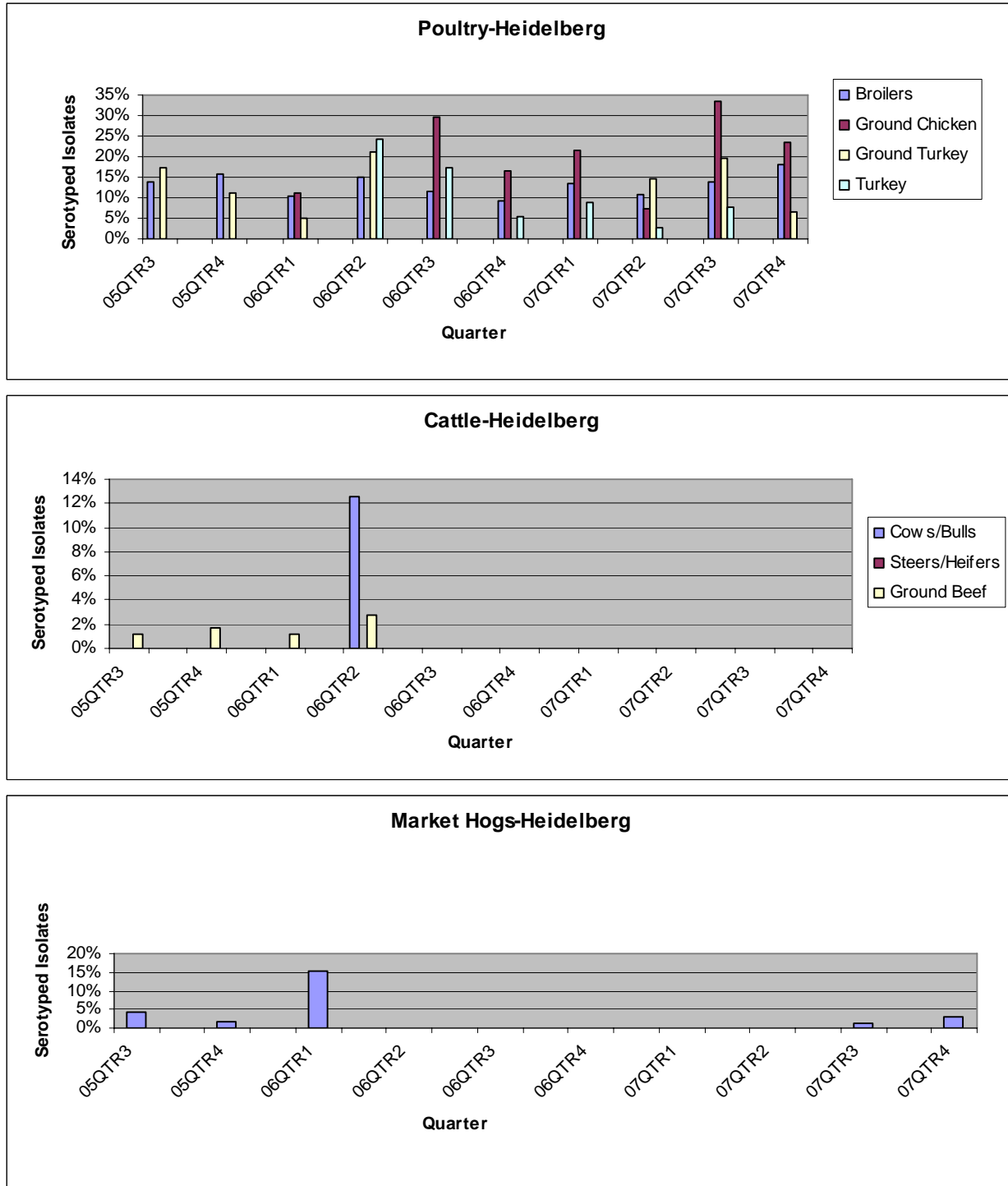
Figure 5
Javiana – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



* There were no Javiana isolates recovered for the time period in cattle and market hogs.



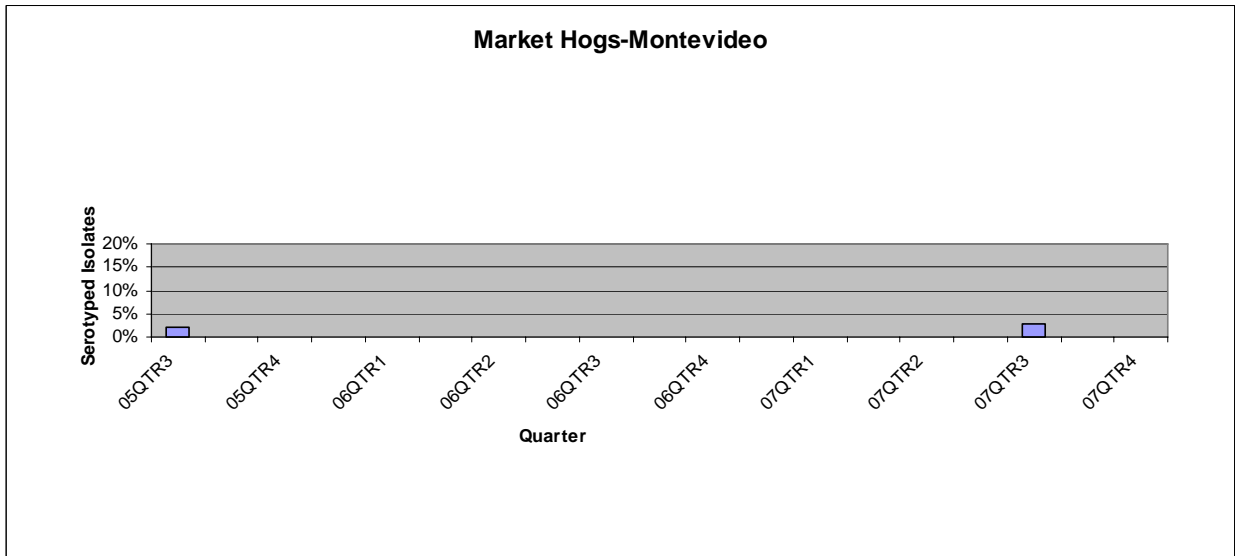
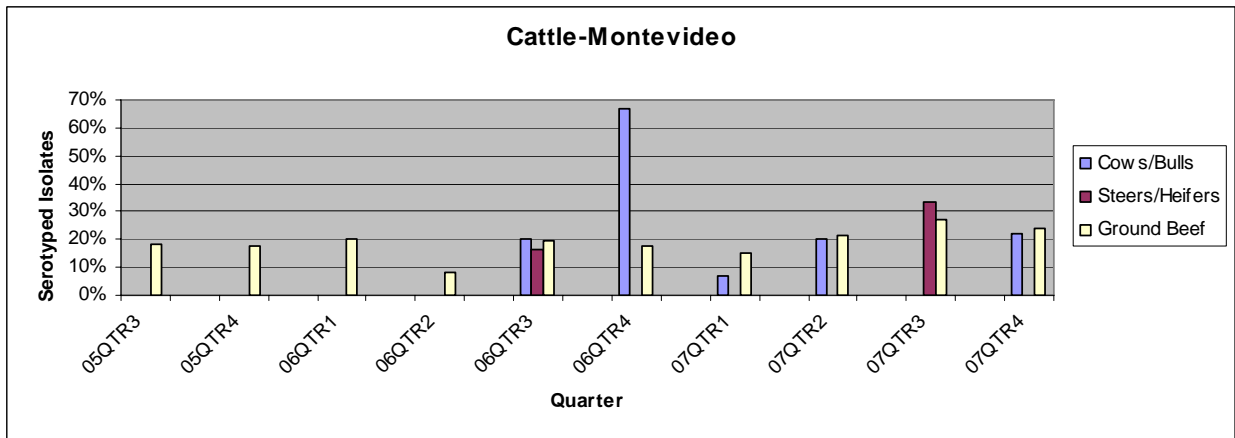
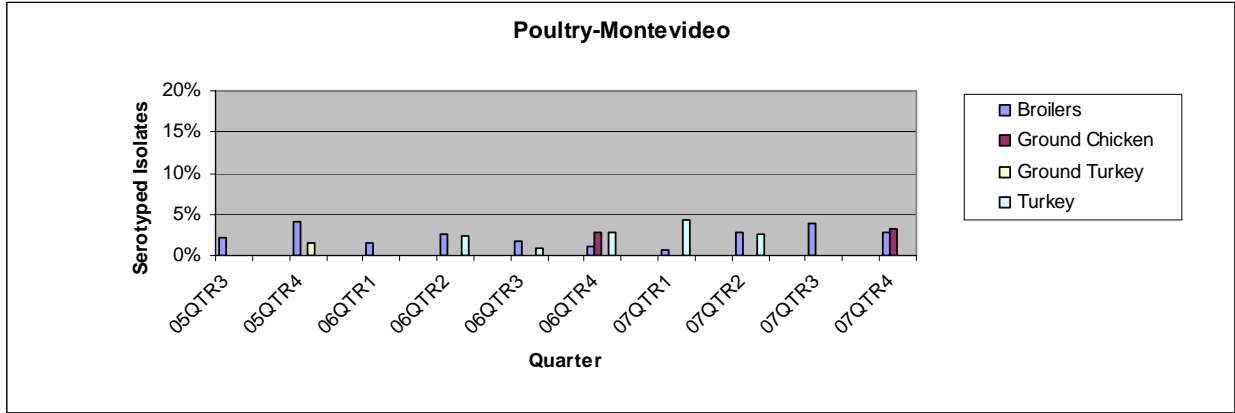
Figure 6
Heidelberg – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



*Please note that the y-axis % varies from graph to graph.



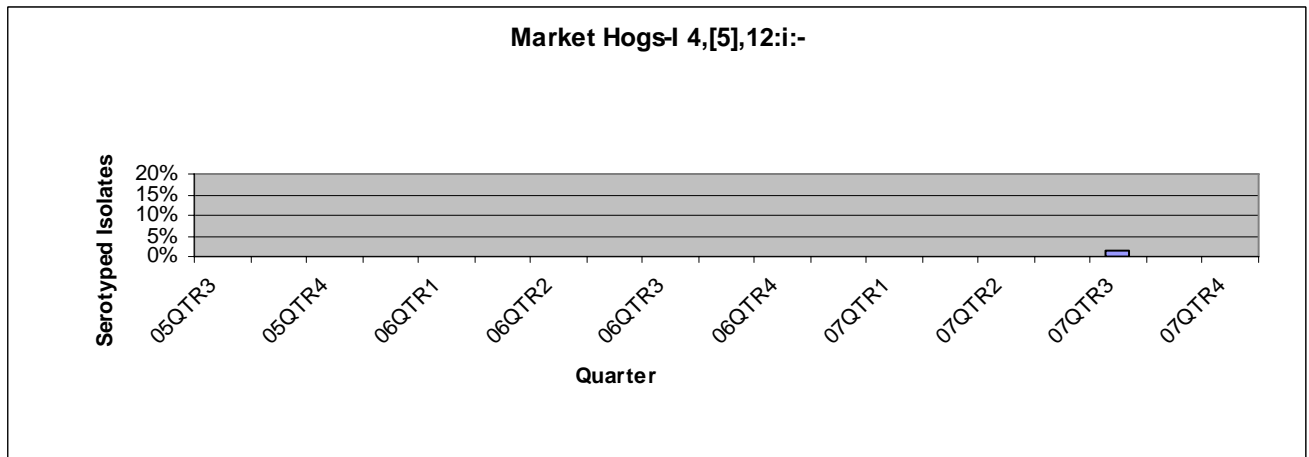
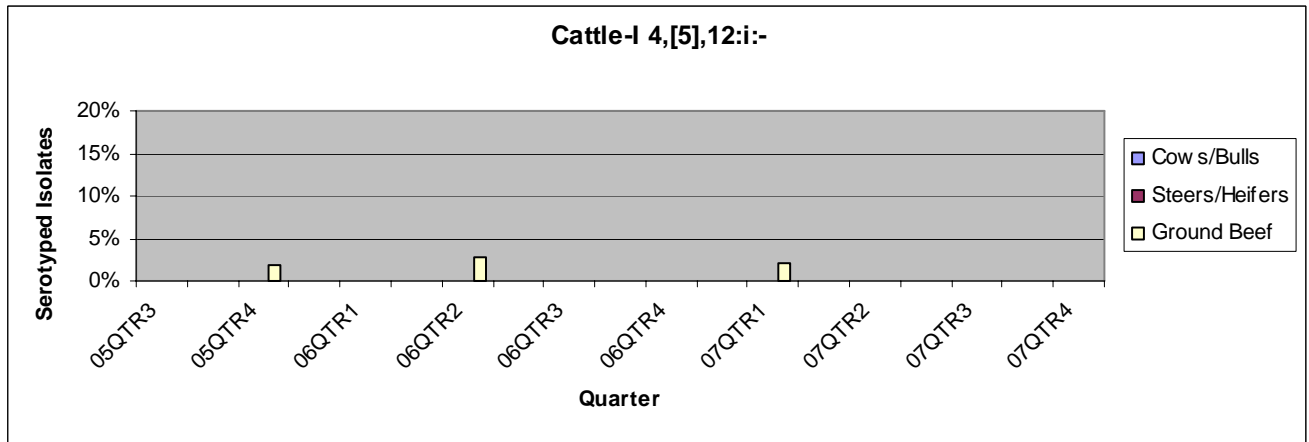
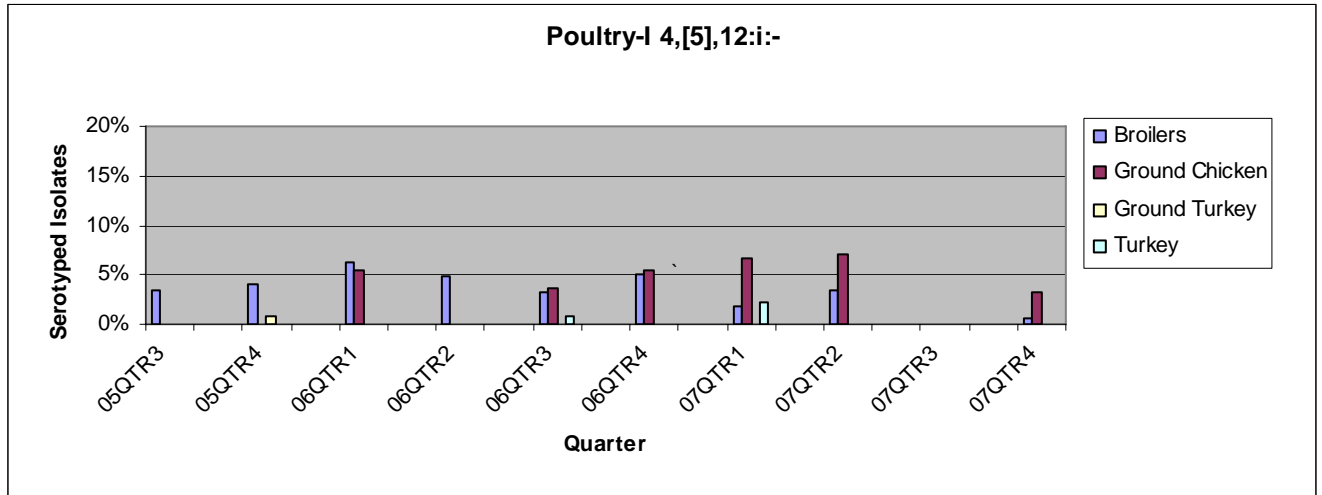
Figure 7
Montevideo – USDA, FSIS, PR/HACCP Verification Sampling by Quarter*
All Samples



*Please note that the y-axis % varies from graph to graph.



Figure 8
I 4,[5],12:1:- – USDA, FSIS, PR/HACCP Verification Sampling by Quarter
All Samples .



*Please note that the y-axis % varies from graph to graph