

Breakpoints

Table 1. Interpretive Criteria Used for Susceptibility Testing of *Salmonella* and *E. coli* ¹

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin	≤ 4	8	≥ 16
	Kanamycin	≤ 16	32	≥ 64
	Streptomycin	≤ 32	N/A	≥ 64
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	≤ 8 / 4	16 / 8	≥ 32 / 16
Cephems	Cefoxitin	≤ 8	16	≥ 32
	Ceftiofur	≤ 2	4	≥ 8
	Ceftriaxone	≤ 1	2	≥ 4
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ²	≤ 256	N/A	≥ 512
	Trimethoprim–Sulfamethoxazole	≤ 2 / 38	N/A	≥ 4 / 76
Macrolides	Azithromycin	≤ 16	N/A	≥ 32
Penicillins	Ampicillin	≤ 8	16	≥ 32
Phenicol	Chloramphenicol	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin ³	≤ 0.06	0.12-0.5	≥ 1
	Nalidixic acid	≤ 16	N/A	≥ 32
Tetracyclines	Tetracycline	≤ 4	8	≥ 16

¹ Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute) M100-S22 document, except for streptomycin and azithromycin, which has no CLSI breakpoints

² Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

³ Revised ciprofloxacin breakpoints for invasive *Salmonella* serotypes from the CLSI M100-S22 document were used for all *Salmonella* and *E. coli* analyses

Table 2. Interpretive Criteria Used for Susceptibility Testing of *Campylobacter* ¹

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)			
		<i>C. jejuni</i>		<i>C. coli</i>	
		Susceptible	Resistant	Susceptible	Resistant
Aminoglycosides	Gentamicin	≤ 2	≥ 4	≤ 2	≥ 4
Ketolides	Telithromycin	≤ 4	≥ 8	≤ 4	≥ 8
Lincosamides	Clindamycin	≤ 0.5	≥ 1	≤ 1	≥ 2
Macrolides	Azithromycin	≤ 0.25	≥ 0.5	≤ 0.5	≥ 1
	Erythromycin	≤ 4	≥ 8	≤ 8	≥ 16
Phenicol	Chloramphenicol	≤ 16	≥ 32	≤ 16	≥ 32
	Florfenicol	≤ 4	≥ 8	≤ 4	≥ 8
Quinolones	Ciprofloxacin	≤ 0.5	≥ 1	≤ 0.5	≥ 1
	Nalidixic acid	≤ 16	≥ 32	≤ 16	≥ 32
Tetracyclines	Doxycycline	≤ 0.5	≥ 1	≤ 1	≥ 2
	Tetracycline	≤ 1	≥ 2	≤ 2	≥ 4

¹ Breakpoints were adopted from epidemiological cut off values

Table 3. Interpretive Criteria Used for Susceptibility Testing of *Enterococcus*¹

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin	≤ 500	N/A	>500
	Kanamycin ²	≤ 512	N/A	≥ 1024
	Streptomycin	≤ 512	N/A	≥ 1024
Glycopeptides	Vancomycin	≤ 4	8 -16	≥ 32
Glycylcycline	Tigecycline ^{2,3}	≤ 0.25	N/A	N/A
Lincosamides	Lincomycin ²	≤ 2	4	≥ 8
Lipopeptides	Daptomycin ⁴	≤ 4	N/A	N/A
Macrolides	Erythromycin	≤ 0.5	1 - 4	≥ 8
	Tylosin ²	≤ 8	16	≥ 32
Nitrofurans	Nitrofurantoin	≤ 32	64	≥ 128
Oxazolidinones	Linezolid	≤ 2	4	≥ 8
Penicillins	Penicillin	≤ 8	N/A	≥ 16
Phenicol	Chloramphenicol	≤ 8	16	≥ 32
Quinolone	Ciprofloxacin	≤ 1	2	≥ 4
Streptogramins	Quinupristin/Dalfopristin	≤ 1	2	≥ 4
Tetracyclines	Tetracycline	≤ 4	8	≥ 16

Table 4. Interpretive Criteria Used for Susceptibility Testing of *Salmonella* and *E. coli* Resistant to Ceftriaxone or Ceftiofur¹

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		Susceptible	Intermediate	Resistant
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	≤ 16	32 - 64	≥ 128
Penems	Imipenem	≤ 1	2	≥ 4
Cephems	Cefepime ⁵	≤ 2	4 - 8	≥ 16
	Cefotaxime	≤ 1	2	≥ 4
	Ceftazidime	≤ 4	8	≥ 16
Monobactams	Aztreonam	≤ 4	8	≥ 16

¹ Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute) M100-S22 document, where available

² No CLSI interpretive criteria for this bacterium/antimicrobial combination currently available

³ Only a susceptible breakpoint (≤0.25 µg/ml) has been established. Isolates with an MIC ≥0.5 µg/ml are reported as resistant

⁴ Only a susceptible breakpoint (≤4 µg/ml) has been established for *E. faecalis*. Isolates with an MIC ≥8 µg/ml are reported as resistant. There are no established CLSI breakpoints for *E. faecium* and *E. hirae*

⁵ Cefepime MICs above the susceptible range and below the resistant range are Susceptible Dose Dependent (SDD) according to the CLSI guidelines in the M100-S24 document

Non-Typhoidal *Salmonella* Data

Non-Typhoidal *Salmonella* Isolates Tested

Table 5. Number of Non-Typhoidal *Salmonella* Isolates Tested, 1996-2013¹

Source		Year																	
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	Humans	1318	1297	1454	1493	1372	1409	1998	1855	1782	2036	2171	2145	2384	2193	2449	2335	2233	2178
Chickens	Retail Chickens							60	83	157	153	152	99	198	272	171	158	229	208
	HACCP		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551	564	491	864	520
	Cecal																		55
Turkeys	Retail Ground Turkey							74	114	142	183	159	190	246	193	202	162	91	106
	HACCP		107	240	713	518	550	244	262	236	227	304	271	148	121	151	103	175	87
	Cecal																		28
Cattle	Retail Ground Beef							9	10	14	8	19	13	24	14	7	9	13	15
	HACCP		24	284	1610	1388	893	1008	670	607	329	389	439	443	200	247	340	280	310
	Cecal (Beef) Cecal (Dairy)																		124 310
Swine	Retail Pork Chops							10	5	11	9	8	18	23	8	20	28	12	24
	HACCP ²		111	793	876	451	418	379	211	308	301	304	211	111	120	111	90		
	Cecal (Market Hogs) Cecal (Sows)																		260 289

¹ NARMS reports for the years 1996-2006 combined data for all non-Typhi *Salmonella* isolates from humans. Beginning in 2007, NARMS reported data separately for all typhoidal *Salmonella* serotypes (i.e. Typhi, Paratyphi A, tartrate-negative Paratyphi B, and Paratyphi C). This report includes data only for non-typhoidal isolates from humans. Data for typhoidal *Salmonella* can be found in the NARMS Human Isolates Final Reports, published by CDC.

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Isolation of Non-Typhoidal *Salmonella* from Retail Meats

Table 6. Number and Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2012

	Retail Chickens	Retail Ground Turkey	Retail Ground Beef	Retail Pork Chops
Number of Meat Samples Tested	1300	1295	1300	1300
Number Positive for <i>Salmonella</i>	229	91	13	12
Percent Positive for <i>Salmonella</i>	17.6%	7.0%	1.0%	0.9%

Figure 1. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2012

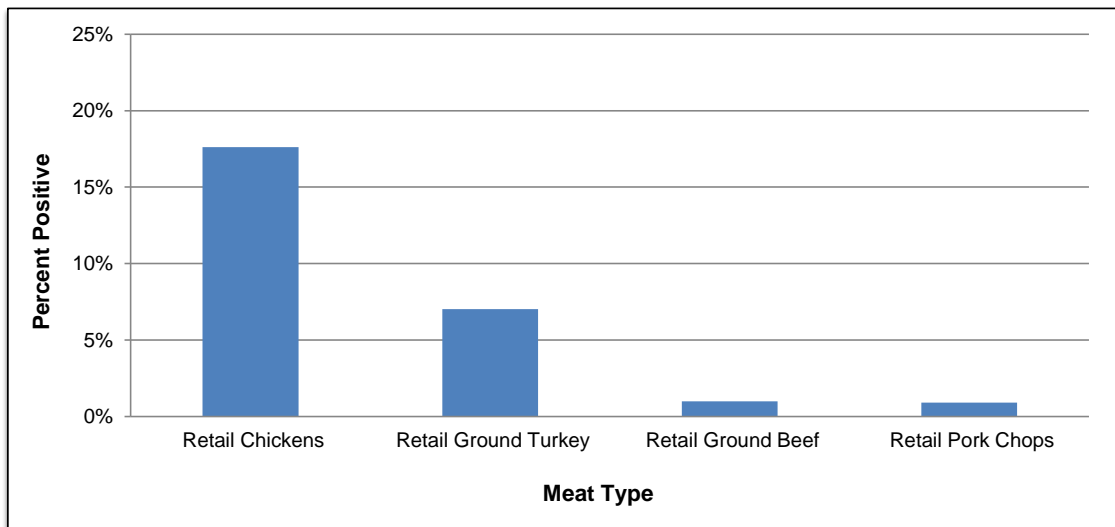
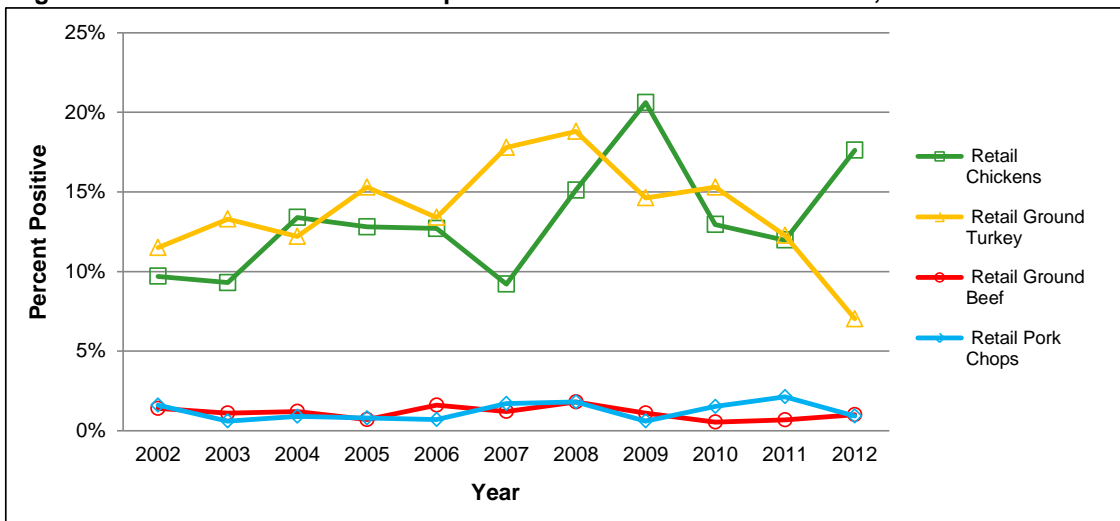


Figure 2. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2002-2012



Isolation of Non-Typhoidal *Salmonella* from Retail Meats

Table 7. Number and Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2013

	Retail Chickens	Retail Ground Turkey	Retail Ground Beef	Retail Pork Chops
Number of Meat Samples Tested	1669	1644	1663	1670
Number Positive for <i>Salmonella</i>	208	106	15	24
Percent Positive for <i>Salmonella</i>	12.5%	6.4%	0.9%	1.4%

Figure 3. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2013

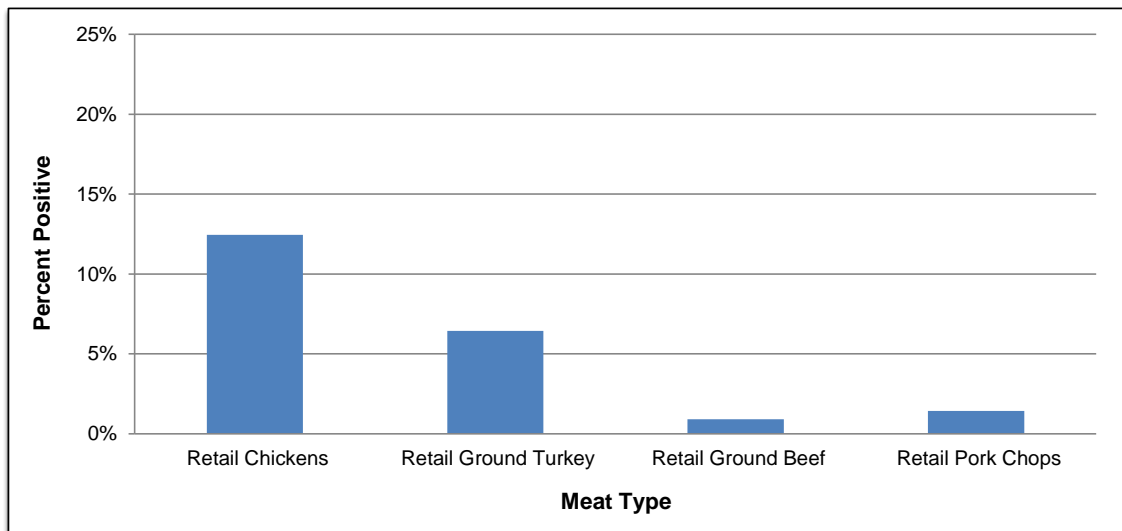
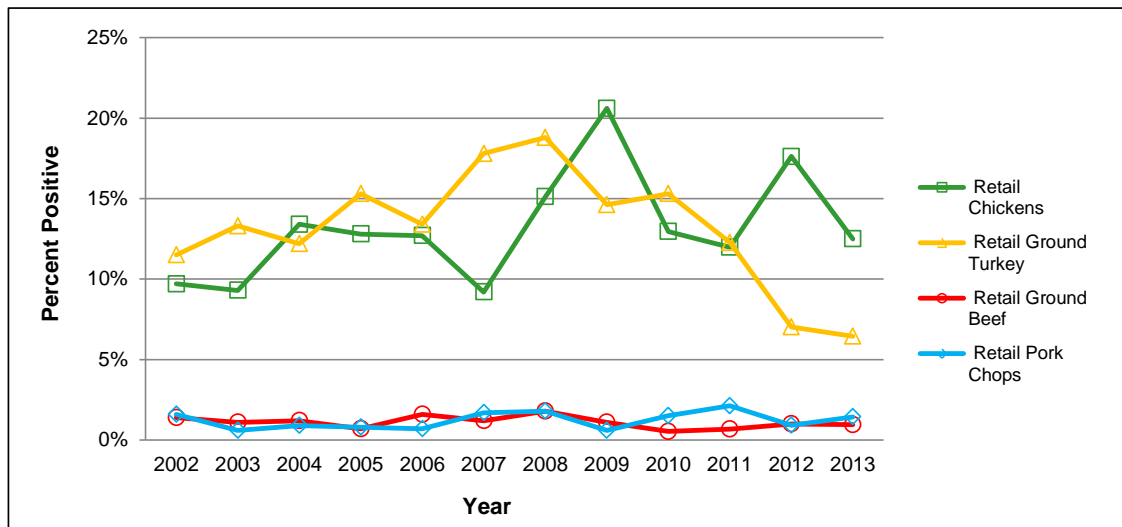


Figure 4. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2002-2013



Non-Typhoidal *Salmonella* Serotypes

Table 8. Top Serotypes among Non-Typhoidal *Salmonella* Isolates, 2012

Humans				Chickens							
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=2233)	Enteritidis	364	16.3	Retail Chickens (N=229)	Typhimurium	88	38.4	HACCP (N=864)	Kentucky	301	34.8
	Typhimurium	296	13.3		Kentucky	62	27.1		Enteritidis	203	23.5
	Newport	258	11.6		Enteritidis	26	11.4		Typhimurium	105	12.2
	Javiana	134	6.0		Heidelberg	17	7.4		Heidelberg	81	9.4
	I 4,[5],12:i:-	117	5.2		Thompson	11	4.8		Infantis	31	3.6
	Infantis	90	4.0		I 4,[5],12:i:-	6	2.6		Thompson	30	3.5
	Montevideo	60	2.7	Mbandaka	4	1.7	Schwarzengrund		26	3.0	
	Muenchen	58	2.6	Montevideo	4	1.7	Other		87	10.1	
	Oranienburg	50	2.2	Infantis	3	1.3					
	Saintpaul	50	2.2	Braenderup	2	0.9					
	Bareilly	49	2.2	Other	6	2.6					
	Braenderup	48	2.1								
	Heidelberg	41	1.8								
	Thompson	34	1.5	Turkeys							
	Mississippi	27	1.2	Source	Serotype	n	%	Source	Serotype	n	%
	Paratyphi B var. L(+ tartrate+	27	1.2	Retail	Illa 18:z4,z23:-	16	17.6	HACCP (N=175)	Hadar	31	17.7
	Schwarzengrund	23	1.0	Ground	Saintpaul	9	9.9		Heidelberg	19	10.9
	Agona	20	0.9	Turkey	Typhimurium	9	9.9		Albany	15	8.6
	Hadar	18	0.8	(N=91)	Hadar	8	8.8		Saintpaul	11	6.3
	Litchfield	17	0.8	Agona	7	7.7	Schwarzengrund		11	6.3	
	Poona	17	0.8	Schwarzengrund	7	7.7	Senftenberg		11	6.3	
Unknown serotype	19	0.9	Heidelberg	5	5.5	Agona	10		5.7		
Partially serotyped	26	1.2	Enteritidis	4	4.4	Muenchen	10		5.7		
Rough/Nonmotile isolates	7	0.3	Reading	4	4.4	Other	57		32.5		
Other	383	17.2	Infantis	3	3.3						
			Albany	2	2.2						
			Anatum	2	2.2						
			Brandenburg	2	2.2						
			Newport	2	2.2						
			Senftenberg	2	2.2						
			Other	9	9.9						
			Cattle								
			Source	Serotype	n	%	Source	Serotype	n	%	
			Retail	Dublin	4	30.8	HACCP (N=280)	Montevideo	84	30.0	
			Ground	Cerro	2	15.4		Dublin	30	10.7	
			Beef	Agona	1	7.7		Anatum	18	6.4	
			(N=13)	Anatum	1	7.7		Typhimurium	16	5.7	
			Infantis	1	7.7	Cerro		14	5.0		
			Kentucky	1	7.7	Muenchen		13	4.6		
			Montevideo	1	7.7	Kentucky		12	4.3		
			Newport	1	7.7	Meleagridis		12	4.3		
			Typhimurium	1	7.7	Muenster		7	2.5		
						Mbandaka		5	1.8		
						Newport	5	1.8			
						Other	64	22.9			
			Swine								
			Source	Serotype	n	%	Source	Serotype	n	%	
			Retail	Typhimurium	6	50.0	HACCP¹ (N=0)				
			Pork	Derby	1	8.3					
			Chops	Heidelberg	1	8.3					
			(N=12)	Infantis	1	8.3					
			Kentucky	1	8.3						
			London	1	8.3						
			Reading	1	8.3						

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Non-Typhoidal *Salmonella* Serotypes

Table 9. Top Serotypes among Non-Typhoidal *Salmonella* Isolates, 2013

Humans				Chickens											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=2178)	Enteritidis	382	17.5	Retail Chickens (N=208)	Typhimurium	68	32.7	HACCP (N=520)	Kentucky	237	45.6	Cecal (N=55)	Kentucky	15	27.3
	Typhimurium	325	14.9		Kentucky	44	21.2		Enteritidis	79	15.2		Typhimurium	15	27.3
	Newport	209	9.6		Heidelberg	28	13.5		Typhimurium	55	10.6		Heidelberg	9	16.4
	Javiana	140	6.4		Enteritidis	25	12.0		Infantis	35	6.7		Enteritidis	6	10.9
	I 4,[5],12:i:-	127	5.8		Schwarzengrund	11	5.3		Heidelberg	29	5.6		I 8,20::z6	2	3.6
	Infantis	76	3.5		Infantis	8	3.8		Schwarzengrund	21	4.0		Ouakam	2	3.6
	Heidelberg	60	2.8		I 4,[5],12:i:-	3	1.4		I 4,[5],12:i:-	21	4.0		Senftenberg	2	3.6
	Muenchen	59	2.7		Mbandaka	3	1.4		Other	43	8.3		Other	4	7.3
	Saintpaul	56	2.6		Thompson	3	1.4								
	Montevideo	53	2.4		Worthington	3	1.4								
	Braenderup	44	2.0	Other	12	5.8									
	Mississippi	36	1.7												
	Oranienburg	34	1.6												
	Thompson	33	1.5												
	Agona	28	1.3												
	Paratyphi B var. L(+ tartrate+	28	1.3												
	Anatum	20	0.9												
	Bareilly	19	0.9												
	Poona	17	0.8												
	Berta	16	0.7												
	Unknown serotype	36	1.7												
Partially serotyped	13	0.6													
Rough/Nonmotile isolates	6	0.3													
Other	361	16.6													

Turkeys											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Turkey (N=106)	Saintpaul	20	18.9	HACCP (N=87)	Hadar	12	13.8	Cecal (N=28)	Albany	5	17.9
	Heidelberg	17	16.0		Reading	10	11.5		Hadar	4	14.3
	Hadar	14	13.2		Muenchen	8	9.2		Reading	3	10.7
	Muenchen	13	12.3		I 4,[5],12:i:-	6	6.9		Saintpaul	3	10.7
	I 4,[5],12:i:-	6	5.7		Heidelberg	6	6.9		Senftenberg	3	10.7
	Reading	5	4.7		Berta	6	6.9		Heidelberg	2	7.1
	Albany	4	3.8		Typhimurium	5	5.7		Schwarzengrund	2	7.1
	Agona	3	2.8		Albany	5	5.7		Typhimurium	2	7.1
	Litchfield	3	2.8		Other	29	33.3		Agona	1	3.6
	Schwarzengrund	3	2.8						Enteritidis	1	3.6
Other	18	17.0				Indiana	1	3.6			
						Kentucky	1	3.6			

Cattle											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Beef (N=15)	Dublin	4	26.7	HACCP (N=310)	Montevideo	89	28.7	Cecal (Beef) (N=124)	Montevideo	21	16.9
	Montevideo	4	26.7		Typhimurium	23	7.4		Anatum	18	14.5
	Infantis	2	13.3		Meleagridis	22	7.1		Typhimurium	14	11.3
	Anatum	1	6.7		Dublin	21	6.8		Meleagridis	9	7.3
	Heidelberg	1	6.7		Anatum	16	5.2		Newport	8	6.5
	Kentucky	1	6.7		Kentucky	14	4.5		Cerro	6	4.8
	Mbandaka	1	6.7		Muenchen	13	4.2		Kentucky	6	4.8
	Muenster	1	6.7		Newport	13	4.2		Muenchen	4	3.2
					Cerro	12	3.9		Muenster	4	3.2
					Infantis	7	2.2		Uganda	4	3.2
			Panama	7	2.2	Agona	3	2.4			
			Other	73	23.5	Lille	3	2.4			
						Mbandaka	3	2.4			
						Senftenberg	3	2.4			
						Other	18	14.5			

Swine											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Pork Chops (N=24)	Derby	5	20.8	HACCP ¹ (N=0)				Cecal (Market Hogs) (N=260)	Derby	38	14.6
	Typhimurium	4	16.7			Anatum	33		12.7		
	Johannesburg	3	12.5			Johannesburg	21		8.1		
	I 4,[5],12:i:-	2	8.3			Typhimurium	21		8.1		
	Heidelberg	2	8.3			Infantis	20		7.7		
	Muenchen	2	8.3			Agona	12		4.6		
	Saintpaul	2	8.3			Uganda	11		4.2		
	Bredeney	1	4.2			Cerro	10		3.8		
	Infantis	1	4.2			Muenchen	9		3.5		
	Liverpool	1	4.2			Meleagridis	6		2.3		
Ohio	1	4.2		Senftenberg	6	2.3					
								Other	73	28.1	

Cecal (Sows)											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Cecal (Sows) (N=289)	Anatum	43	14.9								
	Johannesburg	33	11.4								
	Infantis	27	9.3								
	Derby	24	8.3								
	Uganda	22	7.6								
	Muenchen	14	4.8								
	Meleagridis	12	4.2								
	Adelaide	11	3.8								
	Agona	11	3.8								
	Saintpaul	10	3.5								
Cerro	8	2.8									
Chailey	6	2.1									
Other	68	23.5									

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

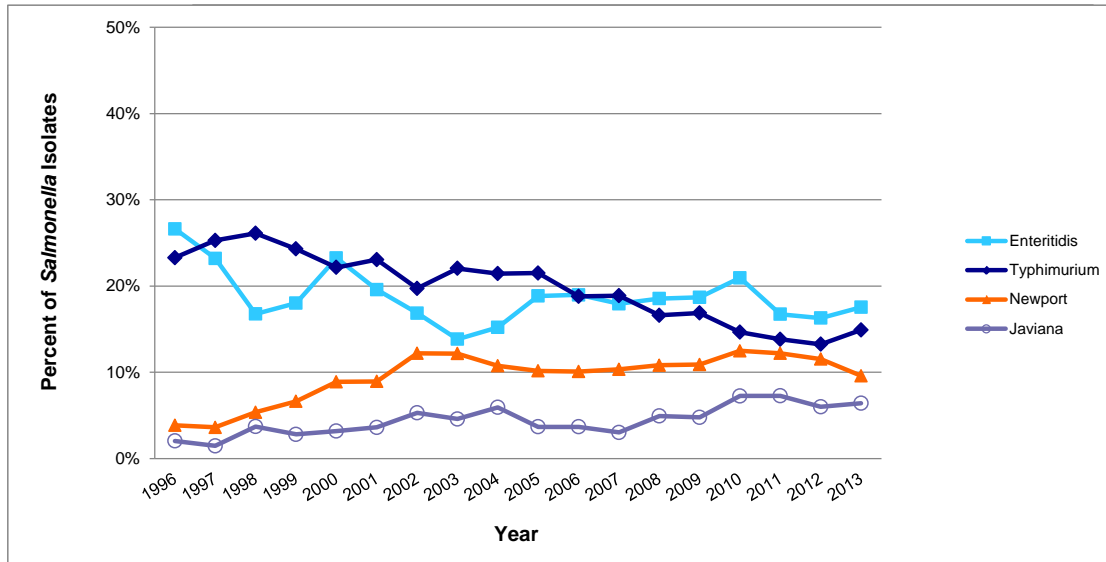
Table 10. Top Non-Typhoidal *Salmonella* Serotypes in Humans and their Distributions among Retail Meat and Food Animal Isolates, 2012

	Humans	Chickens		Turkeys		Cattle		Swine
	Humans (N=2233)	Retail Chickens (N=229)	HACCP (N=864)	Retail Ground Turkey (N=91)	HACCP (N=175)	Retail Ground Beef (N=13)	HACCP (N=280)	Retail Pork Chops (N=12)
1. Enteritidis	16.3% 364	11.4% 26	23.5% 203	4.4% 4	0.6% 1	0.0% 0	0.4% 1	0.0% 0
2. Typhimurium	13.3% 296	38.4% 88	12.2% 105	9.9% 9	2.3% 4	7.7% 1	5.7% 16	50.0% 6
3. Newport	11.6% 258	0.4% 1	0.2% 2	2.2% 2	2.3% 4	7.7% 1	1.8% 5	0.0% 0
4. Javiana	6.0% 134	0.0% 0	0.0% 0	1.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
5. I 4,[5],12:i:-	5.2% 117	2.6% 6	2.0% 17	0.0% 0	0.6% 1	0.0% 0	1.1% 3	0.0% 0
6. Infantis	4.0% 90	1.3% 3	3.6% 31	3.3% 3	0.0% 0	7.7% 1	1.4% 4	8.3% 1
7. Montevideo	2.7% 60	1.7% 4	1.0% 9	1.1% 1	2.9% 5	7.7% 1	30.0% 84	0.0% 0
8. Muenchen	2.6% 58	0.0% 0	0.1% 1	1.1% 1	5.7% 10	0.0% 0	4.6% 13	0.0% 0
9. Oranienburg	2.2% 50	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0
10. Saintpaul	2.2% 50	0.0% 0	0.0% 0	9.9% 9	6.3% 11	0.0% 0	0.0% 0	0.0% 0

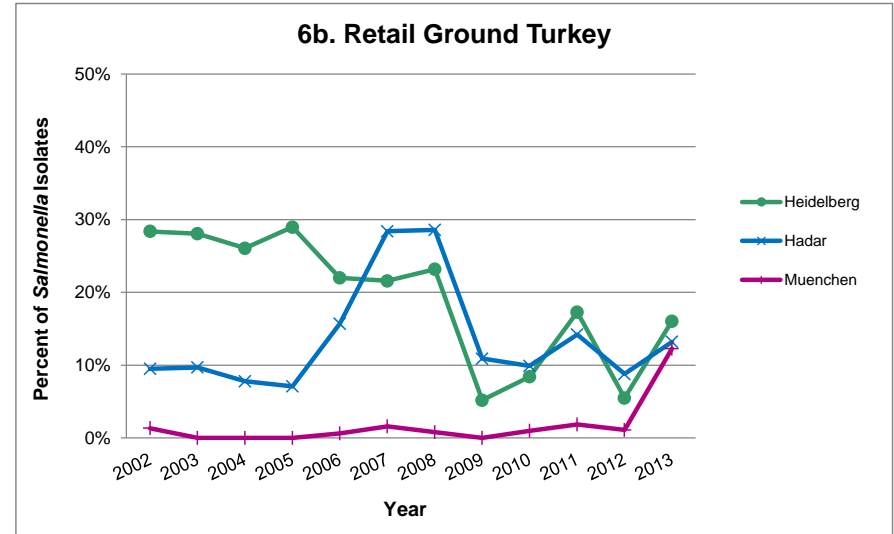
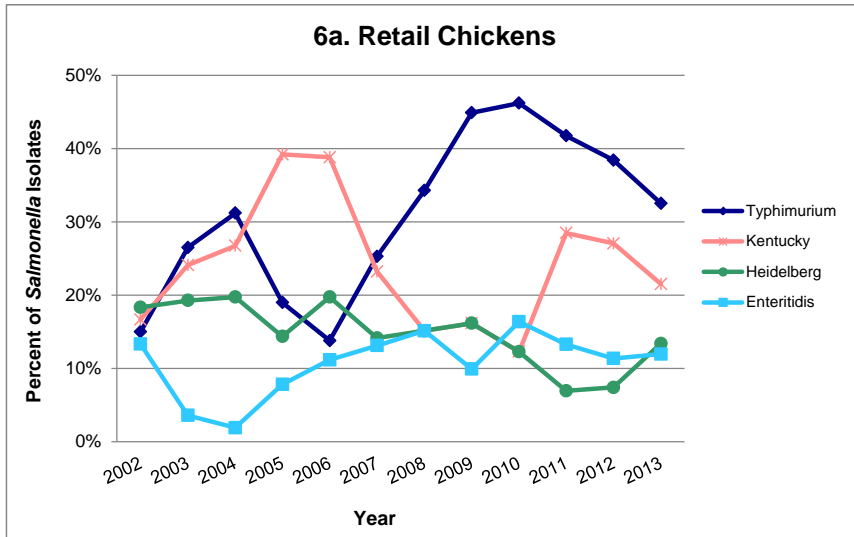
Table 11. Top Non-Typhoidal *Salmonella* Serotypes in Humans and their Distributions among Retail Meat and Food Animal Isolates, 2013

	Humans	Chickens			Turkeys			Cattle				Swine		
	Humans (N=2178)	Retail Chickens (N=210)	HACCP (N=520)	Cecal (N=55)	Retail Ground Turkeys (N=106)	HACCP (N=87)	Cecal (N=28)	Retail Ground Beef (N=16)	HACCP (N=310)	Cecal (Beef) (N=124)	Cecal (Dairy) (N=310)	Retail Pork Chops (N=24)	Cecal (Market Hogs) (N=260)	Cecal (Sows) (N=289)
1. Enteritidis	17.5% 382	12.0% 25	15.2% 79	10.9% 6	1.9% 2	1.1% 1	3.6% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1
2. Typhimurium	14.9% 325	32.7% 68	10.6% 55	27.3% 15	0.9% 1	5.7% 5	7.1% 2	0.0% 0	7.4% 23	11.3% 14	6.8% 21	16.7% 4	8.1% 21	1.4% 4
3. Newport	9.6% 209	1.0% 2	0.4% 2	0.0% 0	0.0% 0	4.6% 4	0.0% 0	0.0% 0	4.2% 13	6.5% 8	2.3% 7	0.0% 0	1.2% 3	1.4% 4
4. Javiana	6.4% 140	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0
5. I 4,[5],12:i:-	5.8% 127	1.4% 3	4.0% 21	0.0% 0	5.7% 6	6.9% 6	0.0% 0	0.0% 0	1.6% 5	0.0% 0	0.3% 1	8.3% 2	1.5% 4	1.0% 3
6. Infantis	3.5% 76	3.8% 8	6.7% 35	1.8% 1	1.9% 2	0.0% 0	0.0% 0	12.5% 2	2.3% 7	0.8% 1	1.0% 3	4.2% 1	7.7% 20	9.3% 27
7. Heidelberg	2.8% 60	13.5% 28	5.6% 29	16.4% 9	16.0% 17	6.9% 6	7.1% 2	6.3% 1	0.6% 2	0.8% 1	0.0% 0	8.3% 2	0.4% 1	1.0% 3
8. Muenchen	2.7% 59	0.5% 1	0.4% 2	0.0% 0	12.3% 13	9.2% 8	0.0% 0	0.0% 0	4.2% 13	3.2% 4	2.9% 9	8.3% 2	3.5% 9	4.8% 14
9. Saintpaul	2.6% 56	0.0% 0	0.2% 1	0.0% 0	18.9% 20	3.4% 3	10.7% 3	0.0% 0	0.6% 2	0.0% 0	0.0% 0	8.3% 2	1.2% 3	3.5% 10
10. Montevideo	2.4% 53	0.5% 1	0.8% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 4	28.7% 89	16.9% 21	18.1% 56	0.0% 0	0.8% 2	1.4% 4

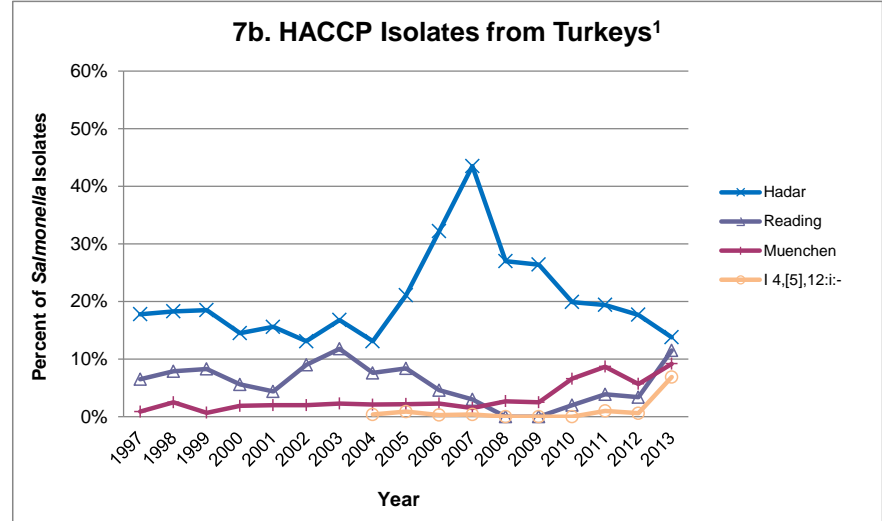
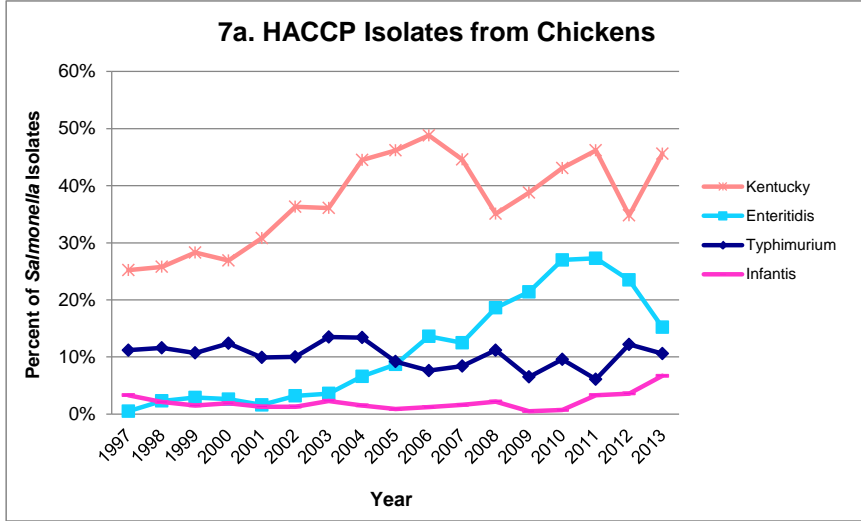
Figure 5. Top Non-Typhoidal *Salmonella* Serotypes from Humans in 2013 and their Relative Frequencies, 1996-2013



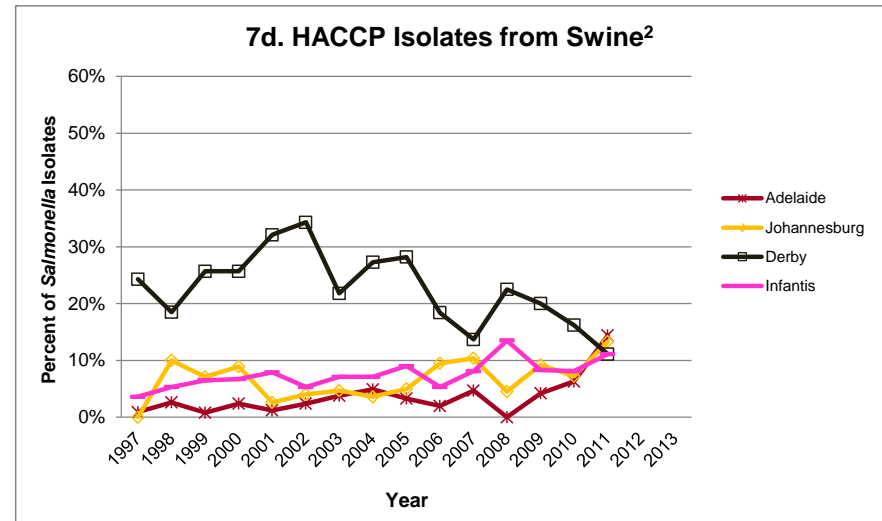
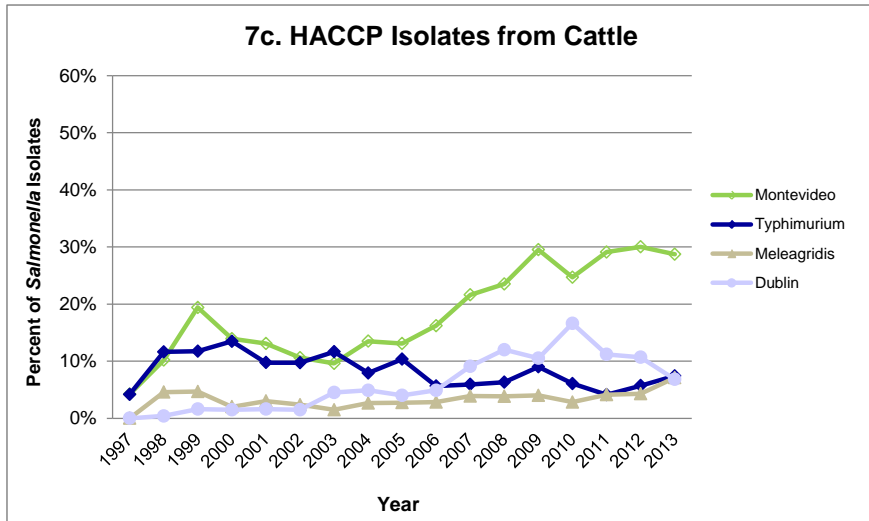
Figures 6. Top Non-Typhoidal *Salmonella* Serotypes from Retail Poultry in 2013 and their Relative Frequencies, 2002-2013



Figures 7. Top Non-Typhoidal *Salmonella* Serotypes from Food Animals in 2013 and their Relative Frequencies, 1997-2013



¹ Antigenic formulas for *Salmonella* I 4,[5],12:i:- were not determined for food animal isolates prior to 2004



² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Antimicrobial Susceptibility among all Non-Typhoidal *Salmonella*

MIC Distributions

Table 12a. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴													
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides	Gentamicin	Humans (2233)	<0.1	1.2	[0.8 - 1.7]	<div style="display: flex; justify-content: space-between;"> 0.015 0.03 0.06 0.125 0.25 0.50 1 2 4 8 16 32 64 128 256 512 1024 </div>													
		Chickens	Retail Chickens (229)	0.0	5.2														[2.7 - 9.0]
			HACCP (864)	0.2	4.6														[3.3 - 6.3]
			Turkeys	Retail Ground Turkey (91)	1.1														26.4
		Cattle	HACCP (175)	1.1	24.6														[18.4 - 31.6]
			Retail Ground Beef (13)	0.0	0.0														[0.0 - 24.7]
		Swine	HACCP (280)	0.0	2.1														[0.8 - 4.6]
			Retail Pork Chops (12)	0.0	8.3														[0.2 - 38.5]
		Kanamycin	Chickens	Humans (2233)	0.0														1.1
	Retail Chickens (229)			0.0	4.8	[2.4 - 8.4]													
	HACCP (864)			0.0	1.5	[0.8 - 2.6]													
	Turkeys		Retail Ground Turkey (91)	0.0	13.2	[7.0 - 21.9]													
			HACCP (175)	2.3	12.0	[7.6 - 17.8]													
	Cattle		Retail Ground Beef (13)	0.0	23.1	[5.0 - 53.8]													
			HACCP (280)	0.0	8.9	[5.9 - 12.9]													
	Swine		Retail Pork Chops (12)	0.0	0.0	[0.0 - 26.5]													
			Streptomycin	Chickens	Humans (2233)	N/A	8.4	[7.3 - 9.6]	<div style="display: flex; justify-content: space-between;"> 0.015 0.03 0.06 0.125 0.25 0.50 1 2 4 8 16 32 64 128 256 512 1024 </div>										
	Retail Chickens (229)	N/A			30.6	[24.7 - 37.0]													
	HACCP (864)	N/A			32.1	[29.0 - 35.3]													
	Turkeys	Retail Ground Turkey (91)		N/A	44.0	[33.6 - 54.8]													
		HACCP (175)		N/A	38.3	[31.1 - 45.9]													
	Cattle	Retail Ground Beef (13)		N/A	23.1	[5.0 - 53.8]													
		HACCP (280)		N/A	18.9	[14.5 - 24.0]													
	Swine	Retail Pork Chops (12)		N/A	41.7	[15.2 - 72.3]													
β-Lactam/β-Lactamase Inhibitor Combinations		Amoxicillin-Clavulanic Acid		Humans (2233)	2.6	2.9	[2.3 - 3.7]	<div style="display: flex; justify-content: space-between;"> 0.015 0.03 0.06 0.125 0.25 0.50 1 2 4 8 16 32 64 128 256 512 1024 </div>											
	Chickens		Retail Chickens (229)	0.0	27.9	[22.2 - 34.2]													
			HACCP (864)	0.3	11.3	[9.3 - 13.6]													
			Turkeys	Retail Ground Turkey (91)	5.5	17.6	[10.4 - 27.0]												
	Cattle		HACCP (175)	13.1	15.4	[10.4 - 21.6]													
			Retail Ground Beef (13)	0.0	15.4	[1.9 - 45.4]													
	Swine		HACCP (280)	2.1	11.1	[7.6 - 15.3]													
			Retail Pork Chops (12)	0.0	0.0	[0.0 - 26.5]													

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 12b. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴															
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512
Cephems	Cefoxitin	Humans (2233)	0.3	2.7	[2.1 - 3.5]																
		Chickens	Retail Chickens (229)	4.4	22.7																[17.4 - 28.7]
			HACCP (864)	2.1	8.6																[6.8 - 10.6]
			Turkeys	Retail Ground Turkey (91)	1.1																15.4
		Turkeys	HACCP (175)	1.7	14.9																[9.9 - 21.0]
			Cattle	Retail Ground Beef (13)	0.0																15.4
		HACCP (280)		0.4	10.4																[7.0 - 14.5]
		Swine	Retail Pork Chops (12)	0.0	0.0																[0.0 - 26.5]
			Humans (2233)	0.1	2.9																[2.2 - 3.6]
	Chickens	Retail Chickens (229)	0.4	27.5	[21.8 - 33.8]																
		HACCP (864)	0.0	10.2	[8.2 - 12.4]																
		Turkeys	Retail Ground Turkey (91)	1.1	16.5	[9.5 - 25.7]															
	Turkeys	HACCP (175)	0.6	14.9	[9.9 - 21.0]																
		Cattle	Retail Ground Beef (13)	0.0	15.4	[1.9 - 45.4]															
	HACCP (280)		0.0	11.1	[7.6 - 15.3]																
	Swine	Retail Pork Chops (12)	0.0	0.0	[0.0 - 26.5]																
		Humans (2233)	<0.1	2.9	[2.2 - 3.6]																
	Chickens	Retail Chickens (229)	0.0	27.9	[22.2 - 34.2]																
		HACCP (864)	0.2	11.2	[9.2 - 13.5]																
		Turkeys	Retail Ground Turkey (91)	0.0	17.6																[10.4 - 27.0]
	Turkeys	HACCP (175)	0.0	16.0	[10.9 - 22.3]																
		Cattle	Retail Ground Beef (13)	0.0	15.4																[1.9 - 45.4]
	HACCP (280)		0.4	10.7	[7.3 - 14.9]																
	Swine	Retail Pork Chops (12)	0.0	0.0	[0.0 - 26.5]																
Humans (2233)		N/A	8.4	[7.3 - 9.6]																	
Chickens	Retail Chickens (229)	N/A	37.1	[30.8 - 43.7]																	
	HACCP (864)	N/A	14.4	[12.1 - 16.9]																	
	Turkeys	Retail Ground Turkey (91)	N/A	27.5																[18.6 - 37.8]	
Turkeys	HACCP (175)	N/A	22.3	[16.4 - 29.2]																	
	Cattle	Retail Ground Beef (13)	N/A	23.1																[5.0 - 53.8]	
HACCP (280)		N/A	19.6	[15.2 - 24.8]																	
Swine	Retail Pork Chops (12)	N/A	33.3	[9.9 - 65.1]																	

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Sulfisoxazole replaced sulfamethoxazole in 2004

Table 12c. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴															
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512
Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole	Humans (2233)	N/A	1.3	[0.9 - 1.9]																
		Chickens	Retail Chickens (229)	N/A	0.0																[0.0 - 1.6]
			HACCP (864)	N/A	0.5																[0.1 - 1.2]
		Turkeys	Retail Ground Turkey (91)	N/A	0.0																[0.0 - 4.0]
			HACCP (175)	N/A	0.6																[0.0 - 3.1]
		Cattle	Retail Ground Beef (13)	N/A	0.0																[0.0 - 24.7]
			HACCP (280)	N/A	1.1																[0.2 - 3.1]
		Swine	Retail Pork Chops (12)	N/A	0.0																[0.0 - 26.5]
		Macrolides	Azithromycin	Humans (2233)	N/A																<0.1
Chickens	Retail Chickens (229)			N/A	0.0	[0.0 - 1.6]															
	HACCP (864)			N/A	0.0	[0.0 - 0.4]															
Turkeys	Retail Ground Turkey (91)			N/A	0.0	[0.0 - 4.0]															
	HACCP (175)			N/A	0.0	[0.0 - 2.1]															
Cattle	Retail Ground Beef (13)			N/A	0.0	[0.0 - 24.7]															
	HACCP (280)			N/A	0.0	[0.0 - 1.3]															
Swine	Retail Pork Chops (12)			N/A	0.0	[0.0 - 26.5]															
Penicillins	Ampicillin			Humans (2233)	0.1	8.8	[7.6 - 10.0]														
		Chickens	Retail Chickens (229)	0.0	29.3	[23.5 - 35.6]															
			HACCP (864)	0.1	12.2	[10.0 - 14.5]															
		Turkeys	Retail Ground Turkey (91)	0.0	40.7	[30.5 - 51.5]															
			HACCP (175)	0.0	42.3	[34.9 - 50.0]															
		Cattle	Retail Ground Beef (13)	0.0	23.1	[5.0 - 53.8]															
			HACCP (280)	0.0	15.4	[11.3 - 20.1]															
		Swine	Retail Pork Chops (12)	0.0	16.7	[2.1 - 48.4]															
		Phenicol	Chloramphenicol	Humans (2233)	0.6	3.9	[3.1 - 4.8]														
Chickens	Retail Chickens (229)			0.0	0.0	[0.0 - 1.6]															
	HACCP (864)			0.1	0.6	[0.2 - 1.3]															
Turkeys	Retail Ground Turkey (91)			1.1	3.3	[0.7 - 9.3]															
	HACCP (175)			2.9	1.1	[0.1 - 4.1]															
Cattle	Retail Ground Beef (13)			7.7	23.1	[5.0 - 53.8]															
	HACCP (280)			0.0	15.0	[11.0 - 19.7]															
Swine	Retail Pork Chops (12)			0.0	0.0	[0.0 - 26.5]															

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 12d. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																				
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024				
Quinolones	Ciprofloxacin	Humans (2233)	3.3	0.3	[0.1 - 0.6]	89.7	6.5	0.3	1.0	1.3	0.9	0.2						0.1								
		Chickens	Retail Chickens (229)	0.0	0.0	[0.0 - 1.6]	86.9	13.1																		
			HACCP (864)	0.1	0.0	[0.0 - 0.4]	92.2	7.5	0.1		0.1															
		Turkeys	Retail Ground Turkey (91)	0.0	0.0	[0.0 - 4.0]	87.9	12.1																		
			HACCP (175)	1.7	0.0	[0.0 - 2.1]	94.3	2.9	1.1			1.7														
		Cattle	Retail Ground Beef (13)	0.0	0.0	[0.0 - 24.7]	61.5	38.5																		
			HACCP (280)	4.2	0.0	[0.0 - 1.3]	92.9	2.5	0.4		2.1	2.1														
	Swine	Retail Pork Chops (12)	0.0	0.0	[0.0 - 26.5]	83.3	16.7																			
	Nalidixic Acid		Humans (2233)	N/A	2.4	[1.8 - 3.1]							0.1	0.6	40.3	54.5	1.3	0.9	0.2	2.2						
			Chickens	Retail Chickens (229)	N/A	0.0	[0.0 - 1.6]									30.1	69.0	0.9								
				HACCP (864)	N/A	0.1	[0.0 - 0.6]							0.3	1.9	55.1	42.5	0.1							0.1	
			Turkeys	Retail Chickens (229)	N/A	0.0	[0.0 - 4.0]									40.7	58.2	1.1								
				HACCP (864)	N/A	1.7	[0.4 - 4.9]								0.6	53.1	43.4	1.1								1.7
			Cattle	Retail Ground Beef (13)	N/A	0.0	[0.0 - 24.7]									15.4	69.2	15.4								
HACCP (280)				N/A	3.6	[1.7 - 6.5]								0.4	54.3	40.0	0.7	1.1								3.6
Swine	Retail Pork Chops (12)	N/A	0.0	[0.0 - 26.5]									33.3	66.7												
Tetracyclines	Tetracycline	Humans (2233)	0.2	11.1	[9.8 - 12.4]												88.8	0.2	0.5	2.2	8.3					
		Chickens	Retail Chickens (229)	0.4	48.0	[41.4 - 54.7]												51.5	0.4		1.3	46.7				
			HACCP (864)	1.3	33.7	[30.5 - 36.9]												65.0	1.3	0.7	0.1	32.9				
		Turkeys	Retail Chickens (229)	0.0	45.1	[34.6 - 55.8]												55.0			2.2	42.9				
			HACCP (864)	1.1	46.3	[38.7 - 54.0]												52.6	1.1		5.7	40.6				
		Cattle	Retail Ground Beef (13)	0.0	23.1	[5.0 - 53.8]												76.9				23.1				
			HACCP (280)	0.7	28.9	[23.7 - 34.6]												70.4	0.7		2.5	26.4				
Swine	Retail Pork Chops (12)	0.0	41.7	[15.2 - 72.3]												58.3				41.7						

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 13a. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴													
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides	Gentamicin	Humans (2178)	<0.1	2.0	[1.4 - 2.7]														
		Chickens	Retail Chickens (208)	0.0	5.3														[2.7 - 9.3]
			HACCP (520)	0.4	2.3														[1.2 - 4.0]
			Cecal (55)	0.0	1.8														[0.0 - 9.7]
			Turkeys	Retail Ground Turkey (106)	0.9														27.4
		HACCP (87)		0.0	23.0														[14.6 - 33.2]
		Cecal (28)		3.6	28.6														[13.2 - 48.7]
		Cattle	Retail (15)	0.0	20.0														[4.3 - 48.1]
			HACCP (310)	0.3	1.9														[0.7 - 4.2]
			Cecal (Beef) (124)	0.8	0.0														[0.0 - 2.9]
			Cecal (Dairy) (310)	0.0	0.0														[0.0 - 1.2]
		Swine	Retail (24)	0.0	0.0														[0.0 - 14.2]
	Cecal (Market Hogs) (260)		1.2	1.2	[0.2 - 3.3]														
	Cecal (Sows) (289)		0.7	0.7	[0.1 - 2.5]														
	Kanamycin	Humans (2178)	0.1	1.6	[1.1 - 2.2]														
		Chickens	Retail Chickens (208)	0.0	11.1														[7.1 - 16.1]
			HACCP (520)	0.0	1.2														[0.4 - 2.5]
			Cecal (55)	0.0	3.6														[0.4 - 12.5]
			Turkeys	Retail Ground Turkey (106)	1.9														10.4
		HACCP (87)		0.0	6.9														[2.6 - 14.4]
		Cecal (28)		3.6	10.7														[2.3 - 28.2]
		Cattle	Retail (15)	6.7	13.3														[1.7 - 40.5]
			HACCP (310)	0.0	6.1														[3.7 - 9.4]
			Cecal (Beef) (124)	0.0	2.4														[0.5 - 6.9]
			Cecal (Dairy) (310)	0.0	0.6														[0.1 - 2.3]
		Swine	Retail (24)	0.0	8.3														[1.0 - 27.0]
	Cecal (Market Hogs) (260)		0.4	3.1	[1.3 - 6.0]														
	Cecal (Sows) (289)		0.0	1.4	[0.4 - 3.5]														
	Streptomycin	Humans (2178)	N/A	11.5	[10.2 - 12.9]														
		Chickens	Retail Chickens (208)	N/A	27.9														[21.9 - 34.5]
HACCP (520)			N/A	42.7	[38.4 - 47.1]														
Cecal (55)			N/A	25.5	[14.7 - 39.0]														
Turkeys			Retail Ground Turkey (106)	N/A	48.1														[38.3 - 58.0]
		HACCP (87)	N/A	35.6	[25.6 - 46.6]														
		Cecal (28)	N/A	42.9	[24.5 - 62.8]														
Cattle		Retail (15)	N/A	26.7	[7.8 - 55.1]														
		HACCP (310)	N/A	20.0	[15.7 - 24.9]														
		Cecal (Beef) (124)	N/A	16.9	[10.8 - 24.7]														
		Cecal (Dairy) (310)	N/A	9.0	[6.1 - 12.8]														
Swine		Retail (24)	N/A	41.7	[22.1 - 63.4]														
	Cecal (Market Hogs) (260)	N/A	18.1	[13.6 - 23.3]															
	Cecal (Sows) (289)	N/A	9.3	[6.2 - 13.3]															

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 13b. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴												
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid	Humans (2178)	2.6	2.4	[1.8 - 3.2]													
		Chickens	Retail Chickens (208)	0.0	19.7												[14.5 - 25.8]	
			HACCP (520)	0.4	8.8												[6.5 - 11.6]	
			Cecal (55)	0.0	7.3												[2.0 - 17.6]	
			Turkeys	Retail Ground Turkey (106)	6.6												8.5	[4.0 - 15.5]
		HACCP (87)		2.3	9.2												[4.1 - 17.3]	
		Cecal (28)		3.6	7.1												[0.9 - 23.5]	
		Cattle	Retail (15)	0.0	26.7												[7.8 - 55.1]	
			HACCP (310)	0.3	14.8												[11.1 - 19.3]	
			Cecal (Beef) (124)	0.8	10.5												[5.7 - 17.3]	
			Cecal (Dairy) (310)	0.3	6.8												[4.2 - 10.2]	
		Swine	Retail (24)	8.3	0.0												[0.0 - 14.2]	
			Cecal (Market Hogs) (260)	4.6	1.9												[0.6 - 4.4]	
			Cecal (Sows) (289)	0.3	2.4												[1.0 - 4.9]	
		Cephems	Cefoxitin	Humans (2178)	0.4												2.4	[1.8 - 3.2]
Chickens	Retail Chickens (208)			2.4	17.3	[12.4 - 23.1]												
	HACCP (520)			1.5	7.1	[5.1 - 9.7]												
	Cecal (55)			3.6	3.6	[0.4 - 12.5]												
	Turkeys			Retail Ground Turkey (106)	0.9	8.5	[4.0 - 15.5]											
HACCP (87)				0.0	9.2	[4.1 - 17.3]												
Cecal (28)				0.0	7.1	[0.9 - 23.5]												
Cattle	Retail (15)			6.7	20.0	[4.3 - 48.1]												
	HACCP (310)			0.6	14.5	[10.8 - 18.9]												
	Cecal (Beef) (124)			0.8	10.5	[5.7 - 17.3]												
	Cecal (Dairy) (310)			0.3	6.8	[4.2 - 10.2]												
Swine	Retail (24)			0.0	0.0	[0.0 - 14.2]												
	Cecal (Market Hogs) (260)			0.0	1.9	[0.6 - 4.4]												
	Cecal (Sows) (289)			0.4	2.4	[1.0 - 4.9]												
Ceftiofur	Ceftiofur			Humans (2178)	0.1	2.5	[1.9 - 3.3]											
		Chickens	Retail Chickens (208)	0.0	19.7	[14.5 - 25.8]												
			HACCP (520)	0.8	8.1	[5.9 - 10.8]												
			Cecal (55)	0.0	7.3	[2.0 - 17.6]												
			Turkeys	Retail Ground Turkey (106)	0.0	9.4	[4.6 - 16.7]											
		HACCP (87)		0.0	10.3	[4.8 - 18.7]												
		Cecal (28)		0.0	7.1	[0.9 - 23.5]												
		Cattle	Retail (15)	6.7	20.0	[4.3 - 48.1]												
			HACCP (310)	0.3	14.8	[11.1 - 19.3]												
			Cecal (Beef) (124)	0.0	10.5	[5.7 - 17.3]												
			Cecal (Dairy) (310)	0.0	6.8	[4.2 - 10.2]												
		Swine	Retail (24)	0.0	0.0	[0.0 - 14.2]												
			Cecal (Market Hogs) (260)	0.0	2.3	[0.9 - 5.0]												
			Cecal (Sows) (289)	0.0	2.4	[1.0 - 4.9]												

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 13c. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴														
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Cepheems	Ceftriaxone	Humans (2178)	0.1	2.5	[1.9 - 3.3]															
		Chickens	Retail Chickens (208)	0.0	19.7															[14.5 - 25.8]
			HACCP (520)	0.2	8.7															[6.4 - 11.4]
			Cecal (55)	0.0	7.3															[2.0 - 17.6]
			Turkeys	Retail Ground Turkey (106)	0.0															9.4
		Turkeys	HACCP (87)	0.0	10.3															[4.8 - 18.7]
			Cecal (28)	0.0	7.1															[0.9 - 23.5]
			Cattle	Retail (15)	0.0															26.7
		Cattle	HACCP (310)	0.0	14.8															[11.1 - 19.3]
			Cecal (Beef) (124)	0.0	10.5															[5.7 - 17.3]
			Cecal (Dairy) (310)	0.0	6.8															[4.2 - 10.2]
		Swine	Retail (24)	0.0	0.0															[0.0 - 14.2]
			Cecal (Market Hogs) (260)	0.0	2.3															[0.9 - 5.0]
			Cecal (Sows) (289)	0.0	2.4															[1.0 - 4.9]
			Folate Pathway Inhibitors	Sulfisoxazole ⁵	Humans (2178)															N/A
Chickens	Retail Chickens (208)	N/A	33.7	[27.3 - 40.5]	23.1	36.1	7.2	33.7												
	HACCP (520)	N/A	11.0	[8.4 - 14.0]	12.3	61.5	15.0	0.2	11.0											
	Cecal (55)	N/A	30.9	[19.1 - 44.8]	30.9	41.8	10.9	30.9												
	Turkeys	Retail Ground Turkey (106)	N/A	27.4	[19.1 - 36.9]	18.9	33.0	20.8	27.4											
Turkeys	HACCP (87)	N/A	29.9	[20.5 - 40.6]	24.1	33.3	12.6	29.9												
	Cecal (28)	N/A	14.3	[4.0 - 32.7]	25.0	28.6	32.1	14.3												
	Cattle	Retail (15)	N/A	40.0	[16.3 - 67.7]	46.7	13.3	40.0												
Cattle	HACCP (310)	N/A	20.6	[16.3 - 25.6]	14.5	49.7	13.5	1.6	20.6											
	Cecal (Beef) (124)	N/A	18.5	[12.1 - 26.5]	22.6	41.1	17.7	18.5												
	Cecal (Dairy) (310)	N/A	9.0	[6.1 - 12.8]	32.3	45.5	13.2	9.0												
Swine	Retail (24)	N/A	29.2	[12.6 - 51.1]	20.8	37.5	12.5	29.2												
	Cecal (Market Hogs) (260)	N/A	20.8	[16.0 - 26.2]	32.3	34.6	12.3	20.8												
	Cecal (Sows) (289)	N/A	9.7	[6.5 - 13.7]	37.4	36.3	16.3	0.4	9.7											
	Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole	Humans (2178)	N/A	1.4	[1.0 - 2.0]	95.7	2.4	0.3	<0.1	0.1	0.2	1.2							
Chickens	Retail Chickens (208)	N/A	0.0	[0.0 - 1.8]	99.5	0.5	0.2	1.2												
	HACCP (520)	N/A	0.2	[0.0 - 1.1]	99.2	0.6	0.2	1.2												
	Cecal (55)	N/A	3.6	[0.4 - 12.5]	94.6	1.8	3.6	1.2												
	Turkeys	Retail Ground Turkey (106)	N/A	0.9	[0.0 - 5.1]	99.1	0.9	1.2												
Turkeys	HACCP (87)	N/A	1.1	[0.0 - 6.2]	96.6	2.3	1.1	1.2												
	Cecal (28)	N/A	0.0	[0.0 - 12.3]	100.0	1.1	1.2													
	Cattle	Retail (15)	N/A	0.0	[0.0 - 21.8]	86.7	13.3	1.3	1.2											
Cattle	HACCP (310)	N/A	1.3	[0.4 - 3.3]	88.7	8.4	1.3	0.3	1.3											
	Cecal (Beef) (124)	N/A	2.4	[0.5 - 6.9]	95.2	2.4	2.4	1.2												
	Cecal (Dairy) (310)	N/A	0.6	[0.1 - 2.3]	97.7	1.6	0.6	1.2												
Swine	Retail (24)	N/A	0.0	[0.0 - 14.2]	95.8	4.2	0.8	1.2												
	Cecal (Market Hogs) (260)	N/A	0.8	[0.1 - 2.8]	95.8	3.5	0.8	1.2												
	Cecal (Sows) (289)	N/A	1.0	[0.2 - 3.0]	98.3	0.7	1.0	1.2												

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Sulfisoxazole replaced sulfamethoxazole in 2004

Table 13d. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴													
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Macrolides	Azithromycin	Humans (2178)	N/A	0.2	[0.1 - 0.5]	<div style="display: flex; justify-content: space-between;"> <0.1 <0.1 0.1 2.8 82.8 13.3 0.6 0.2 </div>													
		Chickens	Retail Chickens (208)	N/A	0.0														[0.0 - 1.8]
			HACCP (520)	N/A	0.0														[0.0 - 0.7]
			Cecal (55)	N/A	0.0														[0.0 - 6.5]
			Turkeys	Retail Ground Turkey (106)	N/A														0.0
		Turkeys	HACCP (87)	N/A	0.0														[0.0 - 4.2]
			Cecal (28)	N/A	0.0														[0.0 - 12.3]
			Cattle	Retail (15)	N/A														0.0
		Cattle	HACCP (310)	N/A	0.0														[0.0 - 1.2]
			Cecal (Beef) (124)	N/A	0.0														[0.0 - 2.9]
			Cecal (Dairy) (310)	N/A	0.0														[0.0 - 1.2]
			Swine	Retail (24)	N/A														0.0
		Swine	Cecal (Market Hogs) (260)	N/A	0.4														[0.0 - 2.1]
Cecal (Sows) (289)	N/A		0.3	[0.0 - 1.9]															
Humans (2178)	0.0		10.4	[9.2 - 11.8]	81.1	7.2	0.9	0.4	0.1	10.3									
Penicillins	Ampicillin	Humans (2178)	0.0	10.4	[9.2 - 11.8]	<div style="display: flex; justify-content: space-between;"> 81.1 7.2 0.9 0.4 0.1 10.3 </div>													
		Chickens	Retail Chickens (208)	0.0	22.1														[16.7 - 28.4]
			HACCP (520)	0.0	10.4														[7.9 - 13.3]
			Cecal (55)	0.0	12.7														[5.3 - 24.5]
			Turkeys	Retail Ground Turkey (106)	0.0														47.2
		Turkeys	HACCP (87)	0.0	26.4														[17.6 - 37.0]
			Cecal (28)	0.0	35.7														[18.6 - 55.9]
			Cattle	Retail (15)	0.0														26.7
		Cattle	HACCP (310)	0.0	17.1														[13.1 - 21.8]
			Cecal (Beef) (124)	0.0	14.5														[8.8 - 22.0]
			Cecal (Dairy) (310)	0.0	8.1														[5.3 - 11.7]
			Swine	Retail (24)	0.0														25.0
		Swine	Cecal (Market Hogs) (260)	0.0	9.6														[6.3 - 13.9]
Cecal (Sows) (289)	0.0		3.5	[1.7 - 6.3]															
Humans (2178)	0.9		3.9	[3.1 - 4.8]	0.5	37.3	57.3	0.9	<0.1	3.9									
Phenicolis	Chloramphenicol	Humans (2178)	0.9	3.9	[3.1 - 4.8]	<div style="display: flex; justify-content: space-between;"> 0.5 37.3 57.3 0.9 <0.1 3.9 </div>													
		Chickens	Retail Chickens (208)	0.0	0.5														[0.0 - 2.6]
			HACCP (520)	0.2	0.4														[0.0 - 1.4]
			Cecal (55)	1.8	0.0														[0.0 - 6.5]
			Turkeys	Retail Ground Turkey (106)	0.0														2.8
		Turkeys	HACCP (87)	3.4	1.1														[0.0 - 6.2]
			Cecal (28)	0.0	0.0														[0.0 - 12.3]
			Cattle	Retail (15)	0.0														26.7
		Cattle	HACCP (310)	0.6	15.5														[11.6 - 20.0]
			Cecal (Beef) (124)	0.0	12.9														[7.6 - 20.1]
			Cecal (Dairy) (310)	0.0	7.4														[4.8 - 10.9]
			Swine	Retail (24)	4.2														12.5
		Swine	Cecal (Market Hogs) (260)	2.3	3.5														[1.6 - 6.5]
Cecal (Sows) (289)	0.3		2.4	[1.0 - 4.9]															

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 13e. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal *Salmonella* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																					
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024					
Quinolones	Ciprofloxacin	Humans (2178)	3.0	0.5	[0.3 - 0.9]	83.0	13.1	0.4	1.0	1.1	0.9	0.1	0.1	0.3													
		Chickens	Retail Chickens (208)	0.0	0.0	[0.0 - 1.8]	80.8	19.2																			
			HACCP (520)	0.0	0.0	[0.0 - 0.7]	88.8	11.2																			
			Cecal (55)	0.0	0.0	[0.0 - 6.5]	78.2	21.8																			
			Turkeys	Retail Ground Turkey (106)	0.0	0.0	[0.0 - 3.4]	85.9	12.3	1.9																	
		HACCP (87)		1.1	0.0	[0.0 - 4.2]	94.3	4.6			1.1																
		Cecal (28)		0.0	0.0	[0.0 - 12.3]	78.6	21.4																			
		Cattle	Retail (15)	0.0	0.0	[0.0 - 21.8]	73.3	26.7																			
			HACCP (310)	3.9	0.0	[0.0 - 1.2]	90.3	5.2	0.6	0.3	1.0	2.6															
			Cecal (Beef) (124)	0.0	0.0	[0.0 - 2.9]	73.4	2.4	24.2																		
			Cecal (Dairy) (310)	0.0	0.3	[0.0 - 1.8]	80.3	19.4					0.3														
		Swine	Retail (24)	0.0	0.0	[0.0 - 14.2]	62.5	33.3	4.2																		
			Cecal (Market Hogs) (260)	2.3	0.4	[0.0 - 2.1]	63.9	32.7	0.8			0.8		1.5		0.4											
			Cecal (Sows) (289)	2.1	0.3	[0.0 - 1.9]	60.9	36.3	0.3			0.3		1.7		0.3											
	Nalidixic Acid	Humans (2178)	Humans (2178)	N/A	2.8	[2.1 - 3.6]							<0.1	0.1	30.3	64.6	1.2	0.9	0.5	2.3							
			Chickens	Retail Chickens (208)	N/A	0.0	[0.0 - 1.8]									26.4	73.1	0.5									
				HACCP (520)	N/A	0.0	[0.0 - 0.7]							2.1	59.4	38.3	0.2										
		Cecal (55)	Cecal (55)	N/A	0.0	[0.0 - 6.5]							1.8	29.1	67.3	1.8											
			Turkeys	Retail Chickens (208)	N/A	0.0	[0.0 - 3.4]							0.9	23.6	74.5	0.9										
				HACCP (520)	N/A	1.1	[0.0 - 6.2]									62.1	36.8			1.1							
		Cecal (55)		N/A	0.0	[0.0 - 12.3]									10.7	89.3											
		Cattle	Retail (15)	N/A	0.0	[0.0 - 21.8]									20.0	80.0											
			HACCP (310)	N/A	2.3	[0.9 - 4.6]							0.3	49.0	45.8	1.0	1.6	0.3	1.9								
			Cecal (Beef) (124)	N/A	1.6	[0.2 - 5.7]									19.4	77.4	0.8	0.8	1.6								
			Cecal (Dairy) (310)	N/A	0.3	[0.0 - 1.8]							0.3	31.6	67.7					0.3							
		Swine	Retail (24)	N/A	0.0	[0.0 - 14.2]									16.7	75.0	8.3										
Cecal (Market Hogs) (260)			N/A	1.2	[0.2 - 3.3]									19.6	75.0	2.7	1.5	0.4	0.8								
Cecal (Sows) (289)			N/A	0.7	[0.1 - 2.5]									15.9	81.0	0.7	1.7	0.3	0.3								
Tetracyclines	Tetracycline	Humans (2178)	1.0	12.6	[11.3 - 14.1]									86.4	1.0	0.2	2.1	10.4									
		Chickens	Retail Chickens (208)	0.0	49.0	[42.1 - 56.0]									51.0			0.5	48.6								
			HACCP (520)	0.4	42.7	[38.4 - 47.1]									56.9	0.4	0.2	0.4	42.1								
			Cecal (55)	1.8	38.2	[25.4 - 52.3]									60.0	1.8			38.2								
			Turkeys	Retail Chickens (208)	0.0	62.3	[52.3 - 71.5]									37.7			0.9	61.3							
		HACCP (520)		0.0	43.7	[33.1 - 54.7]									56.3			8.0	35.6								
		Cecal (55)		0.0	46.4	[27.5 - 66.1]									53.6			46.4									
		Cattle	Retail (15)	0.0	46.7	[21.3 - 73.4]									53.3			46.7									
			HACCP (310)	0.0	24.8	[20.1 - 30.0]									75.2			0.3	1.6	22.9							
			Cecal (Beef) (124)	0.0	28.2	[20.5 - 37.0]									71.0			0.8	4.0	24.2							
			Cecal (Dairy) (310)	0.0	11.0	[7.7 - 15.0]									87.7			1.3	1.9	9.0							
		Swine	Retail (24)	0.0	45.8	[25.6 - 67.2]									54.2			8.3	37.5								
			Cecal (Market Hogs) (260)	0.0	31.2	[25.6 - 37.2]									68.9			6.2	25.0								
			Cecal (Sows) (289)	0.0	24.2	[19.4 - 29.6]									75.4			0.3	5.5	18.7							

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Resistance by Year

Table 14a. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013					
Number of Isolates Tested																	
Antimicrobial Class Antimicrobial (Resistance Breakpoint) Isolate Source	Humans	1998	1855	1782	2036	2171	2145	2384	2193	2449	2335	2233	2178				
	Chickens	Retail Chickens	60	83	157	153	152	99	198	272	171	158	229	208			
		HACCP	1500	1158	1280	1989	1380	994	624	551	564	491	864	520			
		Cecal												55			
	Turkeys	Retail Ground Turkey	74	114	142	183	159	190	246	193	202	162	91	106			
		HACCP	244	262	236	227	304	271	148	121	151	103	175	87			
		Cecal												28			
	Cattle	Retail Ground Beef	9	10	14	8	19	13	24	14	7	9	13	15			
		HACCP	1008	670	607	329	389	439	443	200	247	340	280	310			
		Cecal (Beef)												124			
		Cecal (Dairy)												310			
	Swine	Retail Pork Chops	10	5	11	9	8	18	23	8	20	28	12	24			
		HACCP ¹	379	211	308	301	304	211	111	120	111	90					
Cecal (Market Hogs)													260				
Cecal (Sows)													289				
Aminoglycosides																	
Gentamicin (MIC \geq 16 μ g/ml)	Humans	27	26	24	44	44	45	35	28	24	40	26	43				
		Chickens	Retail Chickens	10.0%	6.0%	3.8%	3.3%	9.2%	6.1%	7.1%	3.3%	5.8%	3.8%	5.2%	5.3%		
			HACCP	5.5%	6.3%	4.9%	4.3%	5.7%	4.5%	5.6%	5.6%	4.6%	3.5%	4.6%	2.3%		
			Cecal												1.8%		
		Turkeys	Retail Ground Turkey	14.9%	22.8%	20.4%	26.8%	28.9%	24.7%	27.6%	18.7%	16.3%	32.1%	26.4%	27.4%		
			HACCP	19.3%	21.0%	25.4%	22.9%	16.4%	12.9%	16.9%	14.9%	19.9%	14.6%	24.6%	23.0%		
			Cecal												28.6%		
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	25.0%	0.0%	7.7%	8.3%	14.3%	0.0%	0.0%	0.0%	20.0%		
			HACCP	2.6%	2.7%	1.8%	2.4%	3.9%	1.6%	1.6%	2.0%	4.9%	2.1%	2.1%	1.9%		
			Cecal (Beef)												0.0%		
			Cecal (Dairy)												0.0%		
		Swine	Retail Pork Chops	30.0%	0.0%	0.0%	0.0%	50.0%	5.6%	13.0%	0.0%	10.0%	3.6%	8.3%	0.0%		
	HACCP		0.8%	0.5%	1.3%	2.7%	2.0%	0.9%	2.7%	0.0%	2.7%	0.0%					
	Cecal (Market Hogs)													3.1%			
	Cecal (Sows)													0.7%			
	Kanamycin (MIC \geq 64 μ g/ml)	Humans	76	64	50	70	63	61	50	54	54	39	24	35			
			Chickens	Retail Chickens	6.7%	4.8%	11.5%	4.6%	9.9%	5.1%	10.6%	15.4%	8.2%	11.4%	4.8%	11.1%	
				HACCP	2.0%	2.8%	2.7%	2.5%	3.6%	3.4%	3.4%	3.1%	4.3%	0.6%	1.5%	1.2%	
				Cecal												3.6%	
			Turkeys	Retail Ground Turkey	18.9%	27.2%	18.3%	20.2%	15.1%	23.7%	17.9%	6.7%	15.8%	14.8%	13.2%	10.4%	
				HACCP	24.2%	16.0%	14.4%	19.8%	10.5%	16.2%	14.2%	10.7%	19.2%	8.7%	12.0%	6.9%	
				Cecal												10.7%	
			Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	25.0%	5.3%	0.0%	8.3%	14.3%	14.3%	11.1%	23.1%	13.3%	
				HACCP	10.1%	13.7%	8.9%	13.1%	9.5%	7.7%	9.9%	9.0%	12.6%	6.2%	8.9%	6.1%	
				Cecal (Beef)												2.4%	
				Cecal (Dairy)												0.6%	
			Swine	Retail Pork Chops	10.0%	0.0%	9.1%	0.0%	25.0%	5.6%	0.0%	12.5%	10.0%	7.1%	0.0%	8.3%	
		HACCP		4.2%	5.7%	3.9%	5.0%	8.6%	7.1%	3.6%	4.2%	10.8%	3.3%				
		Cecal (Market Hogs)													3.1%		
		Cecal (Sows)													1.4%		
		Streptomycin (MIC \geq 64 μ g/ml)	Humans	264	279	213	225	233	222	238	196	210	229	187	251		
				Chickens	Retail Chickens	28.3%	26.5%	28.0%	30.1%	36.2%	30.3%	23.7%	23.2%	25.1%	38.6%	30.6%	27.9%
					HACCP	22.9%	19.6%	22.2%	23.3%	21.2%	19.3%	25.2%	30.5%	36.0%	35.8%	32.1%	42.7%
					Cecal												25.5%
				Turkeys	Retail Ground Turkey	37.8%	45.6%	34.5%	44.3%	40.9%	45.8%	58.5%	28.0%	31.7%	56.2%	44.0%	48.1%
					HACCP	37.7%	29.4%	33.9%	40.1%	28.9%	34.7%	32.4%	38.8%	27.8%	22.3%	38.3%	35.6%
Cecal																42.9%	
Cattle				Retail Ground Beef	22.2%	40.0%	14.3%	25.0%	10.5%	0.0%	20.8%	28.6%	42.9%	33.3%	23.1%	26.7%	
				HACCP	25.9%	28.7%	20.9%	24.3%	23.7%	19.8%	23.0%	22.0%	26.7%	19.4%	18.9%	20.0%	
				Cecal (Beef)												16.9%	
				Cecal (Dairy)												9.0%	
Swine				Retail Pork Chops	70.0%	40.0%	27.3%	33.3%	25.0%	16.7%	13.0%	37.5%	45.0%	57.1%	41.7%	41.7%	
			HACCP	40.1%	30.8%	36.4%	36.5%	26.3%	27.0%	29.7%	29.2%	31.5%	18.9%				
			Cecal (Market Hogs)												18.1%		
			Cecal (Sows)												9.3%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 14b. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	1998	1855	1782	2036	2171	2145	2384	2193	2449	2335	2233	2178		
	Chickens	Retail Chickens	60	83	157	153	152	99	198	272	171	158	229	208	
		HACCP	1500	1158	1280	1989	1380	994	624	551	564	491	864	520	
		Cecal												55	
	Turkeys	Retail Ground Turkey	74	114	142	183	159	190	246	193	202	162	91	106	
		HACCP	244	262	236	227	304	271	148	121	151	103	175	87	
		Cecal												28	
	Cattle	Retail Ground Beef	9	10	14	8	19	13	24	14	7	9	13	15	
		HACCP	1008	670	607	329	389	439	443	200	247	340	280	310	
		Cecal (Beef)												124	
	Cecal (Dairy)												310		
	Swine	Retail Pork Chops	10	5	11	9	8	18	23	8	20	28	12	24	
		HACCP ¹	379	211	308	301	304	211	111	120	111	90		260	
		Cecal (Market Hogs)												289	
Cecal (Sows)															
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	5.3%	4.6%	3.7%	3.2%	3.7%	3.3%	3.1%	3.4%	2.9%	2.6%	2.9%	2.4%	
		Chickens	Retail Chickens	10.0%	25.3%	24.8%	21.6%	19.1%	16.2%	22.2%	37.5%	33.3%	33.5%	27.9%	19.7%
			HACCP	6	21	39	33	29	16	44	102	57	53	64	41
			Cecal	10.2%	9.7%	12.4%	12.1%	12.9%	15.6%	8.7%	12.9%	11.7%	6.3%	11.3%	8.8%
		Turkeys	Retail Ground Turkey	12.2%	11.4%	7.7%	8.7%	5.0%	5.3%	5.7%	5.7%	16.3%	21.0%	17.6%	8.5%
			HACCP	9	13	11	16	8	10	14	11	33	34	16	9
			Cecal	3.7%	1.5%	4.7%	3.5%	5.6%	11.1%	5.4%	13.2%	15.2%	11.7%	15.4%	9.2%
		Cattle	Retail Ground Beef	22.2%	40.0%	14.3%	0.0%	0.0%	0.0%	8.3%	14.3%	28.6%	11.1%	15.4%	26.7%
			HACCP	2	4	2	0	0	0	2	2	2	1	2	4
			Cecal (Beef)	17.7%	21.0%	13.5%	21.0%	18.5%	15.5%	16.5%	15.0%	21.5%	14.7%	11.1%	14.8%
		Cecal (Dairy)	178	141	82	69	72	68	73	30	53	50	31	46	
		Swine	Retail Pork Chops	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	3.6%	0.0%	0.0%
			HACCP	2	1	0	0	0	0	0	2	0	1	0	0
			Cecal (Market Hogs)	3.7%	3.8%	1.9%	4.3%	2.3%	3.3%	4.5%	4.2%	3.6%	2.2%		1.9%
Cecal (Sows)	14	8	6	13	7	7	5	5	4	2		5			
													2.4%		
													7		
Cepheems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	4.3%	4.3%	3.4%	3.0%	3.5%	2.9%	3.0%	3.2%	2.6%	2.6%	2.7%	2.4%	
		Chickens	Retail Chickens	10.0%	25.3%	24.8%	20.9%	18.4%	15.2%	21.2%	33.1%	28.7%	25.9%	22.7%	17.3%
			HACCP	6	21	39	32	28	15	42	90	49	41	52	36
			Cecal	8.7%	8.2%	12.4%	12.0%	12.8%	13.0%	8.0%	11.4%	11.3%	6.5%	8.6%	7.1%
		Turkeys	Retail Ground Turkey	8.1%	2.6%	4.9%	7.1%	5.0%	5.3%	4.9%	5.7%	15.3%	17.9%	15.4%	8.5%
			HACCP	6	3	7	13	8	10	12	11	31	29	14	9
			Cecal	2.5%	1.1%	5.1%	3.5%	5.3%	9.2%	5.4%	12.4%	15.2%	11.7%	14.9%	9.2%
		Cattle	Retail Ground Beef	22.2%	40.0%	14.3%	0.0%	0.0%	0.0%	8.3%	14.3%	28.6%	0.0%	15.4%	20.0%
			HACCP	2	4	2	0	0	0	2	2	2	0	2	3
			Cecal (Beef)	15.9%	17.8%	13.2%	19.8%	17.7%	15.0%	14.7%	13.5%	20.6%	13.8%	10.4%	14.5%
		Cecal (Dairy)	160	119	80	65	69	66	65	27	51	47	29	45	
		Swine	Retail Pork Chops	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	10.7%	0.0%	0.0%
			HACCP	2	1	0	0	0	0	0	2	0	3	0	0
			Cecal (Market Hogs)	2.9%	4.3%	1.9%	3.7%	2.0%	2.8%	4.5%	4.2%	1.8%	2.2%		1.9%
Cecal (Sows)	11	9	6	11	6	6	5	5	2	2		5			
													2.4%		
													7		
Ceftiofur	(MIC ≥ 8 µg/ml)	Humans	4.4%	4.5%	3.4%	2.9%	3.6%	3.3%	3.1%	3.4%	2.8%	2.5%	2.9%	2.5%	
		Chickens	Retail Chickens	10.0%	25.3%	24.8%	20.9%	19.1%	16.2%	22.2%	37.1%	33.3%	34.2%	27.5%	19.7%
			HACCP	6	21	39	32	29	16	44	101	57	54	63	41
			Cecal	10.2%	9.8%	12.4%	12.2%	12.8%	15.4%	8.7%	12.7%	12.1%	6.1%	10.2%	8.1%
		Turkeys	Retail Ground Turkey	8.1%	2.6%	4.9%	7.1%	5.0%	5.3%	4.9%	5.7%	15.8%	20.4%	16.5%	9.4%
			HACCP	6	3	7	13	8	10	12	11	32	33	15	10
			Cecal	3.3%	1.5%	4.7%	3.5%	5.3%	11.1%	5.4%	12.4%	15.2%	11.7%	14.9%	10.3%
		Cattle	Retail Ground Beef	22.2%	40.0%	14.3%	0.0%	0.0%	0.0%	8.3%	14.3%	28.6%	11.1%	15.4%	20.0%
			HACCP	2	4	2	0	0	0	2	2	2	1	2	3
			Cecal (Beef)	17.4%	21.0%	13.3%	21.6%	18.8%	15.5%	16.3%	14.5%	21.5%	13.2%	11.1%	14.8%
		Cecal (Dairy)	175	141	81	71	73	68	72	29	53	45	31	46	
		Swine	Retail Pork Chops	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	7.1%	0.0%	0.0%
			HACCP	2	1	0	0	0	0	0	2	0	2	0	0
			Cecal (Market Hogs)	3.2%	4.3%	1.9%	3.7%	2.0%	2.8%	4.5%	4.2%	1.8%	2.2%		2.3%
Cecal (Sows)	12	9	6	11	6	6	5	5	2	2		6			
													2.4%		
													7		

¹In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 14d. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	1998	1855	1782	2036	2171	2145	2384	2193	2449	2335	2233	2178		
	Chickens	Retail Chickens	60	83	157	153	152	99	198	272	171	158	229	208	
		HACCP	1500	1158	1280	1989	1380	994	624	551	564	491	864	520	
		Cecal												55	
	Turkeys	Retail Ground Turkey	74	114	142	183	159	190	246	193	202	162	91	106	
		HACCP	1008	670	607	329	389	439	443	200	247	340	280	310	
		Cecal												124	
	Cattle	Retail Ground Beef	9	10	14	8	19	13	24	14	7	9	13	15	
		HACCP	1008	670	607	329	389	439	443	200	247	340	280	310	
		Cecal (Beef)												124	
	Cecal (Dairy)													310	
	Swine	Retail Pork Chops	10	5	11	9	8	18	23	8	20	28	12	24	
		HACCP ¹	379	211	308	301	304	211	111	120	111	90			
Cecal (Market Hogs)													260		
Cecal (Sows)													289		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans									0.2%	0.0%	0.2%		
		Chickens	Retail Chickens									5	1	5	
			HACCP									0.6%	0.0%	0.0%	
			Cecal									0	0	0	
		Turkeys	Retail Ground Turkey									0.0%	0.0%	0.0%	
			HACCP									0	0	0	
			Cecal									0	0	0	
		Cattle	Retail Ground Beef									0.0%	0.0%	0.0%	
			HACCP									0	0	0	
			Cecal (Beef)									0.3%	0.0%	0.0%	
		Cecal (Dairy)									1	0	0		
		Swine	Retail Pork Chops									0.0%	0.0%	0.0%	
			HACCP									0	0	0	
Cecal (Market Hogs)										0.0%		0.4%			
Cecal (Sows)													0.3%		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	13.0%	13.6%	12.1%	11.3%	10.9%	10.1%	9.7%	9.8%	9.1%	9.1%	8.8%	10.4%	
		Chickens	Retail Chickens	259	253	216	231	237	217	232	216	223	213	196	227
			HACCP	16.7%	33.7%	30.6%	26.8%	22.4%	18.2%	28.3%	45.6%	38.0%	40.5%	29.3%	22.1%
			Cecal	10	28	48	41	34	18	56	124	65	64	67	46
		Turkeys	Retail Ground Turkey	16.2%	28.9%	20.4%	26.8%	25.8%	42.6%	51.2%	58.0%	48.0%	58.0%	40.7%	47.2%
			HACCP	12	33	29	49	41	81	126	112	97	94	37	50
			Cecal	18.0%	18.7%	22.0%	22.9%	25.3%	36.9%	32.4%	38.8%	44.4%	27.2%	42.3%	26.4%
		Cecal	44	49	52	52	77	100	48	47	67	28	74	23	
		Cattle	Retail Ground Beef	22.2%	40.0%	21.4%	25.0%	10.5%	0.0%	12.5%	28.6%	28.6%	11.1%	23.1%	26.7%
			HACCP	4	3	2	2	2	0	3	2	2	3	3	4
			Cecal (Beef)	23.9%	28.1%	19.3%	26.7%	22.4%	20.0%	21.7%	22.5%	26.3%	17.1%	15.4%	17.1%
		Cecal (Dairy)	241	188	117	88	87	85	96	45	65	58	43	53	
		Swine	Retail Pork Chops	40.0%	40.0%	9.1%	22.2%	25.0%	5.6%	13.0%	37.5%	15.0%	46.4%	16.7%	25.0%
HACCP	4		2	1	2	2	1	3	3	3	13	2	6		
Cecal (Market Hogs)	13.7%		12.8%	16.2%	13.6%	11.5%	18.0%	14.4%	19.2%	17.1%	11.1%				
Cecal (Sows)	52		27	50	41	35	38	16	23	19	10				
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	8.6%	10.1%	7.6%	7.8%	6.4%	7.3%	6.1%	5.7%	5.0%	4.4%	3.9%	3.9%	
		Chickens	Retail Chickens	172	187	136	159	139	156	146	125	122	103	87	85
			HACCP	0.0%	2.4%	1.9%	0.7%	2.6%	1.0%	0.5%	0.0%	2.3%	0.6%	0.0%	0.5%
			Cecal	0	2	3	1	4	1	1	0	4	1	0	1
		Turkeys	Retail Ground Turkey	2.4%	2.1%	1.3%	1.8%	1.7%	1.8%	1.8%	1.6%	3.0%	0.4%	0.6%	0.4%
			HACCP	36	24	16	36	24	18	11	9	17	2	5	5
			Cecal												0.0%
		Cattle	Retail Ground Turkey	1.4%	0.9%	2.8%	0.5%	0.6%	1.6%	1.6%	1.6%	2.5%	3.7%	3.3%	2.8%
			HACCP	1	1	4	1	1	3	4	3	5	6	3	3
			Cecal	5.3%	4.2%	4.7%	4.8%	3.9%	5.5%	2.7%	3.3%	4.6%	1.0%	1.1%	1.1%
		Cecal	13	11	11	11	12	15	4	4	7	1	2	2	
		Swine	Retail Ground Beef	22.2%	40.0%	14.3%	12.5%	5.3%	0.0%	12.5%	21.4%	42.9%	0.0%	23.1%	26.7%
			HACCP	2	4	2	1	1	0	3	3	3	0	3	4
Cecal (Beef)	20.6%		25.1%	17.6%	21.9%	19.8%	20.0%	19.6%	21.0%	25.1%	17.9%	15.0%	15.5%		
Cecal (Dairy)	208	168	107	72	77	88	87	42	62	62	42	48			
Swine	Retail Pork Chops	40.0%	40.0%	18.2%	22.2%	0.0%	0.0%	0.0%	12.5%	15.0%	17.9%	0.0%	12.5%		
	HACCP	4	2	2	2	0	0	0	1	3	5	0	3		
	Cecal (Market Hogs)	10.0%	8.5%	12.7%	10.6%	7.9%	15.2%	9.9%	15.0%	8.1%	4.4%				
	Cecal (Sows)	38	18	39	32	24	32	11	18	9	4				

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 14e. Antimicrobial Resistance among all Non-Typhoidal *Salmonella* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	1998	1855	1782	2036	2171	2145	2384	2193	2449	2335	2233	2178	
		Chickens												
		Retail Chickens	60	83	157	153	152	99	198	272	171	158	229	208
	HACCP													
	Cecal													
	Turkeys													
	Cattle													
	Swine													
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
			Source											
	Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans											
			Retail Chickens											
			HACCP											
Cecal														
Retail Ground Turkey														
HACCP														
Cecal														
Retail Ground Beef														
HACCP														
Cecal (Beef)														
Cecal (Dairy)														
Retail Pork Chops														
HACCP														
Cecal (Market Hogs)														
Cecal (Sows)														
Humans														
Retail Chickens														
HACCP														
Cecal														
Retail Ground Turkey														
HACCP														
Cecal														
Retail Ground Beef														
HACCP														
Cecal (Beef)														
Cecal (Dairy)														
Retail Pork Chops														
HACCP														
Cecal (Market Hogs)														
Cecal (Sows)														
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans												
		Retail Chickens												
		HACCP												
		Cecal												
		Retail Ground Turkey												
		HACCP												
		Cecal												
		Retail Ground Beef												
		HACCP												
		Cecal (Beef)												
		Cecal (Dairy)												
		Retail Pork Chops												
		HACCP												
		Cecal (Market Hogs)												
	Cecal (Sows)													
	Humans													
	Retail Chickens													
	HACCP													
	Cecal													
	Retail Ground Turkey													
	HACCP													
	Cecal													
	Retail Ground Beef													
	HACCP													
	Cecal (Beef)													
	Cecal (Dairy)													
	Retail Pork Chops													
	HACCP													
Cecal (Market Hogs)														
Cecal (Sows)														

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Ceftriaxone Resistance

Table 15. Ceftriaxone-Resistant Non-Typhoidal *Salmonella* Isolates, 2012

Humans				Chickens							
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=64)	Typhimurium	17	26.6	Retail	Typhimurium	49	76.6	HACCP (N=97)	Kentucky	55	56.7
	Newport	16	25.0	Chickens (N=64)	Kentucky	13	20.3	Typhimurium	30	30.9	
	Heidelberg	9	14.1		I 4,[5],12:i:-	2	3.1	Heidelberg	6	6.2	
	Dublin	6	9.4					I 4,[5],12:i:-	2	2.1	
	Agona	3	4.7					4:i:-	1	1.0	
	Enteritidis	2	3.1					I 8,20:-:z6	1	1.0	
	Infantis	2	3.1					Litchfield	1	1.0	
	Schwarzengrund	2	3.1					Enteritidis	1	1.0	
	I 4,[5],12:i:-	1	1.6								
	Albert	1	1.6								
	Berta	1	1.6								
	Blockley	1	1.6								
	Choleraesuis	1	1.6								
	Derby	1	1.6								
Saintpaul	1	1.6									
				Turkeys							
				Source	Serotype	n	%	Source	Serotype	n	%
				Retail	Infantis	3	18.8	HACCP (N=28)	Albany	10	35.7
				Ground Turkey (N=16)	Agona	2	12.5	Agona	3	10.7	
					Albany	2	12.5	Berta	2	7.1	
					Schwarzengrund	2	12.5	Heidelberg	2	7.1	
					Typhimurium	2	12.5	Typhimurium	2	7.1	
					Berta	1	6.3	Senftenberg	2	7.1	
					Javiana	1	6.3	Altona	1	3.6	
					Montevideo	1	6.3	Anatum	1	3.6	
					Newport	1	6.3	Bredeney	1	3.6	
					Saintpaul	1	6.3	Kentucky	1	3.6	
								Muenchen	1	3.6	
							Tennessee	1	3.6		
							Uganda	1	3.6		
				Cattle							
				Source	Serotype	n	%	Source	Serotype	n	%
				Retail Ground Beef (N=2)	Dublin	2	100.0	HACCP (N=30)	Dublin	20	66.7
							Montevideo	2	6.7		
							Newport	2	6.7		
							Reading	2	6.7		
							Typhimurium	2	6.7		
							Kentucky	1	3.3		
							Poona	1	3.3		
				Swine							
				Source	Serotype	n	%	Source	Serotype	n	%
				Retail Pork Chops (N=0)				HACCP¹ (N=0)			

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Ceftriaxone Resistance

Table 16. Ceftriaxone-Resistant Non-Typhoidal *Salmonella* Isolates, 2013

Humans				Chickens											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=55)	Dublin	11	20.0	Retail Chickens (N=41)	Typhimurium	34	82.9	HACCP (N=45)	Kentucky	34	75.6	Cecal (N=4)	Typhimurium	2	50.0
	Newport	11	20.0		Kentucky	7	17.1		Typhimurium	5	11.1		Heidelberg	1	25.0
	Typhimurium	11	20.0		Heidelberg	3	6.7		Kentucky	1	25.0				
	Heidelberg	9	16.4		Infantis	2	4.4								
	Infantis	5	9.1		I 4,[5],12:i:-	1	2.2								
	I 4,[5],12:i:-	2	3.6												
	Agona	1	1.8												
	Berta	1	1.8												
	Enteritidis	1	1.8												
	Kentucky	1	1.8												
Senftenberg	1	1.8													
Unknown	1	1.8													
Turkeys															
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
				Retail Ground Turkey (N=10)	Heidelberg	5	50.0	HACCP (N=9)	Heidelberg	4	44.4	Cecal (N=2)	Albany	2	100.0
			Albany		2	20.0	Albany		3	33.3					
			Brandenburg		1	10.0	Senftenberg		1	11.1					
			Bublin		1	10.0	Hadar		1	11.1					
			Infantis		1	10.0									
Cattle															
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Beef (N=4)	Dublin	4	100.0	HACCP (N=46)	Dublin	18	39.1	Cecal (Beef) (N=13)	Newport	6	46.2				
					Newport	10	21.7		Typhimurium	3	23.1				
					Typhimurium	7	15.2		Dublin	1	7.7				
					Reading	5	10.9		Heidelberg	1	7.7				
					Montevideo	2	4.3		Montevideo	1	7.7				
					Albany	1	2.2		Uganda	1	7.7				
					Berta	1	2.2								
					Heidelberg	1	2.2		Cecal (Dairy) (N=21)	Typhimurium	11	52.4			
					Ohio	1	2.2			Newport	5	23.8			
							Montevideo			2	9.5				
							Anatum			1	4.8				
							Give			1	4.8				
							Ohio			1	4.8				
Swine															
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Pork Chops (N=0)				HACCP¹ (N=0)				Cecal (Market Hogs) (N=6)	Infantis	2	33.3				
						Give	1		16.7						
						Johannesburg	1		16.7						
						Newport	1		16.7						
						Typhimurium	1		16.7						
									Cecal (Sows) (N=7)	Agona	2	28.6			
								Heidelberg		2	28.6				
								Infantis		2	28.6				
								Reading		1	14.3				

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Nalidixic Acid Resistance

Table 17. Nalidixic Acid-Resistant Non-Typhoidal *Salmonella* Isolates, 2012

Humans				Chickens			
Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=54)	Enteritidis	28	51.9	Retail Chickens (N=0)	HACCP Hadar (N=1)	1	100.0
	Typhimurium	5	9.3				
	Infantis	4	7.4	Turkeys			
	Kentucky	3	5.6	Source	Serotype	n	%
	Schwarzengrund	2	3.7	Retail Ground Turkey (N=0)	HACCP Saintpaul (N=3)	3	100.0
	I 4,[5],12:-:1,2	1	1.9				
	I 6,7:r:-	1	1.9	Cattle			
	Illia 50:z4,z23:-	1	1.9	Source	Serotype	n	%
	Agona	1	1.9	Retail Ground Beef (N=0)	HACCP Dublin (N=10)	9	90.0
	Albert	1	1.9			1	10.0
	Choleraesuis	1	1.9	Swine			
	Dublin	1	1.9	Source	Serotype	n	%
	Hadar	1	1.9	Retail Pork Chops (N=0)	HACCP ¹ (N=0)		
	Poona	1	1.9				
	Saintpaul	1	1.9				
Senftenberg	1	1.9					
Unknown serotype	1	1.9					

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Nalidixic Acid Resistance

Table 18. Nalidixic Acid-Resistant Non-Typhoidal *Salmonella* Isolates, 2013

Humans				Chickens																							
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%												
Humans (N=61)	Enteritidis	22	36.1	Retail Chickens (N=0)	HACCP (N=0)							Cecal (N=0)															
	Typhimurium	5	8.2																								
	Infantis	4	6.6																								
	Javiana	4	6.6	Turkeys																							
	Kentucky	3	4.9	Retail Ground Turkey (N=0)	HACCP (N=1)	1 4,[5],12:i:-	1	100.0					Cecal (N=0)														
	Paratyphi B var. L(+)-tartrate+	3	4.9																								
	Agona	2	3.3	Cattle																							
	Choleraesuis	2	3.3	Retail Ground Beef (N=0)	HACCP (N=7)	Dublin	4	57.1					Cecal (Beef) (N=2)	Heidelberg	1	50.0											
	Saintpaul	2	3.3														Typhimurium	2	28.6					Muenster	1	50.0	
	1 4,[5],12:i:-	1	1.6																								Reading
	Anatum	1	1.6																								
	Bredeney	1	1.6			Swine																					
	Dublin	1	1.6			Retail Pork Chops (N=0)	HACCP ¹ (N=0)								Cecal (Market Hogs) (N=3)	Anatum	1	33.3									
	Indiana	1	1.6													Give	1	33.3						Cecal (Sows) (N=2)	Heidelberg	1	50.0
	London	1	1.6																						Typhimurium	1	33.3
	Mbandaka	1	1.6																								
Montevideo	1	1.6																									
Muenster	1	1.6																									
Oranienburg	1	1.6																									
Uganda	1	1.6																									
Unknown serotype	1	1.6																									
Partially serotyped	1	1.6																									
Rough/Nonmotile isolates	1	1.6																									

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Resistance among the Top Non-Typhoidal *Salmonella* Serotypes

Table 19. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Humans with the Number of Resistant Isolates by Class and Agent, 2012

Sources	<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates						Number of Resistant Isolates by Antimicrobial Class and Agent ¹																		
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicol		Quinolones		Tetracyclines			
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET				
Humans	Enteritidis	364	16.3%	321	25	12	6			7				2	2	2	2	10	4			15		2		28	13	
	Typhimurium	296	13.3%	203	6	25	50	10	2	9	6	71		17	16	17	17	80	5			70		54	1	5	80	
	Newport	258	11.6%	240	1	7		10						16	16	16	10	1				18		10			11	
	Javiana	134	6.0%	131	1	2												1				2		1			1	
	I 4,[5],12:i:-	117	5.2%	73	7	6	31			3		34		2	1	1	1	34				34					39	
	Infantis	90	4.0%	83	3	2	1	1						1	1	2	2	3	4			2		1		4	4	
	Montevideo	60	2.7%	56	3	1				1		1						1									3	
	Muenchen	58	2.6%	56		2												2									1	
	Oranienburg	50	2.2%	50																								1
	Saintpaul	50	2.2%	42	2	4	1	1		2		1					1	1	5	4		3		1	1	1	7	
	Bareilly	49	2.2%	47	1	1												1	1			1					1	
	Unknown serotype	19	0.9%	17	1		1											1				1			1		1	
	Partially serotyped	26	1.2%	24			2											2				2		1			2	
	Rough/Nonmotile isolates	7	0.3%	5	2																						1	
	Other	655	29.3%	544	25	65	6	12	3	11	16	58		27	25	25	25	38	10			1	48	17	5	15	83	
Total	2233	100.0%	1892	77	127	98	34	5	26	24	187		65	61	64	64	188	29			1	196	87	7	54	247		

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 20. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Chickens with the Number of Resistant Isolates by Class and Agent, 2012

Sources	<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates						Number of Resistant Isolates by Antimicrobial Class and Agent ¹																			
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicol		Quinolones		Tetracyclines				
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET					
Chickens	Retail Chickens	Typhimurium	88	38.4%	8	1	30	37	12	6	9	13		49	40	49	49	79					50					78	
		Kentucky	62	27.1%	7	23	18	13	1	4		54		13	10	12	13	3					14					25	
		Enteritidis	26	11.4%	26																								
		Heidelberg	17	7.4%	17																								
		Thompson	11	4.8%	11																								
	HACCP	I 4,[5],12:i:-	6	2.6%	3	1			2					2	2	2	2	2					2					3	
		Other	19	8.3%	13	4	2			2		3							1				1					5	
		Total	229	100.0%	85	29	50	50	15	12	11	70		64	52	63	64	85					67					111	
		Kentucky	301	34.8%	45	38	187	30	1	8		226		55	44	47	55	11	3				58						178
		Enteritidis	203	23.5%	195	4	4						3		1	1	1	1					5					3	
Typhimurium	105	12.2%	16	1	58	27	3	4	6	9		31	19	29	30	86	1				29					86			
Heidelberg	81	9.4%	62	4	10	2	3	11	4	10		6	5	6	6	11					8		5			10			
Infantis	31	3.6%	26		5			5		3							5												
Other	143	16.6%	105	18	18	1	1	12	3	26		5	5	5	5	11					5				1	14			
Total	864	100.0%	449	65	282	60	8	40	13	277		98	74	88	97	124	4				105		5		1	291			

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 21. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Turkey with the Number of Resistant Isolates by Class and Agent, 2012

Sources				Number of Isolates						Number of Resistant Isolates by Antimicrobial Class and Agent ¹																	
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols		Quinolones		Tetracyclines		
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET			
Turkeys	Retail Ground Turkey	Illa 18:z4,z23:-	16	17.6%	16																						
		Saintpaul	9	9.9%	1	8				4		4			1									6			
		Typhimurium	9	9.9%	4	1	2	2			1	1	5		2										4		
		Hadar	8	8.8%		6	2			3		8													7		
		Agona	7	7.7%		6		1		5	1	5			2		2	2	6						1		
		Schwarzengrund	7	7.7%	2	1	2	2			2	2			2		2	2							3		
		Heidelberg	5	5.5%		4	1			5		4							1						5		
		Enteritidis	4	4.4%	3	1							1												1		
		Reading	4	4.4%	3	1						1	1												1		
		Infantis	3	3.3%				3		3	3	3			3		3	3	3				3		3		
		Albany	2	2.2%		2									2		2	2									
		Anatum	2	2.2%		2				2		2													2		
		Brandenburg	2	2.2%	1	1						1	1												1		
		Newport	2	2.2%	1			1		1	1	1			1		1	1	1						1		
Senftenberg	2	2.2%		2				1	1														1				
Other	9	9.9%	1	2	5	1		1	2				3		2	2	3	3					5				
	Total	91	100.0%	32	3	41	8	7		24	12	40		16		14	15	16	25				37	3	41		
Turkeys	HACCP	Hadar	31	17.7%	1	1	29			1	1	29												10	30		
		Heidelberg	19	10.9%	5	2	9	2	1	11	6	12			2		2	2	2	4						11	
		Albany	15	8.6%	4	1	9	1		1					9		9	9	10							1	
		Saintpaul	11	6.3%	2	5	4			9	2	7								4						6	
		Schwarzengrund	11	6.3%	7	2	2			0	1	1								2						4	
		Senftenberg	11	6.3%	2		7	1	1	7	3	2			2		2	2	2	1						1	
		Agona	10	5.7%	2		7	1		3	1	2			3		3	3	3	6						3	
		Muenchen	10	5.7%	7	3				1					1		1	1	1	2						2	
		Other	57	32.5%	21	6	20	8	2	11	7	14			10		9	9	10	19	1				20	2	23
			Total	175	100.0%	51	12	91	16	5	43	21	67			27		26	26	28	39	1			74	2	81

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 22. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Cattle with the Number of Resistant Isolates by Class and Agent, 2012

Sources		<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates							Number of Resistant Isolates by Antimicrobial Class and Agent ¹														
					Number of Antimicrobial Classes to which Isolates are Resistant							Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
					0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET	
Cattle	Retail Ground Beef	Dublin	4	30.8%			1	2		2	3		2	2	2	3		3		3			3			
		Cerro	2	15.4%			2																			
		Agona	1	7.7%	1					1																
		Anatum	1	7.7%	1																					
		Infantis	1	7.7%	1																					
		Kentucky	1	7.7%	1																					
		Montevideo	1	7.7%	1																					
		Newport	1	7.7%	1																					
	Typhimurium	1	7.7%	1																						
	Total	13	100.0%	9	1	1	2		3	3		2	2	2	3		3		3			3				
	HACCP	Montevideo	84	30.0%	66	13	3	2		3	2		2	2	2	2		2		2			18			
		Dublin	30	10.7%	1	1	1	6	17	4	4	16	23		21		20	21	20	26		23	26	9	28	
		Anatum	18	6.4%	18																					
Typhimurium		16	5.7%	6		3	4	3	1	3	8		2		2	2	10	1		6	7		1	10		
Cerro		14	5.0%	14																						
Muenchen		13	4.6%	11		2					1						2					2				
Kentucky		12	4.3%	9	1	1	1				1			1	1	1				1			2			
Meleagridis		12	4.3%	12																						
Muenster		7	2.5%	6			1				1					1	1					1				
Mbandaka		5	1.8%	5																						
Newport		5	1.8%	1				2	2			4								3	2			4		
Other	64	22.9%	46	5	7	5	2	1	3	13		3		3	3	4	9	1		8	4			16		
Total	280	100.0%	194	20	17	19	26	4	6	25	53		31	29	31	30	55	3		43	42	10	81			

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 23. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Swine with the Number of Resistant Isolates by Class and Agent, 2012

Sources		<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates							Number of Resistant Isolates by Antimicrobial Class and Agent ¹														
					Number of Antimicrobial Classes to which Isolates are Resistant							Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
					0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET	
Swine	Retail Pork Chops	Typhimurium	6	50.0%	3	2	1			3						3				1			1			
		Derby	1	8.3%			1			1						1							1			
		Heidelberg	1	8.3%			1		1											1			1			
		Infantis	1	8.3%	1																					
		Kentucky	1	8.3%			1			1																
		London	1	8.3%			1																1			
		Reading	1	8.3%			1																1			
Total	12	100.0%	4	3	4	1		1	5						4				2			5				

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 26. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Turkey with the Number of Resistant Isolates by Class and Agent, 2013

Sources	<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates						Number of Resistant Isolates by Antimicrobial Class and Agent ¹																									
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicol	Quinolones		Tetracyclines											
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR		AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET										
Retail Ground Turkey	Saintpaul	20	18.9%	3	17					7	7												4			17						5			
	Heidelberg	17	16.0%		12	3	2			14	6	12		5		5	5	5										14					2		
	Hadar	14	13.2%	1	13					1		13																2					1		
	Muenchen	13	12.3%	7	6					1		2												6									7		
	I 4,[5],12:i:-	6	5.7%			6																					6								
	Reading	5	4.7%	4	1																													4	
	Albany	4	3.8%	2	1	1				1	1			1		1	2	2										2						4	
	Agona	3	2.8%	2	1					1		1															1							3	
	Litchfield	3	2.8%	3																														3	
	Schwarzengrund	3	2.8%	2	1								1															1						3	
Other	18	17.0%	3	6	6	1	2		4	4	9		3		3	3	3		6	1						7		3					8		
Total		106	100.0%	24	9	58	11	4	29	11	51		9		9	10	10		29	1						50		3					40		
HACCP	Hadar	12	13.8%	1	9	2			2		10		1		1	1	1		2								2							11	
	Reading	10	11.5%	7	2	1						1							2	1							1							1	
	Muenchen	8	9.2%	5	3				1		2								3															3	
	I 4,[5],12:i:-	6	6.9%		2	4			1		6								5								4			1				6	
	Berta	6	6.9%	5	1																													1	
	Heidelberg	6	6.9%		5		1		3	3	3		4		4	4	4		3								4							1	
	Albany	5	5.7%	1	1	1	2		3		1		2		2	3	3		1								3								
	Typhimurium	5	5.7%	3	2				1		1									1							1							2	
	Other	29	33.3%	9	6	12	2		9	3	7		1		1	1	1	1	9								8		1					13	
	Total		87	100.0%	31	10	35	10	1	20	6	31		8		8	9	9		26	1						23		1		1			38	
Cecal	Albany	5	17.9%	1	1	1	2		3		2		2		2	2	2		1								3								
	Hadar	4	14.3%		4					1	4																								4
	Reading	3	10.7%	2	1						1								1																1
	Saintpaul	3	10.7%		3				1		1																3								3
	Senftenberg	3	10.7%	2	1				1	1	1																1								
	Heidelberg	2	7.1%		2				1		1								1								1								2
	Schwarzengrund	2	7.1%	2																							1								
	Typhimurium	2	7.1%		2				1	1	1									1							1								2
	Agona	1	3.6%		1				1		1																								1
	Enteritidis	1	3.6%	1																															
	Indiana	1	3.6%	1																															
	Kentucky	1	3.6%	1																															
	Total		28	100.0%	10	1	15	2		8	3	12		2		2	2	2		4							10								13

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 27. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Cattle with the Number of Resistant Isolates by Class and Agent, 2013

Sources	<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates						Number of Resistant Isolates by Antimicrobial Class and Agent ¹																
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicol	Quinolones		Tetracyclines		
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET		
Cattle	Retail Ground Beef	Dublin	4	25.0%					4	1	1	3		4	3	3	4	4		4	4				4	
	Montevideo	4	25.0%	2	2																				2	
	Infantis	2	12.5%	2																						
	Anatum	1	6.3%	1																						
	Heidelberg	1	6.3%			1				1						1									1	
	Kentucky	1	6.3%	1																						
	Mbandaka	1	6.3%			1				1	1	1					1									
	Muenster	1	6.3%	1																						
	Total	15	93.8%	7	2	2	2	4		3	2	4		4	3	3	4	6		4	4					7
	HACCP	Montevideo	89	28.7%	79	6	2	2	2		2	3		2	2	2	2				2	2			0	10
	Typhimurium	23	7.4%	13	2	1	5	2		2	9		7	7	7	10				9	7			2	9	
	Meleagridis	22	7.1%	16	2	4					6				6					1	4				6	
	Dublin	21	6.8%	2	1	1	14	3		4	11	14		18	17	18	18			18	17			4	16	
	Anatum	16	5.2%	14	2																				2	
	Kentucky	14	4.5%	11	3							1													2	
	Muenchen	13	4.2%	13																						
	Newport	13	4.2%	3			10			2	10			10	10	10		2		10	9				10	
	Cerro	12	3.9%	12																						
	Infantis	7	2.2%	7																						
	Panama	7	2.2%	6	1						1															
	Other	73	23.5%	49	4	7	5	8		2	2	18		9	9	9	9	18	2		13	9		1	22	
	Total	310	100.0%	225	16	14	11	39	5	6	19	62		46	45	46	46	64	4		53	48		7	77	
	Cecal (Beef)	Montevideo	21	16.9%	17	3		1				1		1	1	1	1			1	1				4	
	Anatum	18	14.5%	17	1																				1	
	Typhimurium	14	11.3%	4	2		5	3		2	8		3	3	3	8				8	4				10	
	Meleagridis	9	7.3%	7			2				2					2					2				2	
	Newport	8	6.5%	2			6				6		6	6	6	6				6	6				6	
	Cerro	6	4.8%	6																						
	Kentucky	6	4.8%	3	3																				3	
	Muenchen	4	3.2%	4																						
	Muenster	4	3.2%	3			1				1					1	1						1		1	
Uganda	4	3.2%	3			1			1	1		1	1	1	1	1			1	1				1		
Agona	3	2.4%	1		2										2									2		
Lille	3	2.4%	1	2																				2		
Mbandaka	3	2.4%	3																							
Senftenberg	3	2.4%	2	1																				1		
Other	18	14.5%	15	1			1	1		2		2	2	2	2	2	1		2	2			1	3		
Total	124	100.0%	88	13	2	8	12	1	3	21	13		13	13	13	23	3		18	16		2	36			
Cecal (Dairy)	Cerro	92	29.7%	89	3																				3	
Montevideo	56	18.1%	50	3	1	2			1	2		2	2	2	3	1			2	2				5		
Typhimurium	21	6.8%	7			3	11			14		11	11	11	14				14	13				14		
Anatum	18	5.8%	15	2	1					1		1	1	1					1					2		
Meleagridis	17	5.5%	15		1	1				2				2						1				2		
Muenster	16	5.2%	15		1					1				1										1		
Kentucky	15	4.8%	12	3						1														2		
Muenchen	9	2.9%	8	1																				1		
Newport	7	2.3%	2			5				5		5	5	5	5				5	5				5		
Other	59	19.0%	55	1	1		1	1		1	3		2	2	2	2	1		3	2		1	1	3		
Total	310	100.0%	268	13	5	4	19	1	2	28	21		21	21	21	27	2		25	23		1	1	38		

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 28. Number of Non-Typhoidal *Salmonella* Isolates among the Top Serotypes from Swine with the Number of Resistant Isolates by Class and Agent, 2013

Sources	<i>Salmonella</i> Serotype	No. of Isolates	% of Isolates	Number of Isolates						Number of Resistant Isolates by Antimicrobial Class and Agent ¹														
				Number of Antimicrobial Classes to which Isolates are Resistant						Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicol	Quinolones		Tetracyclines
				0	1	2-3	4-5	6-7	8-9	GEN	KAN	STR		AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL
Retail (Pork Chops)	Derby	5	20.8%	2	1	2				2													3	
	Typhimurium	4	16.7%	1			3			3								3		3			3	
	Johannesburg	3	12.5%	3																				
	Heidelberg	2	8.3%			2			2	2								1					2	
	I 4,[5],12:i:-	2	8.3%				2			2								2					2	
	Muenchen	2	8.3%	2																				
	Saintpaul	2	8.3%	2																				
	Bredeney	1	4.2%			1					1													1
	Infantis	1	4.2%	1																				
	Liverpool	1	4.2%	1																				
Ohio	1	4.2%	1																					
Total	24	100.0%	13	1	5	5			2	10				7			6		3				11	
Cecal (Market Hogs)	Derby	38	14.6%	8	8	21	1		1	22				21			1						30	
	Anatum	33	12.7%	21	9	2	1		1					2			1				1		12	
	Johannesburg	21	8.1%	20		1						1	1	1	1		1							
	Typhimurium	21	8.1%	4	2	5	9	1	2	3	12			1	1	15	2	1	14	6	1	1	13	
	Infantis	20	7.7%	16	3		1			3		2	2	2	2		2	2	1				3	
	Agona	12	4.6%	7	1	4									4									5
	Uganda	11	4.2%	11																				
	Cerro	10	3.8%	10																				
	Muenchen	9	3.5%	7		2					1				2									2
	Meleagridis	6	2.3%	6																				
Senftenberg	6	2.3%	6																					
Other	73	28.1%	57	5	6	3	1	1	1	3	9	2	2	2	2	8	6	2		1	3	16		
Total	260	100.0%	173	25	44	14	3	1	3	8	47	5	5	6	6	54	2	1	25	9	1	3	81	
Cecal (Sows)	Anatum	43	14.9%	26	17																		17	
	Johannesburg	33	11.4%	30	3																		3	
	Infantis	27	9.3%	24		1		1	1	2	3	2	2	2	2	1	1	2		2			3	
	Derby	24	8.3%	9	3	12					12				12								15	
	Uganda	22	7.6%	22																				
	Muenchen	14	4.8%	12	1	1									1								2	
	Meleagridis	12	4.2%	11	1																		1	
	Adelaide	11	3.8%	10	1																		1	
	Agona	11	3.8%	6	2	2		1			1	2	2	2	2	1		2		1			4	
	Saintpaul	10	3.5%	10																				
Cerro	8	2.8%	8																					
Chailey	6	2.1%		6																			6	
Other	68	23.5%	47	7	8	4	1	1	2	2	11	3	3	3	3	11	1	6	4	1	2	19		
Total	289	100.0%	215	41	24	4	3	2	2	4	27	7	7	7	7	28	3	1	10	7	1	2	71	

¹ GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole, COT= Trimethoprim/Sulfamethoxazole, AZI= Azithromycin, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 29c. Resistance Patterns among all Non-Typhoidal *Salmonella* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		1998	1855	1782	2036	2171	2145	2384	2193	2449	2335	2233	2178	
		Chickens	Retail Chickens	60	83	157	153	152	99	198	272	171	158	229	208
		HACCP	1500	1158	1280	1989	1380	994	624	551	564	491	864	520	
	Turkeys	Retail Ground Turkey	74	114	142	183	159	190	246	193	202	162	91	106	
		HACCP	244	262	236	227	304	271	148	121	151	103	175	87	
		Cecal												28	
	Cattle	Retail Ground Beef	9	10	14	8	19	13	24	14	7	9	13	15	
		HACCP	1008	670	607	329	389	439	443	200	247	340	280	310	
		Cecal (Beef)												124	
	Swine	Cecal (Dairy)												310	
		Retail Pork Chops	10	5	11	9	8	18	23	8	20	28	12	24	
		HACCP ¹	379	211	308	301	304	211	111	120	111	90		260	
		Cecal (Market Hogs)												289	
	Cecal (Sows)														
Resistance Pattern		Source													
7. At Least ACSSuTAuCx ² Resistant	Humans		3.4%	3.2%	2.4%	2.0%	2.0%	2.1%	1.8%	1.4%	1.3%	1.5%	1.5%	1.4%	
			67	60	42	41	43	46	44	30	33	36	34	31	
		Retail Chickens	0.0%	0.0%	1.9%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%
	Chickens	HACCP	0	0	3	0	4	0	0	0	1	0	0	0	
		Cecal	0.9%	1.0%	0.4%	0.9%	1.1%	1.4%	1.1%	1.3%	2.0%	0.4%	0.2%	0.2%	
			13	12	5	18	15	14	7	7	11	2	2	1	
														0.0%	
	Turkeys	Retail Ground Turkey	1.4%	0.9%	2.1%	0.5%	0.0%	1.1%	1.2%	0.5%	2.0%	3.1%	3.3%	1.9%	
		HACCP	1	1	3	1	0	2	3	1	4	5	3	2	
		Cecal	1.6%	0.8%	2.1%	1.8%	2.3%	4.1%	2.0%	3.3%	1.3%	1.0%	0.0%	0.0%	
														0	
	Cattle	Retail Ground Beef	22.2%	40.0%	14.3%	0.0%	0.0%	0.0%	8.3%	14.3%	28.6%	0.0%	15.4%	20.0%	
		HACCP	2	4	2	0	0	0	2	2	2	0	2	3	
		Cecal (Beef)	14.6%	15.1%	12.0%	17.3%	16.2%	13.9%	14.7%	9.5%	16.2%	11.2%	6.8%	12.6%	
														39	
	Swine	Retail Pork Chops	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	
		HACCP	2	1	0	0	0	0	0	0	0	1	0	0	
		Cecal (Market Hogs)	1.8%	1.9%	1.0%	2.7%	0.7%	0.5%	0.9%	1.7%	0.9%	2.2%			
													0		
	Cecal (Sows)												1.2%		
													3		
													5		
													1.7%		
													5		
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans		0.2%	0.1%	0.1%	0.0%	0.2%	0.2%	0.0%	0.2%	0.1%	0.1%	0.3%	0.2%	
			4	1	2	1	4	5	1	4	2	2	6	5	
		Retail Chickens	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	HACCP	0	0	0	1	0	0	0	0	0	0	0	0	
		Cecal	0.5%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			8	0	2	1	0	0	0	0	0	0	0	0	
														0.0%	
	Turkeys	Retail Ground Turkey	0.0%	0.9%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	
		HACCP	0	1	0	0	0	1	0	0	1	0	0	0	
		Cecal	1.2%	0.4%	0.8%	0.9%	0.3%	0.7%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	
														0	
	Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	2	0	0	0	0	
		Cecal (Beef)	0.2%	0.4%	1.0%	0.9%	0.3%	0.2%	0.7%	0.0%	1.2%	0.9%	1.8%	1.9%	
														6	
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Market Hogs)	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
													0.8%		
	Cecal (Sows)												1		
													1		
													0.3%		
													1		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Table 30. Non-Typhoidal *Salmonella* Isolates that are Resistant to ≥ 3 Antimicrobial Classes, by Serotype, 2012

Humans				Chickens			
Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=193)	Typhimurium	73	37.8	Retail Chickens (N=76)	Typhimurium	57	75.0
	I 4,[5],12:i:-	33	17.1		Kentucky	15	19.7
	Newport	16	8.3		I 4,[5],12:i:-	2	2.6
	Heidelberg	11	5.7		Anatum	1	1.3
	Enteritidis	10	5.2		Mbandaka	1	1.3
	Dublin	7	3.6				
	Agona	5	2.6				
	Derby	4	2.1				
	Infantis	4	2.1				
	Saintpaul	3	1.6				
	Anatum	2	1.0				
	Hadar	2	1.0				
	Kentucky	2	1.0				
	Reading	2	1.0				
	Schwarzengrund	2	1.0				
	Stanley	2	1.0				
	I 4,[5],12:i:-1,2	1	0.5				
	I 6,7:r:-	1	0.5				
	Albert	1	0.5				
	Berta	1	0.5				
Blockley	1	0.5					
Braenderup	1	0.5					
Brandenburg	1	0.5					
Choleraesuis	1	0.5					
Javiana	1	0.5					
Johannesburg	1	0.5					
Ohio	1	0.5					
Uganda	1	0.5					
Unknown serotype	1	0.5					
Partially serotyped	2	1.0					

Chickens				Turkeys			
Source	Serotype	n	%	Source	Serotype	n	%
HACCP (N=116)	Kentucky	61	52.6	Retail Ground Turkey (N=36)	Heidelberg	5	13.9
	Typhimurium	39	33.6		Saintpaul	5	13.9
	Heidelberg	9	7.8		Typhimurium	4	11.1
	I 4,[5],12:i:-	2	1.7		Agona	3	8.3
	4:i:-	1	0.9		Infantis	3	8.3
	I 8,20:-:z6	1	0.9		Albany	2	5.6
	Enteritidis	1	0.9		Anatum	2	5.6
	Litchfield	1	0.9		Hadar	2	5.6
	Rough O:i:1,2	1	0.9		Schwarzengrund	2	5.6
					Berta	1	2.8
					Brandenburg	1	2.8
					Javiana	1	2.8
					Montevideo	1	2.8
					Muenchen	1	2.8
					Newport	1	2.8
					Reading	1	2.8
					Worthington	1	2.8

Chickens				Turkeys			
Source	Serotype	n	%	Source	Serotype	n	%
HACCP (N=70)	Heidelberg	11	15.7	HACCP (N=70)	Heidelberg	11	15.7
	Hadar	11	15.7		Hadar	9	12.9
	Albany	9	12.9		Albany	9	12.9
	Saintpaul	9	12.9		Saintpaul	5	7.1
	Agona	5	7.1		Agona	5	7.1
	Berta	3	4.3		Berta	3	4.3
	Montevideo	3	4.3		Montevideo	3	4.3
	Typhimurium	3	4.3		Typhimurium	3	4.3
	Johannesburg	2	2.9		Johannesburg	2	2.9
	Serflitenberg	2	2.9		Serflitenberg	2	2.9
	4:i:-	1	1.4		4:i:-	1	1.4
	I 4,[5],12:i:-	1	1.4		I 4,[5],12:i:-	1	1.4
	Altona	1	1.4		Altona	1	1.4
	Anatum	1	1.4		Anatum	1	1.4
	Bredeney	1	1.4		Bredeney	1	1.4
	Kentucky	1	1.4		Kentucky	1	1.4
	Muenchen	1	1.4		Muenchen	1	1.4
	Newport	1	1.4		Newport	1	1.4
	Reading	1	1.4		Reading	1	1.4
	Schwarzengrund	1	1.4		Schwarzengrund	1	1.4
	Tennessee	1	1.4		Tennessee	1	1.4
	Uganda	1	1.4		Uganda	1	1.4

Cattle				Swine			
Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Beef (N=3)	Dublin	3	100.0	HACCP (N=56)	Dublin	28	50.0
					Typhimurium	10	17.9
					Newport	4	7.1
					I 4,[5],12:i:-	2	3.6
					Montevideo	2	3.6
					Reading	2	3.6
					4:i:-	1	1.8
					Heidelberg	1	1.8
					Infantis	1	1.8
					Kentucky	1	1.8
					Muenchen	1	1.8
					Muenster	1	1.8
					Poona	1	1.8
					Rough O:i:1,2	1	1.8

Swine				Swine			
Source	Serotype	n	%	Source	Serotype	n	%
Retail Pork Chops (N=3)	Derby	1	33.3	HACCP¹ (N=0)			
	Heidelberg	1	33.3				
	Typhimurium	1	33.3				

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 31. Non-Typhoidal Salmonella Isolates that are Resistant to ≥ 4 Antimicrobial Classes, by Serotype, 2012

Humans				Chickens							
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=137)	Typhimurium	62	45.3	Retail Chickens (N=65)	Typhimurium	49	75.4	HACCP (N=68)	Kentucky	31	45.6
	I 4,[5],12:i:-	31	22.6		Kentucky	14	21.5		Typhimurium	30	44.1
	Newport	10	7.3		I 4,[5],12:i:-	2	3.1		Heidelberg	5	7.4
	Dublin	7	5.1	Turkeys							
	Enteritidis	6	4.4								
	Agona	3	2.2								
	Derby	2	1.5	Source	Serotype	n	%	Source	Serotype	n	%
	Infantis	2	1.5	Retail Ground Turkey (N=15)	Typhimurium	4	26.7	HACCP (N=21)	Saintpaul	4	19.0
	Kentucky	2	1.5		Infantis	3	20.0		Heidelberg	3	14.3
	Saintpaul	2	1.5		Hadar	2	13.3		Typhimurium	3	14.3
	I 4,[5],12:-:1,2	1	0.7		Schwarzengrund	2	13.3		Senftenberg	2	9.5
	Albert	1	0.7		Agona	1	6.7		4:i:-	1	4.8
	Blockley	1	0.7		Berta	1	6.7		I 4,[5],12:i:-	1	4.8
	Braenderup	1	0.7		Heidelberg	1	6.7		Agona	1	4.8
	Choleraesuis	1	0.7		Newport	1	6.7		Albany	1	4.8
	Heidelberg	1	0.7						Bredeney	1	4.8
	Reading	1	0.7						Kentucky	1	4.8
Unknown serotype	1	0.7						Montevideo	1	4.8	
Partially serotyped	2	1.5						Newport	1	4.8	
								Uganda	1	4.8	
				Cattle							
				Source	Serotype	n	%	Source	Serotype	n	%
				Retail Ground Beef (N=3)	Dublin	3	100.0	HACCP (N=49)	Dublin	27	55.1
									Typhimurium	7	14.3
									Newport	4	8.2
									I 4,[5],12:i:-	2	4.1
									Montevideo	2	4.1
									Reading	2	4.1
									4:i:-	1	2.0
									Heidelberg	1	2.0
									Kentucky	1	2.0
									Muenster	1	2.0
									Rough O:i:1,2	1	2.0
				Swine							
				Source	Serotype	n	%	Source	Serotype	n	%
				Retail Pork Chops (N=1)	Typhimurium	1	100.0	HACCP¹ (N=0)			

¹ In 2012 and 2013, FSIS did not sample pork products for Salmonella because in prior years the percent of pork carcass samples positive for Salmonella was consistently low

Table 32. Non-Typhoidal Salmonella Isolates that are Resistant to ≥ 5 Antimicrobial Classes, by Serotype, 2012

Humans				Chickens								
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	
Humans (N=88)	Typhimurium	55	62.5	Retail Chickens (N=56)	Typhimurium	49	87.5	HACCP (N=51)	Typhimurium	28	54.9	
	Newport	10	11.4		Kentucky	5	8.9		Kentucky	16	31.4	
	Dublin	7	8.0		I 4,[5],12:i:-	2	3.6		Heidelberg	5	9.8	
	Agona	2	2.3	Turkeys								
	Enteritidis	2	2.3									
	Infantis	2	2.3	Source	Serotype	n	%	Source	Serotype	n	%	
	Kentucky	2	2.3	Retail Ground Turkey (N=7)	Infantis	3	42.9	HACCP (N=10)	Typhimurium	3	30.0	
	I 4,[5],12:i:-	1	1.1		Typhimurium	2	28.6		Heidelberg	2	20.0	
	Albert	1	1.1		Agona	1	14.3		Agona	1	10.0	
	Blockley	1	1.1		Newport	1	14.3		Bredeney	1	10.0	
	Choleraesuis	1	1.1						Newport	1	10.0	
	Derby	1	1.1						Senftenberg	1	10.0	
	Reading	1	1.1						Uganda	1	10.0	
	Saintpaul	1	1.1									
	Partially serotyped	1	1.1									
					Cattle							
					Source	Serotype	n	%	Source	Serotype	n	%
				Retail Ground Beef (N=3)	Dublin	3	100.0	HACCP (N=38)	Dublin	25	65.8	
									Typhimurium	6	15.8	
									Montevideo	2	5.3	
									Newport	2	5.3	
									Reading	2	5.3	
									I 4,[5],12:i:-	1	2.6	
				Swine								
				Source	Serotype	n	%	Source	Serotype	n	%	
				Retail Pork Chops (N=0)				HACCP¹ (N=0)				

¹ In 2012 and 2013, FSIS did not sample pork products for Salmonella because in prior years the percent of pork carcass samples positive for Salmonella was consistently low

Table 33. Non-Typhoidal *Salmonella* Isolates that are at least ACSSuT¹ Resistant, by Serotype, 2012

Humans				Chickens				
Source	Serotype	n	%	Source	Serotype	n	%	
Humans (N=77)	Typhimurium	51	66.2	Retail Chickens (N=0)	HACCP (N=3)	Heidelberg	3 100.0	
	Newport	10	13.0					
	Dublin	7	9.1					
	Agona	2	2.6	Turkeys				
	Albert	1	1.3	Source	Serotype	n	%	
	Blockley	1	1.3	Retail	Infantis	3	100.0	
	Choleraesuis	1	1.3	Ground Turkey (N=3)	HACCP (N=2)	Newport Typhimurium	1 50.0 1 50.0	
	Derby	1	1.3	Cattle				
	Kentucky	1	1.3	Source	Serotype	n	%	
	Reading	1	1.3	Retail	Dublin	3	100.0	
	Partially serotyped	1	1.3	Ground Beef (N=3)	HACCP (N=26)	Dublin Typhimurium Montevideo Reading 14,[5],12:i:- Newport	14 53.8 6 23.1 2 7.7 2 7.7 1 3.8 1 3.8	
					Swine			
					Source	Serotype	n	%
				Retail	Pork Chops (N=0)	HACCP ² (N=0)		

¹ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 34. Non-Typhoidal *Salmonella* Isolates that are at least ACT/S¹ Resistant, by Serotype, 2012

Humans				Chickens			
Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=7)	Typhimurium	2	28.6	Retail Chickens (N=0)	HACCP (N=0)		
	Blockley	1	14.3				
	Braenderup	1	14.3				
	Dublin	1	14.3	Turkeys			
	Newport	1	14.3	Source	Serotype	n	%
	Reading	1	14.3	Retail	Ground Turkey (N=0)	HACCP (N=0)	
					Cattle		
				Source	Serotype	n	%
				Retail	Ground Beef (N=0)	HACCP (N=1)	Typhimurium 1 100.0
				Swine			
				Source	Serotype	n	%
				Retail	Pork Chops (N=0)	HACCP ² (N=0)	

¹ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 35. Non-Typhoidal *Salmonella* Isolates that are at least ACSSuTAuCx¹ Resistant, by Serotype, 2012

Humans				Chickens					
Source	Serotype	n	%	Source	Serotype	n	%		
Humans (N=34)	Typhimurium	12	35.3	Retail Chickens (N=0)	HACCP Heidelberg (N=2)	2	100.0		
	Newport	10	29.4						
	Dublin	6	17.7	Turkeys					
	Agona	2	5.9	Source	Serotype	n	%		
	Albert	1	2.9	Retail Ground Turkey (N=3)	Infantis	3	100.0	HACCP (N=0)	
	Blockley	1	2.9	Cattle					
	Choleraesuis	1	2.9	Source	Serotype	n	%		
	Derby	1	2.9	Retail Ground Beef (N=2)	Dublin	2	100.0	HACCP (N=19)	
					Dublin	12	63.2	Montevideo	2
				Reading	2	10.5	Typhimurium	2	10.5
				Swine					
				Source	Serotype	n	%		
				Retail Pork Chops (N=0)				HACCP ² (N=0)	

¹ ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 36. Non-Typhoidal *Salmonella* Isolates that are at least Ceftriaxone and Nalidixic Acid Resistant, by Serotype, 2012

Humans				Chickens				
Source	Serotype	n	%	Source	Serotype	n	%	
Humans (N=6)	Typhimurium	2	33.3	Retail Chickens (N=0)	HACCP (N=0)			
	Albert	1	16.7					
	Choleraesuis	1	16.7	Turkeys				
	Dublin	1	16.7	Source	Serotype	n	%	
	Infantis	1	16.7	Retail Ground Turkey (N=0)				HACCP (N=0)
				Cattle				
				Source	Serotype	n	%	
				Retail Ground Beef (N=0)				HACCP (N=5)
					Dublin	5	100.0	
				Swine				
				Source	Serotype	n	%	
				Retail Pork Chops (N=0)				HACCP ¹ (N=0)

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 37. Non-Typhoidal *Salmonella* Isolates that are Resistant to ≥ 3 Antimicrobial Classes, by Serotype, 2013

Humans				Chickens												
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	
Humans (N=214)	I 4,[5],12:i:-	65	30.4	Retail Chickens (N=54)	Typhimurium	43	79.6	HACCP (N=54)	Kentucky	35	64.8	Cecal (N=5)	Typhimurium	3	60.0	
	Typhimurium	55	25.7		Kentucky	7	13.0		Typhimurium	9	16.7		Heidelberg	1	20.0	
	Heidelberg	20	9.4		Heidelberg	4	7.4		Heidelberg	3	5.6		Kentucky	1	20.0	
	Newport	12	5.6				I 4,[5],12:i:-		2	3.7						
	Dublin	11	5.1				Enteritidis		2	3.7						
	Infantis	8	3.7				Infantis	2	3.7							
	Enteritidis	6	2.8				Havana	1	1.9							
	Kentucky	4	1.9													
	Saintpaul	4	1.9													
	Agona	2	0.9													
	Choleraesuis	2	0.9													
	Derby	2	0.9													
	Litchfield	2	0.9													
	Paratyphi B var. L(+) tartrate+	2	0.9													
	Illb 48:i:z	1	0.5													
	Berta	1	0.5													
	Brandenburg	1	0.5													
	Bredeney	1	0.5													
	Hadar	1	0.5													
	Indiana	1	0.5													
	Lomalinda	1	0.5													
London	1	0.5														
Muenchen	1	0.5														
Reading	1	0.5														
Senftenberg	1	0.5														
Unknown serotype	5	2.3														
Partially serotyped	2	0.9														
Rough/Nonmotile isolates	1	0.5														

Turkeys				Cattle											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Turkey (N=42)	Heidelberg	15	35.7	HACCP (N=30)	I 4,[5],12:i:-	6	20.0	Cecal (N=8)	Albany	2	25.0				
	I 4,[5],12:i:-	6	14.3		Heidelberg	4	13.3		Typhimurium	2	25.0				
	Saintpaul	6	14.3		Albany	3	10.0		Agona	1	12.5				
	Muenchen	3	7.1		Hadar	3	10.0		Heidelberg	1	12.5				
	Albany	2	4.8		Muenchen	3	10.0		Reading	1	12.5				
	Infantis	2	4.8		Agona	2	6.7		Saintpaul	1	12.5				
	Hadar	2	4.8		Saintpaul	2	6.7								
	Senftenberg	2	4.8		Senftenberg	2	6.7								
	Agona	1	2.4		Derby	1	3.3								
	Brandenburg	1	2.4		Ohio	1	3.3								
	Dublin	1	2.4		Reading	1	3.3								
	Typhimurium	1	2.4		Schwarzengrund	1	3.3								
					Typhimurium	1	3.3								

Swine			
Source	Serotype	n	%
Retail Pork Chops (N=8)	Typhimurium	3	37.5
	I 4,[5],12:i:-	2	25.0
	Derby	2	25.0
	Heidelberg	1	12.5

¹In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 38. Non-Typhoidal *Salmonella* Isolates that are Resistant to ≥ 4 Antimicrobial Classes, by Serotype, 2013

Humans				Chickens											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=167)	I 4,[5],12:i:-	62	37.1	Retail Chickens (N=44)	Typhimurium	37	84.1	HACCP (N=36)	Kentucky	28	77.8	Cecal (N=4)	Typhimurium	2	50.0
	Typhimurium	48	28.7		Kentucky	6	13.6		Typhimurium	5	13.9		Heidelberg	1	25.0
	Dublin	11	6.6		Heidelberg	1	2.3		I 4,[5],12:i:-	1	2.8		Kentucky	1	25.0
	Newport	10	6.0						Enteritidis	1	2.8				
	Enteritidis	6	3.6				Heidelberg	1	2.8						
	Heidelberg	5	3.0												
	Infantis	4	2.4												
	Kentucky	3	1.8												
	Agona	2	1.2												
	Choleraesuis	2	1.2												
	Paratyphi B var. L(+) tartrate+	2	1.2												
	Illib 48:i:z	1	0.6												
	Bredeney	1	0.6												
	Indiana	1	0.6												
	Lomalinda	1	0.6												
	London	1	0.6												
	Reading	1	0.6												
Senftenberg	1	0.6													
Unknown serotype	3	1.8													
Partially serotyped	1	0.6													
Rough/Nonmotile isolates	1	0.6													

Turkeys											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Turkey (N=15)	I 4,[5],12:i:-	6	40.0	HACCP (N=11)	I 4,[5],12:i:-	4	36.4	Cecal (N=2)	Albany	2	100.0
	Heidelberg	5	33.3		Albany	2	18.2				
	Albany	1	6.7		Hadar	2	18.2				
	Dublin	1	6.7		Heidelberg	1	9.1				
				Ohio	1	9.1					
				Senftenberg	1	9.1					

Cattle											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Ground Beef (N=4)	Dublin	4	100.0	HACCP (N=55)	Dublin	18	32.7	Cecal (Beef) (N=21)	Typhimurium	8	38.1
					Newport	10	18.2		Newport	6	28.6
					Typhimurium	8	14.5		Meleagridis	2	9.5
					Reading	6	10.9		Dublin	1	4.8
					I 4,[5],12:i:-	4	7.3		Heidelberg	1	4.8
					Meleagridis	4	7.3		Montevideo	1	4.8
					Montevideo	2	3.6		Muenster	1	4.8
					Berta	1	1.8		Uganda	1	4.8
					Heidelberg	1	1.8				
					Ohio	1	1.8				

Swine											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Retail Pork Chops (N=5)	Typhimurium	3	60.0	HACCP¹ (N=0)				Cecal (Market Hogs) (N=18)	Typhimurium	10	55.6
	I 4,[5],12:i:-	2	40.0						I 4,[5],12:i:-	3	16.7
							Anatum		1	5.6	
							Derby		1	5.6	
							Give		1	5.6	
							Infantis		1	5.6	
							Newport		1	5.6	

¹In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 39. Non-Typhoidal *Salmonella* Isolates that are Resistant to ≥ 5 Antimicrobial Classes, by Serotype, 2013

Humans				Chickens														
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%			
Humans (N=87)	Typhimurium	40	46.0	Retail Chickens (N=40)	Typhimurium	34	85.0	HACCP (N=28)	Kentucky	21	75.0	Cecal (N=3)	Typhimurium	2	66.7			
	Dublin	11	12.6		Kentucky	5	12.5		Typhimurium	5	17.9		Heidelberg	1	33.3			
	Newport	10	11.5		Heidelberg	1	2.5		I 4,[5],12:i:-	1	3.6							
	Heidelberg	4	4.6				Heidelberg		1	3.6								
	Infantis	4	4.6	Turkeys														
	I 4,[5],12:i:-	3	3.5	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%			
	Agona	2	2.3	Retail Ground Turkey (N=7)	Heidelberg	4	57.1	HACCP (N=2)	Heidelberg	1	50.0	Cecal (N=1)	Albany	1	100.0			
	Choleraesuis	2	2.3		Dublin	1	14.3		Ohio	1	50.0							
	Kentucky	2	2.3		Infantis	1	14.3											
	Paratyphi B var. L(+)-tartrate+	2	2.3		Typhimurium	1	14.3	Cattle										
	Bredeney	1	1.2	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%			
	Enteritidis	1	1.2	Retail Ground Beef (N=4)	Dublin	4	100.0	HACCP (N=46)	Dublin	17	37.0	Cecal (Beef) (N=15)	Newport	6	40.0			
	Indiana	1	1.2						Newport	10	21.7		Typhimurium	5	33.3			
	London	1	1.2						Typhimurium	7	15.2		Dublin	1	6.7			
	Senftenberg	1	1.2						Reading	6	13.0		Heidelberg	1	6.7			
Unknown serotype	1	1.2					Montevideo		2	4.3	Montevideo		1	6.7				
Partially serotyped	1	1.2					Berta		1	2.2	Uganda		1	6.7				
							Heidelberg		1	2.2								
							Meleagridis		1	2.2	Cecal (Dairy) (N=22)		Typhimurium	13	59.1			
							Ohio		1	2.2			Newport	5	22.7			
													Montevideo	2	9.1			
													Give	1	4.5			
									Ohio	1			4.5					
Swine																		
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%		Source	Serotype	n	%		
Retail Pork Chops (N=3)	Typhimurium	3	100.0	HACCP¹ (N=0)				Cecal (Market Hogs) (N=11)	Typhimurium	8	72.7							
							Give		1	9.1								
							Infantis		1	9.1								
									Newport	1	9.1							
									Cecal (Sows) (N=6)	Infantis	2	33.3						
								Agona		1	16.7							
								Heidelberg		1	16.7							
								Reading		1	16.7							
									Typhimurium	1	16.7							

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 40. Non-Typhoidal *Salmonella* Isolates that are at least ACSSuT¹ Resistant, by Serotype, 2013

Humans				Chickens											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=74)	Typhimurium	39	52.7	Retail	Heidelberg	1	100.0	HACCP	Kentucky	1	100.0	Cecal			
	Dublin	10	13.5	Chickens				(N=1)				(N=0)			
	Newport	10	13.5												
	Heidelberg	4	5.4												
	Agona	2	2.7												
	Choleraesuis	2	2.7												
	Paratyphi B var. L(+) tartrate+	2	2.7												
	I 4,[5],12:i:-	1	1.4												
	Enteritidis	1	1.4												
	Indiana	1	1.4												
	Infantis	1	1.4												
	Senftenberg	1	1.4												
				Turkeys											
				Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
				Retail	Dublin	1	33.3	HACCP	Ohio	1	100.0	Cecal			
				Ground Turkey	Infantis	1	33.3	(N=1)				(N=0)			
				(N=3)	Typhimurium	1	33.3								
				Cattle											
				Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
				Retail	Dublin	3	100.0	HACCP	Dublin	13	32.5	Cecal	Newport	6	42.9
				Ground Beef				(N=40)	Newport	9	22.5	(Beef)	Typhimurium	4	28.6
				(N=3)					Typhimurium	7	17.5	(N=14)	Dublin	1	7.1
									Reading	5	12.5		Heidelberg	1	7.1
									Montevideo	2	5.0		Montevideo	1	7.1
									Berta	1	2.5		Uganda	1	7.1
									Heidelberg	1	2.5				
									Meleagridis	1	2.5				
									Ohio	1	2.5				
												Cecal	Typhimurium	13	59.1
												(Dairy)	Newport	5	22.7
												(N=22)	Montevideo	2	9.1
													Give	1	4.5
													Ohio	1	4.5
				Swine											
				Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
				Retail	Typhimurium	3	100.0	HACCP ²				Cecal	Typhimurium	6	66.7
				Pork Chops				(N=0)			(Market Hogs)	Give	1	11.1	
				(N=3)							(N=9)	Infantis	1	11.1	
												Newport	1	11.1	
												Cecal	Infantis	2	33.3
												(Sows)	Agona	1	16.7
												(N=6)	Heidelberg	1	16.7
													Reading	1	16.7
													Typhimurium	1	16.7

¹ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 41. Non-Typhoidal *Salmonella* Isolates that are at least ACT/S¹ Resistant, by Serotype, 2013

Humans				Chickens														
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%			
Humans (N=10)	Agona	2	20.0	Retail Chickens (N=0)	HACCP (N=0)	Cecal (N=0)	Turkeys											
	Choleraesuis	2	20.0				Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
	1,4,[5],12:i:-	1	10.0				Retail Ground Turkey (N=1)	Dublin	1	100.0	HACCP (N=0)	Cecal (N=0)						
	Dublin	1	10.0	Cattle														
	Heidelberg	1	10.0	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%			
	Infantis	1	10.0	Retail Ground Beef (N=0)	HACCP (N=3)	Newport	2	66.7	Cecal (Beef) (N=2)	Heidelberg	1	50.0	Cecal (Dairy) (N=1)	Give	1	100.0		
	Newport	1	10.0			Ohio	1	33.3		Uganda	1	50.0						
Senftenberg	1	10.0	Swine															
				Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%			
				Retail Pork Chops (N=0)	HACCP ¹ (N=0)	Cecal (Market Hogs) (N=0)												
								Cecal (Sows) (N=2)	Agona	1	50.0							
									Infantis	1	50.0							

¹ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 42. Non-Typhoidal *Salmonella* Isolates that are at least ACSSuTAuCx¹ Resistant, by Serotype, 2013

Humans				Chickens											
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%
Humans (N=31)	Dublin	10	32.3	Retail Chickens (N=0)	HACCP (N=1)	Kentucky	1	100.0	Cecal (N=0)						
	Newport	10	32.3												
	Typhimurium	7	22.6												
	Agona	1	3.2												
	Heidelberg	1	3.2												
	Infantis	1	3.2												
Senftenberg	1	3.2													
Turkeys															
				Retail Ground Turkey (N=2)				HACCP (N=0)				Cecal (N=0)			
Cattle															
				Retail Ground Beef (N=3)				HACCP (N=39)				Cecal (Beef) (N=12)			
								Dublin				Newport			
								Newport				Typhimurium			
								Typhimurium				Dublin			
								Reading				Heidelberg			
								Montevideo				Montevideo			
								Berta				Uganda			
								Heidelberg				Cecal (Dairy) (N=20)			
								Ohio				Typhimurium			
												Newport			
												Montevideo			
												Give			
												Ohio			
Swine															
				Retail Pork Chops (N=3)				HACCP ² (N=0)				Cecal (Market Hogs) (N=3)			
				Typhimurium								Give			
												Infantis			
												Newport			
												Cecal (Sows) (N=5)			
												Infantis			
												Agona			
												Heidelberg			
												Reading			

¹ ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

² In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 43. Non-Typhoidal *Salmonella* Isolates that are at least Ceftriaxone and Nalidixic Acid Resistant, by Serotype, 2013

Humans				Chickens												
Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	Source	Serotype	n	%	
Humans (N=5)	Infantis	2	40.0	Retail Chickens (N=0)	HACCP (N=0)							Cecal (N=0)				
	Agona	1	20.0													
	Dublin	1	20.0													
	Enteritidis	1	20.0													
Turkeys																
				Retail Ground Turkey (N=0)				HACCP (N=0)				Cecal (N=0)				
Cattle																
				Retail Ground Beef (N=0)				HACCP (N=6)				Cecal (Beef) (N=1)				
								Dublin				Heidelberg				
								Typhimurium				Give				
												Cecal (Dairy) (N=1)				
Swine																
				Retail Pork Chops (N=0)				HACCP ¹ (N=0)				Cecal (Market Hogs) (N=1)				
												Give				
												Cecal (Sows) (N=1)				
												Heidelberg				

¹ In 2012 and 2013, FSIS did not sample pork products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 44. Distribution of MICs and Occurrence of Resistance to Selected β -Lactam Agents among Non-Typhoidal *Salmonella* Isolates Resistant to Ceftiofur or Ceftriaxone, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹ (or S-DD ²)	%R ³	[95% CI] ⁴	Distribution (%) of MICs (μ g/ml) ⁵													
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	Humans (64)	9.4	6.3	[1.7 - 15.2]														
		Chickens	Retail Chickens (66)	1.5	0.0														[0.0 - 5.4]
			HACCP (97)	1.0	2.1														[0.3 - 7.3]
		Turkeys	Retail Ground Turkey (14)	7.1	0.0														[0.0 - 23.2]
			HACCP (28)	0.0	0.0														[0.0 - 12.3]
		Cattle	Retail Ground Beef (3)	0.0	0.0														[0.0 - 70.8]
			HACCP (31)	13.0	3.2														[0.1 - 16.7]
		Cephems	Cefepime	Humans (64)	4.7														0.0
Chickens	Retail Chickens (66)			0.0	0.0	[0.0 - 5.4]													
	HACCP (97)			0.0	0.0	[0.0 - 3.7]													
Turkeys	Retail Ground Turkey (14)			0.0	0.0	[0.0 - 23.2]													
	HACCP (28)			0.0	0.0	[0.0 - 12.3]													
Cattle	Retail Ground Beef (3)			0.0	0.0	[0.0 - 70.8]													
	HACCP (31)			3.2	0.0	[0.0 - 11.2]													
Cefotaxime	Humans (64)			0.0	100.0	[94.4 - 100.0]													
	Chickens		Retail Chickens (66)	4.5	89.4	[79.4 - 95.6]													
			HACCP (97)	6.2	91.8	[84.4 - 96.4]													
	Turkeys		Retail Ground Turkey (14)	0.0	92.9	[66.1 - 99.8]													
			HACCP (28)	3.6	92.9	[76.5 - 99.1]													
	Cattle		Retail Ground Beef (3)	0.0	66.7	[9.4 - 99.2]													
			HACCP (31)	3.2	96.8	[83.3 - 99.9]													
	Ceftazidime		Humans (64)	4.7	90.6	[80.7 - 96.5]													
Chickens			Retail Chickens (66)	36.4	53.0	[40.3 - 65.4]													
			HACCP (97)	11.3	75.3	[65.5 - 83.5]													
Turkeys			Retail Ground Turkey (14)	7.1	85.7	[57.2 - 98.2]													
			HACCP (28)	0.0	92.9	[76.5 - 99.1]													
Cattle			Retail Ground Beef (3)	33.3	33.3	[0.8 - 90.6]													
		HACCP (31)	3.2	90.3	[74.2 - 98.0]														
Monobactam		Aztreonam	Humans (64)	56.3	28.1	[17.6 - 40.8]													
	Chickens		Retail Chickens (66)	19.7	1.5	[0.0 - 8.2]													
			HACCP (97)	23.7	5.2	[1.7 - 11.6]													
	Turkeys		Retail Ground Turkey (14)	21.4	50.0	[23.0 - 77.0]													
			HACCP (28)	25.0	53.6	[33.9 - 72.5]													
	Cattle		Retail Ground Beef (3)	0.0	0.0	[0.0 - 70.8]													
			HACCP (31)	38.7	16.1	[5.5 - 33.7]													
	Penems		Imipenem	Humans (64)	0.0	0.0													
Chickens		Retail Chickens (66)		0.0	0.0	[0.0 - 5.4]													
		HACCP (97)		0.0	0.0	[0.0 - 3.7]													
Turkeys		Retail Ground Turkey (14)		0.0	0.0	[0.0 - 23.2]													
		HACCP (28)		0.0	0.0	[0.0 - 12.3]													
Cattle		Retail Ground Beef (3)		0.0	0.0	[0.0 - 70.8]													
		HACCP (31)		0.0	0.0	[0.0 - 11.2]													

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that are susceptible-dose dependent (S-DD). Cefepime MIC's above the susceptible range but below the resistant range are designated by CLSI to be S-DD.

³ Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding.

⁴ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁵ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 45. Distribution of MICs and Occurrence of Resistance to Selected beta-Lactam Agents among Non-Typhoidal *Salmonella* Isolates Resistant to Cefotiofur or Ceftriaxone, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	% ¹ (or S-DD) ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵																									
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024									
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	Humans (55)	10.9	1.8	[0.0 - 9.7]																										
		Chickens	Retail Chickens (41)	0.0	0.0													[0.0 - 8.6]													
			Cecal (4)	25.0	0.0													[0.0 - 60.2]													
		Turkeys	Retail Ground Turkey (10)	10.0	10.0													[0.3 - 44.5]													
			Cecal (2)	0.0	0.0													[0.0 - 84.2]													
		Cattle	Retail Ground Beef (4)	0.0	25.0													[0.6 - 80.6]													
			Cecal (Beef) (13)	15.4	0.0													[0.0 - 24.7]													
			Cecal (Dairy) (21)	4.8	0.0													[0.0 - 16.1]													
		Swine	Cecal (Market Hogs) (6)	0.0	0.0													[0.0 - 45.9]													
			Cecal (Sows) (7)	0.0	0.0													[0.0 - 41.0]													
		Cephems	Cefepime	Humans (55)	3.6													1.8	[0.0 - 9.7]												
				Chickens	Retail Chickens (41)													0.0	0.0												
Cecal (4)	0.0				0.0	[0.0 - 60.2]																									
Turkeys	Retail Ground Turkey (10)			0.0	10.0	[0.3 - 44.5]																									
	Cecal (2)			0.0	0.0	[0.0 - 84.2]																									
Cattle	Retail Ground Beef (4)			0.0	0.0	[0.0 - 60.2]																									
	Cecal (Beef) (13)			0.0	0.0	[0.0 - 24.7]																									
	Cecal (Dairy) (21)			0.0	0.0	[0.0 - 16.1]																									
Swine	Cecal (Market Hogs) (6)			16.7	0.0	[0.0 - 45.9]																									
	Cecal (Sows) (7)			0.0	0.0	[0.0 - 41.0]																									
Cefotaxime	Humans (55)			0.0	100.0	[93.5 - 100.0]																									
	Chickens			Retail Chickens (41)	0.0	97.6													[87.1 - 99.9]												
			Cecal (4)	0.0	100.0	[39.8 - 100.0]																									
	Turkeys		Retail Ground Turkey (10)	0.0	90.0	[55.5 - 99.7]																									
			Cecal (2)	0.0	100.0	[15.8 - 100.0]																									
	Cattle		Retail Ground Beef (4)	0.0	100.0	[39.8 - 100.0]																									
			Cecal (Beef) (13)	0.0	100.0	[75.3 - 100.0]																									
			Cecal (Dairy) (21)	0.0	100.0	[83.9 - 100.0]																									
	Swine		Cecal (Market Hogs) (6)	0.0	100.0	[54.1 - 100.0]																									
			Cecal (Sows) (7)	0.0	100.0	[59.0 - 100.0]																									
	Ceftazidime		Humans (55)	5.5	89.1	[77.8 - 95.9]																									
			Chickens	Retail Chickens (41)	51.2	43.9																									[28.5 - 60.3]
Cecal (4)				25.0	50.0	[6.8 - 93.2]																									
Turkeys			Retail Ground Turkey (10)	10.0	80.0	[44.4 - 97.5]																									
			Cecal (2)	0.0	100.0	[15.8 - 100.0]																									
Cattle			Retail Ground Beef (4)	25.0	50.0	[6.8 - 93.2]																									
			Cecal (Beef) (13)	0.0	100.0	[75.3 - 100.0]																									
			Cecal (Dairy) (21)	9.5	90.5	[69.6 - 98.8]																									
Swine		Cecal (Market Hogs) (6)	0.0	83.3	[35.9 - 99.6]																										
		Cecal (Sows) (7)	0.0	100.0	[59.0 - 100.0]																										
Monobactam		Aztreonam	Humans (55)	43.6	32.7	[20.7 - 46.7]																									
			Chickens	Retail Chickens (41)	12.2	0.0																									[0.0 - 8.6]
	Cecal (4)			25.0	25.0	[0.6 - 80.6]																									
	Turkeys		Retail Ground Turkey (10)	60.0	20.0	[2.5 - 55.6]																									
			Cecal (2)	50.0	50.0	[1.3 - 98.7]																									
	Cattle		Retail Ground Beef (4)	0.0	25.0	[0.6 - 80.6]																									
			Cecal (Beef) (13)	46.2	15.4	[1.9 - 45.4]																									
			Cecal (Dairy) (21)	42.9	28.6	[11.3 - 52.2]																									
	Swine		Cecal (Market Hogs) (6)	66.7	33.3	[4.3 - 77.7]																									
			Cecal (Sows) (7)	42.9	42.9	[9.9 - 81.6]																									
	Penems		Imipenem	Humans (55)	0.0	0.0													[0.0 - 6.5]												
				Chickens	Retail Chickens (41)	0.0													0.0												
Cecal (4)		0.0			0.0	[0.0 - 60.2]																									
Turkeys		Retail Ground Turkey (10)		0.0	0.0	[0.0 - 30.8]																									
		Cecal (2)		0.0	0.0	[0.0 - 84.2]																									
Cattle		Retail Ground Beef (4)		0.0	0.0	[0.0 - 60.2]																									
		Cecal (Beef) (13)		0.0	0.0	[0.0 - 24.7]																									
		Cecal (Dairy) (21)		0.0	0.0	[0.0 - 16.1]																									
Swine		Cecal (Market Hogs) (6)		0.0	0.0	[0.0 - 45.9]																									
		Cecal (Sows) (7)		0.0	0.0	[0.0 - 41.0]																									

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that are susceptible-dose dependent (S-DD). Cefepime MIC's above the susceptible range but below the resistant range are designated by CLSI to be S-DD.

³ Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding.

⁴ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁵ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Resistance by Year

Table 46a. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		337	257	271	384	412	385	442	410	513	391	364	382	
	Chickens	Retail Chickens	8	3	3	12	17	13	30	27	28	21	26	25	
		HACCP	48	42	84	173	188	124	116	118	152	134	203	79	
		Cecal												6	
	Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	0	1	4	2	
		HACCP	0	0	0	0	3	0	1	0	1	0	1	1	
		Cecal												1	
	Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	0	
		HACCP	6	3	2	2	2	4	5	0	1	0	1	1	
		Cecal (Beef)												0	
		Cecal (Dairy)												0	
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP ¹	1	1	1	0	0	1	0	0	0	0	0	0	
		Cecal (Market Hogs)												0	
														1	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.3% 1	0.4% 1	0.4% 1	0.8% 3	0.2% 1	0.0% 0	0.2% 1	0.0% 0	0.2% 1	0.5% 2	0.0% 0	0.0% 0	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	1.2% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1	0.0% 0	0.0% 0	1.3% 1
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0			
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal (Beef)												
			Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs)												
			Cecal (Sows)												0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.3% 1	0.0% 0	0.7% 2	0.3% 1	0.2% 1	0.5% 2	0.0% 0	0.2% 1	0.2% 1	0.3% 1	0.0% 0	0.0% 0	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	2.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1	0.0% 0	0.0% 0	0.0% 0
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0	0.0% 0		
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1		0.0% 0	0.0% 0
			Cecal (Beef)												
			Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs)												
			Cecal (Sows)												0.0% 0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	1.5% 5	1.2% 3	2.2% 6	1.0% 4	1.2% 5	0.5% 2	0.7% 3	1.2% 5	0.6% 3	1.8% 7	1.9% 7	2.6% 10	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	14.3% 3	0.0% 0	0.0% 0
			HACCP	2.1% 1	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.8% 1	0.0% 0	0.0% 0	1.3% 2	0.0% 0	1.5% 3	2.5% 2
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0	0.0% 0		
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1		0.0% 0	0.0% 0
			Cecal (Beef)												
			Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs)												
			Cecal (Sows)												0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 46b. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	337	257	271	384	412	385	442	410	513	391	364	382		
	Chickens	Retail Chickens	8	3	3	12	17	13	30	27	28	21	26	25	
		HACCP	48	42	84	173	188	124	116	118	152	134	203	79	
		Cecal												6	
	Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	0	1	4	2	
		HACCP	0	0	0	0	3	0	1	0	1	0	1	1	
		Cecal												1	
	Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	0	
		HACCP	6	3	2	2	2	4	5	0	1	0	1	1	
		Cecal (Beef) Cecal (Dairy)												0 0	
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP ¹	1	1	1	0	0	1	0	0	0	0		0	
		Cecal (Market Hogs) Cecal (Sows)												0 1	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.6% 2	0.0% 0	0.0% 0	0.8% 3	0.5% 2	0.5% 2	0.0% 0	0.0% 0	0.4% 2	0.3% 1	0.5% 2	0.0% 0	
		Chickens	Retail Chickens	0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	4.2% 2	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.0% 0	0.9% 1	0.8% 1	0.0% 0	0.7% 1	0.5% 1	0.0% 0
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0			
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0
		Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	1.0% 4	0.5% 2	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.5% 2
Chickens	Retail Chickens			0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	HACCP			2.1% 1	0.0% 0	1.2% 1	0.6% 1	0.0% 0	0.0% 0	0.9% 1	0.0% 0	0.0% 0	0.7% 1	0.5% 1	0.0% 0
	Cecal														0.0% 0
Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
	HACCP							0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
	Cecal														0.0% 0
Cattle	Retail Ground Beef			0.0% 0	0.0% 0					0.0% 0		0.0% 0			
	HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0
	Cecal (Beef) Cecal (Dairy)														
Swine	Retail Pork Chops														
	HACCP			0.0% 0	0.0% 0	0.0% 0			0.0% 0						
	Cecal (Market Hogs) Cecal (Sows)														0.0% 0
	Ceftiofur (MIC ≥ 8 µg/ml)			Humans	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.5% 2	0.3% 1	0.2% 1	0.0% 0	0.0% 0	0.3% 1	0.5% 2
		Chickens	Retail Chickens	0.0% 0	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	4.2% 2	0.0% 0	1.2% 1	1.2% 2	0.0% 0	0.0% 0	0.9% 1	0.8% 1	1.3% 2	0.7% 1	0.5% 1	0.0% 0
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0			
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 46c. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		337	257	271	384	412	385	442	410	513	391	364	382	
		Chickens													
	Retail Chickens		8	3	3	12	17	13	30	27	28	21	26	25	
		HACCP	48	42	84	173	188	124	116	118	152	134	203	79	
		Cecal												6	
	Retail Ground Turkey		5	1	0	0	0	0	2	0	0	1	4	2	
		HACCP	0	0	0	0	3	0	1	0	1	0	1	1	
		Cecal												1	
	Retail Ground Beef		1	1	0	0	0	0	1	0	1	0	0	0	
		HACCP	6	3	2	2	2	4	5	0	1	0	1	1	
		Cecal (Beef)												0	
		Cecal (Dairy)												0	
	Retail Pork Chops		0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP ¹	1	1	1	0	0	1	0	0	0	0	0	0	
Cecal (Market Hogs)													0		
Cecal (Sows)													1		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0%	0.3%	0.5%	0.3%	0.2%	0.0%	0.0%	0.3%	0.5%	0.3%	
			0	0	0	1	2	1	1	0	0	1	2	1	
		Retail Chickens		0.0%	33.3%	33.3%	0.0%	0.0%	0.0%	0.0%	3.7%	3.6%	0.0%	0.0%	0.0%
			HACCP	0	1	1	0	0	0	0	1	1	0	0	0
			Cecal	4.2%	0.0%	1.2%	0.6%	0.0%	0.0%	0.9%	0.8%	0.6%	0.7%	0.5%	0.0%
				2	0	1	1	0	0	1	1	1	1	0	0
		Retail Ground Turkey		0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
			HACCP	0	0					0			0	0	0
			Cecal												0.0%
															0
		Retail Ground Beef		0.0%	0.0%					0.0%		0.0%			
			HACCP	0	0	0	0	50.0%	0.0%	0	0	0	0	0	0
			Cecal (Beef)	0.0%	0.0%	0.0%	0.0%	0	0	0	0	0	0	0	0
		Cecal (Dairy)													
		Retail Pork Chops													
			HACCP	0.0%	0.0%	0.0%			0.0%						
				0	0	0			0						
			Cecal (Market Hogs)												
		Cecal (Sows)													0.0%
															0
		Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 4 / 76 µg/ml)	Humans	1.5%	1.2%	1.8%	1.6%	1.5%	1.6%	1.4%	1.7%	1.9%	2.0%	2.7%
	5			3	5	6	6	6	6	7	10	8	10	6	
Retail Chickens				0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	3.3%	3.7%	0.0%	9.5%	0.0%	0.0%
	HACCP			0	0	1	0	0	0	1	1	0	2	0	0
	Cecal			4.2%	2.4%	1.2%	0.0%	0.0%	0.8%	0.9%	0.0%	2.0%	0.0%	0.0%	2.5%
				2	1	1	0	0	1	1	0	3	0	0	2
Retail Ground Turkey				0.0%	0.0%					50.0%			0.0%	0.0%	0.0%
	HACCP			0	0					1			0	0	0
	Cecal														0.0%
															0
Retail Ground Beef				0.0%	0.0%					0.0%		0.0%			
	HACCP			0	0	0	0	50.0%	0.0%	0	0	0	0	0	0
	Cecal (Beef)			0.0%	0.0%	0.0%	0.0%	0	0	0	0	0	0	0	0
Cecal (Dairy)															
Retail Pork Chops															
	HACCP			0.0%	0.0%	0.0%			0.0%						
				0	0	0			0						
	Cecal (Market Hogs)														
Cecal (Sows)															0.0%
															0
Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)				Humans	0.6%	0.8%	0.0%	0.5%	0.5%	1.0%	0.9%	0.7%	1.0%	0.5%	1.1%
			2	2	0	2	2	4	4	3	5	2	4	2	
		Retail Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	0	0	0	0	1	0	0	0	0
			Cecal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
															0
		Retail Ground Turkey		0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
			HACCP	0	0					0			0	0	0
			Cecal												0.0%
															0
		Retail Ground Beef		0.0%	0.0%					0.0%		0.0%			
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Beef)												
		Cecal (Dairy)													
		Retail Pork Chops													
			HACCP	0.0%	0.0%	0.0%			0.0%						
				0	0	0			0						
			Cecal (Market Hogs)												
		Cecal (Sows)													0.0%
															0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 46d. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested		Humans	337	257	271	384	412	385	442	410	513	391	364	382	
		Chickens	Retail Chickens	8	3	3	12	17	13	30	27	28	21	26	25
			HACCP	48	42	84	173	188	124	116	118	152	134	203	79
			Cecal												6
		Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	0	1	4	2
			HACCP	6	3	2	2	2	4	5	0	1	0	1	1
			Cecal												0
		Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	0
			HACCP	6	3	2	2	2	4	5	0	1	0	1	1
			Cecal (Beef) Cecal (Dairy)												0
		Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0
			HACCP ¹	1	1	1	0	0	1	0	0	0	0	0	0
			Cecal (Market Hogs) Cecal (Sows)												0
													1		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0%	0.0%	0.0%	
		Chickens	Retail Chickens										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
		Turkeys	Retail Ground Turkey										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
		Cattle	Retail Ground Beef												
			HACCP											0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP												
			Cecal (Market Hogs) Cecal (Sows)												0.0%
													0		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	6.8% 23	2.3% 6	4.1% 11	2.6% 10	4.1% 17	2.1% 8	4.1% 18	3.9% 16	2.3% 12	5.1% 20	4.1% 15	5.8% 22	
		Chickens	Retail Chickens	0.0% 0	66.7% 2	33.3% 1	0.0% 0	17.6% 3	0.0% 0	6.7% 2	18.5% 5	0.0% 0	9.5% 2	0.0% 0	0.0% 0
			HACCP	4.2% 2	0.0% 0	1.2% 1	1.2% 2	1.6% 3	1.6% 2	2.6% 3	2.5% 3	2.6% 4	1.5% 2	2.5% 5	3.8% 3
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	50.0% 1
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0			
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1		0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0
													0		
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.3% 1	0.4% 1	0.4% 1	0.5% 2	0.0% 0	0.5% 2	0.5% 2	0.0% 0	0.6% 3	0.0% 0	0.5% 2	0.3% 1	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 2	0.0% 0	0.0% 0	0.0% 0
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0					0.0% 0			0.0% 0	0.0% 0	0.0% 0
			HACCP					0.0% 0		0.0% 0		0.0% 0		0.0% 0	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0					0.0% 0		0.0% 0			
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0		100.0% 1		0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0% 0	0.0% 0	0.0% 0			0.0% 0						
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0
													0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 46e. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested		Humans	337	257	271	384	412	385	442	410	513	391	364	382	
		Chickens	Retail Chickens	8	3	3	12	17	13	30	27	28	21	26	25
			HACCP	48	42	84	173	188	124	116	118	152	134	203	79
			Cecal												6
		Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	0	1	4	2
			HACCP	0	0	0	0	3	0	1	0	1	0	1	1
			Cecal												1
		Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	0
			HACCP	6	3	2	2	2	4	5	0	1	0	1	1
			Cecal (Beef) Cecal (Dairy)												0
		Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0
			HACCP ¹	1	1	1	0	0	1	0	0	0	0	0	0
			Cecal (Market Hogs) Cecal (Sows)												0
													1		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	
			0	0	1	0	0	0	0	0	0	1	0	0	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal												0.0%
		Turkeys	Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
			HACCP					0.0%		0.0%		0.0%		0.0%	0.0%
			Cecal												0.0%
		Cattle	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail Pork Chops												
			HACCP	0.0%	0.0%	0.0%			0.0%						
			Cecal (Market Hogs) Cecal (Sows)												0.0%
		Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	3.9%	4.7%	6.6%	4.7%	7.0%	5.7%	7.2%	3.7%	5.3%	7.2%	7.7%	5.8%
			13	12	18	18	29	22	32	15	27	28	28	22	
	Chickens		Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal				1	0	0	0	0	0	0	0	0
	Turkeys		Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
			HACCP					0.0%		0.0%		0.0%		0.0%	0.0%
			Cecal												0.0%
	Cattle		Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)												
	Swine		Retail Pork Chops												
			HACCP	0.0%	0.0%	0.0%			0.0%						
Cecal (Market Hogs) Cecal (Sows)														0.0%	
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)		Humans	4.2%	1.6%	3.3%	2.3%	1.7%	3.9%	1.8%	1.2%	2.1%	1.8%	3.6%	4.5%
			14	4	9	9	7	15	8	5	11	7	13	17	
		Chickens	Retail Chickens	0.0%	0.0%	33.3%	0.0%	11.8%	0.0%	3.3%	3.7%	0.0%	19.1%	0.0%	0.0%
			HACCP	2.1%	2.4%	2.4%	0.6%	1.6%	2.4%	0.9%	2.5%	3.3%	0.7%	1.5%	2.5%
			Cecal	1	1	2	1	3	3	1	3	5	1	3	2
		Turkeys	Retail Ground Turkey	0.0%	0.0%						50.0%		0.0%	25.0%	50.0%
			HACCP					0.0%		0.0%		0.0%		0.0%	0.0%
			Cecal												0.0%
		Cattle	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	50.0%	25.0%	0.0%		100.0%		0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)					1	1	0		1		0	0
		Swine	Retail Pork Chops												
			HACCP	0.0%	0.0%	0.0%			0.0%						
			Cecal (Market Hogs) Cecal (Sows)												0.0%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 47a. Resistance Patterns among *Salmonella* Enteritidis Isolates, 2002-2013¹

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	337	257	271	384	412	385	442	410	513	391	364	382	
	Chickens	Retail Chickens	8	3	3	12	17	13	30	27	21	26	25	
		HACCP	48	42	84	173	188	124	116	118	152	134	203	
		Cecal											6	
	Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	1	4	2	
		HACCP	0	0	0	0	3	0	1	0	1	0	1	
		Cecal											1	
	Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	
		HACCP	6	3	2	2	2	4	5	0	1	0	1	
		Cecal (Beef) Cecal (Dairy)											0 0	
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	
		HACCP ²	1	1	1	0	0	1	0	0	0	0	0	
		Cecal (Market Hogs) Cecal (Sows)											0 1	
Resistance Pattern	Source													
1. No Resistance Detected	Humans	87.5%	91.8%	86.7%	91.4%	88.8%	90.4%	87.3%	92.0%	92.0%	88.0%	88.2%	87.4%	
	Chickens	Retail Chickens	295	236	235	351	366	348	386	377	472	344	321	334
		HACCP	100.0%	33.3%	66.7%	100.0%	82.4%	100.0%	90.0%	74.1%	92.9%	81.0%	100.0%	100.0%
		Cecal	8	1	2	12	14	13	27	20	26	17	26	25
	Turkeys	Retail Ground Turkey	95.8%	97.6%	97.6%	97.1%	97.9%	96.0%	97.4%	96.6%	95.4%	97.8%	96.1%	96.2%
		HACCP	46	41	82	168	184	119	113	114	145	131	195	76
		Cecal												100.0%
	Cattle	Retail Ground Turkey	100.0%	100.0%					50.0%			100.0%	75.0%	50.0%
		HACCP	5	1					1		1	3	1	
		Cecal					100.0%		100.0%		100.0%	100.0%	100.0%	
	Swine	Retail Ground Beef	100.0%	100.0%					100.0%		100.0%			
		HACCP	1	1					1		1			
		Cecal (Beef) Cecal (Dairy)	100.0%	100.0%	100.0%	100.0%	50.0%	75.0%	100.0%	0.0%		100.0%	100.0%	
Swine	Retail Pork Chops													
	HACCP	100.0%	100.0%	100.0%			100.0%							
	Cecal (Market Hogs) Cecal (Sows)	1	1	1			1					100.0%		
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	2.1%	0.4%	1.1%	1.3%	1.7%	1.0%	0.7%	1.0%	2.1%	2.3%	2.7%	1.6%	
	Chickens	Retail Chickens	7	1	3	5	7	4	3	4	11	9	10	6
		HACCP	0.0%	33.3%	33.3%	0.0%	0.0%	0.0%	3.3%	3.7%	0.0%	9.5%	0.0%	0.0%
		Cecal	0	1	1	0	0	0	1	1	0	2	0	0
	Turkeys	Retail Ground Turkey	4.2%	0.0%	2.4%	0.6%	0.0%	0.0%	0.9%	0.8%	2.6%	0.7%	0.5%	2.5%
		HACCP	2	0	2	1	0	0	1	1	4	1	1	2
		Cecal												0.0%
	Cattle	Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
		HACCP	0	0					0		0	0	0	
		Cecal					0.0%		0.0%		0.0%	0.0%	0.0%	
	Swine	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
		HACCP	0	0					0		0			
		Cecal (Beef) Cecal (Dairy)	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	100.0%		0.0%	0.0%	
Swine	Retail Pork Chops													
	HACCP	0.0%	0.0%	0.0%			0.0%							
	Cecal (Market Hogs) Cecal (Sows)	0	0	0			0					0.0%		
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	0.6%	0.4%	1.0%	1.0%	0.7%	0.3%	0.2%	0.5%	1.3%	1.6%	1.6%		
	Chickens	Retail Chickens	2	1	2	4	3	1	1	2	5	6	6	
		HACCP	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	9.5%	0.0%	
		Cecal	0	0	1	0	0	0	1	1	0	2	0	
	Turkeys	Retail Ground Turkey	4.2%	0.0%	1.2%	0.0%	0.0%	0.0%	0.9%	0.8%	2.6%	0.0%	0.0%	
		HACCP	2	0	1	0	0	0	1	1	4	1	1	
		Cecal											0.0%	
	Cattle	Retail Ground Turkey	0.0%	0.0%					0.0%		0.0%	0.0%	0.0%	
		HACCP	0	0					0		0	0	0	
		Cecal					0.0%		0.0%		0.0%	0.0%	0.0%	
	Swine	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
		HACCP	0	0					0		0			
		Cecal (Beef) Cecal (Dairy)	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	100.0%		0.0%	0.0%	
Swine	Retail Pork Chops													
	HACCP	0.0%	0.0%	0.0%			0.0%							
	Cecal (Market Hogs) Cecal (Sows)	0	0	0			0					0.0%		

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 47b. Resistance Patterns among *Salmonella* Enteritidis Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	337	257	271	384	412	385	442	410	513	391	364	382	
	Chickens	Retail Chickens	8	3	3	12	17	13	30	27	28	21	26	25
		HACCP	48	42	84	173	188	124	116	118	152	134	203	79
		Cecal												6
	Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	0	1	4	2
		HACCP	0	0	0	0	3	0	1	0	1	0	1	1
		Cecal												1
	Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	0
		HACCP	6	3	2	2	2	4	5	0	1	0	1	1
		Cecal (Beef) Cecal (Dairy)												0
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP ²	1	1	1	0	0	1	0	0	0	0	0	0
		Cecal (Market Hogs) Cecal (Sows)												0
	Resistance Pattern	Source												1
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	0.0%	0.4%	0.7%	0.5%	0.2%	0.3%	0.0%	0.2%	0.0%	0.5%	0.5%	0.3%	
	Chickens	Retail Chickens	0	1	2	2	1	1	0	1	0	2	2	1
		HACCP	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	0.0%	0.0%	0.0%
		Cecal	0	0	1	0	0	0	0	1	0	0	0	0
	Turkeys	Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
		HACCP	0	0			0.0%	0	0	0	0.0%	0	0	0.0%
		Cecal												0.0%
	Cattle	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
		HACCP	0	0	0	0	50.0%	0	0	0	0	0	0	0.0%
		Cecal (Beef) Cecal (Dairy)												0
	Swine	Retail Pork Chops												
		HACCP	0.0%	0.0%	0.0%			0.0%						
		Cecal (Market Hogs) Cecal (Sows)	0	0	0			0						0.0%
	5. At Least ACSSuT ³ Resistant	Humans	0.0%	0.4%	0.4%	0.5%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
Chickens		Retail Chickens	0	1	1	2	0	1	0	0	0	0	0	1
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%
		Cecal	0	0	0	0	0	0	0	0	1	0	0	0
Turkeys		Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
		HACCP	0	0			0.0%	0	0	0	0	0	0	0.0%
		Cecal												0.0%
Cattle		Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
		HACCP	0	0	0	0	50.0%	1	0	0	0	0	0	0.0%
		Cecal (Beef) Cecal (Dairy)												0
Swine		Retail Pork Chops												
		HACCP	0.0%	0.0%	0.0%			0.0%						
		Cecal (Market Hogs) Cecal (Sows)	0	0	0			0						0.0%
6. At Least ACT/S ⁴ Resistant		Humans	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens	Retail Chickens	0	1	0	0	0	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0
	Turkeys	Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%
		HACCP	0	0			0.0%	0	0	0	0	0	0	0.0%
		Cecal												0.0%
	Cattle	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%			
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0.0%
		Cecal (Beef) Cecal (Dairy)												0
	Swine	Retail Pork Chops												
		HACCP	0.0%	0.0%	0.0%			0.0%						
		Cecal (Market Hogs) Cecal (Sows)	0	0	0			0						0.0%

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 47c. Resistance Patterns among *Salmonella* Enteritidis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		337	257	271	384	412	385	442	410	513	391	364	382	
		Chickens	Retail Chickens	8	3	3	12	17	13	30	27	28	21	26	25
			HACCP	48	42	84	173	188	124	116	118	152	134	203	79
	Cecal													6	
	Turkeys	Retail Ground Turkey	5	1	0	0	0	0	2	0	0	1	4	2	
		HACCP	0	0	0	0	3	0	1	0	1	0	1	1	
		Cecal												1	
	Cattle	Retail Ground Beef	1	1	0	0	0	0	1	0	1	0	0	0	
		HACCP	6	3	2	2	2	4	5	0	1	0	1	1	
		Cecal (Beef)												0	
	Swine	Cecal (Dairy)												0	
		Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP ¹	1	1	1	0	0	1	0	0	0	0	0	0	
		Cecal (Market Hogs)												0	
	Cecal (Sows)												1		
Resistance Pattern		Source													
7. At Least ACSSuTAuCx ² Resistant	Humans		0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens		0	0	0	1	0	1	0	0	0	0	0	0	
		Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
	Cecal												0.0%		
	Turkeys	Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%	
		HACCP	0	0			0.0%		0		0.0%		0.0%	0.0%	
		Cecal												0.0%	
	Cattle	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%				
		HACCP	0	0	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	
		Cecal (Beef)	0	0	0	0	1	0	0	0	0		0	0	
		Cecal (Dairy)													
	Swine	Retail Pork Chops													
		HACCP	0.0%	0.0%	0.0%			0.0%							
Cecal (Market Hogs)		0	0	0			0								
Cecal (Sows)													0.0%		
													0		
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.3%	
	Chickens		0	0	0	0	0	1	1	0	0	0	0	1	
		Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
	Cecal												0.0%		
	Turkeys	Retail Ground Turkey	0.0%	0.0%					0.0%			0.0%	0.0%	0.0%	
		HACCP	0	0			0.0%		0		0.0%		0.0%	0.0%	
		Cecal												0.0%	
	Cattle	Retail Ground Beef	0.0%	0.0%					0.0%		0.0%				
		HACCP	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	
		Cecal (Beef)	0	0	0	0	0	0	0	0	0		0	0	
		Cecal (Dairy)													
	Swine	Retail Pork Chops													
		HACCP	0.0%	0.0%	0.0%	0.0%			0.0%						
Cecal (Market Hogs)		0	0	0	0			0							
Cecal (Sows)													0.0%		
													0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 48a. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans	394	409	382	438	408	405	396	370	359	323	296	325		
	Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68	
		HACCP	150	156	171	183	105	83	70	36	54	30	105	55	
		Cecal												15	
	Turkeys	Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1	
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5	
		Cecal												2	
	Cattle	Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0	
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23	
		Cecal (Beef)												14	
		Cecal (Dairy)												21	
	Swine	Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4	
		HACCP ¹	48	27	53	42	25	44	10	20	13	5	6	21	
		Cecal (Market Hogs)												4	
		Cecal (Sows)												4	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	2.3% 9	2.0% 8	2.1% 8	1.8% 8	2.7% 11	2.5% 10	1.5% 6	1.9% 7	0.8% 3	1.9% 6	3.0% 9	1.2% 4	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	2.0% 1	0.0% 0	0.0% 0	0.0% 0	1.5% 1	2.5% 3	6.3% 5	3.0% 2	6.8% 6	4.4% 3
			HACCP	12.7% 19	5.1% 8	4.1% 7	4.4% 8	6.7% 7	3.6% 3	5.7% 4	0.0% 0	5.6% 3	6.7% 2	3.8% 4	3.6% 2
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 2	11.1% 1	0.0% 0
			HACCP	44.4% 4	83.3% 5	64.3% 9	14.3% 1	20.0% 1	16.7% 1	33.3% 1	50.0% 1	0.0% 0	0.0% 0	25.0% 1	20.0% 1
			Cecal												50.0% 1
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0				0.0% 0	
			HACCP	2.0% 2	1.3% 1	0.0% 0	0.0% 0	0.0% 0	7.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.2% 1	0.0% 0
			Cecal (Beef)												0.0% 0
			Cecal (Dairy)												0.0% 0
		Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	2.1% 1	0.0% 0	3.8% 2	7.1% 3	8.0% 2	2.3% 1	10.0% 1	0.0% 0	7.7% 1	0.0% 0		9.5% 2
			Cecal (Market Hogs)												0.0% 0
			Cecal (Sows)												0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	7.6% 30	7.1% 29	5.8% 22	5.7% 25	5.1% 21	5.9% 24	2.5% 10	4.9% 18	7.2% 26	4.0% 13	2.0% 6	0.3% 1	
		Chickens	Retail Chickens	0.0% 0	18.2% 4	34.7% 17	24.1% 7	47.6% 10	12.0% 3	25.0% 17	27.9% 34	10.1% 8	24.2% 16	10.2% 9	25.0% 17
			HACCP	5.3% 8	7.7% 12	9.9% 17	7.7% 14	18.1% 19	7.2% 6	8.6% 6	8.3% 3	16.7% 9	0.0% 0	3.8% 6	3.6% 2
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	50.0% 1	50.0% 1	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0
			HACCP	55.6% 5	50.0% 3	21.4% 3	0.0% 0	0.0% 0	16.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	20.0% 0
			Cecal												50.0% 1
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0				0.0% 0	
			HACCP	26.5% 26	16.7% 13	14.6% 7	38.2% 13	13.6% 3	26.9% 7	14.3% 4	33.3% 6	13.3% 2	14.3% 2	18.8% 3	8.7% 2
			Cecal (Beef)												14.3% 2
			Cecal (Dairy)												0.0% 0
		Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 2	0.0% 0	0.0% 0	0.0% 0	40.0% 2	0.0% 0	0.0% 0	0.0% 0
			HACCP	2.1% 1	0.0% 0	9.4% 5	7.1% 3	16.0% 4	9.1% 4	10.0% 1	0.0% 0	15.4% 2	20.0% 1		14.3% 3
			Cecal (Market Hogs)												25.0% 1
			Cecal (Sows)												0.0% 0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	32.0% 126	35.7% 146	31.9% 122	28.1% 123	29.4% 120	32.3% 131	28.5% 113	25.9% 96	25.6% 92	25.7% 83	24.0% 71	20.6% 67	
		Chickens	Retail Chickens	0.0% 0	18.2% 4	14.3% 7	3.5% 1	9.5% 2	28.0% 7	16.2% 11	15.6% 19	22.8% 18	24.2% 16	14.8% 13	4.4% 3
			HACCP	30.0% 45	16.7% 26	8.2% 14	13.7% 25	17.1% 18	10.8% 9	5.7% 4	5.6% 2	14.8% 8	6.7% 2	8.6% 9	5.5% 3
			Cecal												0.0% 0
		Turkeys	Retail Ground Turkey	0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	0.0% 0	0.0% 0	33.3% 2	50.0% 4	55.6% 5	100.0% 1
			HACCP	77.8% 7	100.0% 6	64.3% 9	57.1% 4	60.0% 3	50.0% 3	33.3% 1	100.0% 2	50.0% 2	0.0% 0	25.0% 1	20.0% 1
Cecal														50.0% 1	
Cattle		Retail Ground Beef	0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1				0.0% 0		
		HACCP	66.3% 65	52.6% 41	56.3% 27	55.9% 19	54.5% 12	50.0% 13	50.0% 14	72.2% 13	53.3% 8	57.1% 8	50.0% 8	39.1% 9	
		Cecal (Beef)												57.1% 8	
		Cecal (Dairy)												66.7% 14	
Swine		Retail Pork Chops	50.0% 1	100.0% 1	100.0% 2	100.0% 2	100.0% 2	0.0% 0	33.3% 1	100.0% 1	80.0% 4	71.4% 5	50.0% 3	70.0% 3	
		HACCP	77.1% 37	59.3% 16	77.4% 41	69.0% 29	72.0% 18	59.1% 26	80.0% 8	80.0% 16	61.5% 8	80.0% 4		57.1% 12	
		Cecal (Market Hogs)												100.0% 4	
		Cecal (Sows)												0.0% 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 48b. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans		394	409	382	438	408	405	396	370	359	323	296	325	
		Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68
			HACCP	150	156	171	183	105	83	70	36	54	30	105	55
	Turkeys	Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1	
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5	2
		Cecal													
	Cattle	Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0	
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23	
		Cecal (Beef)												14	
		Cecal (Dairy)												21	
	Swine	Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4	
		HACCP ¹	48	27	53	42	25	44	10	20	13	5		21	
Cecal (Market Hogs) Cecal (Sows)													4		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	7.6% 30	5.9% 24	4.7% 18	3.2% 14	4.4% 18	6.7% 27	3.5% 14	6.2% 23	4.2% 15	7.1% 23	5.7% 17	3.4% 11	
		Chickens	Retail Chickens	33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12	44.0% 11	48.5% 33	57.4% 70	60.8% 48	54.6% 36	55.7% 49	50.0% 34
			HACCP	28.7% 43	25.6% 40	43.3% 74	19.7% 36	30.5% 32	33.7% 28	24.3% 17	33.3% 12	29.6% 16	6.7% 2	29.5% 31	9.1% 5
			Cecal												13.3% 2
		Turkeys	Retail Ground Turkey	0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	62.5% 5	22.2% 2	0.0% 0
			HACCP	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	50.0% 2	0.0% 0	50.0% 2	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0				0.0% 0	
			HACCP	17.3% 17	20.5% 16	25.0% 12	35.3% 12	27.3% 6	26.9% 7	21.4% 6	27.8% 5	20.0% 3	35.7% 5	12.5% 2	30.4% 7
			Cecal (Beef)												21.4% 3
			Cecal (Dairy)												52.4% 11
		Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	8.3% 4	0.0% 0	0.0% 0	9.5% 4	0.0% 0	2.3% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0		
			Cecal (Market Hogs)												0.0% 0
			Cecal (Sows)												0.0% 0
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	4.3% 17	4.6% 19	4.7% 18	2.5% 11	3.9% 16	5.7% 23	3.5% 14	5.4% 20	3.3% 12	6.8% 22	5.4% 16	3.4% 11	
		Chickens	Retail Chickens	33.3% 3	63.6% 14	49.0% 24	51.7% 15	52.4% 11	40.0% 10	45.6% 31	47.5% 58	51.9% 41	34.9% 23	45.5% 40	44.1% 30
			HACCP	26.7% 40	23.7% 37	43.3% 74	19.7% 36	29.5% 31	24.1% 20	20.0% 14	27.8% 10	27.8% 15	6.7% 2	18.1% 19	3.6% 2
			Cecal												6.7% 1
		Turkeys	Retail Ground Turkey	0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	50.0% 4	22.2% 2	0.0% 0
			HACCP	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	0.0% 0	0.0% 0	50.0% 2	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0				0.0% 0	
			HACCP	11.2% 11	16.7% 13	25.0% 12	35.3% 12	27.3% 6	26.9% 7	17.9% 5	22.2% 4	20.0% 3	35.7% 5	12.5% 2	30.4% 7
			Cecal (Beef)												21.4% 3
			Cecal (Dairy)												52.4% 11
		Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	4.2% 2	3.7% 1	0.0% 0	4.8% 2	0.0% 0	4.5% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal (Market Hogs)												0.0% 0
			Cecal (Sows)												
Ceftiofur	(MIC ≥ 8 µg/ml)	Humans	4.3% 17	5.1% 21	4.5% 17	2.5% 11	4.2% 17	6.4% 26	3.5% 14	6.5% 24	4.7% 17	6.8% 22	5.7% 17	3.4% 11	
		Chickens	Retail Chickens	33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12	44.0% 11	48.5% 33	56.6% 69	60.8% 48	54.6% 36	55.7% 49	50.0% 34
			HACCP	28.0% 42	25.6% 40	43.3% 74	19.7% 36	30.5% 32	32.5% 27	24.3% 17	33.3% 12	29.6% 16	6.7% 2	27.6% 29	9.1% 5
			Cecal												13.3% 2
		Turkeys	Retail Ground Turkey	0.0% 0	100.0% 2	0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	50.0% 3	50.0% 4	22.2% 2	0.0% 0
			HACCP	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0% 0	50.0% 1	0.0% 0	0.0% 0	50.0% 2	0.0% 0
			Cecal												0.0% 0
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0				0.0% 0	
			HACCP	15.3% 15	20.5% 16	25.0% 12	35.3% 12	27.3% 6	26.9% 7	21.4% 6	27.8% 5	20.0% 3	35.7% 5	12.5% 2	30.4% 7
			Cecal (Beef)												21.4% 3
			Cecal (Dairy)												52.4% 11
		Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	4.2% 2	0.0% 0	1.9% 1	4.8% 2	0.0% 0	2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal (Market Hogs)												4.8% 1
			Cecal (Sows)												0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 48c. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans		394	409	382	438	408	405	396	370	359	323	296	325			
		Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68		
			HACCP	150	156	171	183	105	83	70	36	54	30	105	55		
	Turkeys	Cecal												15			
		Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1			
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5			
	Cattle	Cecal												2			
		Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0			
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23			
		Cecal (Beef)												14			
	Swine	Cecal (Dairy)												21			
		Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4			
		HACCP ¹	48	27	53	42	25	44	10	20	13	5		21			
		Cecal (Market Hogs)												4			
		Cecal (Sows)												4			
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source															
Cepheids	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	4.3%	5.1%	4.5%	2.5%	4.2%	6.4%	3.5%	6.5%	4.7%	6.8%	5.7%	3.4%			
			17	21	17	11	17	26	14	24	17	22	17	11			
		Chickens	Retail Chickens	33.3%	63.6%	49.0%	51.7%	57.1%	44.0%	48.5%	57.3%	60.8%	54.6%	55.7%	50.0%		
			HACCP	3	14	24	15	12	11	33	70	48	36	49	34		
			Cecal	26.7%	25.6%	43.3%	19.7%	30.5%	33.7%	24.3%	33.3%	29.6%	6.7%	28.6%	9.1%		
		Turkeys	Cecal	40	40	74	36	32	28	17	12	16	2	30	5		
			Retail Ground Turkey	0.0%	100.0%	0.0%	100.0%		0.0%	0.0%	0.0%	50.0%	62.5%	22.2%	0.0%		
			HACCP	0	2	0	1	0	0	0	0	3	5	2	0		
		Cattle	Cecal	22.2%	16.7%	14.3%	0.0%	0.0%	16.7%	0.0%	50.0%	0.0%	0.0%	50.0%	0.0%		
			Retail Ground Beef	0.0%	0.0%			0.0%	0.0%	0.0%				0.0%			
			HACCP	0	0			0	0	0				0			
			Cecal (Beef)	15.3%	20.5%	25.0%	35.3%	27.3%	26.9%	21.4%	27.8%	20.0%	35.7%	12.5%	30.4%		
		Swine	Cecal (Dairy)	15	16	12	12	6	7	6	5	3	5	2	7		
			Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0		
			Cecal (Market Hogs)	4.2%	0.0%	0.0%	4.8%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%		
			Cecal (Sows)	2	0	0	2	0	1	0	0	0	0		1		
															0.0%		
															0		
		Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	32.2%	38.9%	36.1%	32.0%	33.3%	37.3%	30.3%	30.0%	28.7%	27.2%	27.0%	20.9%	
					127	159	138	140	136	151	120	111	103	88	80	68	
				Chickens	Retail Chickens	44.4%	31.8%	73.5%	69.0%	90.5%	68.0%	94.1%	96.7%	92.4%	93.9%	89.8%	92.7%
					HACCP	4	7	36	20	19	17	64	118	73	62	79	63
					Cecal	31.3%	28.2%	47.4%	37.2%	65.7%	60.2%	70.0%	52.8%	74.1%	70.0%	81.9%	76.4%
				Turkeys	Cecal	47	44	81	68	69	50	49	19	40	21	86	42
					Retail Ground Turkey	0.0%	50.0%	100.0%	0.0%		100.0%	0.0%	100.0%	66.7%	62.5%	55.6%	100.0%
					HACCP	0	1	2	0		1	0	1	4	5	5	1
Cattle	Cecal			77.8%	100.0%	78.6%	57.1%	80.0%	83.3%	66.7%	100.0%	50.0%	0.0%	75.0%	20.0%		
	Retail Ground Beef			0.0%	0.0%			100.0%	0.0%	50.0%				0.0%			
	HACCP			0	0			1	0	1				0			
	Cecal (Beef)			58.2%	44.9%	60.4%	73.5%	59.1%	65.4%	53.6%	83.3%	60.0%	57.1%	62.5%	43.5%		
Swine	Cecal (Dairy)			57	35	29	25	13	17	15	15	9	8	10	10		
	Retail Pork Chops			50.0%	100.0%	100.0%	100.0%	100.0%	0.0%	33.3%	100.0%	80.0%	71.4%	50.0%	75.0%		
	HACCP			1	1	2	2	2	0	1	1	4	5	3	3		
	Cecal (Market Hogs)			68.8%	63.0%	81.1%	69.0%	96.0%	77.3%	80.0%	90.0%	69.2%	80.0%		71.4%		
	Cecal (Sows)			33	17	43	29	24	34	8	18	9	4		15		
															100.0%		
															4		
Folate Pathway Inhibitor	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)			Humans	2.3%	3.4%	2.6%	2.7%	2.2%	2.5%	1.8%	3.0%	1.9%	1.9%	1.7%	1.2%	
					9	14	10	12	9	10	7	11	7	6	5	4	
				Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%
					HACCP	0	0	0	0	0	0	0	0	0	1	0	0
					Cecal	1.3%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	1.0%
				Turkeys	Cecal	2	1	0	0	0	0	0	1	0	0	1	0
					Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
					HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	Cecal	0.0%	0.0%			0.0%	0.0%	0.0%				0.0%			
			Retail Ground Beef	0.0%	0.0%			0.0%	0.0%	0.0%				0.0%			
			HACCP	0	0			0	0	0				0			
			Cecal (Beef)	4.1%	2.6%	4.2%	5.9%	4.5%	0.0%	0.0%	5.6%	6.7%	0.0%	6.2%	0.0%		
		Swine	Cecal (Dairy)	4	2	2	2	1	0	0	1	1	0	1	0		
			Retail Pork Chops	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%		
			HACCP	0	0	0	1	0	0	0	1	0	0	0	0		
			Cecal (Market Hogs)	2.1%	3.7%	1.9%	9.5%	4.0%	9.1%	10.0%	5.0%	7.7%	0.0%		9.5%		
			Cecal (Sows)	1	1	1	4	1	4	1	1	1	0		2		
															0.0%		
															0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 48d. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		394	409	382	438	408	405	396	370	359	323	296	325	
		Chickens													
	Retail Chickens		9	22	49	29	21	25	68	122	79	66	88	68	
		HACCP	150	156	171	183	105	83	70	36	54	30	105	55	
		Cecal												15	
	Retail Ground Turkey		2	2	2	1	0	1	1	1	6	8	9	1	
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5	
		Cecal													
	Retail Ground Beef		2	1	0	0	1	3	2	0	0	0	1	0	
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23	
		Cecal (Beef)												14	
		Cecal (Dairy)												21	
	Retail Pork Chops		2	1	2	2	2	3	3	1	5	7	6	4	
		HACCP ¹	48	27	53	42	25	44	10	20	13	5			
		Cecal (Market Hogs)												21	
Cecal (Sows)													4		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Humans										0.0%	0.0%	0.0%	
		Retail Chickens											0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal												0.0%
		Retail Ground Turkey											0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal												0.0%
		Retail Ground Beef												0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal (Beef)												0.0%
		Cecal (Dairy)													0.0%
		Retail Pork Chops											0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal (Market Hogs)												4.8%
			Cecal (Sows)												1.0%
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	33.8%	36.4%	32.2%	29.0%	28.2%	31.6%	26.3%	28.1%	26.2%	26.0%	23.6%	16.6%	
		Retail Chickens		133	149	123	127	115	128	104	104	94	84	70	54
			HACCP	33.3%	72.7%	53.1%	55.2%	57.1%	48.0%	60.3%	68.0%	69.6%	66.7%	56.8%	55.9%
			Cecal	45.3%	32.1%	46.8%	26.8%	42.9%	37.3%	28.6%	33.3%	35.2%	10.0%	27.6%	10.9%
		Retail Ground Turkey		0.0%	100.0%	50.0%	100.0%		100.0%	0.0%	0.0%	66.7%	87.5%	44.4%	100.0%
			HACCP	55.6%	66.7%	28.6%	57.1%	80.0%	83.3%	33.3%	50.0%	50.0%	0.0%	75.0%	20.0%
			Cecal												50.0%
		Retail Ground Beef		0.0%	0.0%			100.0%	0.0%	50.0%				0.0%	
			HACCP	71.4%	59.0%	60.4%	73.5%	63.6%	61.5%	50.0%	83.3%	53.3%	57.1%	37.5%	39.1%
			Cecal (Beef)												57.1%
		Cecal (Dairy)												66.7%	
		Retail Pork Chops		50.0%	100.0%	50.0%	100.0%	100.0%	0.0%	0.0%	100.0%	20.0%	28.6%	16.7%	75.0%
			HACCP	62.5%	51.9%	71.7%	66.7%	76.0%	70.5%	70.0%	80.0%	53.8%	60.0%		
			Cecal (Market Hogs)												66.7%
			Cecal (Sows)												50.0%
Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	23.4%	28.4%	24.3%	24.4%	22.1%	25.4%	23.5%	20.5%	20.3%	19.8%	18.2%	13.5%	
		Retail Chickens		92	116	93	107	90	103	93	76	73	64	54	44
			HACCP	0.0%	9.1%	4.1%	3.4%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	0.0%
			Cecal	16.0%	5.1%	1.8%	8.2%	7.6%	1.2%	1.4%	0.0%	3.7%	0.0%	0.0%	0.0%
		Retail Ground Turkey		0.0%	50.0%	50.0%	0.0%		100.0%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%
			HACCP	66.7%	50.0%	28.6%	57.1%	60.0%	66.7%	33.3%	0.0%	50.0%	0.0%	25.0%	0.0%
			Cecal												0.0%
		Retail Ground Beef		0.0%	0.0%			100.0%	0.0%	50.0%				0.0%	
			HACCP	49.0%	42.3%	54.2%	47.1%	50.0%	65.4%	35.7%	66.7%	46.7%	42.9%	43.8%	30.4%
			Cecal (Beef)												28.6%
		Cecal (Dairy)												61.9%	
		Retail Pork Chops		50.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	60.0%	28.6%	0.0%	75.0%
			HACCP	56.3%	48.1%	60.4%	54.8%	64.0%	65.9%	50.0%	75.0%	46.2%	40.0%		
			Cecal (Market Hogs)												28.6%
			Cecal (Sows)												25.0%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 48e. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans Chickens Turkeys Cattle Swine	Humans	394	409	382	438	408	405	396	370	359	323	296	325	
		Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68
			HACCP	150	156	171	183	105	83	70	36	54	30	105	55
			Cecal												15
		Turkeys	Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1
			HACCP	9	6	14	7	5	6	3	2	4	2	4	5
			Cecal												2
		Cattle	Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0
			HACCP	98	78	48	34	22	26	28	18	15	14	16	23
			Cecal (Beef)												14
			Cecal (Dairy)												21
		Swine	Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4
			HACCP ¹	48	27	53	42	25	44	10	20	13	5		
			Cecal (Market Hogs)												21
			Cecal (Sows)												4
		Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.2%	0.2%	0.0%	0.0%	0.8%	0.0%	0.0%	0.3%	0.0%	
			0	0	0	1	1	0	0	3	0	0	1	0	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal	0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Dairy)	0	0	0	0	0	0	0	0	0	0	0	0
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Market Hogs)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	
		Cecal (Sows)	0	0	0	0	0	0	0	0	0	0	0	0	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	1.3%	1.2%	0.5%	0.9%	0.7%	1.5%	1.0%	2.2%	1.4%	0.3%	1.7%	1.5%	
			5	5	2	4	3	6	4	8	5	1	5	5	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal	2.7%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	Retail Ground Turkey	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	1	0	0	0	0	0	0	0	0	0	0
			Cecal	1.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cattle		Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Beef)	1.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.2%	8.7%	
		Cecal (Dairy)	1	0	3	0	0	0	0	0	0	0	1	2	
Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	HACCP	0	0	0	0	0	0	0	0	0	0	0	0		
	Cecal (Market Hogs)	2.1%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%		
	Cecal (Sows)	1	0	0	0	0	1	0	0	0	0	0	0		
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	32.0%	38.1%	30.4%	30.4%	31.6%	36.8%	27.8%	28.9%	29.0%	27.2%	27.0%	21.2%	
			126	156	116	133	129	149	110	107	104	88	80	69	
		Chickens	Retail Chickens	44.4%	31.8%	71.4%	69.0%	90.5%	72.0%	92.6%	95.9%	92.4%	92.4%	88.6%	92.7%
			HACCP	4	7	35	20	19	18	63	117	73	61	78	63
			Cecal	28.0%	33.3%	44.4%	34.4%	61.0%	60.2%	64.3%	55.6%	72.2%	66.7%	81.9%	74.5%
		Turkeys	Retail Ground Turkey	0.0%	50.0%	100.0%	0.0%	0.0%	100.0%	0.0%	100.0%	66.7%	87.5%	44.4%	100.0%
			HACCP	0	1	2	0	0	1	0	1	4	7	4	1
			Cecal	77.8%	100.0%	78.6%	57.1%	100.0%	66.7%	66.7%	50.0%	50.0%	0.0%	75.0%	40.0%
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	0	1	0	1	0	0	0	0	0
			Cecal (Beef)	64.3%	53.8%	60.4%	67.6%	54.5%	65.4%	50.0%	88.9%	60.0%	57.1%	62.5%	39.1%
			Cecal (Dairy)	63	42	29	23	12	17	14	16	9	8	10	9
Swine	Retail Pork Chops	100.0%	100.0%	100.0%	100.0%	100.0%	66.7%	33.3%	100.0%	60.0%	57.1%	16.7%	75.0%		
	HACCP	2	1	2	2	2	2	1	1	3	4	1	3		
	Cecal (Market Hogs)	89.6%	74.1%	90.6%	83.3%	96.0%	88.6%	100.0%	100.0%	76.9%	80.0%		61.9%		
	Cecal (Sows)	43	20	48	35	24	39	10	20	10	4		13		
													75.0%		
													3		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 49a. Resistance Patterns among *Salmonella* Typhimurium Isolates, 2002-2013¹

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		394	409	382	438	408	405	396	370	359	323	296	325		
		Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68	
			HACCP	150	156	171	183	105	83	70	36	54	30	105	55	
	Cecal													15		
	Turkeys	Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1		
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5		
		Cecal												2		
	Cattle	Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0		
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23		
		Cecal (Beef)												14		
		Cecal (Dairy)												21		
	Swine	Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4		
		HACCP ²	48	27	53	42	25	44	10	20	13	5				
		Cecal (Market Hogs)												21		
		Cecal (Sows)												4		
Resistance Pattern		Source														
1. No Resistance Detected	Humans		59.9%	54.5%	60.5%	65.1%	62.5%	57.5%	67.9%	63.5%	66.9%	69.0%	68.6%	69.5%		
			236	223	231	285	255	233	269	235	240	223	203	226		
		Chickens	Retail Chickens	22.2%	22.7%	14.3%	24.1%	0.0%	24.0%	5.9%	2.5%	3.8%	4.6%	9.1%	7.4%	
			HACCP	2	5	7	7	0	6	4	3	3	3	8	5	
	Cecal		37.3%	45.5%	40.9%	54.1%	30.5%	30.1%	27.1%	33.3%	22.2%	30.0%	15.2%	23.6%		
			56	71	70	99	32	25	19	12	12	9	16	13		
	Turkeys	Retail Ground Turkey	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	33.3%	12.5%	44.4%	0.0%		
		HACCP	2	0	0	0	0	0	1	0	2	1	4	0		
		Cecal	0.0%	0.0%	14.3%	42.9%	0.0%	16.7%	0.0%	0.0%	50.0%	100.0%	25.0%	60.0%		
			0	0	2	3	0	1	0	0	2	2	1	3		
	Cattle	Retail Ground Beef	100.0%	100.0%			0.0%	100.0%	50.0%				100.0%			
		HACCP	2	1			0	3	1				1			
		Cecal (Beef)	19.4%	39.7%	35.4%	26.5%	31.8%	34.6%	46.4%	5.5%	40.0%	42.9%	37.5%	56.5%		
		Cecal (Dairy)	19	31	17	9	7	9	13	1	6	6	6	13		
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	66.7%	0.0%	0.0%	28.6%	50.0%	25.0%		
		HACCP	0	0	0	0	0	1	2	0	0	2	3	1		
		Cecal (Market Hogs)	8.3%	18.5%	3.8%	16.7%	0.0%	6.8%	0.0%	0.0%	23.1%	0.0%		19.0%		
		Cecal (Sows)	4	5	2	7	0	3	0	0	3	0		4		
	2. Resistant to ≥ 3 Antimicrobial Classes	Humans		32.5%	37.4%	31.7%	30.1%	30.4%	34.3%	27.8%	28.1%	27.3%	26.3%	24.7%	16.9%	
				128	153	121	132	124	139	110	104	98	85	73	55	
			Chickens	Retail Chickens	33.3%	72.7%	71.4%	58.6%	81.0%	68.0%	77.9%	75.4%	75.9%	71.2%	64.8%	63.2%
				HACCP	3	16	35	17	17	17	53	92	60	47	57	43
		Cecal		46.0%	34.6%	48.5%	30.6%	55.2%	39.8%	31.4%	38.9%	44.4%	16.7%	37.1%	16.4%	
				69	54	83	56	58	33	22	14	24	5	39	9	
Turkeys		Retail Ground Turkey	0.0%	100.0%	100.0%	100.0%		100.0%	0.0%	0.0%	66.7%	87.5%	44.4%	100.0%		
		HACCP	0	2	2	1		1	0	0	4	7	4	1		
		Cecal	77.8%	100.0%	71.4%	57.1%	80.0%	83.3%	33.3%	50.0%	50.0%	0.0%	75.0%	20.0%		
			7	6	10	4	4	5	1	1	2	0	3	1		
Cattle		Retail Ground Beef	0.0%	0.0%			100.0%	0.0%	50.0%				0.0%			
		HACCP	0	0			1	0	1				0			
		Cecal (Beef)	70.4%	59.0%	60.4%	73.5%	59.1%	65.4%	50.0%	83.3%	53.3%	57.1%	62.5%	39.1%		
		Cecal (Dairy)	69	46	29	25	13	17	14	15	8	8	10	9		
Swine		Retail Pork Chops	50.0%	100.0%	100.0%	100.0%	100.0%	0.0%	33.3%	100.0%	80.0%	57.1%	16.7%	75.0%		
		HACCP	1	1	2	2	2	0	1	1	4	4	1	3		
		Cecal (Market Hogs)	75.0%	55.6%	77.4%	71.4%	96.0%	72.7%	80.0%	85.0%	61.5%	60.0%		57.1%		
		Cecal (Sows)	36	15	41	30	24	32	8	17	8	3		12		
3. Resistant to ≥ 4 Antimicrobial Classes		Humans		28.4%	32.5%	27.7%	27.4%	27.0%	29.9%	24.7%	24.1%	24.2%	22.0%	20.9%	14.8%	
				112	133	106	120	110	121	98	89	87	71	62	48	
			Chickens	Retail Chickens	0.0%	36.4%	46.9%	48.3%	47.6%	40.0%	54.4%	60.7%	63.3%	59.1%	55.7%	54.4%
				HACCP	0	8	23	14	10	10	37	74	50	39	49	37
		Cecal		25.3%	19.9%	37.4%	21.3%	38.1%	31.3%	25.7%	25.0%	31.5%	6.7%	28.6%	9.1%	
				38	31	64	39	40	26	18	9	17	2	30	5	
	Turkeys	Retail Ground Turkey	0.0%	50.0%	50.0%	0.0%		100.0%	0.0%	0.0%	66.7%	62.5%	44.4%	100.0%		
		HACCP	0	1	1	0		1	0	0	4	5	4	1		
		Cecal	66.7%	66.7%	28.6%	57.1%	60.0%	66.7%	33.3%	50.0%	50.0%	0.0%	75.0%	0.0%		
			6	4	4	4	3	4	1	1	2	0	3	0		
	Cattle	Retail Ground Beef	0.0%	0.0%			100.0%	0.0%	50.0%				0.0%			
		HACCP	0	0			1	0	1				0			
		Cecal (Beef)	58.2%	51.3%	60.4%	64.7%	54.5%	61.5%	46.4%	77.8%	53.3%	57.1%	43.8%	34.8%		
		Cecal (Dairy)	57	40	29	22	12	16	13	14	8	8	7	8		
	Swine	Retail Pork Chops	50.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	100.0%	20.0%	28.6%	16.7%	75.0%		
		HACCP	1	1	2	2	2	0	0	1	1	2	1	3		
		Cecal (Market Hogs)	60.4%	51.9%	71.7%	66.7%	72.0%	70.5%	70.0%	75.0%	53.8%	60.0%		47.6%		
		Cecal (Sows)	29	14	38	28	18	31	7	15	7	3		10		
														2		

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 49b. Resistance Patterns among *Salmonella* Typhimurium Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	394	409	382	438	408	405	396	370	359	323	296	325	
	Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68
		HACCP	150	156	171	183	105	83	70	36	54	30	105	55
		Cecal												15
	Turkeys	Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5
		Cecal												2
	Cattle	Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23
		Cecal (Beef)												14
		Cecal (Dairy)												21
	Swine	Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4
		HACCP ²	48	27	53	42	25	44	10	20	13	5		21
		Cecal (Market Hogs) Cecal (Sows)												4
Resistance Pattern		Source												
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	23.1%	27.9%	24.3%	22.8%	20.8%	24.9%	24.0%	22.2%	20.9%	21.1%	18.6%	12.3%	
		91	114	93	100	85	101	95	82	75	68	55	40	
	Chickens	Retail Chickens	0.0%	27.3%	44.9%	48.3%	47.6%	40.0%	47.1%	56.6%	60.8%	53.0%	55.7%	50.0%
		HACCP	0	6	22	14	10	10	32	69	48	35	49	34
		Cecal												13.3%
	Turkeys	Retail Ground Turkey	0.0%	50.0%	50.0%	0.0%		100.0%	0.0%	0.0%	66.7%	62.5%	22.2%	100.0%
		HACCP	0	1	1	0		1	0	0	4	5	2	1
		Cecal												0.0%
	Cattle	Retail Ground Beef	0.0%	0.0%			100.0%	0.0%	50.0%				0.0%	
		HACCP	0	0			1	0	1				0	7
		Cecal (Beef)	35.7%	33.3%	58.3%	50.0%	50.0%	61.5%	35.7%	72.2%	46.7%	42.9%	37.5%	30.4%
	Swine	Retail Pork Chops	0.0%	0.0%	50.0%	100.0%	0.0%	0.0%	0.0%	100.0%	20.0%	28.6%	0.0%	75.0%
		HACCP	0	0	1	2	0	0	0	1	1	2	0	3
		Cecal (Market Hogs)	47.9%	48.1%	60.4%	54.8%	44.0%	47.7%	40.0%	70.0%	46.2%	40.0%		
		Cecal (Sows)	23	13	32	23	11	21	4	14	6	2		38.1%
														8
														25.0%
														1
	5. At Least ACSSu ³ Resistant	Humans	21.6%	26.7%	23.6%	22.4%	19.6%	22.7%	23.2%	19.5%	18.7%	19.8%	17.2%	12.0%
			85	109	90	98	80	92	92	72	67	64	51	39
Chickens		Retail Chickens	0.0%	9.1%	4.1%	3.5%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%
		HACCP	0	2	2	1	0	0	0	0	2	0	0	0
		Cecal												0.0%
Turkeys		Retail Ground Turkey	0.0%	50.0%	50.0%	0.0%		100.0%	0.0%	0.0%	16.7%	0.0%	0.0%	100.0%
		HACCP	0	1	1	0		1	0	0	1	0	0	1
		Cecal												0.0%
Cattle		Retail Ground Beef	0.0%	0.0%			100.0%	0.0%	50.0%				0.0%	
		HACCP	0	0			1	0	1				0	7
		Cecal (Beef)	31.6%	28.2%	54.2%	41.2%	50.0%	50.0%	35.7%	66.7%	46.7%	42.9%	37.5%	30.4%
Swine		Retail Pork Chops	50.0%	100.0%	50.0%	100.0%	0.0%	0.0%	0.0%	100.0%	20.0%	28.6%	0.0%	75.0%
		HACCP	1	1	1	2	0	0	0	1	1	2	0	3
		Cecal (Market Hogs)	47.9%	44.4%	60.4%	50.0%	44.0%	47.7%	30.0%	70.0%	15.4%	40.0%		
		Cecal (Sows)	23	12	32	21	11	21	3	14	2	2		28.6%
													6	
													25.0%	
6. At Least ACT/S ⁴ Resistant		Humans	2.0%	3.2%	1.6%	2.1%	0.7%	2.0%	0.5%	2.2%	1.1%	0.6%	0.7%	0.0%
			8	13	6	9	3	8	2	8	4	2	2	0
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	HACCP		0	0	0	0	0	0	0	0	0	0	0	0
	Cecal													0.0%
	Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	0		0	0	0	0	0	0	0
		Cecal												0.0%
	Cattle	Retail Ground Beef	0.0%	0.0%			0.0%	0.0%	0.0%				0.0%	
		HACCP	0	0			0	0	0				0	0
		Cecal (Beef)	3.1%	2.6%	4.2%	2.9%	4.5%	0.0%	0.0%	5.6%	6.7%	0.0%	6.3%	0.0%
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	1	0	0	0	1	0	0	0	0
		Cecal (Market Hogs)	2.1%	0.0%	1.9%	7.1%	4.0%	9.1%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Sows)	1	0	1	3	1	4	0	0	0	0		0.0%
														0
														0.0%

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 49c. Resistance Patterns among *Salmonella* Typhimurium Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	394	409	382	438	408	405	396	370	359	323	296	325	
	Chickens	Retail Chickens	9	22	49	29	21	25	68	122	79	66	88	68
		HACCP	150	156	171	183	105	83	70	36	54	30	105	55
		Cecal												15
	Turkeys	Retail Ground Turkey	2	2	2	1	0	1	1	1	6	8	9	1
		HACCP	9	6	14	7	5	6	3	2	4	2	4	5
		Cecal												2
	Cattle	Retail Ground Beef	2	1	0	0	1	3	2	0	0	0	1	0
		HACCP	98	78	48	34	22	26	28	18	15	14	16	23
		Cecal (Beef)												14
		Cecal (Dairy)												21
	Swine	Retail Pork Chops	2	1	2	2	2	3	3	1	5	7	6	4
		HACCP ¹	48	27	53	42	25	44	10	20	13	5		21
		Cecal (Market Hogs)												4
Cecal (Sows)													4	
Resistance Pattern	Source													
7. At Least ACSSuTAuCx ² Resistant	Humans	1.8%	2.4%	2.6%	1.8%	2.9%	3.7%	2.3%	1.6%	1.7%	5.3%	4.1%	2.2%	
		7	10	10	8	12	15	9	6	6	17	12	7	
	Chickens	Retail Chickens	0.0%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	2	0	0	0	0	0	0	0	0	0
		Cecal	2.0%	0.6%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%
		3	1	0	2	0	0	0	0	1	0	0	0	
	Turkeys	Retail Ground Turkey	0.0%	50.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	1	0	0		0	0	0	0	0	0	0
		Cecal	11.1%	16.7%	14.2%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		1	1	2	0	0	1	0	0	0	0	0	0	
	Cattle	Retail Ground Beef	0.0%	0.0%			0.0%	0.0%	0.0%				0.0%	
		HACCP	0	0			0	0	0				0	
		Cecal (Beef)	11.2%	12.8%	20.8%	26.5%	22.7%	26.9%	21.4%	16.7%	20.0%	35.7%	12.5%	30.4%
		Cecal (Dairy)	11	10	10	9	5	7	6	3	3	5	2	7
													14.3%	
													2	
													52.4%	
													11	
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP		0	0	0	0	0	0	0	0	0	0	0	0	
Cecal (Market Hogs)		4.2%	0.0%	0.0%	2.4%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%		0.0%	
Cecal (Sows)		2	0	0	1	0	1	0	0	0	0		0	
												0.0%		
												0		
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.5%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.5%	0.3%	0.0%	0.7%	0.0%	
		2	0	0	0	0	1	0	2	1	0	2	0	
	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal	2.7%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		4	0	0	1	0	0	0	0	0	0	0	0	
	Turkeys	Retail Ground Turkey	0.0%	50.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	1	0	0		0	0	0	0	0	0	0
		Cecal	22.2%	16.7%	14.3%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		2	1	2	0	0	1	0	0	0	0	0	0	
	Cattle	Retail Ground Beef	0.0%	0.0%			0.0%	0.0%	0.0%				0.0%	
		HACCP	0	0			0	0	0				0	
		Cecal (Beef)	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
		Cecal (Dairy)	0	0	2	0	0	0	0	0	0	0	0	2
													0.0%	
													0	
													0.0%	
													0	
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP		0	0	0	0	0	0	0	0	0	0	0	0	
Cecal (Market Hogs)		2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	
Cecal (Sows)		1	0	0	0	0	0	0	0	0	0		0	
												0.0%		
												0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 50a. Antimicrobial Resistance among *Salmonella* Newport Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	244	226	192	207	219	222	258	239	306	285	258	209		
	Chickens	Retail Chickens	2	0	0	0	0	0	0	1	0	0	1	2	
		HACCP	6	7	0	6	0	3	1	0	1	1	2	2	
		Cecal												0	
	Turkeys	Retail Ground Turkey	1	2	2	3	0	0	3	3	2	0	2	0	
		HACCP	10	19	7	5	4	15	8	3	5	4	4	4	
		Cecal												0	
	Cattle	Retail Ground Beef	3	1	2	0	0	0	3	2	2	0	1	0	
		HACCP	113	75	44	27	30	30	31	17	5	13	5	13	
		Cecal (Beef)												8	
	Swine	Cecal (Dairy)												7	
		Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	0	
		HACCP ¹	0	3	0	1	1	1	2	0	0	1		3	
		Cecal (Market Hogs)												4	
	Cecal (Sows)												0		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	3.3% 8	3.1% 7	0.5% 1	1.0% 2	0.9% 2	0.9% 2	0.4% 1	0.4% 1	0.3% 1	0.7% 2	0.0% 0	0.5% 1	
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0		16.7% 1		0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0	50.0% 1	0.0% 0	0.0% 0			33.3% 1	33.3% 1	50.0% 1		50.0% 1	50.0% 1
			HACCP	0.0% 0	52.6% 10	14.3% 1	80.0% 4	50.0% 2	0.0% 0	25.0% 2	66.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0		0.0% 0	
			HACCP	7.1% 8	1.3% 1	0.0% 0	0.0% 0	3.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal (Beef)												0.0% 0
		Swine	Cecal (Dairy)												0.0% 0
			Retail Pork Chops	0.0% 0	0.0% 0										
	HACCP			0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0			
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)												0.0% 0	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	9.8% 24	4.4% 10	2.6% 5	1.9% 4	2.7% 6	0.9% 2	3.5% 9	1.7% 4	0.7% 2	0.4% 1	0.0% 0	0.5% 1	
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0		33.3% 2		0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1	
			HACCP	10.0% 1	21.1% 4	14.3% 1	80.0% 4	50.0% 2	6.7% 1	37.5% 3	33.3% 1	20.0% 1	25.0% 1	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0				33.3% 1	0.0% 0	50.0% 1		0.0% 0	
			HACCP	15.9% 18	17.3% 13	25.0% 11	14.8% 4	13.3% 4	10.0% 3	0.0% 0	5.9% 1	0.0% 0	7.7% 1	0.0% 0	15.4% 2
			Cecal (Beef)												0.0% 0
		Swine	Cecal (Dairy)												0.0% 0
			Retail Pork Chops	0.0% 0	0.0% 0										
	HACCP			0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0			
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)												0.0% 0	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	25.0% 61	24.3% 55	16.1% 31	14.0% 29	14.2% 31	10.4% 23	13.6% 35	8.4% 20	8.5% 26	4.2% 12	3.9% 10	5.7% 12	
		Chickens	Retail Chickens	100.0% 2							0.0% 0			0.0% 0	0.0% 0
			HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey	100.0% 1	50.0% 1	0.0% 0	0.0% 0			33.3% 1	33.3% 1	50.0% 1		50.0% 1	
			HACCP	0.0% 0	31.6% 6	14.3% 1	80.0% 4	0.0% 0	6.7% 1	25.0% 2	66.7% 2	0.0% 0	0.0% 0	25.0% 1	0.0% 0
Cecal															
Cattle		Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2		0.0% 0		
		HACCP	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10	80.0% 4	76.9% 10	
		Cecal (Beef)												75.0% 6	
Swine		Cecal (Dairy)												71.4% 5	
		Retail Pork Chops	100.0% 2	100.0% 1											
	HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0				
	Cecal (Market Hogs)												66.7% 2		
	Cecal (Sows)												0.0% 0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 50b. Antimicrobial Resistance among *Salmonella* Newport Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013																																																																																																																																																																	
Number of Isolates Tested	<table border="1"> <tr> <td>Humans</td> <td>244</td> <td>226</td> <td>192</td> <td>207</td> <td>219</td> <td>222</td> <td>258</td> <td>239</td> <td>306</td> <td>285</td> <td>258</td> <td>209</td> </tr> <tr> <td rowspan="3">Chickens</td> <td>Retail Chickens</td> <td>2</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td>HACCP</td> <td>6</td> <td>7</td> <td>0</td> <td>6</td> <td>0</td> <td>3</td> <td>0</td> <td>1</td> <td>1</td> <td>2</td> <td>0</td> </tr> <tr> <td>Cecal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Turkeys</td> <td>Retail Ground Turkey</td> <td>1</td> <td>2</td> <td>2</td> <td>3</td> <td>0</td> <td>3</td> <td>3</td> <td>2</td> <td>0</td> <td>2</td> <td>0</td> </tr> <tr> <td>HACCP</td> <td>10</td> <td>19</td> <td>7</td> <td>5</td> <td>4</td> <td>15</td> <td>8</td> <td>5</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>Cecal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Cattle</td> <td>Retail Ground Beef</td> <td>3</td> <td>1</td> <td>2</td> <td>0</td> <td>0</td> <td>3</td> <td>2</td> <td>2</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>HACCP</td> <td>113</td> <td>75</td> <td>44</td> <td>27</td> <td>30</td> <td>31</td> <td>17</td> <td>5</td> <td>13</td> <td>5</td> <td>13</td> </tr> <tr> <td>Cecal (Beef) Cecal (Dairy)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>8 7</td> </tr> <tr> <td rowspan="3">Swine</td> <td>Retail Pork Chops</td> <td>2</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>HACCP¹</td> <td>0</td> <td>3</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> <td>2</td> <td>0</td> <td>1</td> <td></td> <td>3</td> </tr> <tr> <td>Cecal (Market Hogs) Cecal (Sows)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>4</td> </tr> </table>												Humans	244	226	192	207	219	222	258	239	306	285	258	209	Chickens	Retail Chickens	2	0	0	0	0	0	1	0	0	1	2	HACCP	6	7	0	6	0	3	0	1	1	2	0	Cecal												Turkeys	Retail Ground Turkey	1	2	2	3	0	3	3	2	0	2	0	HACCP	10	19	7	5	4	15	8	5	4	4	4	Cecal												Cattle	Retail Ground Beef	3	1	2	0	0	3	2	2	0	1	0	HACCP	113	75	44	27	30	31	17	5	13	5	13	Cecal (Beef) Cecal (Dairy)											8 7	Swine	Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	HACCP ¹	0	3	0	1	1	1	2	0	1		3	Cecal (Market Hogs) Cecal (Sows)											4
Humans	244	226	192	207	219	222	258	239	306	285	258	209																																																																																																																																																																	
Chickens	Retail Chickens	2	0	0	0	0	0	1	0	0	1	2																																																																																																																																																																	
	HACCP	6	7	0	6	0	3	0	1	1	2	0																																																																																																																																																																	
	Cecal																																																																																																																																																																												
Turkeys	Retail Ground Turkey	1	2	2	3	0	3	3	2	0	2	0																																																																																																																																																																	
	HACCP	10	19	7	5	4	15	8	5	4	4	4																																																																																																																																																																	
	Cecal																																																																																																																																																																												
Cattle	Retail Ground Beef	3	1	2	0	0	3	2	2	0	1	0																																																																																																																																																																	
	HACCP	113	75	44	27	30	31	17	5	13	5	13																																																																																																																																																																	
	Cecal (Beef) Cecal (Dairy)											8 7																																																																																																																																																																	
Swine	Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0																																																																																																																																																																	
	HACCP ¹	0	3	0	1	1	1	2	0	1		3																																																																																																																																																																	
	Cecal (Market Hogs) Cecal (Sows)											4																																																																																																																																																																	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source																																																																																																																																																																											
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	22.5% 55	21.7% 49	15.6% 30	12.6% 26	12.8% 28	8.1% 18	12.4% 32	7.5% 18	7.8% 24	3.9% 11	6.2% 16	5.3% 11																																																																																																																																																															
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0																																																																																																																																																														
			HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0																																																																																																																																																														
			Cecal																																																																																																																																																																										
		Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1																																																																																																																																																															
			HACCP	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1	0.0% 0	0.0% 0																																																																																																																																																														
			Cecal																																																																																																																																																																										
		Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1		0.0% 0																																																																																																																																																															
			HACCP	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10	40.0% 2	76.9% 10																																																																																																																																																														
			Cecal (Beef) Cecal (Dairy)												75.0% 6 71.4% 5																																																																																																																																																														
		Swine	Retail Pork Chops	100.0% 2	100.0% 1																																																																																																																																																																								
			HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0																																																																																																																																																																
			Cecal (Market Hogs) Cecal (Sows)											33.3% 1 0.0% 0																																																																																																																																																															
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	22.1% 54	21.7% 49	15.6% 30	12.6% 26	13.2% 29	8.1% 18	12.4% 32	6.7% 16	7.5% 23	3.9% 11	6.2% 16	5.3% 11																																																																																																																																																															
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0																																																																																																																																																														
			HACCP	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0																																																																																																																																																														
			Cecal																																																																																																																																																																										
		Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1																																																																																																																																																															
			HACCP	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1	0.0% 0	0.0% 0																																																																																																																																																														
			Cecal																																																																																																																																																																										
		Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1		0.0% 0																																																																																																																																																															
			HACCP	77.9% 88	74.7% 56	77.3% 34	81.5% 22	70.0% 21	76.7% 23	64.5% 20	52.9% 6	60.0% 3	76.9% 10	40.0% 2	76.9% 10																																																																																																																																																														
			Cecal (Beef) Cecal (Dairy)												75.0% 6 71.4% 5																																																																																																																																																														
		Swine	Retail Pork Chops	100.0% 2	100.0% 1																																																																																																																																																																								
			HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0																																																																																																																																																																
			Cecal (Market Hogs) Cecal (Sows)											33.3% 1 0.0% 0																																																																																																																																																															
Ceftiofur	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	22.5% 55	22.1% 50	15.6% 30	12.6% 26	12.8% 28	8.1% 18	12.4% 32	7.1% 17	7.5% 23	3.9% 11	6.2% 16	5.3% 11																																																																																																																																																															
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0																																																																																																																																																														
			HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0																																																																																																																																																														
			Cecal																																																																																																																																																																										
		Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1																																																																																																																																																															
			HACCP	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1	0.0% 0	0.0% 0																																																																																																																																																														
			Cecal																																																																																																																																																																										
		Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1		0.0% 0																																																																																																																																																															
			HACCP	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10	40.0% 2	76.9% 10																																																																																																																																																														
			Cecal (Beef) Cecal (Dairy)												75.0% 6 71.4% 5																																																																																																																																																														
		Swine	Retail Pork Chops	100.0% 2	100.0% 1																																																																																																																																																																								
			HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0																																																																																																																																																																
			Cecal (Market Hogs) Cecal (Sows)											33.3% 1 0.0% 0																																																																																																																																																															

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 50c. Antimicrobial Resistance among *Salmonella* Newport Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Humans		244	226	192	207	219	222	258	239	306	285	258	209				
		Chickens																
	Retail Chickens	HACCP	2	0	0	0	0	0	0	0	1	0	0	1	2			
		HACCP	6	7	0	6	0	3	1	0	1	1	1	2	2			
		Cecal													0			
	Retail Ground Turkey	HACCP	1	2	2	3	0	0	3	3	2	0	0	2	0			
		HACCP	10	19	7	5	4	15	8	3	5	4	4	4	4			
		Cecal													0			
	Retail Ground Beef	HACCP	3	1	2	0	0	0	3	2	2	0	0	1	0			
		HACCP	113	75	44	27	30	30	31	17	5	13	5	5	13			
		Cecal (Beef)													8			
	Cecal (Dairy)	HACCP													7			
		HACCP																
		Cecal (Sows)																
Retail Pork Chops	HACCP ¹	2	1	0	0	0	0	0	0	0	0	0	0	0				
	HACCP	0	3	0	1	1	1	1	2	0	0	1		3				
	Cecal (Market Hogs)													4				
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source																
			Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	22.5%	21.7%	15.1%	12.6%	13.2%	8.1%	12.4%	7.1%	7.5%	3.9%	6.2%	5.3%	
					Retail Chickens	HACCP	55	49	29	26	29	18	32	17	23	11	16	11
						HACCP	0.0%	0.0%						0.0%			0.0%	0.0%
						Cecal	0	6		50.0%		0.0%	100.0%	0	0.0%	0.0%	0.0%	0.0%
					Retail Ground Turkey	HACCP	100.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%		50.0%	
						HACCP	1	0	0	0			0	0	0		1	
						Cecal	0	2	1	0	1	1	2	1	1	1	0	0
					Retail Ground Beef	HACCP	66.7%	100.0%	100.0%				66.7%	0.0%	50.0%		0.0%	
						HACCP	2	1	2				2	0	1		0	
						Cecal (Beef)	78.8%	81.3%	77.3%	81.5%	76.7%	76.7%	64.5%	58.8%	60.0%	76.9%	40.0%	76.9%
					Cecal (Dairy)	HACCP	89	61	34	22	23	23	20	10	3	10	2	10
						HACCP												
						Cecal (Sows)												
Retail Pork Chops	HACCP	100.0%			100.0%													
	HACCP	2	1															
	Cecal (Market Hogs)																	
Cecal (Sows)	HACCP				0.0%	0.0%	0.0%	50.0%			0.0%							
	HACCP				0	0	0	1			0							
	Cecal (Sows)																	
Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 4 / 16 µg/ml)	Humans	25.4%	24.8%	17.2%	15.5%	15.5%	10.4%	13.2%	8.8%	7.8%	4.6%	3.9%	4.8%				
		Retail Chickens	HACCP	62	56	33	32	34	23	34	21	24	13	10	10			
			HACCP	0.0%	0.0%						0.0%			0.0%	0.0%			
			Cecal	0	5		50.0%		0.0%	100.0%	0	0.0%	0.0%	0.0%	0.0%			
		Retail Ground Turkey	HACCP	100.0%	50.0%	0.0%	0.0%			33.3%	33.3%	50.0%		50.0%				
			HACCP	1	1	0	0			1	1	1		1				
			Cecal	0	10	1	4	3	0	3	3	0	1	1	0			
		Retail Ground Beef	HACCP	66.7%	100.0%	100.0%				66.7%	0.0%	100.0%		0.0%				
			HACCP	2	1	2				2	0	2		0				
			Cecal (Beef)	74.3%	73.3%	77.3%	85.2%	83.3%	83.3%	74.2%	70.6%	60.0%	76.9%	80.0%	76.9%			
		Cecal (Dairy)	HACCP	84	55	34	23	25	25	23	12	3	10	4	10			
			HACCP															
			Cecal (Sows)															
		Retail Pork Chops	HACCP	100.0%	100.0%													
HACCP	2		1															
Cecal (Market Hogs)																		
Cecal (Sows)	HACCP				0.0%	0.0%	0.0%	50.0%			0.0%							
	HACCP				0	0	0	1			0							
	Cecal (Sows)																	
Folate Pathway Inhibitor	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	4.1%	1.3%	2.1%	1.9%	3.7%	1.8%	3.1%	1.3%	1.3%	0.0%	0.4%	0.5%				
		Retail Chickens	HACCP	10	3	4	4	8	4	8	3	4	0	1	1			
			HACCP	0.0%	0.0%						0.0%			0.0%	0.0%			
			Cecal	0	0		16.7%		0.0%	100.0%	0	0.0%	0.0%	0.0%	0.0%			
		Retail Ground Turkey	HACCP	100.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%		0.0%				
			HACCP	1	0	0	0			0	0	0		0				
			Cecal	0	0	0	0			0	0	0		0				
		Retail Ground Beef	HACCP	0.0%	0.0%	50.0%				0.0%	0.0%	0.0%		0.0%				
			HACCP	0	0	1				0	0	0		0				
			Cecal (Beef)	7.1%	0.0%	11.4%	25.9%	16.7%	13.3%	12.9%	0.0%	20.0%	7.7%	0.0%	15.4%			
		Cecal (Dairy)	HACCP	8	0	5	7	5	4	4	0	1	1	0	2			
			HACCP															
			Cecal (Sows)															
		Retail Pork Chops	HACCP	100.0%	0.0%													
HACCP	2		0															
Cecal (Market Hogs)																		
Cecal (Sows)	HACCP				0.0%	0.0%	0.0%	0.0%			0.0%							
	HACCP				0	0	0	0			0							
	Cecal (Sows)																	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 50d. Antimicrobial Resistance among *Salmonella* Newport Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		244	226	192	207	219	222	258	239	306	285	258	209	
		Chickens	Retail Chickens	2	0	0	0	0	0	0	1	0	0	1	2
			HACCP	6	7	0	6	0	3	1	0	1	1	2	2
	Turkeys	Retail Ground Turkey	1	2	2	3	0	0	3	3	2	0	2	0	
		HACCP	113	75	44	27	30	30	31	17	5	13	5	13	
		Cecal												8	
	Cattle	Retail Ground Beef	3	1	2	0	0	0	3	2	2	0	1	0	
		HACCP	113	75	44	27	30	30	31	17	5	13	5	13	
		Cecal (Beef)												8	
	Swine	Cecal (Dairy)												7	
		Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	0	
		HACCP ¹	0	3	0	1	1	1	2	0	0	1			
		Cecal (Market Hogs)												3	
		Cecal (Sows)												4	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0%	0.0%	0.0%	
		Chickens	Retail Chickens											0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
		Turkeys	Retail Ground Turkey											0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal												
		Cattle	Retail Ground Beef											0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal (Beef)												0.0%
		Swine	Cecal (Dairy)												0.0%
			Retail Pork Chops												
			HACCP										0.0%		
			Cecal (Market Hogs)												0.0%
	Cecal (Sows)												0.0%		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	24.6% 60	23.0% 52	16.1% 31	14.0% 29	15.5% 34	9.9% 22	14.3% 37	8.4% 20	7.8% 24	3.9% 11	7.0% 18	6.2% 13	
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
			HACCP	16.7% 1	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1	
			HACCP	0.0% 0	15.8% 3	28.6% 2	20.0% 1	75.0% 3	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1	25.0% 1	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1		0.0% 0	
			HACCP	78.8% 89	82.7% 62	81.8% 36	85.2% 23	80.0% 24	76.7% 23	74.2% 23	64.7% 11	60.0% 3	76.9% 10	60.0% 3	76.9% 10
			Cecal (Beef)												75.0% 6
		Swine	Cecal (Dairy)												71.4% 5
			Retail Pork Chops	100.0% 2	100.0% 1										
			HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0		
			Cecal (Market Hogs)												33.3% 1
	Cecal (Sows)												0.0% 0		
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	25.0% 61	22.6% 51	15.6% 30	13.5% 28	12.8% 28	9.5% 21	12.0% 31	7.5% 18	7.5% 23	3.5% 10	3.9% 10	4.8% 10	
		Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
			HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		0.0% 0	
			HACCP	0.0% 0	21.1% 4	14.3% 1	0.0% 0	0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2		0.0% 0	
			HACCP	77.9% 88	78.7% 59	77.3% 34	81.5% 22	66.7% 20	76.7% 23	64.5% 20	52.9% 9	60.0% 3	76.9% 10	40.0% 2	69.2% 9
			Cecal (Beef)												75.0% 6
		Swine	Cecal (Dairy)												71.4% 5
			Retail Pork Chops	100.0% 2	100.0% 1										
			HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0		
			Cecal (Market Hogs)												33.3% 1
	Cecal (Sows)												0.0% 0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 50e. Antimicrobial Resistance among *Salmonella* Newport Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	244	226	192	207	219	222	258	239	306	285	258	209	
	Chickens	Retail Chickens	2	0	0	0	0	0	1	0	0	1	2	
		HACCP	6	7	0	6	0	3	1	0	1	2	2	
		Cecal											0	
	Turkeys	Retail Ground Turkey	1	2	2	3	0	0	3	3	2	0	2	
		HACCP	10	19	7	5	4	15	8	3	5	4	4	
		Cecal											0	
	Cattle	Retail Ground Beef	3	1	2	0	0	0	3	2	2	0	1	
		HACCP	113	75	44	27	30	30	31	17	5	13	5	
		Cecal (Beef) Cecal (Dairy)											13 8 7	
	Swine	Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	
		HACCP ¹	0	3	0	1	1	1	2	0	0	1	0	
		Cecal (Market Hogs) Cecal (Sows)											3 4	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		0	0	0	0	0	0	0	0	0	0	0	0	
		Chickens	Retail Chickens	0.0%							0.0%			0.0%
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%		0.0%	0.0%	0.0%
			Cecal	0	0		0		0	0		0	0	0
		Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0		0		0	0		0	0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%				0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)	0	0		0		0	0		0	0	0.0% 0
		Swine	Retail Pork Chops	0.0%	0.0%									
	HACCP		0	0.0%		0.0%	0.0%	0.0%			0.0%			
	Cecal (Market Hogs) Cecal (Sows)												0.0% 0	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.8%	0.4%	0.5%	0.0%	0.9%	0.0%	0.4%	0.0%	0.3%	0.4%	0.0%	
		2	1	1	0	2	0	1	0	1	1	0	0	
		Chickens	Retail Chickens	0.0%							0.0%			0.0%
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%		0.0%	0.0%	0.0%
			Cecal	0	0		0		0	0		0	0	0
		Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0		0		0	0		0	0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%				0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cecal (Beef) Cecal (Dairy)			0	1	0	0		0	0		0	0	0.0% 0	
Swine		Retail Pork Chops	0.0%	0.0%										
	HACCP	0	0.0%		0.0%	0.0%	0.0%			0.0%				
	Cecal (Market Hogs) Cecal (Sows)											0.0% 0		
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	25.4%	24.3%	17.2%	14.5%	14.6%	9.9%	14.0%	8.8%	8.5%	4.6%	4.3%	
		62	55	33	30	32	22	36	21	26	13	11	13	
		Chickens	Retail Chickens	100.0%							0.0%			0.0%
			HACCP	0.0%	85.7%		50.0%		0.0%	100.0%		0.0%	0.0%	0.0%
			Cecal	2	6		3		0	1		0	0	0
		Turkeys	Retail Ground Turkey	100.0%	0.0%	0.0%	0.0%			66.7%	0.0%	0.0%		50.0%
			HACCP	40.0%	36.8%	28.6%	60.0%	25.0%	20.0%	62.5%	33.3%	0.0%	50.0%	50.0%
			Cecal	4	7	2	3	1	3	5	1	0	2	2
		Cattle	Retail Ground Beef	66.7%	100.0%	100.0%				66.7%	0.0%	100.0%		0.0%
			HACCP	2	1	2				2	0	2		0
			Cecal (Beef) Cecal (Dairy)	80.5%	84.0%	84.1%	81.5%	83.3%	86.7%	74.2%	70.6%	60.0%	76.9%	80.0%
		Swine	Retail Pork Chops	91	63	37	22	25	26	23	12	3	10	4
	HACCP		100.0%	100.0%		0.0%	0.0%	0.0%	50.0%		100.0%			
	Cecal (Market Hogs) Cecal (Sows)		2	3		0	0	0	1		1		66.7% 2	
													25.0% 1	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 51a. Resistance Patterns among *Salmonella* Newport Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	244	226	192	207	219	222	258	239	306	285	258	209	
	Chickens	Retail Chickens	2	0	0	0	0	0	0	1	0	0	1	2
		HACCP	6	7	0	6	0	3	1	0	1	1	2	2
		Cecal												0
	Turkeys	Retail Ground Turkey	1	2	2	3	0	0	3	3	2	0	2	0
		HACCP	10	19	7	5	4	15	8	3	5	4	4	4
		Cecal												0
	Cattle	Retail Ground Beef	3	1	2	0	0	0	3	2	2	0	1	0
		HACCP	113	75	44	27	30	30	31	17	5	13	5	13
		Cecal (Beef)												8
	Swine	Cecal (Dairy)												7
		Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	0
		HACCP ²	0	3	0	1	1	1	2	0	0	1		
		Cecal (Market Hogs)												3
	Cecal (Sows)												4	
Resistance Pattern		Source												
1. No Resistance Detected	Humans	72.5% 177	73.5% 166	81.8% 157	84.1% 174	82.2% 180	89.2% 198	85.3% 220	89.1% 213	90.5% 277	94.4% 269	93.0% 240	91.9% 192	
	Chickens	Retail Chickens	0.0% 0							100.0% 1			100.0% 1	100.0% 2
		HACCP	83.3% 5	14.3% 1		50.0% 3		100.0% 3	0.0% 0		100.0% 1	100.0% 1	100.0% 2	100.0% 2
		Cecal												
	Turkeys	Retail Ground Turkey	0.0% 0	50.0% 1	100.0% 1	100.0% 1			0.0% 0	66.7% 2	50.0% 1		50.0% 1	
		HACCP	60.0% 6	21.1% 4	57.1% 4	20.0% 1	25.0% 1	80.0% 12	12.5% 1	0.0% 0	80.0% 4	50.0% 2	50.0% 2	100.0% 4
		Cecal												
	Cattle	Retail Ground Beef	33.3% 2	0.0% 0	0.0% 0				33.3% 1	100.0% 2	0.0% 0		100.0% 1	
		HACCP	19.5% 22	14.7% 11	15.9% 7	14.8% 4	16.7% 5	13.3% 4	25.8% 8	29.4% 5	40.0% 2	23.1% 3	20.0% 1	23.1% 3
		Cecal (Beef)												25.0% 2
	Swine	Cecal (Dairy)												28.6% 2
		Retail Pork Chops	0.0% 0	0.0% 0										
		HACCP		0.0% 0		100.0% 1	100.0% 1	100.0% 1	50.0% 1			0.0% 0		
		Cecal (Market Hogs)												33.3% 1
	Cecal (Sows)												75.0% 3	
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	25.0% 61	23.5% 53	16.7% 32	14.5% 30	15.5% 34	10.8% 24	13.6% 35	8.4% 20	7.8% 24	3.9% 11	6.2% 16	5.7% 12	
	Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1	
		HACCP	0.0% 0	26.3% 5	14.3% 1	80.0% 4	75.0% 3	6.7% 1	37.5% 3	33.3% 1	20.0% 1	25.0% 1	25.0% 1	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2		0.0% 0	
		HACCP	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10	80.0% 4	76.9% 10
		Cecal (Beef)												75.0% 6
	Swine	Cecal (Dairy)												71.4% 5
		Retail Pork Chops	100.0% 2	100.0% 1										
		HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0		
		Cecal (Market Hogs)												33.3% 1
	Cecal (Sows)												0.0% 0	
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	25.0% 61	23.0% 52	16.1% 31	14.0% 29	13.7% 30	9.5% 21	13.6% 35	7.5% 18	7.8% 24	3.9% 11	3.9% 10	4.8% 10	
	Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		50.0% 1	
		HACCP	0.0% 0	21.1% 4	14.3% 1	0.0% 0	25.0% 1	6.7% 1	25.0% 2	33.3% 1	20.0% 1	25.0% 1	25.0% 1	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	100.0% 2		0.0% 0	
		HACCP	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12	60.0% 3	76.9% 10	80.0% 4	76.9% 10
		Cecal (Beef)												75.0% 6
	Swine	Cecal (Dairy)												71.4% 5
		Retail Pork Chops	100.0% 2	100.0% 1										
		HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0		
		Cecal (Market Hogs)												33.3% 1
	Cecal (Sows)												0.0% 0	

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 51b. Resistance Patterns among *Salmonella* Newport Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	244	226	192	207	219	222	258	239	306	285	258	209	
	Chickens	Retail Chickens	2	0	0	0	0	0	0	1	0	0	1	2
		HACCP	6	7	0	6	0	3	1	0	1	1	2	2
		Cecal												0
	Turkeys	Retail Ground Turkey	1	2	2	3	0	0	3	3	2	0	2	0
		HACCP	10	19	7	5	4	15	8	3	5	4	4	4
		Cecal												0
	Cattle	Retail Ground Beef	3	1	2	0	0	0	3	2	2	0	1	0
		HACCP	113	75	44	27	30	30	31	17	5	13	5	13
		Cecal (Beef)												8
		Cecal (Dairy)												7
	Swine	Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	0
		HACCP ²	0	3	0	1	1	1	2	0	0	1	0	0
Cecal (Market Hogs)													3	
Cecal (Sows)													4	
Resistance Pattern	Source													
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	23.4% 57	22.6% 51	15.1% 29	12.6% 26	13.2% 29	8.6% 19	12.8% 33	7.1% 17	7.5% 23	3.5% 10	3.9% 10	4.8% 10	
	Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	100.0% 2	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	
		HACCP	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1	6.7% 1	12.5% 1	33.3% 1	0.0% 0	25.0% 1	25.0% 1	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 1				66.7% 2	0.0% 0	50.0% 1		0.0% 0	
		HACCP	78.8% 89	81.3% 61	79.5% 35	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10	60.0% 3	76.9% 10	40.0% 2	76.9% 10
		Cecal (Beef)												75.0% 6
		Cecal (Dairy)												71.4% 5
	Swine	Retail Pork Chops	100.0% 1	100.0% 1										
		HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1		0.0% 0			
		Cecal (Market Hogs)												33.3% 1
		Cecal (Sows)												0.0% 0
	5. At Least ACSSu ³ Resistant	Humans	23.4% 57	22.1% 50	15.1% 29	12.6% 26	12.3% 27	8.6% 19	11.6% 30	7.1% 17	7.5% 23	3.5% 10	3.9% 10	4.8% 10
Chickens		Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
Turkeys		Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		HACCP	0.0% 0	5.3% 1	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0
		Cecal												
Cattle		Retail Ground Beef	66.7% 2	100.0% 1	100.0% 1				66.7% 2	0.0% 0	50.0% 1		0.0% 0	
		HACCP	70.8% 80	66.7% 50	75.0% 33	81.5% 22	63.3% 19	70.0% 21	64.5% 20	47.1% 8	60.0% 3	76.9% 10	20.0% 1	69.2% 9
		Cecal (Beef)												75.0% 6
		Cecal (Dairy)												71.4% 5
Swine		Retail Pork Chops	100.0% 2	100.0% 1										
		HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1		0.0% 0			
		Cecal (Market Hogs)												33.3% 1
		Cecal (Sows)												0.0% 0
6. At Least ACT/S ⁴ Resistant		Humans	3.7% 9	1.3% 3	1.0% 2	1.9% 4	2.7% 6	0.5% 1	2.7% 7	1.3% 3	1.3% 4	0.0% 0	0.4% 1	0.5% 1
	Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	0.0% 0		16.7% 1		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		HACCP	0.0% 0	0.0% 0	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef	0.0% 0	0.0% 0	50.0% 1				0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		HACCP	7.1% 8	0.0% 0	2.3% 1	25.9% 7	10.0% 3	13.3% 4	12.9% 4	0.0% 0	20.0% 1	7.7% 1	0.0% 0	15.4% 2
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops	100.0% 2	0.0% 0										
		HACCP		33.3% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0			
		Cecal (Market Hogs)												0.0% 0
		Cecal (Sows)												0.0% 0

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 51c. Resistance Patterns among *Salmonella* Newport Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	244	226	192	207	219	222	258	239	306	285	258	209	
	Chickens	Retail Chickens	2	0	0	0	0	0	0	1	0	0	1	2
		HACCP	6	7	0	6	0	3	1	0	1	1	2	2
		Cecal												0
	Turkeys	Retail Ground Turkey	1	2	2	3	0	0	3	3	2	0	2	0
		HACCP	10	19	7	5	4	15	8	3	5	4	4	4
		Cecal												0
	Cattle	Retail Ground Beef	3	1	2	0	0	0	3	2	2	0	1	0
		HACCP	113	75	44	27	30	30	31	17	5	13	5	13
		Cecal (Beef)												8
		Cecal (Dairy)												7
	Swine	Retail Pork Chops	2	1	0	0	0	0	0	0	0	0	0	0
		HACCP ¹	0	3	0	1	1	1	2	0	0	1	0	0
		Cecal (Market Hogs)												3
		Cecal (Sows)												4
Resistance Pattern	Source													
7. At Least ACSSuTAuCx ² Resistant	Humans	22.5% 55	21.2% 48	15.1% 29	12.6% 26	11.0% 24	8.1% 18	11.6% 30	7.1% 17	7.5% 23	3.5% 10	3.9% 10	4.8% 10	
	Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	71.4% 5		50.0% 3		0.0% 0	100.0% 1		0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	100.0% 1	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0		0.0% 0	
		HACCP	0.0% 0	5.2% 1	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef	66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0	50.0% 1		0.0% 0	
		HACCP	70.8% 80	66.7% 50	72.7% 32	81.5% 22	63.3% 19	70.0% 21	64.5% 20	47.1% 8	60.0% 3	76.9% 10	20.0% 1	69.2% 9
		Cecal (Beef)												75.0% 6
		Cecal (Dairy)												71.4% 5
	Swine	Retail Pork Chops	100.0% 2	100.0% 1										
		HACCP		100.0% 3		0.0% 0	0.0% 0	0.0% 0	50.0% 1			0.0% 0		
		Cecal (Market Hogs)												33.3% 1
Cecal (Sows)													0.0% 0	
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.4% 1	0.0% 0	0.5% 1	0.0% 0	0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0	
	Chickens	Retail Chickens	0.0% 0							0.0% 0			0.0% 0	0.0% 0
		HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	
		Cecal												
	Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0		0.0% 0	
		HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal												
	Cattle	Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		HACCP	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops	0.0% 0	0.0% 0										
		HACCP		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0		
		Cecal (Market Hogs)												0.0% 0
Cecal (Sows)													0.0% 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 52a. Antimicrobial Resistance among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	35	36	36	33	105	73	84	72	78	82	117	127		
	Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3	
		HACCP	N/A ¹	N/A	44	102	79	49	29	21	17	6	17	21	
		Cecal												0	
	Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	1	6	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5	
		Cecal (Beef)												0	
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2	
		HACCP ²	N/A	N/A	0	1	2	1	1	1	1	2		4	
		Cecal (Market Hogs)												3	
		Cecal (Sows)												0	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0%	5.6%	5.6%	0.0%	4.8%	1.4%	3.6%	2.8%	1.3%	2.4%	2.6%	4.7%	
		Chickens	Retail Chickens	0	2	2	0	5	1	3	2	1	2	3	6
			HACCP	0.0%	0.0%	0.0%	11.1%	22.2%	50.0%	0.0%	12.5%	0.0%		0.0%	0.0%
			Cecal	0	0	0	1	2	1	0	1	0		0	0
		Turkeys	Retail Ground Turkey	0.0%				50.0%							0.0%
			HACCP	0			100.0%	100.0%	100.0%				0.0%	0.0%	16.7%
			Cecal	0			0	1	1				0	0	1
		Cattle	Retail Ground Beef						50.0%						0.0%
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
			Cecal (Beef)												0
		Swine	Retail Pork Chops												0.0%
			HACCP				0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%		0
			Cecal (Market Hogs)												0.0%
			Cecal (Sows)												0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.2%	0.0%	1.3%	0.0%	0.0%	0.8%	
		Chickens	Retail Chickens	0	0	0	0	0	0	0	0	0	0	2	1
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		33.3%	0.0%
			Cecal	0	0	2	0	0	2	0	0	11.8%	0.0%	0.0%	4.8%
		Turkeys	Retail Ground Turkey	0.0%				0.0%							0.0%
			HACCP	0		0.0%	0.0%	0.0%	0.0%				0.0%	0.0%	0.0%
			Cecal	0											0
		Cattle	Retail Ground Beef					0.0%							0.0%
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	33.3%	0.0%
			Cecal (Beef)												0
		Swine	Retail Pork Chops												0.0%
			HACCP				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0
			Cecal (Market Hogs)												0.0%
			Cecal (Sows)												0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	2.9%	8.3%	5.6%	3.0%	3.8%	8.2%	10.7%	12.5%	19.2%	24.4%	29.1%	53.5%	
		Chickens	Retail Chickens	1	3	2	1	4	6	9	9	15	20	34	68
			HACCP	0.0%	0.0%	0.0%	11.1%	22.2%	0.0%	0.0%	12.5%	0.0%		0.0%	0.0%
			Cecal	0	0	0	1	2	0	0	1	0	1	3	3
		Turkeys	Retail Ground Turkey	0.0%				50.0%							100.0%
			HACCP	0		100.0%	50.0%	100.0%	100.0%				0.0%	100.0%	100.0%
			Cecal	0		1	1	1	1				0	1	6
		Cattle	Retail Ground Beef					0.0%							0.0%
HACCP					25.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	66.7%	100.0%	
Cecal (Beef)					1	0	0	0	0	0		0	2	5	
Swine		Retail Pork Chops												0.0%	
		HACCP				100.0%	0.0%	0.0%	100.0%	0.0%	100.0%	100.0%		0	
		Cecal (Market Hogs)							1	0	1	2		75.0%	
		Cecal (Sows)												2	

¹ N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 52b. Antimicrobial Resistance among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested		Humans	35	36	36	33	105	73	84	72	78	82	117	127	
		Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3
			HACCP	N/A ¹	N/A	44	102	79	49	29	21	17	6	17	21
			Cecal												0
		Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6
			HACCP	N/A	N/A	4	2	3	6	1	1	0	2	1	6
			Cecal												0
		Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0
			HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5
			Cecal (Beef) Cecal (Dairy)												0 1
		Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2
			HACCP ²	N/A	N/A	0	1	2	1	1	1	1	2		
			Cecal (Market Hogs) Cecal (Sows)												4 3
		Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	1.4% 1	4.8% 4	4.2% 3	3.8% 3	3.7% 3	1.7% 2	1.6% 2	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 2	0.0% 0
			HACCP			4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.5% 2	0.0% 0	16.7% 1	11.8% 2	4.8% 1
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0							0.0% 0
			HACCP			0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef						0.0% 0						
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1	0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												0.0% 0
		Swine	Retail Pork Chops												0.0% 0
			HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0
		Cepheems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	2.7% 1	4.8% 4	2.8% 2	2.6% 2	3.7% 4	0.9% 1
Chickens	Retail Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 2	0.0% 0
	HACCP					4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	4.8% 1	0.0% 0	16.7% 1	11.8% 2	4.8% 1
	Cecal														
Turkeys	Retail Ground Turkey			0.0% 0				0.0% 0							0.0% 0
	HACCP					0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
	Cecal														
Cattle	Retail Ground Beef								0.0% 0						
	HACCP					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1	0.0% 0	0.0% 0
	Cecal (Beef) Cecal (Dairy)														0.0% 0
Swine	Retail Pork Chops														0.0% 0
	HACCP						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
	Cecal (Market Hogs) Cecal (Sows)														0.0% 0
	Ceftiofur (MIC ≥ 8 µg/ml)			Humans	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	2.7% 1	4.8% 4	2.8% 2	2.6% 2	3.7% 3	0.9% 1
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 2	0.0% 0
			HACCP			4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.5% 2	0.0% 0	16.7% 1	11.8% 2	4.8% 1
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0							0.0% 0
			HACCP			0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef						0.0% 0						
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1	0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												0.0% 0
		Swine	Retail Pork Chops												0.0% 0
			HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0

¹ N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 52c. Antimicrobial Resistance among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		35	36	36	33	105	73	84	72	78	82	117	127	
		Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3
			HACCP	N/A ¹	N/A	44	102	79	49	29	21	17	6	17	21
	Cecal													0	
	Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	1	6	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5	
		Cecal (Beef)												0	
	Swine	Cecal (Dairy)												1	
		Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2	
		HACCP ²	N/A	N/A	0	1	2	1	1	1	1	2			
		Cecal (Market Hogs)												4	
		Cecal (Sows)												3	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	2.9% 1	5.6% 2	2.8% 1	3.0% 1	3.8% 4	2.7% 2	4.8% 4	2.8% 2	2.6% 2	3.7% 3	0.9% 1	1.6% 2	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 2	0.0% 0
			HACCP			4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.5% 2	0.0% 0	16.7% 1	11.8% 2	4.8% 1
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0							0.0% 0
			HACCP			0.0% 0	50.0% 1	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef						0.0% 0						
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		50.0% 1	0.0% 0	0.0% 0
			Cecal (Beef)												
		Swine	Cecal (Dairy)												0.0% 0
			Retail Pork Chops												0.0% 0
			HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
			Cecal (Market Hogs)												0.0% 0
			Cecal (Sows)												0.0% 0
Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ³ (MIC ≥ 512 µg/ml)	Humans	2.9% 1	5.6% 2	11.1% 4	0.0% 0	8.6% 9	4.1% 3	13.1% 11	13.9% 10	19.2% 15	23.2% 19	29.1% 34	53.5% 68	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2	50.0% 1	0.0% 0	25.0% 2	0.0% 0		33.3% 3	0.0% 0
			HACCP			13.6% 6	9.8% 10	13.9% 11	6.1% 3	6.9% 2	9.5% 2	29.4% 5	33.3% 2	17.6% 3	14.3% 3
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0				50.0% 1							100.0% 6
			HACCP			100.0% 1	50.0% 1	100.0% 1	100.0% 1				0.0% 0	100.0% 1	83.3% 5
			Cecal												
		Cattle	Retail Ground Beef						50.0% 1						
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	66.7% 2	100.0% 5
			Cecal (Beef)												
		Swine	Cecal (Dairy)												100.0% 1
			Retail Pork Chops												100.0% 2
			HACCP				100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0% 0	100.0% 1	100.0% 2		
			Cecal (Market Hogs)												75.0% 3
			Cecal (Sows)												66.7% 2
Folate Pathway Inhibitor	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	2.9% 1	0.0% 0	2.8% 1	0.0% 0	0.0% 0	1.4% 1	4.8% 4	1.4% 1	1.3% 1	1.2% 1	0.0% 0	2.4% 3	
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0
			HACCP			4.5% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0							0.0% 0
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail Ground Beef						0.0% 0						
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0
			Cecal (Beef)												
		Swine	Cecal (Dairy)												0.0% 0
			Retail Pork Chops												0.0% 0
			HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0
			Cecal (Market Hogs)												0.0% 0
			Cecal (Sows)												0.0% 0

¹ N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 52d. Antimicrobial Resistance among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans	35	36	36	33	105	73	84	72	78	82	117	127		
	Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3	
		HACCP	N/A ¹	N/A	44	102	79	49	29	21	17	6	17	21	
		Cecal												0	
	Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5	
		Cecal (Beef)												0	
		Cecal (Dairy)												1	
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2	
		HACCP ²	N/A	N/A	0	1	2	1	1	1	1	2			
		Cecal (Market Hogs)												4	
Cecal (Sows)													3		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans									0.0%	0.0%	1.6%		
		Chickens	Retail Chickens									0	0	2	
			HACCP									0.0%	0.0%	0.0%	
			Cecal									0	0	0	
		Turkeys	Retail Ground Turkey											0.0%	
			HACCP									0.0%	0.0%	0.0%	
			Cecal									0	0	0	
		Cattle	Retail Ground Beef												0.0%
			HACCP									0.0%	0.0%	0.0%	
			Cecal (Beef)												0
			Cecal (Dairy)												0
		Swine	Retail Pork Chops												0.0%
			HACCP									0.0%			0
			Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	8.6%	8.3%	5.6%	6.1%	6.7%	5.5%	9.5%	11.1%	21.8%	25.6%	29.1%	49.8%	
		Chickens	Retail Chickens	3	3	2	2	7	4	8	8	17	21	34	63
			HACCP	0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%		33.3%	0.0%
			Cecal			6.8%	8.8%	17.7%	20.4%	6.9%	9.5%	5.9%	16.7%	11.8%	4.8%
		Turkeys	Retail Ground Turkey	0.0%											100.0%
			HACCP			0.0%	50.0%	0.0%	0.0%				0.0%	100.0%	66.7%
			Cecal												4
		Cattle	Retail Ground Beef						0.0%						
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	66.7%	80.0%	
			Cecal (Beef)												1
			Cecal (Dairy)												100.0%
		Swine	Retail Pork Chops												100.0%
			HACCP				100.0%	50.0%	0.0%	100.0%	0.0%	0.0%	100.0%		2
			Cecal (Market Hogs)												75.0%
Cecal (Sows)													33.3%		
Phenicolts	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	2.9%	0.0%	2.8%	0.0%	1.9%	1.4%	6.0%	8.3%	1.3%	1.2%	0.0%	2.4%	
		Chickens	Retail Chickens	1	0	1	0	2	1	5	6	1	1	0	3
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	Retail Ground Turkey	0.0%					0.0%						0.0%
			HACCP			0.0%	0.0%	0.0%	0.0%				0.0%	0.0%	0.0%
			Cecal												0
		Cattle	Retail Ground Beef						0.0%						
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%
			Cecal (Beef)												
			Cecal (Dairy)												0.0%
		Swine	Retail Pork Chops												0.0%
			HACCP				0.0%	50.0%	0.0%	100.0%	0.0%	0.0%	0.0%		
			Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%		

¹ N/A = data not available. Antioic formulas for monohasic *Salmonella* were not determined for food animal isolates prior to 2004

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 52e. Antimicrobial Resistance among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		35	36	36	33	105	73	84	72	78	82	117	127	
		Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3
			HACCP	N/A ¹	N/A	44	102	79	49	29	21	17	6	17	21
	Cecal													0	
	Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	1	6	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0	
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5	
		Cecal (Beef)												0	
	Swine	Cecal (Dairy)												1	
		Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2	
		HACCP ²	N/A	N/A	0	1	2	1	1	1	1	2		4	
		Cecal (Market Hogs)												3	
	Cecal (Sows)														
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.8%	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal												0
		Turkeys	Retail Ground Turkey	0.0%				0.0%							0.0%
			HACCP			0.0%	0.0%	0.0%	0.0%				0.0%	0.0%	0.0%
			Cecal												0
		Cattle	Retail Ground Beef						0.0%						
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
			Cecal (Beef)												0
		Swine	Cecal (Dairy)												0.0%
			Retail Pork Chops												0
	HACCP					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0	
	Cecal (Market Hogs)													0.0%	
		Cecal (Sows)												0	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0%	2.8%	2.8%	0.0%	1.0%	1.4%	1.2%	0.0%	2.6%	0.0%	0.0%	0.8%	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%
			HACCP			2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal			1	0	0	0	0	0	0	0	0	0
		Turkeys	Retail Ground Turkey	0.0%				0.0%							0.0%
			HACCP			0.0%	0.0%	0.0%	0.0%				0.0%	0.0%	16.7%
			Cecal												1
		Cattle	Retail Ground Beef						0.0%						
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
Cecal (Beef)														0	
Swine		Cecal (Dairy)												0.0%	
		Retail Pork Chops												0	
	HACCP				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0		
	Cecal (Market Hogs)												0.0%		
	Cecal (Sows)												0		
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	5.7%	0.0%	11.1%	3.0%	8.6%	9.6%	16.7%	16.7%	28.2%	25.6%	33.3%	55.1%	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	11.1%	11.1%	0.0%	0.0%	25.0%	0.0%		50.0%	0.0%
			HACCP			11.4%	4.9%	3.8%	14.3%	3.4%	9.5%	11.8%	33.3%	0.0%	19.0%
			Cecal			5	5	3	7	1	2	2	2	0	4
		Turkeys	Retail Ground Turkey	0.0%				0.0%							100.0%
			HACCP			0.0%	50.0%	0.0%	0.0%				100.0%	100.0%	100.0%
			Cecal			0	1	0	0				1	1	6
		Cattle	Retail Ground Beef						0.0%						
			HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	100.0%	100.0%
			Cecal (Beef)											3	5
		Swine	Cecal (Dairy)												0.0%
			Retail Pork Chops												100.0%
HACCP					100.0%	50.0%	0.0%	100.0%	0.0%	100.0%	100.0%		2		
Cecal (Market Hogs)													75.0%		
	Cecal (Sows)												3		

¹ N/A = data not available. Antigenic formulas for monophase *Salmonella* were not determined for food animal isolates prior to 2004

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 53a. Resistance Patterns among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	35	36	36	33	105	73	84	72	78	82	117	127	
	Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3
		HACCP	N/A ²	N/A	44	102	79	49	29	21	17	6	17	21
		Cecal												0
	Turkeys	Retail Ground Turkeys	2	0	0	0	2	0	0	0	0	0	0	6
		HACCP	N/A	N/A	1	2	1	1	0	0	0	1	1	6
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5
		Cecal (Beef)												0
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2
		HACCP ³	N/A	N/A	0	1	2	1	1	1	1	2		4
		Cecal (Market Hogs)												3
	Cecal (Sows)												3	
Resistance Pattern														
Source														
1. No Resistance Detected	Humans	91.4%	77.8%	80.6%	87.9%	85.7%	82.2%	76.2%	76.4%	66.7%	65.9%	62.4%	39.4%	
	Chickens	Retail Chickens	100.0%	100.0%	100.0%	88.9%	55.6%	50.0%	100.0%	75.0%	100.0%	54	73	50
		HACCP	5	2	4	8	5	1	4	6	2	3	3	3
		Cecal			77.3%	76.5%	68.4%	65.3%	82.8%	76.2%	70.6%	50.0%	70.6%	76.2%
	Turkeys	Retail Ground Turkeys	100.0%				50.0%							0.0%
		HACCP	2		0.0%	50.0%	0.0%	0.0%				0.0%	0.0%	0.0%
		Cecal			0	1	0	0				0	0	0
	Cattle	Retail Ground Beef						50.0%						
		HACCP			75.0%	100.0%	100.0%	100.0%	100.0%	100.0%		50.0%	0.0%	0.0%
		Cecal (Beef)			3	2	3	6	1	1		1	0	0
	Swine	Retail Pork Chops												0.0%
		HACCP				0.0%	50.0%	100.0%	0.0%	100.0%	0.0%	0.0%		0.0%
		Cecal (Market Hogs)				0	1	1	0	1	0	0		0
		Cecal (Sows)												25.0%
														1
														0.0%
														0
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	5.7%	5.6%	8.3%	3.0%	9.5%	5.5%	10.7%	12.5%	21.8%	26.8%	28.2%	51.2%	
	Chickens	Retail Chickens	2	2	3	1	10	4	9	9	17	22	33	65
		HACCP	0.0%	0.0%	0.0%	11.1%	22.2%	0.0%	0.0%	12.5%	0.0%	33.3%	11.8%	9.5%
		Cecal	0	0	6	10	15	10	2	2	2	2	2	2
	Turkeys	Retail Ground Turkey	0.0%				0.0%							100.0%
		HACCP	0		0.0%	50.0%	0.0%	0.0%				0.0%	100.0%	100.0%
		Cecal			0	1	0	0				0	1	6
	Cattle	Retail Ground Beef						0.0%						
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		50.0%	66.6%	100.0%
		Cecal (Beef)			0	0	0	0	0	0		1	2	5
	Swine	Retail Pork Chops												100.0%
		HACCP				100.0%	50.0%	0.0%	100.0%	0.0%	100.0%	100.0%		2
		Cecal (Market Hogs)				1	1	0	1	0	1	2		75.0%
		Cecal (Sows)												3
														66.7%
														2
	3. Resistant to ≥ 4 Antimicrobial Classes	Humans	2.9%	0.0%	2.8%	0.0%	3.8%	2.7%	7.1%	9.7%	19.2%	19.5%	26.5%	48.8%
Chickens		Retail Chickens	1	0	1	0	4	2	6	7	15	16	31	62
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	2	0
		Cecal	0	0	1	0	1	0	0	1	1	0	0	1
Turkeys		Retail Ground Turkey	0.0%				0.0%							100.0%
		HACCP	0		0.0%	50.0%	0.0%	0.0%				0.0%	100.0%	66.7%
		Cecal			0	1	0	0				0	1	4
Cattle		Retail Ground Beef						0.0%						
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	66.6%	80.0%
		Cecal (Beef)			0	0	0	0	0	0		0	2	4
Swine		Retail Pork Chops												0.0%
		HACCP				100.0%	50.0%	0.0%	100.0%	0.0%	100.0%	100.0%		2
		Cecal (Market Hogs)				1	1	0	1	0	1	2		75.0%
		Cecal (Sows)												3
														33.3%
														1

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

³ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 53b. Resistance Patterns among *Salmonella* 14,[5],12:i:- Isolates, 2002-2013¹

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested														
	Humans	35	36	36	33	105	73	84	72	78	82	117	127	
	Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3
		HACCP	N/A ²	N/A	44	102	79	49	29	21	17	6	7	21
		Cecal												0
	Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6
		HACCP	N/A	N/A	1	2	1	1	0	0	0	1	1	6
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5
		Cecal (Beef) Cecal (Dairy)												0 1
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2
		HACCP ³	N/A	N/A	0	1	2	1	1	1	1	2		
		Cecal (Market Hogs) Cecal (Sows)												4 3
	Resistance Pattern	Source												
	4. Resistant to ≥ 5 Antimicrobial Classes	Humans	2.9% 1	0.0% 0	2.8% 1	0.0% 0	2.9% 3	1.4% 1	4.8% 4	6.9% 5	3.8% 3	0.0% 0	0.9% 1	2.4% 3
Chickens		Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	33.3% 2	0.0% 0	
		HACCP			2.3% 1	0.0% 0	1.3% 1	0.0% 0	4.8% 1	0.0% 0	0.0% 0	0.0% 0	4.8% 1	
		Cecal												
Turkeys		Retail Ground Turkey	0.0% 0				0.0% 0						0.0% 0	
		HACCP			0.0% 0	50.0% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Cecal												
Cattle		Retail Ground Beef						0.0% 0						
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	33.3% 1	0.0% 0	
		Cecal (Beef) Cecal (Dairy)											0.0% 0	
Swine		Retail Pork Chops											0.0% 0	
		HACCP				0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0		
		Cecal (Market Hogs) Cecal (Sows)											0.0% 0	
5. At Least ACSSu⁴ Resistant		Humans	2.9% 1	0.0% 0	2.8% 1	0.0% 0	1.9% 2	1.4% 1	3.6% 3	6.9% 5	1.3% 1	0.0% 0	0.0% 0	0.8% 1
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Cecal													
	Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0						0.0% 0	
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Cecal												
	Cattle	Retail Ground Beef						0.0% 0						
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	33.3% 1	0.0% 0	
		Cecal (Beef) Cecal (Dairy)											0.0% 0	
	Swine	Retail Pork Chops											0.0% 0	
		HACCP				0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0		
		Cecal (Market Hogs) Cecal (Sows)											0.0% 0	
	6. At Least ACT/S⁵ Resistant	Humans	2.9% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.8% 1
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
HACCP					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Cecal														
Turkeys		Retail Ground Turkey	0.0% 0				0.0% 0						0.0% 0	
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Cecal												
Cattle		Retail Ground Beef						0.0% 0						
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal (Beef) Cecal (Dairy)											0.0% 0	
Swine		Retail Pork Chops											0.0% 0	
		HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal (Market Hogs) Cecal (Sows)											0.0% 0	

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

³ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

⁴ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁵ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 53c. Resistance Patterns among *Salmonella* I 4,[5],12:i:- Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	35	36	36	33	105	73	84	72	78	82	117	127	
	Chickens	Retail Chickens	5	2	4	9	9	2	4	8	2	0	6	3
		HACCP	N/A ¹	N/A	44	102	79	49	29	21	17	6	7	21
		Cecal												0
	Turkeys	Retail Ground Turkey	2	0	0	0	2	0	0	0	0	0	0	6
		HACCP	N/A	N/A	1	2	1	1	0	0	0	1	1	6
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	0	2	0	0	0	0	0	0
		HACCP	N/A	N/A	4	2	3	6	1	1	0	2	3	5
		Cecal (Beef) Cecal (Dairy)												0 1
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	2
		HACCP ²	N/A	N/A	0	1	2	1	1	1	1	2		
		Cecal (Market Hogs) Cecal (Sows)												4 3
	Resistance Pattern	Source												
7. At Least ACSSuTAuCx ³ Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0							0.0% 0
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef						0.0% 0						
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops												0.0% 0
		HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal (Market Hogs)												0.0% 0
Cecal (Sows)													0.0% 0	
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP			2.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Turkeys	Retail Ground Turkey	0.0% 0				0.0% 0							0.0% 0
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0				0.0% 0	0.0% 0	0.0% 0
		Cecal												
	Cattle	Retail Ground Beef						0.0% 0						
		HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops												0.0% 0
		HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal (Market Hogs)												0.0% 0
Cecal (Sows)													0.0% 0	

¹ N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 54a. Antimicrobial Resistance among *Salmonella* Infantis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		37	31	29	30	22	26	51	44	53	63	90	76	
		Retail	1	0	0	0	1	1	5	3	3	4	3	8	
	Chickens	HACCP	20	27	19	17	16	16	14	3	4	16	31	35	
		Cecal												1	
														3	
	Turkeys	Retail	0	0	0	0	0	0	1	1	2	1	3	2	
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0	
		Cecal												0	
	Cattle	Retail	0	1	0	0	0	0	0	0	0	3	1	2	
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7	
		Cecal (Beef)												3	
		Cecal (Dairy)													
	Swine	Retail	0	0	0	1	2	5	1	2	1	1	1	1	
		HACCP ¹	20	15	22	27	16	17	15	10	9	10			
Cecal (Market Hogs)													20		
	Cecal (Sows)												27		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	3.9%	
		Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	
		HACCP	5.0%	0.0%	5.3%	0.0%	6.3%	0.0%	0.0%	0.0%	25.0%	0.0%	16.1%	0.0%	
		Cecal	1	0	1	0	1	0	0	0	1	0	5	0	
														0.0%	
		Chickens	Retail												
			HACCP												
			Cecal												
		Turkeys	Retail							0.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			HACCP	0.0%					0.0%	0	0				
			Cecal	0					0						
		Cattle	Retail		0.0%									0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Dairy)												0.0%
	Swine	Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	4.5%	3.7%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	1	1	1	0	0	0	0	0	0	0	
		Cecal (Sows)												0.0%	
														0.0%	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	2.2%	3.9%
		Retail	0.0%	1	0	0	0	0	0	3	0	0	0	2	3
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0	
														0.0%	
		Chickens	Retail												
			HACCP												
			Cecal												
		Turkeys	Retail							0.0%	100.0%	100.0%	0.0%	100.0%	50.0%
			HACCP	0.0%					0.0%	0	1	2	0	3	1
			Cecal	0					0		1				
		Cattle	Retail		0.0%									0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Dairy)												0.0%
	Swine	Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
HACCP		0.0%	0.0%	0.0%	0.0%	6.3%	5.9%	0.0%	0.0%	33.3%	20.0%				
Cecal (Market Hogs)		0	0	0	0	1	1	0	0	3	2				
Cecal (Sows)													0.0%		
													7.4%		
													2		
Streptomycin (MIC ≥ 64 µg/ml)	Humans	2.7%	9.7%	0.0%	3.3%	4.5%	3.8%	2.0%	6.8%	1.9%	4.8%	0.0%	3.9%		
	Retail	1	3	0	1	1	1	1	3	1	3	0	3		
	HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Cecal	0	0	0	0	0	0	0	0	0	0	0	0		
													0.0%		
	Chickens	Retail													
		HACCP	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	9.7%	2.9%	
		Cecal	2	0	0	0	0	0	0	0	1	0	3	1	
														0.0%	
	Turkeys	Retail							0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
		HACCP	100.0%					100.0%	0	1					
		Cecal	1					1		1					
	Cattle	Retail		0.0%									0.0%	0.0%	
		HACCP	0.0%	8.3%	0.0%	14.3%	15.4%	0.0%	0.0%	0.0%	0.0%	6.7%	25.0%	0.0%	
		Cecal (Beef)	0	1	0	1	2	0	0	0	0	1	1	0	
Cecal (Dairy)													0.0%		
Swine	Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	HACCP	0.0%	0.0%	4.5%	11.1%	12.5%	0.0%	0.0%	0.0%	11.1%	30.0%				
	Cecal (Market Hogs)	0	0	1	3	2	0	0	0	1	3				
	Cecal (Sows)												15.0%		
													3		
													11.1%		
													3		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 54b. Antimicrobial Resistance among *Salmonella* Infantis Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	37	31	29	30	22	26	51	44	53	63	90	76		
	Chickens	Retail	1	0	0	0	1	1	5	3	3	4	3	8	
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35	
		Cecal												1	
	Turkeys	Retail	0	0	0	0	0	0	1	1	2	1	3	2	
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0	
		Cecal												0	
	Cattle	Retail	0	1	0	0	0	0	0	0	0	3	1	2	
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7	
		Cecal (Beef) Cecal (Dairy)												3 0	
	Swine	Retail	0	0	0	1	2	5	1	2	1	1	1	1	
		HACCP ¹	20	15	22	27	16	17	15	10	9	10	0	0	
		Cecal (Market Hogs) Cecal (Sows)												20 27	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	2.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	9.1% 4	3.8% 2	1.6% 1	1.1% 1	3.9% 3	
		Chickens	Retail	0.0% 0				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	5.9% 1	6.3% 1	0.0% 0	0.0% 0	0.0% 0	25.0% 1	6.3% 1	0.0% 0	5.7% 2
			Cecal												0.0% 0
		Turkeys	Retail							0.0% 0	100.0% 1	100.0% 2	100.0% 1	100.0% 3	50.0% 1
			HACCP	0.0% 0					100.0% 1		100.0% 1				
			Cecal												
		Cattle	Retail		0.0% 0								0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	8.3% 1	0.0% 0	14.3% 1	23.1% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 1	0.0% 0	0.0% 0
			Cecal (Beef)												0.0% 0
			Cecal (Dairy)												0.0% 0
		Swine	Retail				0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	4.5% 1	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.0% 1		
			Cecal (Market Hogs)												10.0% 2
Cecal (Sows)													7.4% 2		
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	2.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.4% 5	3.8% 2	1.6% 1	1.1% 1	3.9% 3	
		Chickens	Retail	0.0% 0				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	5.9% 1	12.5% 2	0.0% 0	0.0% 0	0.0% 0	25.0% 1	6.3% 1	0.0% 0	5.7% 2
			Cecal												0.0% 0
		Turkeys	Retail							0.0% 0	100.0% 1	100.0% 2	100.0% 1	100.0% 3	50.0% 1
			HACCP	0.0% 0					100.0% 1		100.0% 1				
			Cecal												
		Cattle	Retail		0.0% 0								0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	8.3% 1	0.0% 0	14.3% 1	23.1% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 1	0.0% 0	0.0% 0
			Cecal (Beef)												0.0% 0
			Cecal (Dairy)												0.0% 0
		Swine	Retail				0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	4.5% 1	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.0% 1		
			Cecal (Market Hogs)												10.0% 2
Cecal (Sows)													7.4% 2		
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	2.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.8% 1	0.0% 0	11.4% 5	3.8% 2	1.6% 1	2.2% 2	6.6% 5	
		Chickens	Retail	0.0% 0				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	5.9% 1	6.3% 1	0.0% 0	0.0% 0	0.0% 0	25.0% 1	6.3% 1	0.0% 0	5.7% 2
			Cecal												0.0% 0
		Turkeys	Retail							0.0% 0	100.0% 1	100.0% 2	100.0% 1	100.0% 3	50.0% 1
			HACCP	0.0% 0					100.0% 1		100.0% 1				
			Cecal												
		Cattle	Retail		0.0% 0								0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	8.3% 1	0.0% 0	14.3% 1	23.1% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 1	0.0% 0	0.0% 0
			Cecal (Beef)												0.0% 0
			Cecal (Dairy)												0.0% 0
		Swine	Retail				0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.0% 1		
			Cecal (Market Hogs)												10.0% 2
Cecal (Sows)													7.4% 2		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 54c. Antimicrobial Resistance among *Salmonella* Infantis Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Humans	37	31	29	30	22	26	51	44	53	63	90	76			
	Chickens	Retail	1	0	0	0	1	1	5	3	3	4	3	8		
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35		
		Cecal												1		
	Turkeys	Retail	0	0	0	0	0	0	1	1	2	1	3	2		
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0		
		Cecal												0		
	Cattle	Retail Ground Beef	0	1	0	0	0	0	0	0	0	3	1	2		
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7		
		Cecal (Beef)												3		
		Cecal (Dairy)												0		
	Swine	Retail Pork Chops	0	0	0	1	2	5	1	2	1	1	1	1		
		HACCP ¹	20	15	22	27	16	17	15	10	9	10	0	0		
		Cecal (Market Hogs)												20		
Cecal (Sows)												27				
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	2.7%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	11.4%	3.8%	1.6%	2.2%	6.6%		
			1	0	0	0	0	1	0	5	2	1	2	5		
		Chickens	Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	5.9%	6.3%	0.0%	0.0%	0.0%	25.0%	6.3%	0.0%	5.7%	
			Cecal	0	0	0	1	1	0	0	0	1	1	0	2	
		Turkeys	Retail							0.0%	100.0%	100.0%	100.0%	100.0%	50.0%	
			HACCP	0.0%					100.0%	1	1					
			Cecal	0												
		Cattle	Retail		0.0%								0.0%	0.0%	0.0%	
			HACCP	0.0%	8.3%	0.0%	14.3%	23.1%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%	
			Cecal (Beef)	0	1	0	1	3	0	0	0	0	1	0	0	
			Cecal (Dairy)												0.0%	
		Swine	Retail				0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	10.0%			
			Cecal (Market Hogs)	0	0	0	0	1	0	0	0	0	1		10.0%	
			Cecal (Sows)												7.4%	
														2		
		Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	5.4%	9.7%	3.4%	6.7%	9.1%	3.8%	3.9%	6.8%	7.5%	4.8%	3.3%	9.2%
					2	3	1	2	2	1	2	3	4	3	3	7
				Chickens	Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP	0.0%				0.0%	10.5%	0.0%	6.3%	0.0%	0.0%	0.0%	25.0%	0.0%	16.1%	0.0%	
Cecal	0				0	2	0	1	0	0	0	1	0	5	0	
Turkeys	Retail									0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	HACCP			100.0%					100.0%	1	1					
	Cecal			1												
Cattle	Retail				0.0%								0.0%	0.0%	0.0%	
	HACCP			0.0%	8.3%	0.0%	14.3%	15.4%	0.0%	0.0%	0.0%	0.0%	6.7%	25.0%	0.0%	
	Cecal (Beef)			0	1	0	1	2	0	0	0	0	1	1	0	
	Cecal (Dairy)														0.0%	
Swine	Retail						0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	HACCP			5.0%	6.7%	4.5%	3.7%	18.8%	0.0%	0.0%	10.0%	0.0%	10.0%			
	Cecal (Market Hogs)			1	1	1	1	3	0	0	1	0	1		10.0%	
	Cecal (Sows)														7.4%	
														2		
Folate Pathway Inhibitor	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)			Humans	0.0%	3.2%	3.4%	0.0%	0.0%	0.0%	2.0%	2.3%	1.9%	1.6%	4.4%	3.9%
					0	1	1	0	0	0	1	1	1	1	4	3
				Chickens	Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0		0	0	0	0	0	0	0	0	0	0	0	
		Turkeys	Retail							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	100.0%					0.0%	0	0					
			Cecal	1												
		Cattle	Retail		0.0%								0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%	
			Cecal (Beef)	0	0	0	0	1	0	0	0	0	1	0	0	
			Cecal (Dairy)												0.0%	
		Swine	Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal (Market Hogs)	1	0	0	0	0	0	0	0	0	0		0.0%	
			Cecal (Sows)												3.7%	
														1		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 54d. Antimicrobial Resistance among *Salmonella* Infantis Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	37	31	29	30	22	26	51	44	53	63	90	76	
	Chickens	Retail	1	0	0	0	1	1	5	3	3	4	3	8
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35
		Cecal												1
	Turkeys	Retail	0	0	0	0	0	0	1	1	2	1	3	2
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7
		Cecal												3
	Cattle	Retail Ground Beef	0	1	0	0	0	0	0	0	0	3	1	2
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7
		Cecal (Beef) Cecal (Dairy)												3
	Swine	Retail Pork Chops	0	0	0	1	2	5	1	2	1	1	1	1
		HACCP ¹	20	15	22	27	16	17	15	10	9	10	0	0
		Cecal (Market Hogs) Cecal (Sows)												20
													27	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans									0.0%	0.0%	0.0%	
		Chickens	Retail									0.0%	0.0%	0.0%
			HACCP									0.0%	0.0%	0.0%
			Cecal									0.0%	0.0%	0.0%
		Turkeys	Retail									0.0%	0.0%	0.0%
			HACCP									0.0%	0.0%	0.0%
			Cecal									0.0%	0.0%	0.0%
		Cattle	Retail									0.0%	0.0%	0.0%
			HACCP									0.0%	0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)											0.0%
		Swine	Retail									0.0%	0.0%	0.0%
			HACCP									0.0%	0.0%	0.0%
			Cecal (Market Hogs) Cecal (Sows)											0.0%
														3.7%
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	2.7%	0.0%	0.0%	0.0%	0.0%	3.8%	2.0%	13.6%	5.7%	1.6%	9.2%	
		Chickens	Retail	1	0	0	0	0	1	6	3	1	2	7
			HACCP	0	0	0	5.9%	18.8%	0	0	0	25.0%	6.3%	0.0%
			Cecal	0	0	0	1	3	0	0	1	1	0	2
		Turkeys	Retail						0.0%	100.0%	100.0%	100.0%	100.0%	50.0%
			HACCP	0					1	1	2	1	3	1
			Cecal											
		Cattle	Retail		0.0%							0.0%	0.0%	0.0%
			HACCP	0	8.3%	14.3%	23.1%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)		1	1	3	0	0	0	0	1	0	0
		Swine	Retail				0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	10.0%	0.0%	4.5%	0.0%	6.3%	0.0%	10.0%	33.3%	30.0%		
			Cecal (Market Hogs) Cecal (Sows)	2	0	1	0	1	0	1	3	3		
														10.0%
												7.4%		
												2		
Phenolics	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.5%	3.8%	1.6%	3.9%	
		Chickens	Retail	1	0	0	0	0	1	2	2	1	1	3
			HACCP	0	0	0	0	0	0	0	0	0	0	0
			Cecal	0	0	0	0	0	0	0	0	0	0	0
		Turkeys	Retail						0.0%	100.0%	100.0%	100.0%	100.0%	50.0%
			HACCP	0					0	0	2	1	3	1
			Cecal											
		Cattle	Retail		0.0%							0.0%	0.0%	0.0%
			HACCP	0	8.3%	0.0%	14.3%	15.4%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)		1	0	1	2	0	0	0	1	0	0
		Swine	Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	10.0%		
			Cecal (Market Hogs) Cecal (Sows)	0	0	0	0	2	0	0	0	1		
														5.0%
												1		
												7.4%		
												2		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 54e. Antimicrobial Resistance among *Salmonella* Infantis Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	37	31	29	30	22	26	51	44	53	63	90	76	
	Chickens	Retail	1	0	0	0	1	1	5	3	3	4	3	8
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35
		Cecal												1
	Turkeys	Retail	0	0	0	0	0	0	1	1	2	1	3	2
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0
		Cecal												0
	Cattle	Retail Ground Beef	0	1	0	0	0	0	0	0	0	3	1	2
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7
		Cecal (Beef) Cecal (Dairy)												3
	Swine	Retail Pork Chops	0	0	0	1	2	5	1	2	1	1	1	1
		HACCP ¹	20	15	22	27	16	17	15	10	9	10	0	0
		Cecal (Market Hogs) Cecal (Sows)												20
													27	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal											0.0%
		Turkeys	Retail						0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%					0.0%		0.0%			
			Cecal											
		Cattle	Retail		0.0%							0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)											0.0%
		Swine	Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			Cecal (Market Hogs) Cecal (Sows)											0.0%
		Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0%	6.5%	3.4%	3.3%	0.0%	0.0%	2.0%	2.3%	0.0%	1.6%	4.4%
	Chickens		Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal											0.0%
	Turkeys		Retail						0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%					0.0%		0.0%			
			Cecal											
	Cattle		Retail		0.0%							0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)											0.0%
	Swine		Retail				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			Cecal (Market Hogs) Cecal (Sows)											0.0%
	Tetracyclines		Tetracycline (MIC ≥ 16 µg/ml)	Humans	2.7%	6.5%	0.0%	3.3%	4.5%	7.7%	3.9%	11.4%	3.8%	4.8%
		Chickens		Retail	0.0%				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP				0.0%	0.0%	5.3%	0.0%	12.5%	0.0%	0.0%	0.0%	25.0%	0.0%	5.7%
Cecal														0.0%
Turkeys		Retail							0.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		HACCP		100.0%				100.0%		100.0%				
		Cecal												
Cattle		Retail			0.0%							0.0%	0.0%	0.0%
		HACCP		0.0%	8.3%	0.0%	28.6%	15.4%	0.0%	0.0%	20.0%	6.7%	25.0%	0.0%
		Cecal (Beef) Cecal (Dairy)												0.0%
Swine		Retail					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP		10.0%	6.7%	4.5%	3.7%	12.5%	11.8%	0.0%	10.0%	33.3%	30.0%	
		Cecal (Market Hogs) Cecal (Sows)												15.0%
														11.1%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 55a. Resistance Patterns among *Salmonella* Infantis Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	37	31	29	30	22	26	51	44	53	63	90	76	
	Chickens	Retail Chickens	1	0	0	0	1	1	5	3	3	4	3	8
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35
		Cecal												1
	Turkeys	Retail Ground Turkeys	0	0	0	0	0	0	1	1	2	1	3	2
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0
		Cecal												0
	Cattle	Retail Ground Beef	0	1	0	0	0	0	0	0	0	3	1	2
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7
		Cecal (Beef)												1
		Cecal (Dairy)												3
	Swine	Retail Pork Chops	0	0	0	1	2	5	1	2	1	1	1	1
		HACCP ²	20	15	22	27	16	17	15	10	9	10		20
		Cecal (Market Hogs)												
Cecal (Sows)													27	
Resistance Pattern	Source													
1. No Resistance Detected	Humans	94.6% 35	83.9% 26	93.1% 27	90.0% 27	90.9% 20	92.3% 24	96.1% 49	84.1% 37	88.7% 47	93.7% 59	92.2% 83	81.6% 62	
	Chickens	Retail Chickens	100.0% 1				100.0% 1	100.0% 1	100.0% 5	100.0% 3	100.0% 3	75.0% 3	100.0% 3	87.5% 7
		HACCP	90.0% 18	100.0% 27	89.5% 17	94.1% 16	81.3% 13	100.0% 16	100.0% 14	100.0% 3	75.0% 3	93.8% 15	83.9% 26	88.6% 31
		Cecal												100.0% 1
	Turkeys	Retail Ground Turkeys							100.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP	0.0% 0					0.0% 0		0.0% 0				
		Cecal												
	Cattle	Retail Ground Beef		100.0% 1								100.0% 3	100.0% 1	100.0% 2
		HACCP	100.0% 26	91.7% 11	100.0% 18	71.4% 5	76.9% 10	100.0% 13	100.0% 4	100.0% 1	80.0% 4	93.3% 14	75.0% 3	100.0% 7
		Cecal (Beef)												100.0% 1
		Cecal (Dairy)												100.0% 3
	Swine	Retail Pork Chops				100.0% 1	100.0% 2	10.0% 5	100.0% 1	50.0% 1	100.0% 1	100.0% 1	100.0% 1	100.0% 1
		HACCP	80.0% 16	93.3% 14	90.9% 20	88.9% 24	81.3% 13	88.2% 15	100.0% 15	90.0% 9	66.7% 6	70.0% 7		
		Cecal (Market Hogs)												80.0% 16
		Cecal (Sows)												88.9% 24
	2. Resistant to ≥ 3 Antimicrobial Classes	Humans	2.7% 1	3.2% 1	0.0% 0	3.3% 1	4.5% 1	7.7% 2	3.9% 2	15.9% 7	3.8% 2	6.3% 4	4.4% 4	10.5% 8
Chickens		Retail Chickens	0.0% 0				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0	0.0% 0
		HACCP	0.0% 0	0.0% 0	5.3% 1	5.9% 1	18.8% 3	0.0% 0	0.0% 0	0.0% 0	25.0% 1	6.3% 1	0.0% 0	5.7% 2
		Cecal												0.0% 0
Turkeys		Retail Ground Turkeys							0.0% 0	100.0% 1	100.0% 2	100.0% 1	100.0% 3	100.0% 2
		HACCP	100.0% 1					100.0% 1		100.0% 1				
		Cecal												
Cattle		Retail Ground Beef		0.0% 0								0.0% 0	0.0% 0	0.0% 0
		HACCP	0.0% 0	8.3% 1	0.0% 0	14.3% 1	23.1% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 1	25.0% 1	0.0% 0
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
Swine		Retail Pork Chops				0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP	0.0% 0	0.0% 0	9.1% 2	0.0% 0	12.5% 2	0.0% 0	0.0% 0	10.0% 1	33.3% 3	30.0% 3		
		Cecal (Market Hogs)												15.0% 3
		Cecal (Sows)												7.4% 2
3. Resistant to ≥ 4 Antimicrobial Classes		Humans	2.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.0% 1	9.1% 4	1.9% 1	3.2% 2	2.2% 2	5.3% 4
	Chickens	Retail Chickens	0.0% 0				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0	0.0% 0	0.0% 0
		Cecal												0.0% 0
	Turkeys	Retail Ground Turkeys							0.0% 0	100.0% 1	100.0% 2	100.0% 1	100.0% 3	50.0% 1
		HACCP	0.0% 0					100.0% 1		100.0% 1				
		Cecal												
	Cattle	Retail Ground Beef		0.0% 0								0.0% 0	0.0% 0	0.0% 0
		HACCP	0.0% 0	8.3% 1	0.0% 0	14.3% 1	15.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 1	0.0% 0	0.0% 0
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.0% 1		
		Cecal (Market Hogs)												5.0% 1
		Cecal (Sows)												7.4% 2

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 55b. Resistance Patterns among *Salmonella* Infantis Isolates, 2002-2013¹

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of Isolates Tested	Humans		37	31	29	30	22	26	51	44	53	63	90	76
	Chickens	Retail Chickens	1	0	0	0	1	1	5	3	3	4	3	8
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35
		Cecal												1
	Turkeys	Retail Ground Turkeys	0	0	0	0	0	0	1	1	2	1	3	2
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0
		Cecal												0
	Cattle	Retail Ground Beef	0	1	0	0	0	0	0	0	0	3	1	2
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7
		Cecal (Beef)												1
		Cecal (Dairy)												3
	Swine	Retail Pork Chops	0	0	0	1	2	5	1	2	1	1	1	1
		HACCP ²	20	15	22	27	16	17	15	10	9	10		
		Cecal (Market Hogs)												20
		Cecal (Sows)												27
	Resistance Pattern		Source											
4. Resistant to ≥ 5 Antimicrobial Classes	Humans		2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	9.0%	1.9%	3.2%	2.2%	5.3%
	Chickens	Retail Chickens	1	0	0	0	0	0	1	4	1	2	2	4
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal	0	0	0	0	0	0	0	0	25.0%	0.0%	0.0%	0.0%
	Turkeys	Retail Ground Turkeys							0	100.0%	100.0%	100.0%	100.0%	50.0%
		HACCP	0	0	0	0	0	1	0	1	0	0	0	1
		Cecal												0
	Cattle	Retail Ground Beef		0.0%								0.0%	0.0%	0.0%
		HACCP	0	1	0	1	2	0	0	0	0	6.7%	0.0%	0.0%
		Cecal (Beef)												0.0%
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	0	1	0	0	0	0	10.0%	0	0
		Cecal (Market Hogs)												5.0%
		Cecal (Sows)												7.4%
														2
5. At Least ACSSuT ³ Resistant	Humans		2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.5%	1.9%	0.0%	0.0%	1.3%
	Chickens	Retail Chickens	1	0	0	0	0	0	1	2	1	0	0	1
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal	0	0	0	0	0	0	0	0	25.0%	0.0%	0.0%	0.0%
	Turkeys	Retail Ground Turkeys							0	100.0%	100.0%	100.0%	100.0%	50.0%
		HACCP	0	0	0	0	0	1	0	0	0	0	0	1
		Cecal												0
	Cattle	Retail Ground Beef		0.0%								0.0%	0.0%	0.0%
		HACCP	0	1	0	1	2	0	0	0	0	6.7%	0.0%	0.0%
		Cecal (Beef)												0.0%
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	0	1	0	0	0	0	10.0%	0	0
		Cecal (Market Hogs)												5.0%
		Cecal (Sows)												7.4%
														2
6. At Least ACT/S ⁴ Resistant	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
	Chickens	Retail Chickens	0	0	0	0	0	0	0	0	0	0	0	1
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0
	Turkeys	Retail Ground Turkeys							0	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal												0
	Cattle	Retail Ground Beef		0.0%								0.0%	0.0%	0.0%
		HACCP	0	0	0	0	1	0	0	0	0	6.7%	0.0%	0.0%
		Cecal (Beef)												0.0%
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal (Market Hogs)												0.0%
		Cecal (Sows)												3.7%
														1

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 55c. Resistance Patterns among *Salmonella* Infantis Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		37	31	29	30	22	26	51	44	53	63	90	76	
	Chickens	Retail Chickens	1	0	0	0	1	1	5	3	3	4	3	8	
		HACCP	20	27	19	17	16	16	14	3	4	16	31	35	
		Cecal												1	
	Turkeys	Retail Ground Turkeys	0	0	0	0	0	0	1	1	2	1	3	2	
		HACCP	1	0	0	0	0	1	0	1	0	0	0	0	
		Cecal												0	
	Cattle	Retail Ground Beef	0	1	0	0	0	0	0	0	0	0	3	1	2
		HACCP	26	12	18	7	13	13	4	1	5	15	4	7	
		Cecal (Beef)												1	
		Cecal (Dairy)												3	
	Swine	Retail Pork Chops	0	0	0	1	2	5	1	2	1	1	1	1	
		HACCP ¹	20	15	22	27	16	17	15	10	9	10	10	20	
		Cecal (Market Hogs)												1	
		Cecal (Sows)												27	
Resistance Pattern		Source													
7. At Least ACSSuTAuCx ¹ Resistant	Humans		2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	1.9%	0.0%	0.0%	1.3%	
	Chickens	Retail Chickens	1	0	0	0	0	0	0	2	1	0	0	1	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0	0	0	0	0	0	0	0	25.0%	0.0%	0.0%	0.0%	
		Cecal									1	0	0	0	
	Turkeys	Retail Ground Turkeys							0.0%	100.0%	100.0%	100.0%	100.0%	50.0%	
		HACCP	0.0%					0.0%		0.0%					
		Cecal	0											1	
	Cattle	Retail Ground Beef		0.0%									0.0%	0.0%	
		HACCP	0.0%	8.3%	0.0%	14.3%	15.4%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%	
		Cecal (Beef)	0	1	0	1	2	0	0	0	0	1	0	0	
		Cecal (Dairy)												0.0%	
	Swine	Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	10.0%			
		Cecal (Market Hogs)	0	0	0	0	1	0	0	0	0	1		5.0%	
		Cecal (Sows)												7.4%	
														2	
	8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	2.6%
Chickens		Retail Chickens	0	0	0	0	0	0	0	0	0	0	0	1	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal												0.0%	
Turkeys		Retail Ground Turkeys							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%					0.0%		0.0%					
		Cecal	0												
Cattle		Retail Ground Beef		0.0%									0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Dairy)												0.0%	
Swine		Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
		Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0		0.0%	
		Cecal (Sows)												0.0%	
													0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 56a. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	105	96	92	125	102	98	75	86	62	70	41	60		
	Chickens	Retail	11	16	31	22	30	14	30	44	21	11	17	28	
		HACCP	403	226	167	283	164	142	94	74	25	28	81	29	
		Cecal												9	
	Turkeys	Retail	21	32	37	53	35	41	57	10	17	28	5	17	
		HACCP	60	57	46	25	43	23	8	3	14	5	19	6	
		Cecal												2	
	Cattle	Retail	0	0	0	0	0	0	1	0	0	0	0	1	
		HACCP	8	9	1	6	4	0	3	0	2	0	2	2	
		Cecal (Beef)												1	
	Swine	Retail	3	0	3	0	4	0	0	1	0	1	1	2	
		HACCP ¹	11	11	4	8	13	2	1	4	5	0		1	
		Cecal (Market Hogs)												3	
		Cecal (Sows)												0	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	3.8%	5.2%	4.3%	6.4%	4.9%	16.3%	14.7%	2.3%	8.1%	20.0%	7.3%	21.7%	
		Chickens	Retail	45.5%	18.8%	9.7%	13.6%	20.0%	7.1%	26.7%	2.3%	4.8%	0.0%	0.0%	21.4%
			HACCP	5	4	3	3	6	1	8	1	1	0	0	6
			Cecal	8.9%	7.5%	10.2%	9.2%	9.8%	11.3%	10.6%	23.0%	28.0%	14.3%	13.6%	10.3%
		Turkeys	Retail	23.8%	12.5%	35.1%	37.7%	31.4%	24.4%	57.9%	70.0%	29.4%	78.6%	100.0%	82.4%
			HACCP	5	4	13	20	11	10	33	7	5	22	5	14
			Cecal	18.3%	12.3%	17.4%	36.0%	32.6%	13.0%	50.0%	33.3%	21.4%	60.0%	57.9%	50.0%
		Cattle	Retail							100.0%					100.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%		33.3%		50.0%		50.0%	0.0%
			Cecal (Beef)												0.0%
		Swine	Retail	100.0%		0.0%		75.0%			0.0%		0.0%	100.0%	0.0%
			HACCP	3	0	0	0	3	0	0	0	0	0	1	0
	Cecal (Market Hogs)		9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%			0.0%	
		Cecal (Sows)	1	0	0	0	0	0	1	0	0			0	
														33.3%	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	10.5%	8.3%	8.7%	12.8%	8.8%	11.2%	26.7%	20.9%	21.0%	21.4%	9.8%	26.7%	
		Chickens	Retail	36.4%	0.0%	0.0%	0.0%	0.0%	7.1%	10.0%	15.9%	19.0%	0.0%	0.0%	21.4%
			HACCP	4	0	0	0	0	1	3	7	4	0	0	6
			Cecal	3.7%	5.3%	6.0%	6.7%	7.3%	6.3%	8.5%	12.2%	32.0%	7.1%	4.9%	3.4%
		Turkeys	Retail	38.1%	34.4%	27.0%	30.2%	34.3%	56.1%	52.6%	20.0%	76.5%	32.1%	0.0%	35.3%
			HACCP	8	11	10	16	12	23	30	2	13	9	0	6
			Cecal	30.0%	21.1%	19.6%	44.0%	27.9%	34.8%	50.0%	66.7%	64.3%	20.0%	31.6%	50.0%
		Cattle	Retail							100.0%					0.0%
			HACCP	37.5%	55.6%	100.0%	50.0%	0.0%		33.3%		50.0%		50.0%	0.0%
			Cecal (Beef)	3	5	1	3	0		1		1		1	0.0%
		Swine	Retail	0.0%		33.3%		0.0%			100.0%		100.0%	0.0%	100.0%
			HACCP	0	1	1	0	0	0	0	1	0	1	0	2
	Cecal (Market Hogs)		54.5%	100.0%	75.0%	75.0%	84.6%	100.0%	100.0%	50.0%	60.0%			100.0%	
		Cecal (Sows)	6	11	3	6	11	2	1	2	3			0	
														33.3%	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	17.1%	12.5%	15.2%	13.6%	11.8%	12.2%	30.7%	23.3%	25.8%	37.1%	17.1%	40.0%	
		Chickens	Retail	63.6%	12.5%	22.6%	18.2%	23.3%	21.4%	40.0%	13.6%	14.3%	9.1%	0.0%	28.6%
			HACCP	7	2	7	4	7	3	12	6	3	1	0	8
			Cecal	18.6%	17.7%	18.0%	15.5%	10.4%	13.4%	16.0%	27.0%	44.0%	14.3%	12.3%	10.3%
		Turkeys	Retail	57.1%	37.5%	43.2%	47.2%	45.7%	39.0%	71.9%	60.0%	94.1%	92.9%	80.0%	70.6%
			HACCP	12	12	16	25	16	16	41	6	16	26	4	12
Cecal			35.0%	28.1%	21.7%	44.0%	34.9%	26.1%	37.5%	66.7%	57.1%	60.0%	63.2%	50.0%	
Cattle		Retail							100.0%					0.0%	
		HACCP	37.5%	55.6%	100.0%	50.0%	0.0%		33.3%		50.0%		100.0%	50.0%	
		Cecal (Beef)	3	5	1	3	0		1		1		2	1	
Swine		Retail	100.0%		33.3%		0.0%			100.0%		100.0%	0.0%	100.0%	
		HACCP	3	11	3	7	9	2	1	2	4			2	
	Cecal (Market Hogs)	45.5%	100.0%	75.0%	87.5%	69.2%	100.0%	100.0%	50.0%	80.0%			100.0%		
	Cecal (Sows)	5	11	3	7	9	2	1	2	4			1		
													33.3%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 56b. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans	105	96	92	125	102	98	75	86	62	70	41	60		
	Chickens	Retail	11	16	31	22	30	14	30	44	21	11	17	28	
		HACCP	403	226	167	283	164	142	94	74	25	28	81	29	
		Cecal												9	
	Turkeys	Retail	21	32	37	53	35	41	57	10	17	28	5	17	
		HACCP	60	57	46	25	43	23	8	3	14	5	19	6	
		Cecal												2	
	Cattle	Retail	0	0	0	0	0	0	1	0	0	0	0	1	
		HACCP	8	9	1	6	4	0	3	0	2	0	2	2	
		Cecal (Beef)												1	
		Cecal (Dairy)												0	
	Swine	Retail	3	0	3	0	4	0	0	1	0	1	1	2	
		HACCP ¹	11	11	4	8	13	2	1	4	5	0		1	
Cecal (Market Hogs) Cecal (Sows)													3		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	9.5% 10	5.2% 5	9.8% 9	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18	24.2% 15	10.0% 7	22.0% 9	13.3% 8	
		Chickens	Retail	0.0% 0	6.3% 1	9.7% 3	13.6% 3	10.0% 3	21.4% 3	16.7% 5	31.8% 14	19.0% 4	0.0% 0	0.0% 0	0.0% 0
			HACCP	8.7% 35	9.3% 21	10.2% 17	21.9% 62	15.9% 26	17.6% 25	8.5% 8	17.6% 13	32.0% 8	17.9% 5	7.4% 6	10.3% 3
			Cecal												11.1% 1
		Turkeys	Retail	19.0% 4	9.4% 3	5.4% 2	9.4% 5	17.1% 6	9.8% 4	7.0% 4	10.0% 1	23.5% 4	39.6% 11	0.0% 0	29.4% 5
			HACCP	5.0% 3	0.0% 0	6.5% 3	0.0% 0	9.3% 4	26.1% 6	12.5% 1	33.3% 1	35.7% 5	20.0% 1	10.5% 2	66.7% 4
			Cecal												0.0% 0
		Cattle	Retail							0.0% 0					0.0% 0
			HACCP	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1		50.0% 1		0.0% 0	50.0% 1
			Cecal (Beef) Cecal (Dairy)												100.0% 1
		Swine	Retail	0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0	0.0% 0	0.0% 0
			HACCP	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	20.0% 1			0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												66.7% 1
Cepheems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	8.6% 9	5.2% 5	7.6% 7	8.8% 11	8.8% 9	7.1% 7	8.0% 6	19.8% 17	24.2% 15	8.6% 6	22.0% 9	15.0% 9	
		Chickens	Retail	0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.8% 14	14.3% 3	0.0% 0	0.0% 0	0.0% 0
			HACCP	7.4% 30	7.1% 16	10.2% 17	21.6% 61	15.2% 25	16.9% 24	8.5% 8	17.6% 13	32.0% 8	17.9% 5	6.2% 5	6.9% 2
			Cecal												11.1% 1
		Turkeys	Retail	19.0% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.5% 2	10.0% 1	23.5% 4	35.7% 10	0.0% 0	29.4% 5
			HACCP	1.7% 1	0.0% 0	6.5% 3	0.0% 0	9.3% 4	17.4% 4	12.5% 1	33.3% 1	35.7% 5	20.0% 1	10.5% 2	66.7% 4
			Cecal												0.0% 0
		Cattle	Retail							0.0% 0					0.0% 0
			HACCP	37.5% 3	44.4% 4	100.0% 1	66.7% 4	0.0% 0		33.3% 1		50.0% 1		0.0% 0	50.0% 1
			Cecal (Beef) Cecal (Dairy)												100.0% 1
		Swine	Retail	0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0	2.0% 0	0.0% 0
			HACCP	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												66.7% 2
Ceftiofur	(MIC ≥ 8 µg/ml)	Humans	7.6% 8	5.2% 5	8.7% 8	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18	24.2% 15	8.6% 6	22.0% 9	15.0% 9	
		Chickens	Retail	0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.8% 14	19.0% 4	0.0% 0	0.0% 0	0.0% 0
			HACCP	8.9% 36	9.3% 21	10.2% 17	21.9% 62	15.9% 26	16.9% 24	8.5% 8	17.6% 13	32.8% 8	17.9% 5	7.4% 6	10.3% 3
			Cecal												11.1% 1
		Turkeys	Retail	19.0% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.5% 2	10.0% 1	23.5% 4	39.3% 11	0.0% 0	29.4% 5
			HACCP	5.0% 3	0.0% 0	6.5% 3	0.0% 0	9.3% 4	26.1% 6	12.5% 1	33.3% 1	35.7% 5	20.0% 1	10.5% 2	66.7% 4
			Cecal												0.0% 0
		Cattle	Retail							0.0% 0					0.0% 0
			HACCP	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1		50.0% 1		0.0% 0	50.0% 1
			Cecal (Beef) Cecal (Dairy)												100.0% 1
		Swine	Retail	0.0% 0		0.0% 0		0.0% 0			100.0% 1		0.0% 0	0.0% 0	0.0% 0
			HACCP	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												66.7% 2

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 56d. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		105	96	92	125	102	98	75	86	62	70	41	60	
		Chickens	Retail	11	16	31	22	30	14	30	44	21	11	17	28
			HACCP	403	226	167	283	164	142	94	74	25	28	81	29
	Turkeys	Retail	21	32	37	53	35	41	57	10	17	28	5	17	
		HACCP	8	9	1	6	4	0	3	0	2	0	2	2	
		Cecal												1	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	1	0	0	0	0	1	
		HACCP	8	9	1	6	4	0	3	0	2	0	2	2	
		Cecal (Beef)												1	
	Swine	Retail Pork Chops	3	0	3	0	4	0	0	1	0	1	1	2	
		HACCP ¹	11	11	4	8	13	2	1	4	5	0			
		Cecal (Market Hogs)												1	
		Cecal (Sows)												3	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0%	0.0%	0.0%
Chickens			Retail										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
Turkeys			Retail										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal												0.0%
Cattle			Retail												0.0%
			HACCP											0.0%	0.0%
			Cecal (Beef)												0.0%
Swine			Retail										0.0%	0.0%	0.0%
			HACCP												
			Cecal (Market Hogs)												0.0%
			Cecal (Sows)												0.0%
Penicillins			Ampicillin (MIC ≥ 32 µg/ml)	Humans	12.4%	10.4%	25.0%	20.0%	18.6%	18.4%	28.0%	27.9%	38.7%	30.0%	26.8%
	Chickens	Retail		13	10	23	25	19	18	21	24	24	21	11	20
		HACCP		18.2%	18.8%	25.8%	27.3%	16.7%	21.4%	23.3%	31.8%	19.0%	0.0%	0.0%	3.6%
		Cecal		2	3	8	6	5	3	7	14	4	0	0	1
	Turkeys	Retail		14.9%	19.0%	16.2%	25.1%	16.5%	20.4%	13.8%	20.3%	40.0%	21.4%	9.9%	24.1%
		HACCP		60	43	27	71	27	29	13	15	10	6	8	7
		Cecal													33.3%
	Cattle	Retail		19.0%	9.4%	13.5%	18.9%	31.4%	53.7%	82.5%	80.0%	70.6%	96.4%	100.0%	82.4%
		HACCP		4	3	5	10	11	22	47	8	12	27	5	14
		Cecal (Beef)		13.3%	3.5%	17.4%	24.0%	37.2%	65.2%	50.0%	66.7%	57.1%	60.0%	57.9%	66.7%
	Swine	Retail		8	2	8	6	16	15	4	2	8	3	11	4
		HACCP													50.0%
		Cecal (Market Hogs)													1
		Cecal (Sows)													0.0%
	Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)		Humans	1.0%	0.0%	1.1%	0.8%	0.0%	3.1%	1.3%	4.7%	1.6%	4.3%	0.0%
Chickens			Retail	1	0	1	1	0	3	1	4	1	3	0	4
			HACCP	0.0%	0.0%	3.2%	0.0%	0.0%	7.1%	3.3%	0.0%	0.0%	0.0%	0.0%	3.9%
			Cecal	0	0	1	0	0	1	0	0	0	0	0	1
Turkeys			Retail	1.7%	3.1%	4.2%	3.2%	2.4%	4.2%	4.3%	5.4%	20.0%	3.6%	6.2%	3.4%
			HACCP	7	7	7	9	4	6	4	4	5	1	5	1
			Cecal												0.0%
Cattle			Retail	0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.7%	0.0%	0.0%
			HACCP	0	0	2	0	0	0	0	0	0	3	0	0
			Cecal (Beef)	1.7%	0.0%	0.0%	0.0%	4.7%	4.3%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Swine			Retail	1	0	0	0	2	1	1	0	0	0	0	0
			HACCP												0.0%
			Cecal (Market Hogs)												0.0%
			Cecal (Sows)												33.3%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 56e. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		105	96	92	125	102	98	75	86	62	70	41	60	
		Chickens	Retail	11	16	31	22	30	14	30	44	21	11	17	28
			HACCP	403	226	167	283	164	142	94	74	25	28	81	29
	Cecal													9	
	Turkeys	Retail	21	32	37	53	35	41	57	10	17	28	5	17	
		HACCP	60	57	46	25	43	23	8	3	14	5	19	6	
		Cecal												2	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	1	0	0	0	0	1	
		HACCP	8	9	1	6	4	0	3	0	2	0	2	2	
		Cecal (Beef) Cecal (Dairy)												1 0	
	Swine	Retail Pork Chops	3	0	3	0	4	0	0	1	0	1	1	2	
		HACCP ¹	11	11	4	8	13	2	1	4	5	0			
		Cecal (Market Hogs) Cecal (Sows)												1 3	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Chickens	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cecal															0.0%
															0
Turkeys			Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	1	0	0	0	0	0	0	0	0	0	0	0.0%
Cattle			Retail							0.0%					0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%		0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)												0.0% 0
Swine			Retail	0.0%		0.0%		0.0%			0.0%		0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal (Market Hogs)												0.0%
			Cecal (Sows)												0.0%
Nalidixic Acid (MIC ≥ 32 µg/ml)			Humans	0.0%	1.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens	Retail	0.0%	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	3	0	0	0	0	0	0	0	0	0	0	0.0%
															0
		Turkeys	Retail	4.8%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	1	0	0	0	0	0	0	0	0	0	0	0.0%
		Cattle	Retail							0.0%					0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%		0.0%	0.0%
			Cecal (Beef) Cecal (Dairy)												100.0% 1
		Swine	Retail	0.0%		0.0%		0.0%			0.0%		0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal (Market Hogs)												0.0%
			Cecal (Sows)												33.3%
		Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	19.0%	16.7%	19.6%	18.4%	13.7%	22.4%	36.0%	27.9%	22.6%	34.3%	14.6%
Chickens				Retail	20	16	18	23	14	22	27	24	14	24	6
	HACCP			45.5%	0.0%	6.5%	4.5%	3.3%	7.1%	26.7%	15.9%	19.0%	9.1%	0.0%	26.9%
	Cecal			5	0	2	1	1	1	8	7	4	1	0	7
				11.7%	16.4%	15.0%	14.5%	12.2%	12.7%	13.8%	14.9%	32.0%	10.7%	12.3%	3.4%
Turkeys	Retail			57.1%	43.8%	70.3%	56.6%	68.6%	70.7%	79.0%	60.0%	82.4%	92.9%	100.0%	88.2%
	HACCP			12	14	26	30	24	29	45	6	14	26	5	15
	Cecal			70.0%	84.2%	73.9%	64.0%	62.8%	65.2%	87.5%	66.7%	100.0%	80.0%	57.9%	16.7%
Cattle	Retail			42	48	34	16	27	15	7	2	14	4	11	
	HACCP														100.0%
	Cecal (Beef) Cecal (Dairy)														100.0% 1
Swine	Retail			66.7%		100.0%		0.0%			100.0%		100.0%	100.0%	100.0%
	HACCP		2		3		0			1		1	1	2	
	Cecal (Market Hogs) Cecal (Sows)		72.7%	100.0%	75.0%	87.5%	92.3%	100.0%	100.0%	100.0%	80.0%			100.0% 1	
	8		11	3	7	12	2	1	4	4				33.3%	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 57c. Resistance Patterns among *Salmonella* Heidelberg Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	105	96	92	125	102	98	75	86	62	70	41	60	
	Chickens	Retail Chickens	11	16	31	22	30	14	30	44	21	11	17	28
		HACCP	403	226	167	283	164	142	94	74	25	28	81	29
		Cecal												9
	Turkeys	Retail Ground Turkey	21	32	37	53	35	41	57	10	17	28	5	17
		HACCP	60	57	46	25	43	23	8	3	14	5	19	6
		Cecal												2
	Cattle	Retail Ground Beef	0	0	0	0	0	0	1	0	0	0	0	1
		HACCP	8	9	1	6	4	0	3	0	2	0	2	2
		Cecal (Beef)												1
	Swine	Retail Pork Chops	3	0	3	0	4	0	0	1	0	1	1	2
		HACCP ¹	11	11	4	8	13	2	1	4	5	0		1
		Cecal (Market Hogs)												3
		Cecal (Sows)												1
Resistance Pattern		Source												
7. At Least ACSSuTAuCx ² Resistant	Humans	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	1.4%	0.0%	1.7%	
	Chickens	Retail Chickens	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	0	0	1	0	0	0	0	0	0	0	0	0
			1.5%	2.2%	2.4%	2.8%	1.8%	4.2%	2.1%	4.1%	16.0%	3.6%	2.5%	0.0%
	Turkeys	Retail Ground Turkey	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.7%	0.0%	0.0%
		Cecal	0	0	2	0	0	0	0	0	0	3	0	0
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP	1.7%	0.0%	0.0%	0.0%	4.7%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)	1	0	0	0	2	1	0	0	0	0	0	0
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops							0.0%					0.0%
		HACCP	12.5%	33.3%	100.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%
		Cecal (Beef)	1	3	1	3	0	0	0	0	0	0	0	1
		Cecal (Dairy)												100.0%
	Swine	Retail Pork Chops	0.0%		0.0%		0.0%			0.0%		0.0%	0.0%	0.0%
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal (Market Hogs)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%
Cecal (Sows)		0	0	0	0	0	0	0	0	0			0	
												33.3%		
												1		
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0
			0.70%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Turkeys	Retail Ground Turkey	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0
	Cattle	Retail Ground Beef							0.0%					0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal (Dairy)												100.0%
	Swine	Retail Pork Chops								0.0%		0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%
		Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0			0
		Cecal (Sows)												33.3%
													1	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 58a. Antimicrobial Resistance among *Salmonella* Derby Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	11	5	8	3	3	8	11	13	2	6	7	5		
	Chickens	Retail	0	0	0	0	0	0	1	0	0	0	0	0	
		HACCP	2	0	0	2	1	0	0	0	0	0	0	1	
		Cecal												0	
	Turkeys	Retail	0	0	3	1	2	1	6	5	2	2	1	0	
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2	
		Cecal												0	
	Cattle	Retail	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1	
		Cecal (Beef)												0	
	Swine	Retail	0	0	0	0	0	4	0	3	6	2	1	5	
		HACCP ¹	130	46	84	85	56	29	25	24	18	10		38	
		Cecal (Market Hogs)												24	
		Cecal (Sows)													
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%		
		Chickens	Retail	0	0	0	0	0	0	100.0%	0	1	0	0	
			HACCP	0.0%			0.0%	0.0%							0.0%
			Cecal												0
		Turkeys	Retail			0.0%	0.0%	100.0%	0.0%	66.7%	60.0%	50.0%	100.0%	0.0%	
			HACCP	0.0%		20.0%	0.0%	0.0%	0.0%	4	3	1	2	0.0%	0.0%
			Cecal			3	0	0	0		1	0	0	0	0
		Cattle	Retail												
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%		0.0%
			Cecal (Beef)												
		Swine	Retail						0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	2.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
	Cecal (Market Hogs)					2	1	0						0	
	Cecal (Sows)												0.0%		
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail					1	0	0.0%	0	0	0	0	
			HACCP	0.0%			50.0%	0.0%							0.0%
			Cecal				1	0							0
		Turkeys	Retail			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal												0
		Cattle	Retail												
			HACCP	0.0%	15.4%	0.0%	33.3%	0.0%	0.0%			0.0%	0.0%		0.0%
			Cecal (Beef)		2	0	2	0	0			0	0		0
		Swine	Retail						0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.8%	0.0%	0.0%	0.0%	3.6%	3.4%	4.0%	0.0%	0.0%	0.0%		0.0%
	Cecal (Market Hogs)		1	0	0	0	2	1	1	0	0	0		2.6%	
	Cecal (Sows)												0.0%		
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	27.3%	40.0%	50.0%	0.0%	66.7%	62.5%	27.3%	46.2%	50.0%	50.0%	57.1%	40.0%	
		Chickens	Retail	3	2	4	0	2	5	3	6	1	3	4	2
			HACCP	0.0%			100.0%	0.0%		100.0%					0.0%
			Cecal				2	0		1					0
		Turkeys	Retail			0.0%	0.0%	0.0%	0.0%	83.3%	60.0%	50.0%	100.0%	0.0%	
			HACCP	0.0%		40.0%	33.3%	14.3%	0.0%	5	3	1	2	0.0%	50.0%
			Cecal			6	1	1	0		1	0	0	0	1
		Cattle	Retail												
HACCP			33.3%	46.2%	66.7%	66.7%	50.0%	0.0%			0.0%	0.0%		100.0%	
Cecal (Beef)			6	6	8	4	1	0			0	0		1	
Swine		Retail						0.0%		33.3%	50.0%	0.0%	100.0%	40.0%	
		HACCP	67.7%	54.3%	56.0%	61.2%	55.4%	48.3%	72.0%	58.3%	50.0%	40.0%		22	
	Cecal (Market Hogs)	88	25	47	52	31	14	18	14	9	4		57.9%		
Cecal (Sows)												12			

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 58b. Antimicrobial Resistance among *Salmonella* Derby Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		11	5	8	3	3	8	11	13	2	6	7	5		
		Chickens	Retail	0	0	0	0	0	0	1	0	0	0	0	0	
			HACCP	2	0	0	2	1	0	0	0	0	0	0	1	
	Cecal													0		
	Turkeys	Retail	0	0	3	1	2	1	6	5	2	2	1	0		
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2		
		Cecal												0		
	Cattle	Retail	0	0	0	0	0	0	0	0	0	0	0	0		
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1		
		Cecal (Beef) Cecal (Dairy)												0		
	Swine	Retail	0	0	0	0	0	4	0	3	6	2	1	5		
		HACCP ¹	130	46	84	85	56	29	25	24	18	10		38		
		Cecal (Market Hogs) Cecal (Sows)												24		
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
	β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	14.3% 1	0.0% 0	
Chickens			Retail								0.0% 0					
			HACCP	0.0% 0			50.0% 1	0.0% 0							0.0% 0	
			Cecal													
Turkeys			Retail			66.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	40.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
Cattle			Retail													
			HACCP	5.6% 1	15.4% 2	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
			Cecal (Beef) Cecal (Dairy)												0.0% 0	
Swine			Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	1.5% 2	2.2% 1	1.2% 1	0.0% 0	0.0% 0	0.0% 0	8.0% 2	4.2% 1	0.0% 0	0.0% 0		0.0% 0	
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0	
Cephems			Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	14.3% 1	0.0% 0
				Chickens	Retail								0.0% 0			
	HACCP	0.0% 0					50.0% 1	0.0% 0							0.0% 0	
	Cecal															
	Turkeys	Retail				66.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	40.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP		0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal														
	Cattle	Retail														
		HACCP		5.6% 1	15.4% 2	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
		Cecal (Beef) Cecal (Dairy)													0.0% 0	
	Swine	Retail							0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP		1.5% 2	2.2% 1	1.2% 1	0.0% 0	0.0% 0	0.0% 0	8.0% 2	4.2% 1	0.0% 0	0.0% 0		0.0% 0	
		Cecal (Market Hogs) Cecal (Sows)													0.0% 0	
		Ceftiofur (MIC ≥ 8 µg/ml)		Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	14.3% 1	0.0% 0
				Chickens	Retail								0.0% 0			
HACCP			0.0% 0				50.0% 1	0.0% 0							0.0% 0	
Cecal																
Turkeys			Retail			66.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	40.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
Cattle			Retail													
			HACCP	5.6% 1	15.4% 2	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
			Cecal (Beef) Cecal (Dairy)												0.0% 0	
Swine			Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	1.5% 2	2.2% 1	1.2% 1	0.0% 0	0.0% 0	0.0% 0	8.0% 2	4.2% 1	0.0% 0	0.0% 0		0.0% 0	
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 58c. Antimicrobial Resistance among *Salmonella* Derby Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	11	5	8	3	3	8	11	13	2	6	7	5		
	Chickens	Retail	0	0	0	0	0	0	1	0	0	0	0	0	
		HACCP	2	0	0	2	1	0	0	0	0	0	0	1	
		Cecal												0	
	Turkeys	Retail	0	0	3	1	2	1	6	5	2	2	1	0	
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1	
		Cecal (Beef) Cecal (Dairy)												0 2	
	Swine	Retail Pork Chops	0	0	0	0	0	4	0	3	6	2	1	5	
		HACCP ¹	130	46	84	85	56	29	25	24	18	10		38	
		Cecal (Market Hogs) Cecal (Sows)												24	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	14.3% 1	0.0% 0	
		Chickens	Retail							0.0% 0					
			HACCP	0.0% 0			50.0% 1	0.0% 0							0.0% 0
			Cecal												
		Turkeys	Retail			66.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	40.0% 2	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail												
			HACCP	5.6% 1	15.4% 2	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0
			Cecal (Beef) Cecal (Dairy)												0.0% 0
		Swine	Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	1.5% 2	2.2% 1	1.2% 1	0.0% 0	0.0% 0	0.0% 0	8.0% 2	4.2% 1	0.0% 0	0.0% 0		0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0
		Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	45.5% 5	40.0% 2	62.5% 5	33.3% 1	66.7% 2	62.5% 5	36.4% 4	61.5% 8	50.0% 1	50.0% 3	57.1% 4
Chickens	Retail									100.0% 1					
	HACCP			50.0% 1			100.0% 2	0.0% 0							0.0% 0
	Cecal														
Turkeys	Retail					0.0% 0	0.0% 0	100.0% 2	0.0% 0	66.7% 4	60.0% 3	50.0% 1	100.0% 2	0.0% 0	
	HACCP			0.0% 0		33.3% 5	33.3% 1	14.3% 1	0.0% 0		75.0% 3	0.0% 0	0.0% 0	0.0% 0	50.0% 1
	Cecal														
Cattle	Retail														
	HACCP			27.8% 5	53.8% 7	66.7% 8	66.7% 4	50.0% 1	100.0% 1			0.0% 0	0.0% 0		100.0% 1
	Cecal (Beef) Cecal (Dairy)														0.0% 0
Swine	Retail								0.0% 0		33.3% 1	50.0% 3	0.0% 0	100.0% 1	40.0% 2
	HACCP			63.1% 82	47.8% 22	57.1% 48	60.0% 51	48.2% 27	55.2% 16	72.0% 18	62.5% 15	44.4% 8	40.0% 4		55.3% 21
	Cecal (Market Hogs) Cecal (Sows)														50.0% 12
Folate Pathway Inhibitor	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)			Humans	0.0% 0	0.0% 0	25.0% 2	0.0% 0	33.3% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	14.3% 1
		Chickens	Retail							0.0% 0					
			HACCP	0.0% 0			0.0% 0	0.0% 0							0.0% 0
			Cecal												
		Turkeys	Retail			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Cattle	Retail												
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0
			Cecal (Beef) Cecal (Dairy)												0.0% 0
		Swine	Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			HACCP	0.8% 1	2.2% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	4.0% 1	4.2% 1	0.0% 0	0.0% 0		0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 58d. Antimicrobial Resistance among *Salmonella* Derby Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans	11	5	8	3	3	8	11	13	2	6	7	5			
	Chickens	Retail	0	0	0	0	0	0	1	0	0	0	0	0		
		HACCP	2	0	0	2	1	0	0	0	0	0	0	1		
		Cecal												0		
	Turkeys	Retail	0	0	3	1	2	1	6	5	2	2	1	0		
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1		
		Cecal												0		
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0		
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1		
		Cecal (Beef) Cecal (Dairy)												0 2		
	Swine	Retail Pork Chops	0	0	0	0	0	4	0	3	6	2	1	5		
		HACCP ¹	130	46	84	85	56	29	25	24	18	10				
		Cecal (Market Hogs) Cecal (Sows)												38 24		
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
	Macrolides	Azithromycin (MIC ≥ 32 µg/ml)	Humans										0.0% 0	0.0% 0	0.0% 0	
Chickens			Retail													
			HACCP												0.0% 0	
			Cecal													
Turkeys			Retail									0.0% 0	0.0% 0			
			HACCP									0.0% 0	0.0% 0	0.0% 0		
			Cecal													
Cattle			Retail													
			HACCP									0.0% 0			0.0% 0	
			Cecal (Beef) Cecal (Dairy)												0.0% 0	
Swine			Retail									0.0% 0	0.0% 0	0.0% 0		
			HACCP									0.0% 0			0.0% 0	
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	
Penicillins			Ampicillin (MIC ≥ 32 µg/ml)	Humans	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	9.1% 1	7.7% 1	0.0% 0	16.7% 1	14.3% 1	0.0% 0
				Chickens	Retail							0.0% 0				
	HACCP	0.0% 0					50.0% 1	0.0% 0							0.0% 0	
	Cecal															
	Turkeys	Retail				66.7% 2	0.0% 0	0.0% 0	0.0% 0	16.7% 1	40.0% 2	0.0% 0	0.0% 0	0.0% 0		
		HACCP		0.0% 0		6.7% 1	0.0% 0	0.0% 0	0.0% 0		50.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal														
	Cattle	Retail														
		HACCP		5.6% 1	15.4% 2	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
		Cecal (Beef) Cecal (Dairy)													0.0% 0	
	Swine	Retail							0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP		6.9% 9	2.2% 1	3.6% 3	1.2% 1	1.8% 1	3.4% 1	8.0% 2	4.2% 1	0.0% 0	0.0% 0		2.6% 1	
		Cecal (Market Hogs) Cecal (Sows)													0.0% 0 0.0% 0	
	Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)		Humans	0.0% 0	0.0% 0	12.5% 1	0.0% 0	33.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	28.6% 2	0.0% 0
				Chickens	Retail							0.0% 0				
HACCP			0.0% 0				0.0% 0	0.0% 0							0.0% 0	
Cecal																
Turkeys			Retail			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
Cattle			Retail													
			HACCP	0.0% 0	7.7% 1	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
			Cecal (Beef) Cecal (Dairy)												0.0% 0	
Swine			Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	2.3% 3	0.0% 0	2.4% 2	1.2% 1	0.0% 0	0.0% 0	12.0% 3	4.2% 1	0.0% 0	0.0% 0		0.0% 0	
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 58e. Antimicrobial Resistance among *Salmonella* Derby Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	11	5	8	3	3	8	11	13	2	6	7	5		
	Chickens	Retail	0	0	0	0	0	0	1	0	0	0	0	0	
		HACCP	2	0	0	2	1	0	0	0	0	0	0	1	
		Cecal												0	
	Turkeys	Retail	0	0	3	1	2	1	6	5	2	2	1	0	
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1	
		Cecal (Beef) Cecal (Dairy)												0 2	
	Swine	Retail Pork Chops	0	0	0	0	0	4	0	3	6	2	1	5	
		HACCP ¹	130	46	84	85	56	29	25	24	18	10			
		Cecal (Market Hogs) Cecal (Sows)												38 24	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Chickens			Retail							0.0% 0					
			HACCP	0.0% 0			0.0% 0	0.0% 0							
			Cecal												
Turkeys			Retail			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal												
Cattle			Retail												
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0		
			Cecal (Beef) Cecal (Dairy)												
Swine			Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal (Market Hogs)											0.0% 0		
		Cecal (Sows)													
Nalidixic Acid (MIC ≥ 32 µg/ml)		Humans	0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail							0.0% 0					
			HACCP	0.0% 0			0.0% 0	0.0% 0							
			Cecal												
		Turkeys	Retail			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal												
		Cattle	Retail												
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0		
			Cecal (Beef) Cecal (Dairy)												
	Swine	Retail						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		HACCP	0.0% 0	0.0% 0	0.0% 0	1.2% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
Cecal (Market Hogs)												0.0% 0			
Cecal (Sows)															
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	54.5% 6	60.0% 3	50.0% 4	33.3% 1	66.7% 2	62.5% 5	36.4% 4	69.2% 9	0.0% 0	83.3% 5	71.4% 5	60.0% 3	
		Chickens	Retail							100.0% 1					
			HACCP	50.0% 1			100.0% 2	100.0% 1							
			Cecal												
		Turkeys	Retail			100.0% 3	10.0% 1	100.0% 2	100.0% 1	83.3% 5	10.0% 5	100.0% 2	100.0% 2	100.0% 1	
			HACCP	0.0% 0		20.0% 3	66.7% 2	85.7% 6	100.0% 1		100.0% 4	100.0% 1	0.0% 0	0.0% 0	
			Cecal												
		Cattle	Retail												
			HACCP	38.9% 7	69.2% 9	66.7% 8	66.7% 4	50.0% 1	100.0% 1			0.0% 0	0.0% 0		
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail						100.0% 4		33.3% 1	66.7% 4	50.0% 1	100.0% 1	60.0% 3
			HACCP	75.4% 98	60.9% 28	65.5% 55	69.4% 59	67.9% 38	75.9% 22	92.0% 23	83.3% 20	77.8% 14	70.0% 7		
			Cecal (Market Hogs)												78.9% 30
			Cecal (Sows)												62.5% 15

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 59a. Resistance Patterns among *Salmonella* Derby Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	11	5	8	3	3	8	11	13	2	6	7	5	
	Chickens	Retail Chickens	0	0	0	0	0	1	0	0	0	0	0	0
		HACCP	2	0	0	2	1	0	0	0	0	0	0	1
		Cecal												0
	Turkeys	Retail Ground Turkey	0	0	3	1	2	1	6	5	2	2	1	0
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1
		Cecal (Beef)												0
	Swine	Retail Pork Chops	0	0	0	0	0	4	0	3	6	2	1	5
		HACCP ²	130	46	84	85	56	29	25	24	18	10		38
		Cecal (Market Hogs)												24
	Cecal (Sows)												24	
Resistance Pattern		Source												
1. No Resistance Detected	Humans	45.5%	40.0%	0.4%	0.7%	0.0%	37.5%	45.5%	23.1%	50.0%	16.7%	28.6%	40.0%	
	Chickens	Retail Chickens	5	2	3	2	0	3	0	3	1	1	2	2
		HACCP				0.0%	0.0%		0.0%					100.0%
		Cecal	1			0	0							1
	Turkeys	Retail Ground Turkey			0.0%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0
		HACCP	100.0%		53.3%	33.3%	14.3%	0.0%		0.0%	0.0%	100.0%	100.0%	0.0%
		Cecal	1		8	1	1	0		0	0	1	1	0
	Cattle	Retail Ground Beef												
		HACCP	50.0%	30.8%	33.3%	33.3%	50.0%	0.0%		100.0%	100.0%			0.0%
		Cecal (Beef)	9	4	4	2	1	0		1	2			0
	Swine	Retail Pork Chops						0.0%		66.7%	33.3%	50.0%	0.0%	40.0%
		HACCP	23.1%	39.1%	32.1%	30.6%	32.1%	24.1%	8.0%	16.7%	16.7%	30.0%		21.1%
		Cecal (Market Hogs)	30	18	27	26	18	7	2	4	3	3		8
		Cecal (Sows)												37.5%
														9
	2. Resistant to ≥ 3 Antimicrobial Classes	Humans	27.3%	40.0%	0.4%	0.0%	0.7%	62.5%	18.2%	46.2%	0.0%	50.0%	57.1%	40.0%
		Chickens	Retail Chickens	3	2	3	0	2	5	2	6	0	3	4
HACCP			0.0%			100.0%	0.0%							0.0%
Cecal			0			2	0							0
Turkeys		Retail Ground Turkey			66.7%	0.0%	100.0%	0.0%	66.7%	100.0%	50.0%	100.0%	0.0%	0
		HACCP	0.0%		20.0%	33.3%	14.3%	0.0%		50.0%	0.0%	0.0%	0.0%	50.0%
		Cecal	0		3	1	1	0		2	0	0	0	1
Cattle		Retail Ground Beef												
		HACCP	27.8%	38.5%	66.7%	66.7%	50.0%	0.0%		0.0%	0.0%			0.0%
		Cecal (Beef)	5	5	8	4	1	0		0	0			0
Swine		Retail Pork Chops						0.0%		33.3%	50.0%	0.0%	100.0%	40.0%
		HACCP	60.0%	47.8%	57.1%	61.2%	48.2%	48.3%	72.0%	62.5%	38.9%	40.0%		55.3%
		Cecal (Market Hogs)	78	22	48	52	27	14	18	15	7	4		21
		Cecal (Sows)												50.0%
														12
3. Resistant to ≥ 4 Antimicrobial Classes		Humans	0.0%	0.0%	0.1%	0.0%	0.3%	0.0%	0.0%	7.7%	0.0%	16.7%	28.6%	0.0%
		Chickens	Retail Chickens	0	0	1	0	1	0	0	1	0	1	2
	HACCP		0.0%			50.0%	0.0%							0.0%
	Cecal		0			1	0							0
	Turkeys	Retail Ground Turkey			66.7%	0.0%	0.0%	0.0%	16.7%	40.0%	0.0%	0.0%	0.0%	0
		HACCP	0.0%		0.0%	0.0%	0.0%	0.0%		50.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	0		0	0	0	0		2	0	0	0	0
	Cattle	Retail Ground Beef												
		HACCP	5.6%	15.4%	0.0%	16.7%	0.0%	0.0%		0.0%	0.0%			0.0%
		Cecal (Beef)	1	2	0	1	0	0		0	0			0
	Swine	Retail Pork Chops						0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	6.9%	2.2%	2.4%	1.2%	1.8%	3.4%	12.0%	4.2%	0.0%	0.0%		2.6%
		Cecal (Market Hogs)	9	1	2	1	1	1	3	1	0	0		1
		Cecal (Sows)												0.0%
														0

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 59b. Resistance Patterns among *Salmonella* Derby Isolates, 2002-2013¹

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		11	5	8	3	3	8	11	13	2	6	7	5	
		Chickens	Retail Chickens	0	0	0	0	0	0	1	0	0	0	0	0
			HACCP	2	0	0	2	1	0	0	0	0	0	0	1
	Cecal													0	
	Turkeys	Retail Ground Turkey	0	0	3	1	2	1	6	5	2	2	1	0	
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1	
		Cecal (Beef)												0	
	Swine	Retail Pork Chops	0	0	0	0	0	4	0	3	6	2	1	5	
		HACCP ²	130	46	84	85	56	29	25	24	18	10		38	
		Cecal (Market Hogs)												24	
		Cecal (Sows)													
Resistance Pattern		Source													
4. Resistant to ≥ 5 Antimicrobial Classes	Humans		0.0% 0	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	14.3% 1	0.0% 0	
		Chickens	Retail Chickens							0.0% 0					
			HACCP	0.0% 0			50.0% 1	0.0% 0							0.0% 0
	Cecal														
	Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal													
	Cattle	Retail Ground Beef													
		HACCP	0.0% 0	15.4% 2	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
		Cecal (Beef)													
	Swine	Retail Pork Chops						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP	1.5% 2	2.2% 1	1.2% 1	0.0% 0	0.0% 0	0.0% 0	8.0% 2	4.2% 1	0.0% 0	0.0% 0		0.0% 0	
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)											0.0% 0		
5. At Least ACSSuT ³ Resistant	Humans		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 1	0.0% 0	
		Chickens	Retail Chickens							0.0% 0					
			HACCP	0.0% 0			0.0% 0	0.0% 0							0.0% 0
	Cecal														
	Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		25.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal													
	Cattle	Retail Ground Beef													
		HACCP	0.0% 0	0.0% 0	0.0% 0	16.7% 1	0.0% 0	0.0% 0			0.0% 0	0.0% 0		0.0% 0	
		Cecal (Beef)													
	Swine	Retail Pork Chops						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP	0.0% 0	0.0% 0	1.2% 1	0.0% 0	0.0% 0	0.0% 0	8.0% 2	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)											0.0% 0		
6. At Least ACT/S ⁴ Resistant	Humans		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail Chickens							0.0% 0					
			HACCP	0.0% 0			0.0% 0	0.0% 0							0.0% 0
	Cecal														
	Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		HACCP	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal													
	Cattle	Retail Ground Beef													
		HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0		0.0% 0	
		Cecal (Beef)													
	Swine	Retail Pork Chops						0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	4.0% 1	4.2% 1	0.0% 0	0.0% 0		0.0% 0	
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)											0.0% 0		

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 59c. Resistance Patterns among *Salmonella* Derby Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	Humans	11	5	8	3	3	8	11	13	2	6	7	5	
		Chickens	Retail Chickens	0	0	0	0	0	0	1	0	0	0	0	0
			HACCP	2	0	0	2	1	0	0	0	0	0	0	1
	Cecal													0	
	Turkeys	Retail Ground Turkey	0	0	3	1	2	1	6	5	2	2	1	0	
		HACCP	1	0	15	3	7	1	0	4	1	1	1	2	
		Cecal												0	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP	18	13	12	6	2	1	0	0	1	2	0	1	
		Cecal (Beef)												0	
	Swine	Cecal (Dairy)												2	
		Retail Pork Chops	0	0	0	0	0	4	0	3	6	2	1	5	
		HACCP ¹	130	46	84	85	56	29	25	24	18	10			
Cecal (Market Hogs)													38		
Cecal (Sows)													24		
Resistance Pattern	Source														
7. At Least ACSSuTAuCx ² Resistant	Humans	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	
		Chickens	Retail Chickens	0						0.0%					
			HACCP	0.0%			0.0%	0.0%							0.0%
	Cecal		0											0	
	Turkeys	Retail Ground Turkey			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%		0.0%	0.0%	0.0%	0.0%		25.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0		0	0	0	0		1	0	0	0	0	
	Cattle	Retail Ground Beef													
		HACCP	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%			0.0%	0.0%		0.0%	
		Cecal (Beef)	0	0	0	1	0	0			0	0		0	
	Swine	Cecal (Dairy)												0.0%	
		Retail Pork Chops						0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.0%	0.0%	0.0%	0.0%		0.0%	
Cecal (Market Hogs)	0	0	0	0	0	0	2	0	0	0		0			
Cecal (Sows)												0.0%			
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail Chickens							0.0%					
			HACCP	0.0%			0.0%	0.0%							0.0%
	Cecal		0											0	
	Turkeys	Retail Ground Turkey			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%		0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0		0	0	0	0		0	0	0	0	0	
	Cattle	Retail Ground Beef													
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%		0.0%	
		Cecal (Beef)	0	0	0	0	0	0			0	0		0	
	Swine	Cecal (Dairy)												0.0%	
		Retail Pork Chops						0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	
Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0		0			
Cecal (Sows)												0.0%			

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 60a. Antimicrobial Resistance among *Salmonella* Montevideo Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	61	43	50	48	62	51	68	57	58	65	60	53		
	Chickens	Retail	0	1	3	1	2	6	4	4	0	1	4	1	
		HACCP	30	30	29	62	21	20	13	10	5	1	9	4	
		Cecal												0	
	Turkeys	Retail	0	2	2	4	8	2	1	4	1	1	1	0	
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0	
		Cecal												0	
	Cattle	Retail	1	2	0	2	6	3	2	4	1	1	1	4	
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89	
		Cecal (Beef)												21	
	Swine	Retail	0	0	0	0	0	1	0	0	1	0	0	0	
		HACCP ¹	4	2	0	1	0	2	1	2	0	0		2	
		Cecal (Market Hogs)												4	
		Cecal (Sows)													
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	1.6%	0.0%	0.0%	27.1%	17.7%	7.8%	2.9%	7.0%	3.4%	0.0%	1.7%	0.0%	
		Chickens	Retail	1	100.0%	33.3%	100.0%	0.0%	50.0%	0.0%	25.0%		0.0%	0.0%	0.0%
			HACCP	3.3%	30.0%	27.6%	11.3%	9.5%	20.0%	53.8%	10.0%	0.0%	0.0%	33.3%	0.0%
			Cecal	1	9	8	7	2	4	7	1	0	0	3	0
		Turkeys	Retail		0.0%	100.0%	0.0%	37.5%	50.0%	0.0%	25.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	66.7%	0.0%	100.0%	100.0%	50.0%	40.0%	
			Cecal	0	0	0	0	0	2	0	1	3	1	2	
		Cattle	Retail	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	1	0	0	0	0	0	0	0	0	0	0	0.0%
		Swine	Retail						100.0%			0.0%			
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%				
			Cecal (Market Hogs)	0	0		0		0	0	0				0.0%
			Cecal (Sows)												0.0%
		Kanamycin (MIC ≥ 64 µg/ml)	Humans	1.6%	0.0%	0.0%	22.9%	19.4%	7.8%	0.0%	1.8%	3.4%	0.0%	0.0%	0.0%
	Chickens		Retail	1	0	0	11	12	4	0	1	2	0	0	0
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0	0	5	1	2	2	0	0	0	2	0
	Turkeys		Retail		100.0%	50.0%	50.0%	50.0%	50.0%	0.0%	50.0%	100.0%	100.0%	0.0%	
			HACCP	50.0%	2	0	33.3%	0.0%	0.0%	100.0%	0.0%	66.7%	50.0%	40.0%	
			Cecal	1	0	0	1	0	0	1	0	2	1	2	
	Cattle		Retail	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	2.2%
			Cecal (Beef)	1	0	0	0	0	0	0	0	0	0	3	2
	Swine		Retail						0.0%			0.0%			
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%				
			Cecal (Market Hogs)	0	0		0		0	0	0				0.0%
			Cecal (Sows)												0.0%
	Streptomycin (MIC ≥ 64 µg/ml)		Humans	3.3%	0.0%	4.0%	27.1%	19.4%	7.8%	2.9%	5.3%	3.4%	3.1%	1.7%	0.0%
		Chickens	Retail	2	0	2	13	12	4	2	3	2	2	1	0
			HACCP	13.3%	36.7%	27.6%	9.7%	9.5%	10.0%	46.2%	10.0%	0.0%	0.0%	33.3%	0.0%
			Cecal	4	11	8	6	2	2	6	1	0	0	3	0
		Turkeys	Retail		100.0%	50.0%	50.0%	75.0%	50.0%	0.0%	75.0%	100.0%	100.0%	0.0%	
			HACCP	50.0%	2	0	33.3%	33.3%	0.0%	100.0%	100.0%	100.0%	50.0%	60.0%	
			Cecal	1	0	0	1	1	0	1	1	3	1	3	
		Cattle	Retail	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP			1.9%	1.6%	2.4%	2.3%	1.6%	0.0%	1.0%	1.7%	3.3%	5.1%	2.4%	3.4%	
Cecal (Beef)			2	1	2	1	1	0	1	1	2	5	2	4.8%	
Swine		Retail						100.0%			0.0%				
		HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%					
		Cecal (Market Hogs)	0	0		0		0	0	0				0.0%	
		Cecal (Sows)												0.0%	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 60b. Antimicrobial Resistance among *Salmonella* Montevideo Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans	61	43	50	48	62	51	68	57	58	65	60	53			
	Chickens	Retail	0	1	3	1	2	6	4	4	0	1	4	1		
		HACCP	30	30	29	62	21	20	13	10	5	1	9	4		
		Cecal												0		
	Turkeys	Retail	0	2	2	4	8	2	1	4	1	1	1	0		
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0		
		Cecal												0		
	Cattle	Retail	1	2	0	2	6	3	2	4	1	1	1	4		
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89		
		Cecal (Beef)												21		
		Cecal (Dairy)												56		
	Swine	Retail	0	0	0	0	0	1	0	0	1	0	0	0		
		HACCP1	4	2	0	1	0	2	1	2	0	0		2		
		Cecal (Market Hogs) Cecal (Sows)												4		
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
	β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1	0.0% 0	0.0% 0	
Chickens			Retail		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	
			HACCP	3.3% 1	3.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
Turkeys			Retail		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1		
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal													
Cattle			Retail	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	1.9% 2	1.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2	
			Cecal (Beef)												4.8% 1	
			Cecal (Dairy)												3.6% 2	
Swine			Retail						0.0% 0			0.0% 0				
			HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0					
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	
Cephems			Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1	0.0% 0	0.0% 0
				Chickens	Retail		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0
	HACCP	3.3% 1			3.3% 1	0.0% 0	0.0% 0	4.8% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Cecal															
	Turkeys	Retail			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1		
		HACCP		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal														
	Cattle	Retail		0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP		1.9% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2	
		Cecal (Beef)													4.8% 1	
		Cecal (Dairy)													3.6% 2	
	Swine	Retail							0.0% 0			0.0% 0				
		HACCP		0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0					
		Cecal (Market Hogs) Cecal (Sows)													0.0% 0 0.0% 0	
		Ceftiofur (MIC ≥ 8 µg/ml)		Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1	0.0% 0	0.0% 0
				Chickens	Retail		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0
HACCP			3.3% 1		3.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Cecal																
Turkeys			Retail		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1		
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal													
Cattle			Retail	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	1.9% 2	0.0% 0	0.0% 0	0.0% 0	1.6% 1	0.0% 0	0.0% 0	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2	
			Cecal (Beef)												4.8% 1	
			Cecal (Dairy)												3.6% 2	
Swine			Retail						0.0% 0			0.0% 0				
			HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0					
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 60c. Antimicrobial Resistance among *Salmonella* Montevideo Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		61	43	50	48	62	51	68	57	58	65	60	53	
		Chickens	Retail	0	1	3	1	2	6	4	4	0	1	4	1
			HACCP	30	30	29	62	21	20	13	10	5	1	9	4
	Cecal													0	
	Turkeys	Retail	0	2	2	4	8	2	1	4	1	1	1	0	
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0	
		Cecal												0	
	Cattle	Retail Ground Beef	1	2	0	2	6	3	2	4	1	1	1	4	
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89	
		Cecal (Beef)												21	
		Cecal (Dairy)												56	
	Swine	Retail Pork Chops	0	0	0	0	0	1	0	0	1	0	0	0	
		HACCP ¹	4	2	0	1	0	2	1	2	0	0	0	2	
		Cecal (Market Hogs)												4	
		Cecal (Sows)												0	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Cepheems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	
		Chickens	Retail	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	3.3%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	1	1	0	0	0	0	0	0	0	0	0	0
		Turkeys	Retail		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0	0	0	0	0	0	0	0	0	0	1
		Cattle	Retail	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	1.9%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	4.0%	2.4%	2.2%
			Cecal (Beef)	2	1	0	0	0	0	0	1	0	4	2	2
		Cecal (Dairy)												4.8%	
		Swine	Retail						0.0%			0.0%			
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%				
			Cecal (Market Hogs)	0	0		0		0	0	0				0.0%
		Cecal (Sows)													0.0%
Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	1.6%	0.0%	0.0%	25.0%	19.4%	7.8%	4.4%	7.0%	3.4%	3.1%	1.7%	1.9%	
		Chickens	Retail	1	0	0	12	12	4	3	4	2	2	1	1
			HACCP	10.0%	100.0%	0.0%	100.0%	0.0%	50.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	3	5	7	6	3	2	3	1	0	0	1	0
		Turkeys	Retail		0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	66.7%	0.0%	60.0%	
			Cecal	0	0	0	0	1	0	0	0	2	0	3	
		Cattle	Retail	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.9%	0.0%	1.2%	0.0%	1.6%	1.1%	1.9%	1.7%	0.0%	4.0%	2.4%	2.2%
			Cecal (Beef)	1	0	1	0	1	1	2	1	0	4	2	2
		Cecal (Dairy)												4.8%	
		Swine	Retail						100.0%			0.0%			
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%				
			Cecal (Market Hogs)	0	0		0		0	0	0				0.0%
		Cecal (Sows)													0.0%
Folate Pathway Inhibitor	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	0.0%	0.0%	2.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	1.9%	
		Chickens	Retail	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0	0	0	0	0	0	0	0	0	0	0
		Turkeys	Retail		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	Retail	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)						1	1	0	0	0	0	0.0%
		Cecal (Dairy)												1.8%	
		Swine	Retail						0.0%			0.0%			
			HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%				
			Cecal (Market Hogs)	0	0		0		0	0	0				0.0%
		Cecal (Sows)													0.0%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 60d. Antimicrobial Resistance among *Salmonella* Montevideo Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans Chickens Turkeys Cattle Swine	Humans	61	43	50	48	62	51	68	57	58	65	60	53	
		Chickens	Retail	0	1	3	1	2	6	4	4	0	1	4	1
			HACCP	30	30	29	62	21	20	13	10	5	1	9	4
			Cecal												0
		Turkeys	Retail	0	2	2	4	8	2	1	4	1	1	1	0
			HACCP	107	64	82	43	63	95	104	59	61	99	84	89
			Cecal												21
		Cattle	Retail Ground Beef	1	2	0	2	6	3	2	4	1	1	1	4
			HACCP	107	64	82	43	63	95	104	59	61	99	84	89
			Cecal (Beef)												21
			Cecal (Dairy)												56
		Swine	Retail Pork Chops	0	0	0	0	0	1	0	0	1	0	0	0
			HACCP ¹	4	2	0	1	0	2	1	2	0	0	0	0
			Cecal (Market Hogs)												2
		Cecal (Sows)											4		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0%	0.0%	0.0%	
		Chickens	Retail										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
		Turkeys	Retail										0.0%	0.0%	
			HACCP										0.0%	0.0%	
			Cecal										0.0%	0.0%	
		Cattle	Retail										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal (Beef)										0.0%	0.0%	0.0%
			Cecal (Dairy)										0.0%	0.0%	0.0%
		Swine	Retail												
			HACCP												
			Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	3.3%	0.0%	2.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	
		Chickens	Retail	2	0	1	0	1	0	0	0	0	0	1	0
			HACCP	0	0	0	0	0	0	0	25.0%	0	0	0	0
			Cecal	3.3%	3.3%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	Retail	1	1	0	1	0	0	0	0	0	0	0	0
			HACCP		0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0
			Cecal	50.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	33.3%	50.0%	20.0%	1
		Cattle	Retail	0	0	0	0	0	0	0	0	0	0	0	0
			HACCP	1.9%	1.6%	0.0%	0.0%	0.0%	0.0%	1.0%	1.7%	0.0%	4.0%	2.4%	2.2%
			Cecal (Beef)	2	1	0	0	0	0	1	1	0	4	2	4.8%
			Cecal (Dairy)												1
		Swine	Retail						0.0%			0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%		
Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	1.6%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	
		Chickens	Retail	1	0	0	0	1	0	0	0	0	1	0	0
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal	3.3%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	Retail		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			Cecal	0	0	0	0	0	0	0	0	0	0	0	
		Cattle	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.9%	0.0%	1.2%	0.0%	1.6%	0.0%	1.0%	1.7%	0.0%	4.0%	2.4%	2.2%
			Cecal (Beef)	1	0	1	0	1	0	1	1	0	4	2	4.8%
			Cecal (Dairy)												1
		Swine	Retail						0.0%			0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 60e. Antimicrobial Resistance among *Salmonella* Montevideo Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013					
Number of Isolates Tested	Humans	61	43	50	48	62	51	68	57	58	65	60	53				
	Chickens	Retail	0	1	3	1	2	6	4	4	0	1	4	1			
		HACCP	30	30	29	62	21	20	13	10	5	1	9	4			
		Cecal												0			
	Turkeys	Retail	0	2	2	4	8	2	1	4	1	1	1	0			
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0			
		Cecal												0			
	Cattle	Retail Ground Beef	1	2	0	2	6	3	2	4	1	1	1	4			
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89			
		Cecal (Beef)												21			
		Cecal (Dairy)												56			
	Swine	Retail Pork Chops	0	0	0	0	0	1	0	0	1	0	0	0			
		HACCP ¹	4	2	0	1	0	2	1	2	0	0	0	2			
		Cecal (Market Hogs)												4			
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source															
			Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
					Chickens	Retail	0	0	0	0	0	0	0	0	0	0	0
						HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						Cecal	0	0	0	0	0	0	0	0	0	0	0
					Turkeys	Retail	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						Cecal	0	0	0	0	0	0	0	0	0	0	0
					Cattle	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0.0%
						Cecal (Dairy)	0	0	0	0	0	0	0	0	0	0	0.0%
					Swine	Retail	0	0	0	0	0	0.0%	0	0.0%	0	0	0
						HACCP	0.0%	0.0%	0	0.0%	0	0.0%	0.0%	0.0%	0	0	0.0%
						Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0.0%
Cecal (Sows)	0	0				0	0	0	0	0	0	0	0	0.0%			
Quinolones	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	1.9%				
		Chickens	Retail	0	0	1	0	0	0	0	0	1	0	1			
			HACCP	0.0%	0.0%	3.4%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal	0	0	1	3	0	0	0	0	0	0	0			
		Turkeys	Retail	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal	0	0	0	0	0	0	0	0	0	0	0			
		Cattle	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0.0%			
			Cecal (Dairy)	0	0	0	0	0	0	0	0	0	0	0.0%			
		Swine	Retail	0	0	0	0	0	0.0%	0	0.0%	0	0	0			
			HACCP	0.0%	0.0%	0	0.0%	0	0.0%	0.0%	0.0%	0	0	0.0%			
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0.0%			
			Cecal (Sows)	0	0	0	0	0	0	0	0	0	0	0.0%			
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	3.3%	2.3%	2.0%	25.0%	19.4%	7.8%	1.5%	1.8%	5.2%	6.2%	5.0%	0.0%			
		Chickens	Retail	2	1	1	12	12	4	1	1	3	4	3	0		
			HACCP	10.0%	13.3%	3.4%	4.8%	9.5%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal	3	4	1	3	2	2	0	0	0	0	0	0		
		Turkeys	Retail	0	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			HACCP	50.0%	0.0%	25.0%	0.0%	33.3%	0.0%	0.0%	0.0%	66.7%	0.0%	60.0%	0		
			Cecal	1	0	1	0	1	0	0	0	2	0	3	0		
		Cattle	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%		
			HACCP	11.2%	12.5%	9.8%	9.3%	4.8%	7.4%	7.7%	6.8%	11.5%	17.2%	21.4%	11.2%		
			Cecal (Beef)	12	8	8	4	3	7	8	4	7	17	18	19.0%		
			Cecal (Dairy)												4		
		Swine	Retail	0	0	0	0	0	0	0	0	0	0	0	5		
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.9%		
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	5		
			Cecal (Sows)	0	0	0	0	0	0	0	0	0	0	0	0.0%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 61a. Resistance Patterns among *Salmonella* Montevideo Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	61	43	50	48	62	51	68	57	58	65	60	53		
	Chickens	Retail Chickens	0	1	3	1	2	6	4	4	0	1	4	1	
		HACCP	30	30	29	62	21	20	13	10	5	1	9	4	
		Cecal												0	
	Turkeys	Retail Ground Turkey	0	2	2	4	8	2	1	4	1	1	1	0	
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0	
		Cecal												0	
	Cattle	Retail Ground Beef	1	2	0	2	6	3	2	4	1	1	1	4	
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89	
		Cecal (Beef) Cecal (Dairy)												21 56	
	Swine	Retail Pork Chops	0	0	0	0	0	1	0	0	1	0	0	0	
		HACCP ²	4	2	0	1	0	2	1	2	0	0		2	
		Cecal (Market Hogs) Cecal (Sows)												4	
	Resistance Pattern	Source													
	1. No Resistance Detected	Humans	91.8% 56	97.7% 42	0.9% 44	0.7% 34	79.0% 49	92.2% 47	95.6% 65	93.0% 53	94.8% 55	93.8% 61	93.3% 56	96.2% 51	
Chickens		Retail Chickens		0.0% 0	66.7% 2	0.0% 0	100.0% 2	50.0% 3	100.0% 4	25.0% 1	100.0% 1	100.0% 4	100.0% 1		
		HACCP	83.3% 25	56.7% 17	65.5% 19	87.1% 54	76.2% 16	80.0% 16	46.2% 6	90.0% 9	100.0% 5	100.0% 1	66.7% 6	100.0% 4	
		Cecal													
Turkeys		Retail Ground Turkey		0.0% 0	0.0% 0	50.0% 2	25.0% 2	50.0% 1	100.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		HACCP	50.0% 1	100.0% 1	75.0% 3	66.7% 2	33.3% 1	33.3% 1	0.0% 0	0.0% 0	0.0% 0	50.0% 1	40.0% 2		
		Cecal													
Cattle		Retail Ground Beef	100.0% 1	100.0% 2		100.0% 2	100.0% 6	100.0% 3	100.0% 2	100.0% 4	100.0% 1	100.0% 1	100.0% 1	50.0% 2	
		HACCP	88.8% 95	85.9% 55	90.2% 74	90.7% 39	95.2% 60	92.6% 88	92.3% 96	93.2% 55	86.9% 53	81.8% 81	78.6% 66	88.8% 79	
		Cecal (Beef) Cecal (Dairy)												81.0% 17 89.3% 50	
Swine		Retail Pork Chops						0.0% 0		0.0% 0					
		HACCP	100.0% 4	100.0% 2		100.0% 1		100.0% 2	100.0% 1	100.0% 2					
		Cecal (Market Hogs) Cecal (Sows)												100.0% 2 100.0% 4	
2. Resistant to ≥ 3 Antimicrobial Classes		Humans	1.6% 1	0.0% 0	0.0% 0	0.3% 12	0.2% 12	7.8% 4	0.0% 0	1.8% 1	3.4% 2	3.1% 2	0.0% 0	0.0% 0	
		Chickens	Retail Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1		0.0% 0	0.0% 0	0.0% 0
			HACCP	6.7% 2	3.3% 1	0.0% 0	6.5% 4	4.8% 1	10.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey		0.0% 0	0.0% 0	50.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	100.0% 1	
	HACCP		50.0% 1	0.0% 0	0.0% 0	0.0% 0	33.3% 1	0.0% 0	0.0% 0	0.0% 0	66.7% 2	0.0% 0	60.0% 3		
	Cecal														
	Cattle	Retail Ground Beef	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP	1.9% 2	1.6% 1	1.2% 1	0.0% 0	1.6% 1	0.0% 0	1.0% 1	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2	
		Cecal (Beef) Cecal (Dairy)												4.8% 1 3.6% 2	
	Swine	Retail Pork Chops						0.0% 0				0.0% 0			
		HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0					
		Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	
	3. Resistant to ≥ 4 Antimicrobial Classes	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1	0.0% 0	0.0% 0	
		Chickens	Retail Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	25.0% 1		0.0% 0	0.0% 0	0.0% 0
			HACCP	3.3% 1	3.3% 1	0.0% 0	4.8% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal												
		Turkeys	Retail Ground Turkey		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	33.3% 1	0.0% 0	20.0% 1		
Cecal															
Cattle		Retail Ground Beef	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		HACCP	1.9% 2	1.6% 1	1.2% 1	0.0% 0	1.6% 1	0.0% 0	1.0% 1	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2	
		Cecal (Beef) Cecal (Dairy)												4.8% 1 3.6% 2	
Swine		Retail Pork Chops						0.0% 0			0.0% 0				
		HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0					
		Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 61b. Resistance Patterns among *Salmonella* Montevideo Isolates, 2002-2013¹

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Humans		61	43	50	48	62	51	68	57	58	65	60	53			
	Chickens	Retail Chickens	0	1	3	1	2	6	4	4	0	1	4	1			
		HACCP	30	30	29	62	21	20	13	10	5	1	9	4			
		Cecal												0			
	Turkeys	Retail Ground Turkey	0	2	2	4	8	2	1	4	1	1	1	0			
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0			
		Cecal												0			
	Cattle	Retail Ground Beef	1	2	0	2	6	3	2	4	1	1	1	4			
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89			
		Cecal (Beef) Cecal (Dairy)												21 56			
	Swine	Retail Pork Chops	0	0	0	0	0	1	0	0	1	0	0	0			
		HACCP ²	4	2	0	1	0	2	1	2	0	0	0	0			
		Cecal (Market Hogs) Cecal (Sows)												2 4			
Resistance Pattern		Source															
4. Resistant to ≥ 5 Antimicrobial Classes		Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1	0.0% 0	0.0% 0			
		Chickens	Retail Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0		
			HACCP	3.3% 1	0.0% 0	0.0% 0	1.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal														
		Turkeys	Retail Ground Turkey		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
			Cecal														
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			HACCP	1.9% 2	0.0% 0	0.0% 0	0.0% 0	1.6% 1	0.0% 0	1.0% 1	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2		
			Cecal (Beef)												4.8% 1		
			Cecal (Dairy)												3.6% 2		
		Swine	Retail Pork Chops						0.0% 0				0.0% 0				
			HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0						
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0		
		5. At Least ACSSuT ³ Resistant		Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.5% 1	0.0% 0	0.0% 0	
				Chickens	Retail Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0
					HACCP	3.3% 1	0.0% 0	0.0% 0	1.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
					Cecal												
				Turkeys	Retail Ground Turkey		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
					HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Cecal																	
Cattle	Retail Ground Beef			0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	HACCP			0.9% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.0% 1	1.7% 1	0.0% 0	4.0% 4	2.4% 2	2.2% 2		
	Cecal (Beef)														4.8% 1		
	Cecal (Dairy)														3.6% 2		
Swine	Retail Pork Chops								0.0% 0				0.0% 0				
	HACCP			0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0						
	Cecal (Market Hogs) Cecal (Sows)														0.0% 0 0.0% 0		
6. At Least ACT/S ⁴ Resistant				Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
				Chickens	Retail Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0
					HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
					Cecal												
				Turkeys	Retail Ground Turkey		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
					HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal															
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal (Beef)												0.0% 0		
			Cecal (Dairy)												0.0% 0		
		Swine	Retail Pork Chops						0.0% 0				0.0% 0				
			HACCP	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0						
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0		

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 61c. Resistance Patterns among *Salmonella* Montevideo Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		61	43	50	48	62	51	68	57	58	65	60	53	
		Chickens	Retail Chickens	0	1	3	1	2	6	4	4	0	1	4	1
			HACCP	30	30	29	62	21	20	13	10	5	1	9	4
	Cecal													0	
	Turkeys	Retail Ground Turkey	0	2	2	4	8	2	1	4	1	1	1	0	
		HACCP	2	1	4	3	3	3	1	1	3	2	5	0	
		Cecal												0	
	Cattle	Retail Ground Beef	1	2	0	2	6	3	2	4	1	1	1	4	
		HACCP	107	64	82	43	63	95	104	59	61	99	84	89	
		Cecal (Beef) Cecal (Dairy)												21 56	
	Swine	Retail Pork Chops	0	0	0	0	0	1	0	0	1	0	0	0	
		HACCP ¹	4	2	0	1	0	2	1	2	2	0	0	0	
		Cecal (Market Hogs) Cecal (Sows)												2 4	
	Resistance Pattern	Source													
	7. At Least ACSSuTauCx ² Resistant	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%
Chickens			Retail Chickens	0	0	0	0	0	0	0	0	0	0	0	0
			HACCP	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	1	0	0	0	0	0	0	0	0	0	0	0	
Turkeys		Retail Ground Turkey		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0	0	0	0	0	0	0	0	0	0	0		
Cattle		Retail Ground Beef	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	4.0%	2.4%	2.2%	
		Cecal (Beef) Cecal (Dairy)	1	0	0	0	0	0	0	1	0	4	2	2 1 2	
Swine		Retail Pork Chops						0.0%			0.0%				
		HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%				
		Cecal (Market Hogs) Cecal (Sows)	0	0		0		0	0	0	0			0.0% 0	
8. At Least Ceftriaxone and Nalidixic Acid Resistant		Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Chickens	Retail Chickens	0	0	0	0	0	0	0	0	0	0	0
	HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cecal	0		0	0	0	0	0	0	0	0	0	0	0	
	Turkeys	Retail Ground Turkey		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0	0	0	0	0	0	0	0	0	0	0		
	Cattle	Retail Ground Beef	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef) Cecal (Dairy)	0	0	0	0	0	0	0	0	0	0	0	0.0% 0 0	
	Swine	Retail Pork Chops						0.0%			0.0%				
		HACCP	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%				
		Cecal (Market Hogs) Cecal (Sows)	0	0		0		0	0	0	0			0.0% 0 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTauCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 62a. Antimicrobial Resistance among *Salmonella* Anatum Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	22	18	16	12	10	18	14	13	19	16	16	20		
	Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0	
		HACCP	4	2	4	1	6	0	1	1	1	1	0	0	
		Cecal												0	
	Turkeys	Retail	0	1	0	1	0	1	7	1	0	0	2	2	
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2	
		Cecal												0	
	Cattle	Retail	2	0	0	0	2	1	0	0	1	0	1	1	
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16	
		Cecal (Beef)												18	
	Swine	Retail	0	0	0	2	0	0	0	0	1	0	0	0	
		HACCP1	21	10	32	19	61	13	5	10	5	8		33	
		Cecal (Market Hogs)												0	
		Cecal (Sows)												43	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	12.5%	0.0%	
		Chickens	Retail Chickens	0	0	0	0.0%	0.0%	0	0.0%	0	0.0%	0.0%	100.0%	0
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0	0.0%	100.0%	0.0%	0.0%	0	1
			Cecal												
		Turkeys	Retail Ground Turkey		0.0%		0.0%		100.0%	14.3%	0.0%			100.0%	0.0%
			HACCP			0.0%	0.0%	22.2%	0.0%	0.0%	0.0%	66.7%		0.0%	0.0%
			Cecal												
		Cattle	Retail	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)												0.0%
		Swine	Retail				0.0%					100.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
	Cecal (Market Hogs)													0.0%	
		Cecal (Sows)												0.0%	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	7.1%	0.0%	5.3%	0.0%	12.5%	0.0%	
		Chickens	Retail Chickens			1	0.0%	0.0%		0.0%	0	0.0%	0.0%	0.0%	0
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0
			Cecal												
		Turkeys	Retail Ground Turkey		0.0%		0.0%		0.0%	0.0%	0.0%			0.0%	0.0%
			HACCP			0.0%	0.0%	22.2%	0.0%	0.0%	0.0%	66.7%		0.0%	0.0%
			Cecal												
		Cattle	Retail	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)												0.0%
		Swine	Retail				0.0%					0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		3.0%
	Cecal (Market Hogs)													1	
		Cecal (Sows)												0	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	7.1%	0.0%	10.5%	6.3%	12.5%	0.0%	
		Chickens	Retail Chickens			1	100.0%	0.0%		0.0%	0	0.0%	100.0%	100.0%	1
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	100.0%	0.0%	0.0%	0	0
			Cecal												
		Turkeys	Retail		0.0%		0.0%		0.0%	14.3%	0.0%			100.0%	0.0%
			HACCP			0.0%	0.0%	44.4%	0.0%	100.0%	0.0%	0.0%		0.0%	0.0%
			Cecal												
		Cattle	Retail	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%
HACCP			2.1%	3.3%	1.5%	0.0%	7.7%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cecal (Beef)														0.0%	
Swine		Retail				0.0%					100.0%				
		HACCP	4.8%	10.0%	3.1%	10.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	
	Cecal (Market Hogs)												0.0%		
	Cecal (Sows)												0.0%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 62b. Antimicrobial Resistance among *Salmonella* Anatum Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	22	18	16	12	10	18	14	13	19	16	16	20		
	Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0	
		HACCP	4	2	4	1	6	0	1	1	1	1	0	0	
		Cecal												0	
	Turkeys	Retail	0	1	0	1	0	1	7	1	0	0	2	2	
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2	
		Cecal												0	
	Cattle	Retail	2	0	0	0	2	1	0	0	1	0	1	1	
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16	
		Cecal (Beef) Cecal (Dairy)												18 18	
	Swine	Retail	0	0	0	2	0	0	0	0	1	0	0	0	
		HACCP1	21	10	32	19	61	13	5	10	5	8		33	
		Cecal (Market Hogs) Cecal (Sows)												0 43	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail Chickens				100.0% 1	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			
			Cecal												
		Turkeys	Retail		0.0% 0		0.0% 0		0.0% 0	42.9% 3	0.0% 0			0.0% 0	0.0% 0
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0		33.3% 1	0.0% 0
			Cecal												
		Cattle	Retail	0.0% 0			0.0% 0	0.0% 0				0.0% 0		0.0% 0	0.0% 0
			HACCP	1.1% 1	3.3% 2	1.5% 1	0.0% 0	3.8% 1	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												0.0% 0 5.6% 1
		Swine	Retail				0.0% 0					0.0% 0			
			HACCP	0.0% 0	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	20.0% 1	0.0% 0		
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0
		Cepheims	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Chickens	Retail Chickens						100.0% 1	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
	HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			
	Cecal														
Turkeys	Retail				0.0% 0		0.0% 0		0.0% 0	42.9% 3	0.0% 0			0.0% 0	0.0% 0
	HACCP					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0		33.3% 1	0.0% 0
	Cecal														
Cattle	Retail			0.0% 0			0.0% 0	0.0% 0				0.0% 0		0.0% 0	0.0% 0
	HACCP			1.1% 1	3.3% 2	1.5% 1	0.0% 0	3.8% 1	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cecal (Beef) Cecal (Dairy)														0.0% 0 5.6% 1
Swine	Retail						0.0% 0					0.0% 0			
	HACCP			0.0% 0	0.0% 0	0.0% 0	5.3% 1	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Cecal (Market Hogs) Cecal (Sows)														0.0% 0 0.0% 0
Ceftiofur	(MIC ≥ 8 µg/ml)			Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	Retail Chickens				100.0% 1	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			
			Cecal												
		Turkeys	Retail		0.0% 0		0.0% 0		0.0% 0	42.9% 3	0.0% 0			0.0% 0	0.0% 0
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0		33.3% 1	0.0% 0
			Cecal												
		Cattle	Retail	0.0% 0			0.0% 0	0.0% 0				0.0% 0		0.0% 0	0.0% 0
			HACCP	1.1% 1	3.3% 2	1.5% 1	0.0% 0	3.8% 1	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												0.0% 0 5.6% 1
		Swine	Retail				0.0% 0					0.0% 0			
			HACCP	0.0% 0	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	20.0% 1	0.0% 0		
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 62c. Antimicrobial Resistance among *Salmonella* Anatum Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		22	18	16	12	10	18	14	13	19	16	16	20		
		Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0	
			HACCP	4	2	4	1	6	0	1	1	1	1	0	0	
	Turkeys	Retail	0	1	0	1	0	1	7	1	0	0	2	2		
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2		
	Cattle	Retail Ground Beef	2	0	0	0	2	1	0	0	1	0	1	1		
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16		
		Cecal (Beef) Cecal (Dairy)												18 18		
	Swine	Retail Pork Chops	0	0	0	2	0	0	0	0	1	0	0	0		
		HACCP ¹	21	10	32	19	61	13	5	10	5	8		33		
		Cecal (Market Hogs) Cecal (Sows)												43		
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
	Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Chickens	Retail Chickens				100.0% 1	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
				HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		
Cecal																
Turkeys			Retail		0.0% 0		0.0% 0		0.0% 0	42.9% 3	0.0% 0			0.0% 0	0.0% 0	
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0		33.3% 1	0.0% 0	
			Cecal													
Cattle			Retail	0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
			HACCP	1.1% 1	3.3% 2	1.5% 1	0.0% 0	3.8% 1	8.7% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal (Beef) Cecal (Dairy)												0.0% 0 5.6% 1	
Swine			Retail				0.0% 0					0.0% 0				
			HACCP	0.0% 0	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	20.0% 1	0.0% 0			
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	
Folate Pathway Inhibitor			Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	7.1% 1	0.0% 0	5.3% 1	0.0% 0	12.5% 2	0.0% 0
				Chickens	Retail Chickens				0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0
	HACCP	0.0% 0			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	100.0% 1	0.0% 0	0.0% 0			
	Cecal															
	Turkeys	Retail			0.0% 0		0.0% 0		100.0% 1	14.3% 1	0.0% 0			0.0% 0	0.0% 0	
		HACCP				0.0% 0	0.0% 0	33.3% 3	0.0% 0	100.0% 1	0.0% 0	50.0% 3		0.0% 0	0.0% 0	
		Cecal														
	Cattle	Retail		0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
		HACCP		2.1% 2	3.3% 2	1.5% 1	0.0% 0	3.8% 1	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal (Beef) Cecal (Dairy)													0.0% 0 0.0% 0	
	Swine	Retail					0.0% 0					100.0% 1				
		HACCP		4.8% 1	0.0% 0	6.3% 2	0.0% 0	1.6% 1	7.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
		Cecal (Market Hogs) Cecal (Sows)													6.1% 2 0.0% 0	
	Folate Pathway Inhibitor	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)		Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
				Chickens	Retail Chickens				0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0
HACCP			0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0			
Cecal																
Turkeys			Retail		0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	
			Cecal													
Cattle			Retail	0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal (Beef) Cecal (Dairy)												0.0% 0 0.0% 0	
Swine			Retail				0.0% 0					0.0% 0				
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0 0.0% 0	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 62d. Antimicrobial Resistance among *Salmonella* Anatum Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		22	18	16	12	10	18	14	13	19	16	16	20	
		Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0
			HACCP	4	2	4	1	6	0	1	1	1	1	0	0
	Turkeys	Retail	0	1	0	1	0	1	7	1	0	0	0	2	
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16	
		Cecal												18	
	Cattle	Retail Ground Beef	2	0	0	0	2	1	0	0	1	0	1	1	
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16	
		Cecal (Beef)												18	
	Swine	Cecal (Dairy)												18	
		Retail Pork Chops	0	0	0	2	0	0	0	0	1	0	0	0	
		HACCP ¹	21	10	32	19	61	13	5	10	5	8		33	
		Cecal (Market Hogs)												43	
			Cecal (Sows)												
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0%	0.0%	0.0%	
		Chickens	Retail Chickens										0.0%	0.0%	0
			HACCP										0.0%	0.0%	0
			Cecal										0.0%	0.0%	0
		Turkeys	Retail											0.0%	0.0%
			HACCP											0.0%	0.0%
			Cecal											0.0%	0.0%
		Cattle	Retail											0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal (Beef)											0.0%	0.0%
		Swine	Cecal (Dairy)												0.0%
			Retail											0.0%	0.0%
			HACCP										0.0%		0.0%
			Cecal (Market Hogs)												0.0%
		Cecal (Sows)											0.0%		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	14.3%	0.0%	5.3%	0.0%	0.0%	0.0%	
		Chickens	Retail Chickens	0	0	1	100.0%	0.0%	0	0.0%	0	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0	0.0%	0.0%	0.0%	0.0%	0.0%	0
			Cecal												
		Turkeys	Retail		0.0%		0.0%		100.0%	42.9%	0.0%			100.0%	0.0%
			HACCP				0.0%	33.3%	0.0%	100.0%	50.0%	33.3%		33.3%	0.0%
			Cecal					3	0	1	1	2		1	0
		Cattle	Retail	0.0%			0.0%	0.0%	0	0		0.0%		0.0%	0.0%
			HACCP	1.1%	3.3%	1.5%	0.0%	3.8%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)		2	1	0	1	1	0	0	0	0	0	0.0%
		Swine	Cecal (Dairy)												5.6%
			Retail				0.0%					100.0%			
			HACCP	0.0%	20.0%	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%	20.0%	0.0%		
			Cecal (Market Hogs)		2	0	0	0	0	1	0	1	0		3.0%
		Cecal (Sows)											0.0%		
Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail Chickens			1	0.0%	0.0%	0	0.0%	0	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0	0.0%	0.0%	0.0%	0.0%	0.0%	0
			Cecal												
		Turkeys	Retail		0.0%		0.0%		0.0%	0.0%	0.0%			0.0%	0.0%
			HACCP				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%
			Cecal												
		Cattle	Retail	0.0%			0.0%	0.0%				0.0%		0.0%	0.0%
			HACCP	0.0%	3.3%	1.5%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)		2	1	0	1	0	0	0	0	0	0	0.0%
		Swine	Cecal (Dairy)												0.0%
			Retail				0.0%					0.0%			
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Market Hogs)												0.0%
		Cecal (Sows)											0.0%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 62e. Antimicrobial Resistance among *Salmonella* Anatum Isolates, 2002-2013

Year	2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013															
Number of Isolates Tested	Humans	Humans	22	18	16	12	10	18	14	13	19	16	16	20		
		Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0	
			HACCP	4	2	4	1	6	0	1	1	1	1	0	0	
	Cecal															
	Turkeys	Retail	0	1	0	1	0	1	7	1	0	0	2	2		
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2		
		Cecal												0		
	Cattle	Retail Ground Beef	2	0	0	0	2	1	0	0	1	0	1	1		
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16		
		Cecal (Beef)												18		
		Cecal (Dairy)												18		
	Swine	Retail Pork Chops	0	0	0	2	0	0	0	0	1	0	0	0		
		HACCP ¹	21	10	32	19	61	13	5	10	5	8		33		
		Cecal (Market Hogs)												0		
Cecal (Sows)													43			
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	Humans	0.0% 0	5.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Chickens	Retail Chickens				0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
				HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal														
		Turkeys	Retail		0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	
			Cecal													
		Cattle	Retail	0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal (Beef)												0.0% 0	
			Cecal (Dairy)												0.0% 0	
		Swine	Retail				0.0% 0					0.0% 0				
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	
			Cecal (Market Hogs)												0.0% 0	
	Cecal (Sows)													0.0% 0		
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	5.0% 1	
			Chickens	Retail Chickens				0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
				HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal														
		Turkeys	Retail		0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	
			HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	
			Cecal													
		Cattle	Retail	0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal (Beef)												0.0% 0	
			Cecal (Dairy)												0.0% 0	
		Swine	Retail				0.0% 0					0.0% 0				
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
Cecal (Market Hogs)														3.0% 1		
Cecal (Sows)													0.0% 0			
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	Humans	0.0% 0	5.6% 1	12.5% 2	0.0% 0	10.0% 1	16.7% 3	21.4% 3	7.7% 1	0.0% 0	12.5% 2	18.8% 3	0.0% 0	
			Chickens	Retail Chickens				100.0% 1	100.0% 1		0.0% 0		0.0% 0	0.0% 0	100.0% 1	
				HACCP	0.0% 0	0.0% 0	50.0% 2	0.0% 0	33.3% 2		0.0% 0	100.0% 1	0.0% 0	0.0% 0		
		Cecal														
		Turkeys	Retail		0.0% 0		100.0% 1		0.0% 0	42.9% 3	0.0% 0			100.0% 2	100.0% 2	
			HACCP			100.0% 1	100.0% 1	55.6% 5	100.0% 1	100.0% 1	0.0% 0	33.3% 2		33.3% 1	50.0% 1	
			Cecal													
		Cattle	Retail	0.0% 0				50.0% 1	0.0% 0				0.0% 0		0.0% 0	0.0% 0
			HACCP	21.3% 20	29.5% 18	29.4% 20	31.8% 7	26.9% 7	26.1% 6	14.7% 5	28.6% 2	7.1% 1	11.1% 2	0.0% 0	12.5% 2	
			Cecal (Beef)												5.6% 1	
			Cecal (Dairy)												11.1% 2	
		Swine	Retail				50.0% 1						0.0% 0			
			HACCP	81.0% 17	50.0% 5	93.8% 30	89.5% 17	91.8% 56	69.2% 9	60.0% 3	50.0% 5	60.0% 3	50.0% 4		36.4% 12	
			Cecal (Market Hogs)												36.4% 12	
Cecal (Sows)													39.5% 17			

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 63a. Resistance Patterns among *Salmonella* Anatum Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	22	18	16	12	10	18	14	13	19	16	16	20		
	Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0	
		HACCP	4	2	4	1	6	0	1	1	1	1	0	0	
		Cecal												0	
	Turkeys	Retail Ground Turkey	0	1	0	1	0	1	7	1	0	0	2	2	
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2	
		Cecal												0	
	Cattle	Retail Ground Beef	2	0	0	0	2	1	0	0	1	0	1	1	
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16	
		Cecal (Beef)												18	
	Swine	Retail Pork Chops	0	0	0	2	0	0	0	0	1	0	0	0	
		HACCP ²	21	10	32	19	61	13	5	10	5	8		33	
		Cecal (Market Hogs)												43	
		Cecal (Sows)													
Resistance Pattern		Source													
1. No Resistance Detected	Humans	100.0% 22	94.4% 17	87.5% 14	100.0% 12	90.0% 9	83.3% 15	78.6% 11	92.3% 12	84.2% 16	81.3% 13	81.3% 13	95.0% 19		
	Chickens	Retail Chickens				0.0% 0	0.0% 0		100.0% 2		100.0% 1	0.0% 0	0.0% 0		
		HACCP	75.0% 3	100.0% 2	50.0% 2	100.0% 1	66.7% 4		100.0% 1	0.0% 0	100.0% 1	100.0% 1			
		Cecal													
	Turkeys	Retail Ground Turkey		100.0% 1		0.0% 0		0.0% 0	42.9% 3	100.0% 3			0.0% 0	0.0% 0	
		HACCP			0.0% 0	0.0% 0	22.2% 2	0.0% 0	0.0% 0	50.0% 1	16.7% 1		33.3% 1	50.0% 1	
		Cecal													
	Cattle	Retail Ground Beef	100.0% 2				50.0% 1	100.0% 1			100.0% 1		100.0% 1	100.0% 1	
		HACCP	76.6% 72	70.5% 43	70.6% 48	68.2% 15	69.2% 18	73.9% 17	85.3% 29	71.4% 5	92.9% 13	88.9% 16	100.0% 18	87.5% 14	
		Cecal (Beef)												94.4% 17	
	Swine	Retail Pork Chops				50.0% 1					0.0% 0				
		HACCP	14.3% 3	30.0% 3	6.3% 2	10.5% 2	6.6% 4	30.8% 4	20.0% 1	50.0% 5	20.0% 1	50.0% 4		63.6% 21	
		Cecal (Market Hogs)												60.5% 26	
		Cecal (Sows)													
	2. Resistant to ≥ 3 Antimicrobial Classes	Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	14.3% 2	0.0% 0	5.3% 1	0.0% 0	12.5% 2	0.0% 0	
		Chickens	Retail Chickens				100.0% 1	0.0% 0		0.0% 0		0.0% 0	0.0% 0	100.0% 1	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	100.0% 1	0.0% 0	0.0% 0		
Cecal															
Turkeys		Retail Ground Turkey		0.0% 0		0.0% 0		100.0% 1	42.9% 3	0.0% 0			100.0% 1	0.0% 0	
		HACCP			0.0% 0	0.0% 0	33.3% 3	0.0% 0	100.0% 1	50.0% 1	33.3% 2		33.3% 1	0.0% 0	
		Cecal													
Cattle		Retail Ground Beef	0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
		HACCP	1.1% 1	3.3% 2	1.5% 1	0.0% 0	3.8% 1	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal (Beef)												0.0% 0	
Swine		Retail Pork Chops				0.0% 0					100.0% 1				
		HACCP	0.0% 0	10.0% 1	3.1% 1	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	20.0% 1	0.0% 0		3.0% 1	
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)													
3. Resistant to ≥ 4 Antimicrobial Classes		Humans	0.0% 0	0.0% 0	6.3% 1	0.0% 0	0.0% 0	0.0% 0	14.3% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail Chickens				100.0% 1	0.0% 0		0.0% 0		0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Cecal														
	Turkeys	Retail Ground Turkey		0.0% 0		0.0% 0		0.0% 0	42.9% 3	0.0% 0			0.0% 0	0.0% 0	
		HACCP			0.0% 0	0.0% 0	11.1% 1	0.0% 0	100.0% 1	0.0% 0	0.0% 0		0.0% 0	0.0% 0	
		Cecal													
	Cattle	Retail Ground Beef	0.0% 0				0.0% 0	0.0% 0			0.0% 0		0.0% 0	0.0% 0	
		HACCP	0.0% 0	3.3% 2	1.5% 1	0.0% 0	3.8% 1	4.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Cecal (Beef)												0.0% 0	
	Swine	Retail Pork Chops				0.0% 0					0.0% 0				
		HACCP	0.0% 0	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		3.0% 1	
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)													

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 63b. Resistance Patterns among *Salmonella* Anatum Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	22	18	16	12	10	18	14	13	19	16	16	20		
	Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0	
		HACCP	4	2	4	1	6	0	1	1	1	1	0	0	
		Cecal												0	
	Turkeys	Retail Ground Turkey	0	1	0	1	0	1	7	1	0	0	2	2	
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2	
		Cecal												0	
	Cattle	Retail Ground Beef	2	0	0	0	2	1	0	0	1	0	1	1	
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16	
		Cecal (Beef)												18	
		Cecal (Dairy)												18	
	Swine	Retail Pork Chops	0	0	0	2	0	0	0	0	1	0	0	0	
		HACCP ²	21	10	32	19	61	13	5	10	5	8			
		Cecal (Market Hogs)												33	
Cecal (Sows)													43		
Resistance Pattern		Source													
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Chickens	Retail Chickens	0	0	1	0	0	0	1	0	0	0	0	0	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal													
	Turkeys	Retail Ground Turkey	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal													
	Cattle	Retail Ground Beef	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%	
		HACCP	0.0%	3.3%	1.5%	0.0%	3.8%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)												0.0%	
		Cecal (Dairy)												0.0%	
	Swine	Retail Pork Chops				0.0%					0.0%				
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
		Cecal (Market Hogs)												0.0%	
		Cecal (Sows)												0.0%	
	5. At Least ACSSuT ³ Resistant	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail Chickens	0	0	1	0	0	0	1	0	0	0	0	0
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cecal															
Turkeys		Retail Ground Turkey	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal													
Cattle		Retail Ground Beef	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%	
		HACCP	0.0%	3.3%	1.5%	0.0%	3.8%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)												0.0%	
		Cecal (Dairy)												0.0%	
Swine		Retail Pork Chops				0.0%					0.0%				
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
		Cecal (Market Hogs)												0.0%	
		Cecal (Sows)												0.0%	
6. At Least ACT/S ⁴ Resistant		Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail Chickens				0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Cecal														
	Turkeys	Retail Ground Turkey	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal													
	Cattle	Retail Ground Beef	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)												0.0%	
		Cecal (Dairy)												0.0%	
	Swine	Retail Pork Chops				0.0%					0.0%				
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
		Cecal (Market Hogs)												0.0%	
		Cecal (Sows)												0.0%	

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 63c. Resistance Patterns among *Salmonella* Anatum Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	22	18	16	12	10	18	14	13	19	16	16	20	
	Chickens	Retail Chickens	0	0	0	1	1	0	2	0	1	1	1	0
		HACCP	4	2	4	1	6	0	1	1	1	1	0	0
		Cecal												0
	Turkeys	Retail Ground Turkey	0	1	0	1	0	1	7	1	0	0	2	2
		HACCP	0	0	1	1	9	1	1	2	6	0	3	2
		Cecal												0
	Cattle	Retail Ground Beef	2	0	0	0	2	1	0	0	1	0	1	1
		HACCP	94	61	68	22	26	23	34	7	14	18	18	16
		Cecal (Beef)												18
		Cecal (Dairy)												18
	Swine	Retail Pork Chops	0	0	0	2	0	0	0	0	1	0	0	0
		HACCP ¹	21	10	32	19	61	13	5	10	5	8		
		Cecal (Market Hogs)												33
Cecal (Sows)													43	
Resistance Pattern		Source												
7. At Least ACSSuTAuCx ² Resistant	Humans	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens	0	0	1	0	0	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal												
	Turkeys	Retail Ground Turkey		0.0%		0.0%		0.0%	0.0%	0.0%			0.0%	0.0%
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%
		Cecal												
	Cattle	Retail Ground Beef	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%
		HACCP	0.0%	3.3%	1.5%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)		2	1	0	1	0	0	0	0	0		0.0%
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops				0.0%					0.0%			
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%	
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens				0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		
		Cecal												
	Turkeys	Retail Ground Turkey		0.0%		0.0%		0.0%	0.0%	0.0%			0.0%	0.0%
		HACCP			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%
		Cecal												
	Cattle	Retail Ground Beef	0.0%				0.0%	0.0%			0.0%		0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)												0.0%
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops				0.0%					0.0%			
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 64a. Antimicrobial Resistance among *Salmonella* Johannesburg Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	1	2	2	3	0	7	3	5	2	1	5	1		
	Chickens	Retail	0	0	0	0	1	0	0	0	0	0	0	0	
		HACCP	4	3	0	3	2	1	0	0	8	6	1	0	
		Cecal												0	
	Turkeys	Retail	0	0	0	1	0	0	0	0	0	0	0	0	
		HACCP	0	0	0	1	2	1	0	1	0	0	2	0	
		Cecal												0	
	Cattle	Retail	0	0	0	0	1	0	0	0	0	0	0	0	
		HACCP	1	0	2	0	1	0	0	0	1	0	2	2	
		Cecal (Beef)												0	
		Cecal (Dairy)												0	
	Swine	Retail	0	2	0	0	0	0	2	0	0	0	0	3	
		HACCP1	15	10	11	15	29	22	5	11	8	12		21	
		Cecal (Market Hogs)												33	
		Cecal (Sows)													
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	
		Chickens	Retail					0.0% 0							
			HACCP	0.0% 0	66.7% 2		100.0% 3	50.0% 1	100.0% 1			62.5% 5	66.7% 4	0.0% 0	
			Cecal												
		Turkeys	Retail				0.0% 0								
			HACCP				0.0% 0	50.0% 1	0.0% 0		100.0% 1			100.0% 2	
			Cecal												
		Cattle	Retail					0.0% 0							
			HACCP	0.0% 0		0.0% 0		0.0% 0				0.0% 0		0.0% 0	50.0% 1
			Cecal (Beef)												
			Cecal (Dairy)												
		Swine	Retail		0.0% 0					0.0% 0					0.0% 0
	HACCP		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
	Cecal (Market Hogs)													0.0% 0	
	Cecal (Sows)													0.0% 0	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		14.3% 1	0.0% 0	0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	
		Chickens	Retail					0.0% 0							
			HACCP	0.0% 0	33.3% 1		100.0% 3	50.0% 1	0.0% 0			12.5% 1	16.7% 1	0.0% 0	
			Cecal												
		Turkeys	Retail				0.0% 0								
			HACCP				0.0% 0	0.0% 0	0.0% 0		0.0% 0			0.0% 0	
			Cecal												
		Cattle	Retail					0.0% 0							
			HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1		0.0% 0	0.0% 0
			Cecal (Beef)												
			Cecal (Dairy)												
		Swine	Retail		0.0% 0					0.0% 0					0.0% 0
	HACCP		0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.4% 1	9.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
	Cecal (Market Hogs)													0.0% 0	
	Cecal (Sows)													0.0% 0	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	
		Chickens	Retail					0.0% 0							
			HACCP	0.0% 0	66.7% 2		100.0% 3	50.0% 1	100.0% 1			62.5% 5	66.7% 4	0.0% 0	
			Cecal												
		Turkeys	Retail				0.0% 0								
			HACCP				100.0% 1	0.0% 0	0.0% 0		0.0% 0			50.0% 1	
Cecal															
Cattle		Retail					0.0% 0								
		HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1		0.0% 0	100.0% 2	
		Cecal (Beef)													
		Cecal (Dairy)													
Swine		Retail		0.0% 0					0.0% 0					0.0% 0	
	HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0				
	Cecal (Market Hogs)												0.0% 0		
	Cecal (Sows)												0.0% 0		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 64b. Antimicrobial Resistance among *Salmonella* Johannesburg Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		1	2	2	3	0	7	3	5	2	1	5	1	
		Chickens	Retail	0	0	0	0	1	0	0	0	0	0	0	0
			HACCP	4	3	0	3	2	1	0	0	0	8	6	1
	Cecal														0
	Turkeys	Retail	0	0	0	1	0	0	0	0	0	0	0	0	0
		HACCP	0	0	0	1	2	1	0	0	1	0	0	2	0
		Cecal													0
	Cattle	Retail	0	0	0	0	1	0	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	0	1	0	2	2
		Cecal (Beef)													0
		Cecal (Dairy)													0
	Swine	Retail	0	2	0	0	0	0	0	2	0	0	0	0	3
		HACCP ¹	15	10	11	15	29	22	5	11	8	12			21
		Cecal (Market Hogs)													0
		Cecal (Sows)													33
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail					0.0% 0							
			HACCP	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
			Cecal												
		Turkeys	Retail				0.0% 0								
			HACCP				0.0% 0	0.0% 0	100.0% 1			0.0% 0			0.0% 0
			Cecal												
		Cattle	Retail				0.0% 0								
			HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1			0.0% 0
			Cecal (Beef)												
		Swine	Retail		0.0% 0						0.0% 0				
			HACCP	0.0% 0	0.0% 0	0.0% 0	6.7% 1	6.9% 2	9.1% 2	0.0% 0	9.1% 1	0.0% 0	0.0% 0		
			Cecal (Market Hogs)												4.8% 1
			Cecal (Sows)												0.0% 0
		Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Chickens	Retail							0.0% 0							
	HACCP			0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
	Cecal														
Turkeys	Retail						0.0% 0								
	HACCP						0.0% 0	0.0% 0	0.0% 0			0.0% 0			0.0% 0
	Cecal														
Cattle	Retail						0.0% 0								
	HACCP			0.0% 0		0.0% 0		0.0% 0				100.0% 1			0.0% 0
	Cecal (Beef)														
Swine	Retail				0.0% 0						0.0% 0				
	HACCP			6.7% 1	0.0% 0	0.0% 0	6.7% 1	6.9% 2	9.1% 2	0.0% 0	9.1% 1	0.0% 0	0.0% 0		
	Cecal (Market Hogs)														4.8% 1
	Cecal (Sows)														0.0% 0
Cephems	Ceftiofur (MIC ≥ 8 µg/ml)			Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	Retail					0.0% 0							
			HACCP	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
			Cecal												
		Turkeys	Retail				0.0% 0								
			HACCP				0.0% 0	0.0% 0	100.0% 1			0.0% 0			0.0% 0
			Cecal												
		Cattle	Retail				0.0% 0								
			HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1			0.0% 0
			Cecal (Beef)												
		Swine	Retail		0.0% 0						0.0% 0				
			HACCP	0.0% 0	0.0% 0	0.0% 0	6.7% 1	6.9% 2	9.1% 2	0.0% 0	9.1% 1	0.0% 0	0.0% 0		
			Cecal (Market Hogs)												4.8% 1
			Cecal (Sows)												0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 64c. Antimicrobial Resistance among *Salmonella* Johannesburg Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		1	2	2	3	0	7	3	5	2	1	5	1	
		Chickens	Retail	0	0	0	0	1	0	0	0	0	0	0	0
			HACCP	4	3	0	3	2	1	0	0	0	8	6	1
	Cecal														0
	Turkeys	Retail	0	0	0	1	0	0	0	0	0	0	0	0	0
		HACCP	0	0	0	1	2	1	0	0	1	0	0	2	0
		Cecal													0
	Cattle	Retail Ground Beef	0	0	0	0	1	0	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	0	1	0	2	2
		Cecal (Beef)													0
	Swine	Retail Pork Chops	0	2	0	0	0	0	0	2	0	0	0	0	3
		HACCP ¹	15	10	11	15	29	22	5	11	8	12			21
		Cecal (Market Hogs)													0
			Cecal (Sows)												33
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Cephems	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail	0	0	0	0	0.0%							
			HACCP	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
			Cecal												
		Turkeys	Retail				0.0%								
			HACCP				0.0%	0.0%	100.0%		0.0%			0.0%	
			Cecal				0	0	1		0			0	
		Cattle	Retail				0.0%								
			HACCP	0.0%		0.0%		0.0%				100.0%		0.0%	0.0%
			Cecal (Beef)												
		Swine	Retail		0.0%					0.0%					0.0%
			HACCP	0.0%	0.0%	0.0%	6.7%	6.9%	9.1%	0.0%	9.1%	0.0%	0.0%		
			Cecal (Market Hogs)				1	2	2		1				4.8%
				Cecal (Sows)											0.0%
		Folate Pathway Inhibitor	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	20.0%
Chickens	Retail							0.0%							
	HACCP			0.0%	66.7%		100.0%	100.0%	100.0%			25.0%	66.7%	0.0%	
	Cecal														
Turkeys	Retail						0.0%								
	HACCP						100.0%	50.0%	0.0%		100.0%			100.0%	
	Cecal						1	1	0		1			2	
Cattle	Retail						0.0%								
	HACCP			0.0%	0.0%	0.0%		0.0%				100.0%		0.0%	50.0%
	Cecal (Beef)														
Swine	Retail				0.0%					0.0%					0.0%
	HACCP			0.0%	0.0%	0.0%	0.0%	3.4%	4.5%	0.0%	0.0%	0.0%	0.0%		
	Cecal (Market Hogs)						0	1	1		0				0.0%
				Cecal (Sows)											0.0%
Folate Pathway Inhibitor	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)			Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens	Retail					0.0%							
			HACCP	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
			Cecal												
		Turkeys	Retail				0.0%								
			HACCP				0.0%	0.0%	0.0%		0.0%			0.0%	
			Cecal				0	0	0		0			0	
		Cattle	Retail				0.0%								
			HACCP	0.0%		0.0%		0.0%				100.0%		0.0%	0.0%
			Cecal (Beef)												
		Swine	Retail		0.0%					0.0%					0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Market Hogs)												0.0%
				Cecal (Sows)											0.0%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 64d. Antimicrobial Resistance among *Salmonella* Johannesburg Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		1	2	2	3	0	7	3	5	2	1	5	1	
		Chickens	Retail	0	0	0	0	1	0	0	0	0	0	0	0
			HACCP	4	3	0	3	2	1	0	0	0	8	6	1
	Cecal														0
	Turkeys	Retail	0	0	0	1	0	0	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	0	1	0	2	2
		Cecal													0
	Cattle	Retail Ground Beef	0	0	0	0	1	0	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	0	1	0	2	2
		Cecal (Beef) Cecal (Dairy)													0
	Swine	Retail Pork Chops	0	2	0	0	0	0	0	2	0	0	0	0	3
		HACCP ¹	15	10	11	15	29	22	5	11	8	12			21
		Cecal (Market Hogs) Cecal (Sows)													33
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail												
			HACCP										0.0% 0	0.0% 0	
			Cecal												
		Turkeys	Retail												
			HACCP											0.0% 0	
			Cecal												
		Cattle	Retail												
			HACCP											0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail												
			HACCP										0.0% 0		0.0% 0
			Cecal (Market Hogs) Cecal (Sows)												
		Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0	0.0% 0
Chickens	Retail							0.0% 0							
	HACCP			0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	16.7% 1	0.0% 0	
	Cecal														
Turkeys	Retail						0.0% 0								
	HACCP						0.0% 0	0.0% 0	100.0% 1		0.0% 0			0.0% 0	
	Cecal														
Cattle	Retail							0.0% 0							
	HACCP			0.0% 0		0.0% 0		0.0% 0				100.0% 1		0.0% 0	0.0% 0
	Cecal (Beef) Cecal (Dairy)														
Swine	Retail				0.0% 0						0.0% 0				
	HACCP			0.0% 0	0.0% 0	0.0% 0	6.7% 1	10.3% 3	9.1% 2	0.0% 0	9.1% 1	0.0% 0	0.0% 0		
	Cecal (Market Hogs) Cecal (Sows)														4.8% 1
Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)			Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens	Retail					0.0% 0							
			HACCP	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
			Cecal												
		Turkeys	Retail				0.0% 0								
			HACCP				100.0% 1	0.0% 0	0.0% 0		0.0% 0			0.0% 0	
			Cecal												
		Cattle	Retail					0.0% 0							
			HACCP	0.0% 0	0.0% 0	0.0% 0		0.0% 0				100.0% 1		0.0% 0	0.0% 0
			Cecal (Beef) Cecal (Dairy)												
		Swine	Retail		0.0% 0						0.0% 0				
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.4% 1	4.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal (Market Hogs) Cecal (Sows)												0.0% 0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 64e. Antimicrobial Resistance among *Salmonella* Johannesburg Isolates, 1996-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		1	2	2	3	0	7	3	5	2	1	5	1		
		Chickens														
	Retail		0	0	0	0	1	0	0	0	0	0	0	0	0	
		HACCP	4	3	0	3	2	1	0	0	0	8	6	1	0	
		Cecal													0	
	Turkeys	Retail	0	0	0	1	0	0	0	0	0	0	0	0	0	
		HACCP	0	0	0	1	2	1	0	1	0	0	0	2	0	
		Cecal													0	
	Cattle	Retail Ground Beef	0	0	0	0	1	0	0	0	0	0	0	0	0	
		HACCP	1	0	2	0	1	0	0	0	0	1	0	2	2	
		Cecal (Beef)													0	
		Cecal (Dairy)													0	
	Swine	Retail Pork Chops	0	2	0	0	0	0	0	2	0	0	0	0	3	
		HACCP ¹	15	10	11	15	29	22	5	11	8	12			21	
Cecal (Market Hogs)														0		
Cecal (Sows)														33		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Chickens	Retail					0.0% 0								
			HACCP	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		
			Cecal													
		Turkeys	Retail				0.0% 0									
			HACCP				0.0% 0	0.0% 0	0.0% 0		0.0% 0			0.0% 0		
			Cecal													
		Cattle	Retail					0.0% 0								
			HACCP	0.0% 0		0.0% 0		0.0% 0				0.0% 0		0.0% 0	0.0% 0	
			Cecal (Beef)													
			Cecal (Dairy)													
		Swine	Retail		0.0% 0						0.0% 0					0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
			Cecal (Market Hogs)												0.0% 0	
	Cecal (Sows)														0.0% 0	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Chickens	Retail					0.0% 0								
			HACCP	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0		
			Cecal													
		Turkeys	Retail				0.0% 0									
			HACCP				0.0% 0	0.0% 0	0.0% 0		0.0% 0			0.0% 0		
			Cecal													
		Cattle	Retail					0.0% 0								
			HACCP	0.0% 0		0.0% 0		0.0% 0				0.0% 0		0.0% 0	0.0% 0	
			Cecal (Beef)													
			Cecal (Dairy)													
		Swine	Retail		0.0% 0						0.0% 0					0.0% 0
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
Cecal (Market Hogs)														0.0% 0		
Cecal (Sows)														0.0% 0		
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	100.0% 1	50.0% 1	0.0% 0	33.3% 1		28.6% 2	66.7% 2	60.0% 3	50.0% 1	100.0% 1	20.0% 1	0.0% 0		
		Chickens	Retail					0.0% 0								
			HACCP	0.0% 0	33.3% 1		100.0% 3	50.0% 1	0.0% 0			0.0% 0	16.7% 1	0.0% 0		
			Cecal													
		Turkeys	Retail				0.0% 0									
			HACCP				100.0% 1	50.0% 1	100.0% 1		0.0% 0			100.0% 2		
			Cecal													
		Cattle	Retail					100.0% 1								
			HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1		0.0% 0	100.0% 2	
			Cecal (Beef)													
			Cecal (Dairy)													
		Swine	Retail		100.0% 2						50.0% 1					0.0% 0
			HACCP	13.3% 2	10.0% 1	27.3% 3	66.7% 10	37.9% 11	54.5% 12	40.0% 2	54.5% 6	25.0% 2	58.3% 7			
			Cecal (Market Hogs)												0.0% 0	
Cecal (Sows)														9.1% 3		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Multidrug Resistance

Table 65a. Resistance Patterns among *Salmonella* Johannesburg Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	1	2	2	3	0	7	3	5	2	1	5	1	
	Chickens	Retail Chickens	0	0	0	0	1	0	0	0	0	0	0	0
		HACCP	4	3	0	3	2	1	0	0	8	6	1	0
		Cecal												0
	Turkeys	Retail Ground Turkey	0	0	0	1	0	0	0	0	0	0	0	0
		HACCP	0	0	0	1	2	1	0	1	0	0	2	0
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	1	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	1	0	2	2
		Cecal (Beef)												0
	Swine	Retail Pork Chops	0	2	0	0	0	0	2	0	0	0	0	3
		HACCP ²	15	10	11	15	29	22	5	11	8	12		21
		Cecal (Market Hogs)												33
		Cecal (Sows)												
Resistance Pattern	Source													
1. No Resistance Detected	Humans	0.0% 0	50.0% 1	1.0% 2	0.7% 2		57.1% 4	33.3% 1	40.0% 2	50.0% 1	0.0% 0	80.0% 4	100.0% 1	
	Chickens	Retail Chickens					100.0% 1							
		HACCP	100.0% 4	33.3% 1		0.0% 0	0.0% 0	0.0% 0			37.5% 3	16.7% 1	100.0% 1	
		Cecal												
	Turkeys	Retail Ground Turkey				100.0% 1								
		HACCP				0.0% 0	50.0% 1	0.0% 0		0.0% 0			0.0% 0	
		Cecal												
	Cattle	Retail Ground Beef					0.0% 0							
		HACCP	100.0% 1		100.0% 2		100.0% 1				0.0% 0		100.0% 2	0.0% 0
		Cecal (Beef)												
	Swine	Retail Pork Chops		0.0% 0					50.0% 1					100.0% 1
		HACCP	80.0% 12	90.0% 9	72.7% 8	33.3% 5	58.6% 17	40.9% 9	60.0% 3	36.4% 4	75.0% 6	41.7% 5		
		Cecal (Market Hogs)												95.2% 20
		Cecal (Sows)												90.9% 30
2. Resistant to ≥ 3 Antimicrobial Classes	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	20.0% 1	0.0% 0	
	Chickens	Retail Chickens					0.0% 0							
		HACCP	0.0% 0	33.3% 1		100.0% 3	50.0% 1	0.0% 0			0.0% 0	16.7% 1	0.0% 0	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0% 0								
		HACCP				100.0% 1	50.0% 1	100.0% 1		0.0% 0			100.0% 2	
		Cecal												
	Cattle	Retail Ground Beef					0.0% 0							
		HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1		0.0% 0	50.0% 1
		Cecal (Beef)												
	Swine	Retail Pork Chops		0.0% 0					0.0% 0					0.0% 0
		HACCP	0.0% 0	0.0% 0	0.0% 0	6.7% 1	10.3% 3	13.6% 3	0.0% 0	9.1% 1	0.0% 0	0.0% 0		
		Cecal (Market Hogs)												4.8% 1
		Cecal (Sows)												0.0% 0
3. Resistant to ≥ 4 Antimicrobial Classes	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Chickens	Retail Chickens					0.0% 0							
		HACCP	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0			0.0% 0	0.0% 0	0.0% 0	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0% 0								
		HACCP				100.0% 1	0.0% 0	100.0% 1		0.0% 0			0.0% 0	
		Cecal												
	Cattle	Retail Ground Beef					0.0% 0							
		HACCP	0.0% 0		0.0% 0		0.0% 0				100.0% 1		0.0% 0	0.0% 0
		Cecal (Beef)												
	Swine	Retail Pork Chops		0.0% 0					0.0% 0					0.0% 0
		HACCP	0.0% 0	0.0% 0	0.0% 0	6.7% 1	6.9% 2	9.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal (Market Hogs)												0.0% 0
		Cecal (Sows)												0.0% 0

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 65b. Resistance Patterns among *Salmonella* Johannesburg Isolates, 2002-2013¹

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	1	2	2	3	0	7	3	5	2	1	5	1	
	Chickens	Retail Chickens	0	0	0	0	1	0	0	0	0	0	0	0
		HACCP	4	3	0	3	2	1	0	0	8	6	1	0
		Cecal												0
	Turkeys	Retail Ground Turkey	0	0	0	1	0	0	0	0	0	0	0	0
		HACCP	0	0	0	1	2	1	0	1	0	0	2	0
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	1	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	1	0	2	2
		Cecal (Beef)												0
		Cecal (Dairy)												0
	Swine	Retail Pork Chops	0	2	0	0	0	0	2	0	0	0	0	3
		HACCP ²	15	10	11	15	29	22	5	11	8	12		
		Cecal (Market Hogs)												21
Cecal (Sows)													33	
Resistance Pattern		Source												
4. Resistant to ≥ 5 Antimicrobial Classes	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens	0	0	0	0	0.0%	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0%								
		HACCP				0.0%	0.0%	0.0%		0.0%			0.0%	
		Cecal												
	Cattle	Retail Ground Beef					0.0%							
		HACCP	0.0%		0.0%	0.0%	0.0%				100.0%		0.0%	0.0%
		Cecal (Beef)												
		Cecal (Dairy)												
	Swine	Retail Pork Chops		0.0%					0.0%					0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	3.4%	4.5%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)					1	1	0	0	0	0		0.0%
Cecal (Sows)													0.0%	
5. At Least ACSSuT ³ Resistant	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens					0.0%							
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0%								
		HACCP				0.0%	0.0%	0.0%		0.0%			0.0%	
		Cecal												
	Cattle	Retail Ground Beef					0.0%							
		HACCP	0.0%		0.0%		0.0%				100.0%		0.0%	0.0%
		Cecal (Beef)												
		Cecal (Dairy)												
	Swine	Retail Pork Chops		0.0%					0.0%					0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%	
6. At Least ACT/S ⁴ Resistant	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens					0.0%							
		HACCP	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0%								
		HACCP				0.0%	0.0%	0.0%		0.0%			0.0%	
		Cecal												
	Cattle	Retail Ground Beef					0.0%							
		HACCP	0.0%		0.0%		0.0%				100.0%		0.0%	0.0%
		Cecal (Beef)												
		Cecal (Dairy)												
	Swine	Retail Pork Chops		0.0%					0.0%					0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%	

¹ Starting in 2011, testing included nine antimicrobial classes with the addition of the macrolide azithromycin. Because resistance to azithromycin is low (in this case, <1%), antimicrobial class resistance data from 2011 and beyond are comparable to the data from previous years.

² In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

³ ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

⁴ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 65c. Resistance Patterns among *Salmonella* Johannesburg Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	1	2	2	3	0	7	3	5	2	1	5	1	
	Chickens	Retail Chickens	0	0	0	0	1	0	0	0	0	0	0	0
		HACCP	4	3	0	3	2	1	0	0	8	6	1	0
		Cecal												0
	Turkeys	Retail Ground Turkey	0	0	0	1	0	0	0	0	0	0	0	0
		HACCP	0	0	0	1	2	1	0	1	0	0	2	0
		Cecal												0
	Cattle	Retail Ground Beef	0	0	0	0	1	0	0	0	0	0	0	0
		HACCP	1	0	2	0	1	0	0	0	1	0	2	2
		Cecal (Beef)												0
		Cecal (Dairy)												0
	Swine	Retail Pork Chops	0	2	0	0	0	0	2	0	0	0	0	3
		HACCP ¹	15	10	11	15	29	22	5	11	8	12		
		Cecal (Market Hogs)												21
Cecal (Sows)													33	
Resistance Pattern		Source												
7. At Least ACSSuTAuCx ² Resistant	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens	0	0	0	0	0.0%	0	0	0	0	0	0	0
		HACCP	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0%								
		HACCP				0.0%	0.0%	0.0%		0.0%			0.0%	
		Cecal												
	Cattle	Retail Ground Beef					0.0%							
		HACCP	0.0%		0.0%		0.0%				100.0%		0.0%	0.0%
		Cecal (Beef)												
		Cecal (Dairy)												
	Swine	Retail Pork Chops		0.0%					0.0%					0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%	
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Chickens	Retail Chickens					0.0%							
		HACCP	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	
		Cecal												
	Turkeys	Retail Ground Turkey				0.0%								
		HACCP				0.0%	0.0%	0.0%		0.0%			0.0%	
		Cecal												
	Cattle	Retail Ground Beef					0.0%							
		HACCP	0.0%		0.0%		0.0%				0.0%		0.0%	0.0%
		Cecal (Beef)												
		Cecal (Dairy)												
	Swine	Retail Pork Chops		0.0%					0.0%					0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)												0.0%
Cecal (Sows)													0.0%	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Resistance by Year

Table 66a. Antimicrobial Resistance among *Salmonella* Kentucky Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans	5	2	2	3	3	2	5	3	6	4	7	6	
	Chickens	Retail	10	20	42	60	59	23	30	44	21	45	62	44
		HACCP	545	418	570	919	674	443	219	214	243	227	301	237
		Cecal												15
	Turkeys	Retail	3	4	1	2	1	2	0	2	2	2	1	2
		HACCP	4	9	6	5	8	1	1	2	0	2	1	0
		Cecal												1
	Cattle	Retail	0	0	0	0	0	0	1	0	0	3	1	1
		HACCP	50	30	25	9	14	12	22	10	13	18	12	14
		Cecal (Beef)												6
		Cecal (Dairy)												15
	Swine	Retail	0	0	0	0	0	0	0	0	0	0	1	0
		HACCP1	3	0	1	1	1	1	1	0	0	0		1
		Cecal (Market Hogs) Cecal (Sows)												3
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	16.7%	25.0%	28.6%	50.0%
		Retail	0.0%	5.0%	2.4%	0.0%	8.5%	0.0%	6.7%	2.3%	4.8%	4.4%	6.5%	0.0%
		HACCP	0.0%	1.0%	1.0%	0.0%	5.0%	0.0%	2.0%	1.0%	1.0%	2.0%	4.0%	0.0%
		Cecal	1.8%	2.6%	2.1%	1.4%	5.5%	3.4%	3.2%	2.3%	1.6%	1.3%	2.7%	0.8%
		Chickens	10	11	12	13	37	15	7	5	4	3	8	2
		Turkeys	1	1	0	0	0	0	0	1	0	0	0	0
		HACCP	50.0%	22.2%	0.0%	20.0%	37.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	2	2	0	1	3	0	0	0	0	0	0	0
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)												0.0%
		Cecal (Dairy)												0.0%
		Swine	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%				0.0%	0.0%
		HACCP	0		0	0	0	0	0				0	0
		Cecal (Market Hogs)												0.0%
	Cecal (Sows)												0.0%	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%
		Retail	0.0%	0.0%	2.4%	0.0%	8.5%	4.3%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%
		HACCP	0.0%	0.0%	1.0%	0.0%	5.0%	2.1%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%
		Cecal	0.6%	0.5%	0.5%	0.5%	2.1%	2.0%	1.8%	2.3%	0.0%	0.0%	0.0%	0.4%
		Chickens	3	2	3	5	14	9	4	5	0	0	0	1
		Turkeys	1	0	0	0	0	0	0	0	0	0	0	0
		HACCP	25.0%	0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	1	0	0	0	1	0	0	0	0	0	0	0
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)												0.0%
		Cecal (Dairy)												0.0%
		Swine	0.0%		0.0%	0.0%	0.0%	100.0%	0.0%				0.0%	0.0%
		HACCP	0		0	0	0	1	0				0	0
		Cecal (Market Hogs)												0.0%
	Cecal (Sows)												0.0%	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	20.0%	33.3%	66.7%	25.0%	28.6%	0.0%
		Retail	30.0%	65.0%	52.4%	50.0%	69.5%	60.9%	66.7%	70.5%	81.0%	80.0%	87.1%	79.6%
		HACCP	3	13	22	30	41	14	20	31	17	36	54	35
		Cecal	27.3%	21.5%	33.7%	36.3%	34.9%	32.5%	51.6%	54.7%	67.9%	69.2%	75.1%	81.0%
Chickens		149	90	192	334	235	144	113	117	165	157	226	192	
Turkeys		1	2	0	1	0	1	0	0	0	2	0	2	
HACCP		75.0%	44.4%	16.7%	40.0%	25.0%	0.0%	0.0%	50.0%	0.0%	0.0%	100.0%	100.0%	
Cecal		3	4	1	2	2	0	0	1	0	0	1	0	
Cattle		0.0%	3.3%	4.0%	0.0%	14.3%	0.0%	4.5%	0.0%	23.1%	16.7%	8.3%	7.1%	
HACCP		7	1	1	0	2	0	1	0	3	3	1	1	
Cecal (Beef)													0.0%	
Cecal (Dairy)													6.7%	
Swine		0.0%		0.0%	0.0%	100.0%	0.0%	0.0%				100.0%	100.0%	
HACCP		0		0	0	1	0	0				1	0	
Cecal (Market Hogs)													0.0%	
Cecal (Sows)												0.0%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 66b. Antimicrobial Resistance among *Salmonella* Kentucky Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	5	2	2	3	3	2	5	3	6	4	7	6		
	Chickens	Retail	10	20	42	60	59	23	30	44	21	45	62	44	
		HACCP	545	418	570	919	674	443	219	214	243	227	301	237	
		Cecal												15	
	Turkeys	Retail	3	4	1	2	1	2	0	2	2	2	1	2	
		HACCP	4	9	6	5	8	1	1	2	0	2	1	0	
		Cecal												1	
	Cattle	Retail	0	0	0	0	0	0	1	0	0	3	1	1	
		HACCP	50	30	25	9	14	12	22	10	13	18	12	14	
		Cecal (Beef)												6	
		Cecal (Dairy)												15	
	Swine	Retail	0	0	0	0	0	0	0	0	0	0	1	0	
		HACCP ¹	3	0	1	1	1	1	1	0	0	0			
		Cecal (Market Hogs)												1	
	Cecal (Sows)													3	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	20.0%	0.0%	16.7%	0.0%	14.3%	33.3%	
		Chickens	Retail	10.0%	25.0%	26.2%	21.7%	22.0%	8.7%	20.0%	36.4%	19.0%	28.9%	21.0%	15.9%
			HACCP	2	5	11	13	13	2	6	16	4	13	13	7
			Cecal	10.6%	7.2%	9.6%	13.5%	15.4%	19.9%	11.0%	19.2%	15.2%	8.8%	18.3%	14.8%
		Turkeys	Retail	58	30	55	124	104	88	24	41	37	20	55	35
			HACCP												6.7%
			Cecal												1
		Cattle	Retail	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	1	0	0	0	0	0		0	0	0	0	0
			Cecal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	100.0%	
		Swine	Retail												0.0%
			HACCP												0
			Cecal (Market Hogs)												0
			Cecal (Sows)												0
		Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	20.0%	0.0%	16.7%	0.0%	14.3%
Chickens	Retail			20.0%	25.0%	26.2%	21.7%	22.0%	8.7%	20.0%	36.4%	19.0%	31.1%	16.1%	13.6%
	HACCP			2	5	11	13	13	2	6	16	4	14	10	6
	Cecal			8.1%	5.7%	9.6%	13.3%	15.1%	16.3%	10.5%	17.3%	14.8%	8.8%	14.6%	12.7%
Turkeys	Retail			44	24	55	122	102	72	23	37	36	20	44	30
	HACCP														0.0%
	Cecal														0
Cattle	Retail			33.3%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
	HACCP			1	0	0	0	0	0		0	0	0	0	0
	Cecal			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
Swine	Retail														0.0%
	HACCP														0
	Cecal (Market Hogs)														0
	Cecal (Sows)														0
Ceftiofur	(MIC ≥ 8 µg/ml)			Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	20.0%	0.0%	16.7%	0.0%	0.0%
		Chickens	Retail	20.0%	25.0%	26.2%	21.7%	22.0%	8.7%	20.0%	36.4%	19.0%	28.9%	19.4%	15.9%
			HACCP	2	5	11	13	13	2	6	16	4	13	12	7
			Cecal	10.8%	7.4%	9.6%	13.5%	15.3%	19.9%	11.0%	18.7%	15.2%	8.4%	15.6%	13.1%
		Turkeys	Retail	59	31	55	124	103	88	24	40	37	19	47	31
			HACCP												6.7%
			Cecal												1
		Cattle	Retail	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	1	0	0	0	0	0		0	0	0	0	0
			Cecal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
		Swine	Retail												0.0%
			HACCP												0
			Cecal (Market Hogs)												0
			Cecal (Sows)												0

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 66c. Antimicrobial Resistance among *Salmonella* Kentucky Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Humans	5	2	2	3	3	2	5	3	6	4	7	6				
	Chickens	Retail	10	20	42	60	59	23	30	44	21	45	62	44			
		HACCP	545	418	570	919	674	443	219	214	243	227	301	237			
		Cecal												15			
	Turkeys	Retail	3	4	1	2	1	2	0	2	2	2	1	2			
		HACCP	4	9	6	5	8	1	1	2	0	2	1	0			
		Cecal												1			
	Cattle	Retail Ground Beef	0	0	0	0	0	0	1	0	0	3	1	1			
		HACCP	50	30	25	9	14	12	22	10	13	18	12	14			
		Cecal (Beef)												6			
		Cecal (Dairy)												15			
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	1	0			
		HACCP ¹	3	0	1	1	1	1	1	0	0	0					
		Cecal (Market Hogs)												1			
		Cecal (Sows)												3			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
	Cepheims	Ceftriaxone (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	16.7%		
			0	0	0	0	1	0	1	0	1	0	0	1			
Chickens			Retail	20.0%	25.0%	26.2%	23.3%	22.0%	8.7%	20.0%	36.4%	19.0%	28.9%	21.0%	15.9%		
			HACCP	10.5%	7.2%	9.5%	13.6%	15.3%	19.9%	11.0%	19.2%	15.2%	8.8%	18.3%	14.3%		
			Cecal	57	30	54	125	103	88	24	41	37	20	55	34		
Turkeys			Retail	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			HACCP	1	0	0	0	0	0	0	0	0	0	0	0		
			Cecal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%			
Cattle			Retail							0.0%			33.3%	0.0%	0.0%		
			HACCP	4.0%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	0.0%		
			Cecal (Beef)	2	0	0	0	2	0	0	0	0	0	1	0		
Swine			Retail											0.0%	0.0%		
			HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%							
			Cecal (Market Hogs)	0		0	0	0	0	0					0.0%		
Cecal (Sows)														0.0%			
Folate Pathway Inhibitor			Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 4 µg/ml)	Humans	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	33.3%	16.7%	25.0%	28.6%	50.0%		
					0	1	0	0	0	0	1	1	1	2	3		
				Chickens	Retail	0.0%	5.0%	4.8%	0.0%	8.5%	4.3%	6.7%	4.6%	0.0%	8.9%	4.8%	0.0%
					HACCP	0	1	2	0	5	1	2	2	0	4	3	0
					Cecal	2.2%	3.8%	3.3%	2.2%	6.2%	3.8%	4.1%	2.3%	1.6%	1.3%	3.7%	2.1%
	Turkeys	Retail		33.3%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%		
		HACCP		1	2	4	1	7	0	1	2	0	0	0	0		
		Cecal		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Cattle	Retail								0.0%		0.0%	0.0%	0.0%	0.0%		
		HACCP		4.0%	0.0%	4.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	0.0%		
		Cecal (Beef)		2	0	1	0	1	0	0	0	0	0	1	0		
	Swine	Retail												0.0%	0.0%		
		HACCP		0.0%		0.0%	0.0%	0.0%	0.0%	0.0%							
		Cecal (Market Hogs)		0		0	0	0	0	0					0.0%		
	Cecal (Sows)													0.0%			
	Folate Pathway Inhibitor	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)		Humans	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%		
					0	1	0	0	0	0	0	1	0	0	0	0	
				Chickens	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%
					HACCP	0	0	0	0	0	0	0	0	0	1	0	0
					Cecal	0.6%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.4%
Turkeys			Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			HACCP	0	0	0	0	0	0	0	0	0	0	0	0		
			Cecal	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Cattle			Retail							0.0%		0.0%	0.0%	0.0%	0.0%		
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0		
Swine			Retail											0.0%	0.0%		
			HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%							
			Cecal (Market Hogs)	0		0	0	0	0	0					0.0%		
Cecal (Sows)														0.0%			

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 66d. Antimicrobial Resistance among *Salmonella* Kentucky Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		5	2	2	3	3	2	5	3	6	4	7	6	
		Chickens	Retail	10	20	42	60	59	23	30	44	21	45	62	44
			HACCP	545	418	570	919	674	443	219	214	243	227	301	237
	Cecal													15	
	Turkeys	Retail	3	4	1	2	1	2	0	2	2	2	2	1	2
		HACCP	4	9	6	5	8	1	1	2	0	2	1	0	6
		Cecal													6
	Cattle	Retail Ground Beef	0	0	0	0	0	0	1	0	0	0	3	1	1
		HACCP	50	30	25	9	14	12	22	10	13	18	12	14	6
		Cecal (Beef)												6	15
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	1	0
		HACCP ¹	3	0	1	1	1	1	1	0	0	0	0		1
		Cecal (Market Hogs)													3
			Cecal (Sows)												
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Macrolides	Azithromycin (MIC ≥32 µg/ml)	Humans										0.0%	0.0%	0.0%	
		Chickens	Retail										2.2%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
		Turkeys	Retail										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal										0.0%	0.0%	0.0%
		Cattle	Retail										0.0%	0.0%	0.0%
			HACCP										0.0%	0.0%	0.0%
			Cecal (Beef)										0.0%	0.0%	0.0%
		Swine	Retail											0.0%	0.0%
			HACCP												0.0%
			Cecal (Market Hogs)												0.0%
				Cecal (Sows)											0.0%
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	20.0%	33.3%	33.3%	25.0%	71.4%	50.0%	
		Chickens	Retail	20.0%	25.0%	28.6%	21.7%	22.0%	8.7%	20.0%	38.6%	19.1%	28.9%	22.6%	15.9%
			HACCP	11.4%	8.4%	10.9%	14.4%	16.2%	20.1%	11.4%	19.6%	15.2%	8.8%	19.3%	14.8%
			Cecal	62	35	62	132	109	89	25	42	37	20	58	35
		Turkeys	Retail	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%		50.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	11.1%	0.0%	20.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
			Cecal	1	0	0	1	1	0	0	0	0	0	1	0
		Cattle	Retail							0.0%			33.3%	0.0%	0.0%
			HACCP	4.0%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	0.0%
			Cecal (Beef)	2	0	0	0	2	0	0	0	0	0	1	0
		Swine	Retail											0.0%	0.0%
			HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%					0.0%
			Cecal (Market Hogs)	0		0	0	0	0	0					0.0%
				Cecal (Sows)											0.0%
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	
		Chickens	Retail	0.0%	0.0%	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%
			HACCP	0.4%	0.2%	0.7%	0.5%	1.8%	2.0%	2.3%	1.9%	1.2%	0.4%	0.0%	0.4%
			Cecal	2	1	4	5	12	9	5	4	3	1	0	1
		Turkeys	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	Retail							0.0%			0.0%	0.0%	0.0%
			HACCP	2.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	1	0	0	0	1	0	0	0	0	0	0	0
		Swine	Retail											0.0%	0.0%
			HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%					0.0%
			Cecal (Market Hogs)	0		0	0	0	0	0					0.0%
				Cecal (Sows)											0.0%

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 66e. Antimicrobial Resistance among *Salmonella* Kentucky Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		5	2	2	3	3	2	5	3	6	4	7	6	
		Chickens	Retail	10	20	42	60	59	23	30	44	21	45	62	44
			HACCP	545	418	570	919	674	443	219	214	243	227	301	237
	Cecal													15	
	Turkeys	Retail	3	4	1	2	1	2	0	2	2	2	2	1	2
		HACCP	4	9	6	5	8	1	1	2	0	2	2	1	0
		Cecal												1	1
	Cattle	Retail Ground Beef	0	0	0	0	0	0	0	1	0	0	3	1	1
		HACCP	50	30	25	9	14	12	22	10	13	18	12	14	6
		Cecal (Beef) Cecal (Dairy)												15	15
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	1	0
		HACCP ¹	3	0	1	1	1	1	1	1	0	0	0		
		Cecal (Market Hogs) Cecal (Sows)													3
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	16.7%	25.0%	42.9%	50.0%	
		Chickens	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal													0.0%
		Turkeys	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal													0.0%
		Cattle	Retail							0.0%			0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal (Beef)													0.0%
		Cecal (Dairy)													0.0%
		Swine	Retail											0.0%	0.0%
	HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%						0.0%	
	Cecal (Market Hogs)													0.0%	
	Cecal (Sows)													0.0%	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%	50.0%	0.0%	33.3%	0.0%	0.0%	33.3%	16.7%	25.0%	42.9%	50.0%	
		Chickens	Retail	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.6%	0.7%	0.2%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal	3	3	1	0	1	1	0	0	0	0	0	0	0
		Turkeys	Retail	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cecal													0.0%
		Cattle	Retail							0.0%			0.0%	0.0%	0.0%
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cecal (Beef)														0.0%	
Cecal (Dairy)														0.0%	
Swine		Retail											0.0%	0.0%	
HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%						0.0%		
Cecal (Market Hogs)													0.0%		
Cecal (Sows)													0.0%		
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	0.0%	50.0%	0.0%	0.0%	33.3%	0.0%	40.0%	33.3%	66.7%	100.0%	42.9%	33.3%	
		Chickens	Retail	30.0%	60.0%	54.8%	53.3%	72.9%	73.9%	56.7%	68.2%	71.4%	75.6%	40.3%	63.6%
		HACCP	3	12	23	32	43	17	17	30	15	34	25	28	28
		Cecal	34.9%	32.5%	37.5%	43.9%	47.2%	56.9%	51.1%	57.5%	69.5%	72.2%	59.1%	70.5%	70.5%
		Turkeys	Retail	66.7%	50.0%	0.0%	100.0%	100.0%	100.0%		50.0%	50.0%	100.0%	100.0%	0.0%
		HACCP	2	2	0	2	1	2		1	1	2	1	0	0
		Cecal	50.0%	100.0%	100.0%	60.0%	87.5%	0.0%	100.0%	100.0%	50.0%	50.0%	0.0%	0.0%	0.0%
		Cattle	Retail							0.0%			100.0%	0.0%	0.0%
		HACCP	30.0%	10.0%	48.0%	22.2%	35.7%	0.0%	13.6%	0.0%	53.8%	38.9%	16.7%	14.3%	50.0%
		Cecal (Beef)	15	3	12	2	5	0	3	0	7	7	2	2	3
		Cecal (Dairy)													13.3%
		Swine	Retail											0.0%	0.0%
HACCP	0.0%		100.0%	0.0%	100.0%	100.0%	0.0%						0.0%		
Cecal (Market Hogs)			1	0	1	1	0						0.0%		
Cecal (Sows)													0.0%		

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

Table 67c. Resistance Patterns among *Salmonella* Kentucky Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	5	2	2	3	3	2	5	3	6	4	7	6		
	Chickens	Retail Chickens	10	20	42	60	59	23	30	44	21	45	62	44	
		HACCP	545	418	570	919	674	443	219	214	243	227	301	237	
		Cecal												15	
	Turkeys	Retail Ground Turkey	3	4	1	2	1	2	0	2	2	2	1	2	
		HACCP	4	9	6	5	8	1	1	2	0	2	1	0	
		Cecal												1	
	Cattle	Retail Ground Beef	0	0	0	0	0	0	1	0	0	3	1	2	
		HACCP	50	30	25	9	14	12	22	10	13	18	12	14	
		Cecal (Beef)												6	
		Cecal (Dairy)												15	
	Swine	Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	1	0	
		HACCP ¹	3	0	1	1	1	1	1	0	0	0			
		Cecal (Market Hogs)												1	
		Cecal (Sows)												3	
Resistance Pattern	Source														
7. At Least ACSSuTAuCx ¹ Resistant	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Chickens	Retail Chickens	0	0	0	0	0	0	0	0	0	0	0	0	
		HACCP	0.0%	0.0%	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal	0	0	0	0	4	0	0	0	0	0	0	0.4%	
	Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal												0	
	Cattle	Retail Ground Beef							0.0%			0.0%	0.0%	0.0%	
		HACCP	2.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)	1	0	0	0	1	0	0	0	0	0	0	0	
		Cecal (Dairy)												0.0%	
	Swine	Retail Pork Chops											0.0%		
		HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%						
		Cecal (Market Hogs)	0		0	0	0	0	0					0.0%	
		Cecal (Sows)												0.0%	
	8. At Least Ceftriaxone and Nalidixic Acid Resistant	Humans	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens	Retail Chickens	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			HACCP	0	0	0	1	18	0	0	0	0	0	0	0
Cecal			1	1	0	4	12	7	4	4	3	1	0	0	
Turkeys		Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal												0.0%	
Cattle		Retail Ground Beef							0.0%			0.0%	0.0%	0.0%	
		HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Dairy)												0.0%	
Swine		Retail Pork Chops											0.0%		
		HACCP	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%						
		Cecal (Market Hogs)	0		0	0	0	0	0					0.0%	
		Cecal (Sows)												0.0%	

¹ In 2012 and 2013, FSIS did not sample products for *Salmonella* because in prior years the percent of pork carcass samples positive for *Salmonella* was consistently low

² ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Campylobacter Data

Campylobacter jejuni and Campylobacter coli Isolates Tested

Table 68. Number of *Campylobacter jejuni* Isolates Tested, 1997-2013¹

Source	Year																
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Humans	209	297	293	306	365	329	303	320	788	709	992	1033	1350	1159	1275	1191	1182
Chickens	Retail Chickens					198	325	510	403	426	332	329	404	355	393	421	428
	HACCP				64 ²	526	374	508	567	228	166	78	117	208	344	1348	788 ³
	Cecal																11
Turkeys	Retail Ground Turkey					2	4	7	10	12	20	10	9	5	13	3	7
	Cecal																0
Cattle	Cecal (Beef)																531
	Cecal (Dairy)																542
Swine	Cecal (Market Hogs)																4
	Cecal (Sows)																6

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports

² These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

³ Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013

Table 69. Number of *Campylobacter coli* Isolates Tested, 1997-2013¹

Source	Year																
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Humans	6	8	20	12	17	25	22	26	99	97	105	115	142	115	148	134	142
Chickens	Retail Chickens					90	142	196	151	145	143	181	176	148	210	193	198
	HACCP				52 ²	288	247	186	380	123	76	28	81	100	233	693	393 ³
	Cecal																50
Turkeys	Retail Ground Turkey					2	1	5	9	10	14	19	16	7	18	3	5
	Cecal																18
Cattle	Cecal (Beef)																131
	Cecal (Dairy)																98
Swine	Cecal (Market Hogs)																190
	Cecal (Sows)																163

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

³ Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013

Isolation of *Campylobacter* from Retail Meats

Table 70. Number and Percent of Retail Meat Samples Culture Positive for *Campylobacter*, 2012¹

	Retail Chickens	Retail Ground Turkey
Number of Meat Samples Tested	1300	1295
Number Positive for <i>Campylobacter</i>	617	7
Percent Positive for <i>Campylobacter</i>	47.5%	0.5%

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

Figure 8. Percent of Retail Meat Samples Culture Positive for *Campylobacter*, 2012

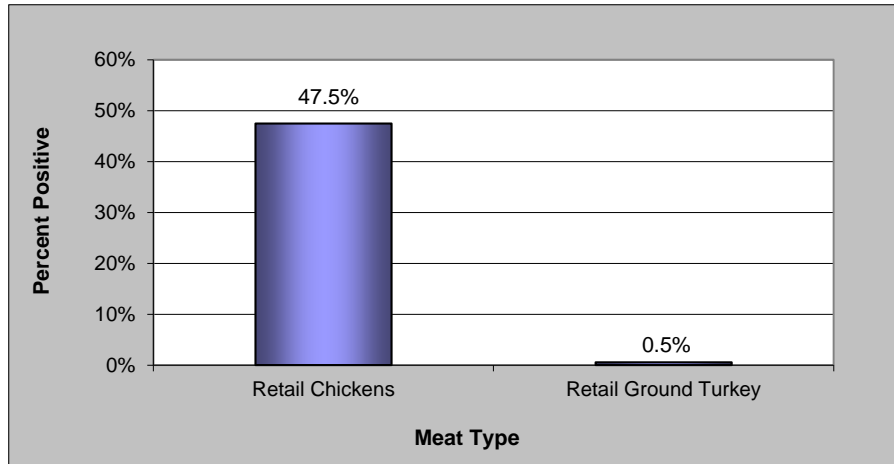
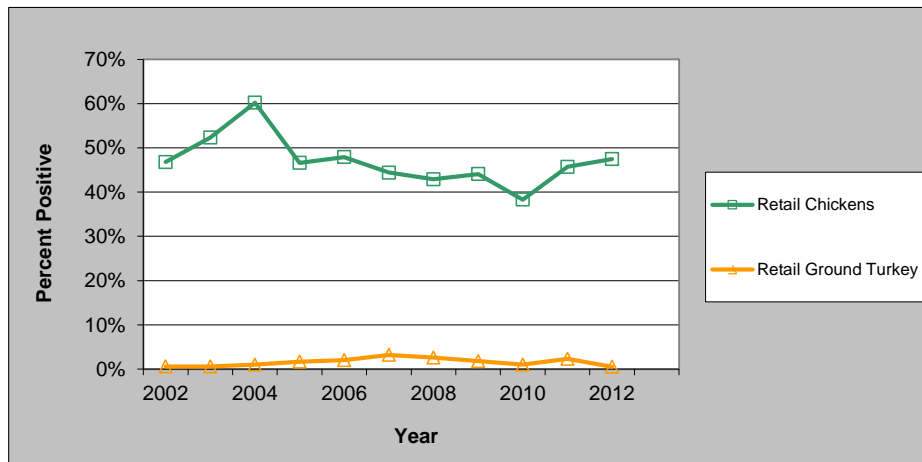


Figure 9. Percent of Retail Meat Samples Culture Positive for *Campylobacter*, 2002-2012



Isolation of *Campylobacter* from Retail Meats

Table 71. Number and Percent of Retail Meat Samples Culture Positive for *Campylobacter*, 2013¹

	Retail Chickens	Retail Ground Turkey
Number of Meat Samples Tested	1669	1644
Number Positive for <i>Campylobacter</i>	629	12
Percent Positive for <i>Campylobacter</i>	37.7%	0.7%

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

Figure 10. Percent of Retail Meat Samples Culture Positive for *Campylobacter*, 2013

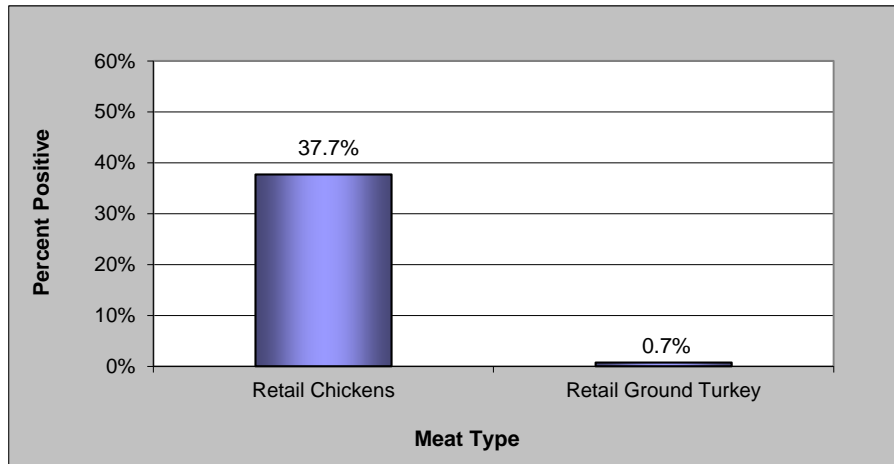
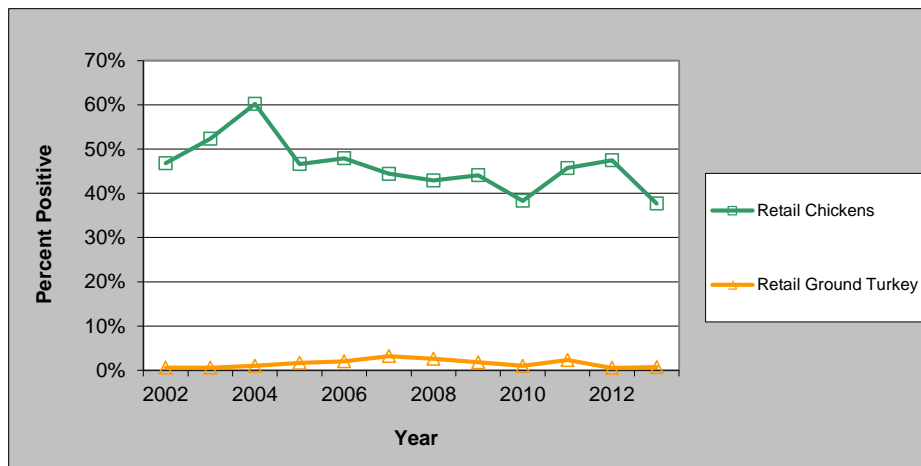


Figure 11. Percent of Retail Meat Samples Culture Positive for *Campylobacter*, 2002-2013



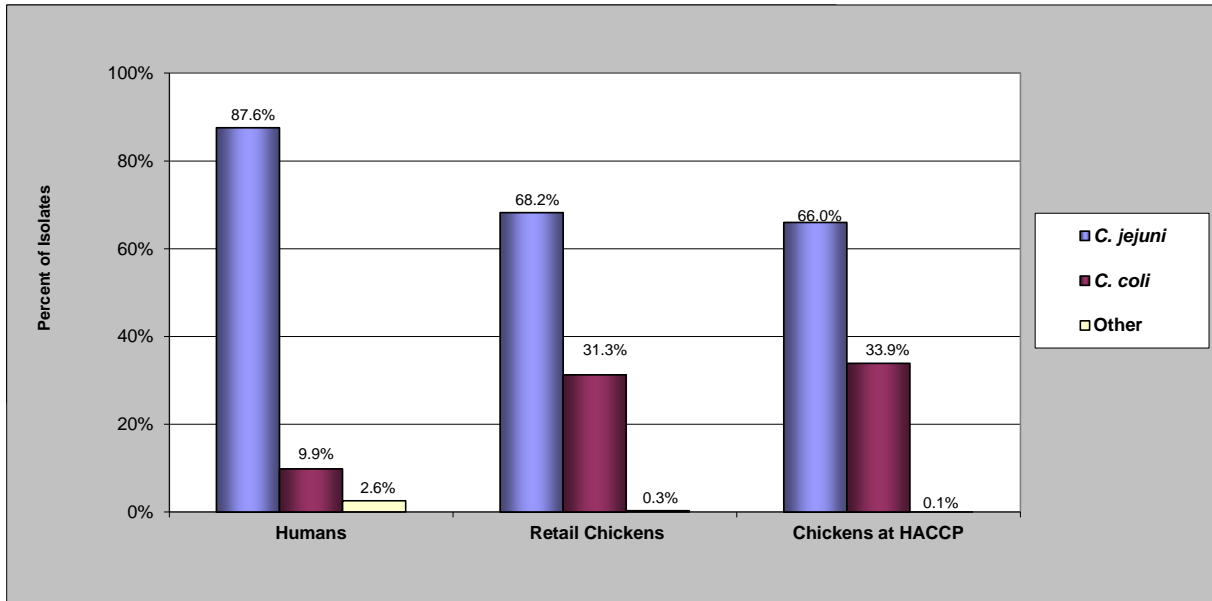
Campylobacter Species

Table 72. *Campylobacter* Species Isolated, 2012¹

<i>Campylobacter</i> Species	Humans (N=1360)	Retail Chickens (N=617)	HACCP (N=2042)	Retail Ground Turkey (N=7)
<i>C. jejuni</i>	87.6% 1191	68.2% 421	66.0% 1348	42.9% 3
<i>C. coli</i>	9.9% 134	31.3% 193	33.9% 693	42.9% 3
Other	2.6% 35	0.3% 3	0.05% 1	14.3% 1

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

Figure 12. *Campylobacter* Species Isolated, 2012



Campylobacter Species

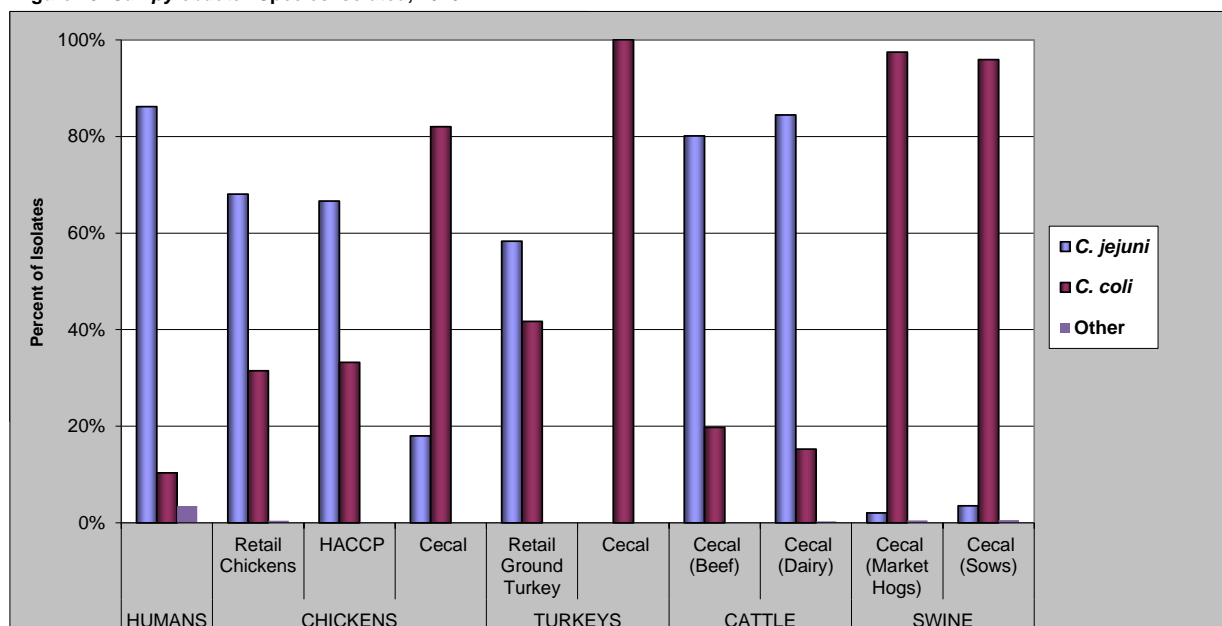
Table 73. *Campylobacter* Species Isolated, 2013¹

Campylobacter Species	Humans	Chickens			Turkeys		Cattle		Swine	
	Humans (N=1372)	Retail Chickens (N= 629)	HACCP ² (N=1183)	Cecal (N= 61)	Retail Ground Turkey (N= 12)	Cecal (N= 18)	Cecal (Beef) (N= 663)	Cecal (Dairy) (N= 642)	Cecal (Market Hogs) (N= 195)	Cecal (Sows) (N= 170)
<i>C. jejuni</i>	86.2% 1182	68.0% 428	66.6% 788	18.0% 11	58.3% 7	0.0% 0	80.1% 531	84.4% 542	2.1% 4	3.5% 6
<i>C. coli</i>	10.3% 142	31.5% 198	33.2% 393	82.0% 50	41.7% 5	100.0% 18	19.8% 131	15.3% 98	97.4% 190	95.9% 163
Other	3.5% 48	0.5% 3	0.2% 2	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.3% 2	0.5% 1	0.6% 1

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013

Figure 13. *Campylobacter* Species Isolated, 2013



Antimicrobial Susceptibility among *Campylobacter jejuni*

MIC Distributions

Table 74a. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																					
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256							
Aminoglycosides	Gentamicin	Humans (1191)	1.0	[0.5 - 1.8]						3.0	27.0	57.4	11.4	0.2	0.1		0.3		0.7							
		Chickens	Retail Chickens (421)	0.2	[0.0 - 1.3]						0.5	8.8	75.1	15.2	0.2					0.2						
			HACCP (1348)	0.4	[0.2 - 1.0]						2.2	24.9	63.9	8.5			0.1		0.4							
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						33.3		33.3	33.3												
Ketolides	Telithromycin	Humans (1191)	1.4	[0.8 - 2.3]	0.1					0.3	3.3	19.1	38.8	31.0	6.0	0.3		1.1								
		Chickens	Retail Chickens (421)	0.7	[0.1 - 2.1]						0.2	1.4	21.9	43.9	26.8	4.3	0.7	0.2		0.5						
			HACCP (1348)	0.5	[0.2 - 1.1]	0.1	0.1	1.3	19.7	50.1	23.1	4.5	0.4	0.2		0.3										
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						33.3		66.7													
Lincosamides	Clindamycin	Humans (1191)	10.8	[9.1 - 12.7]						0.7	8.9	30.1	23.3	26.2	8.4		0.8		0.2		0.3		0.3		0.8	
		Chickens	Retail Chickens (421)	1.2	[0.4 - 2.7]						3.8	29.0	47.7	15.9	2.4			0.5		0.2		0.5				
			HACCP (1348)	1.0	[0.6 - 1.7]						1.2	21.9	55.9	17.7	2.3	0.4		0.1		0.1		0.2		0.1		
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						100.0															
Macrolides	Azithromycin	Humans (1191)	1.8	[1.1 - 2.7]	0.7	9.6	32.8	34.3	20.9	0.3		0.1									0.3	1.2				
		Chickens	Retail Chickens (421)	1.2	[0.4 - 2.7]	12.1	48.9	31.1	6.7			0.5									0.7					
			HACCP (1348)	1.0	[0.6 - 1.7]	6.8	63.5	27.0	1.4	0.2								0.1	1.0							
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						100.0															
	Erythromycin	Humans (1191)	1.5	[0.9 - 2.4]						0.1	1.6	19.5	26.1	35.3	14.4	1.5	0.1				0.3	1.2				
		Chickens	Retail Chickens (421)	0.7	[0.1 - 2.1]						0.2	0.2	15.7	47.5	24.9	10.0	0.5	0.2								0.7
HACCP (1348)			1.1	[0.6 - 1.8]						0.1	0.2	10.0	49.9	30.0	8.2	0.4	0.1			0.1	0.1	0.8				
Turkeys		Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						66.7		33.3														

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 74b. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴														
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Phenicol	Florfenicol	Humans (1191)	1.4	[0.8 - 2.3]						2.9	53.7	34.4	7.5	1.0	0.3			0.2	
		Chickens	Retail Chickens (421)	0.0	[0.0 - 0.9]			0.5		0.7	31.1	60.1	7.4	0.2					
			HACCP (1348)	0.0	[0.0 - 0.3]				0.1	0.3	32.8	63.6	3.0	0.2					
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						66.7	33.3							
Quinolones	Ciprofloxacin	Humans (1191)	25.3	[22.8 - 27.8]	0.2	0.6	22.8	42.1	8.2	0.8	0.3	0.1	1.7	9.1	8.1	3.4	1.6	1.1	
		Chickens	Retail Chickens (421)	16.4	[13.0 - 20.3]		1.2	24.9	44.9	12.6				0.7	7.4	4.5	3.8		
			HACCP (1348)	22.6	[20.4 - 25.0]	0.1	1.6	41.7	30.8	3.1	0.1		0.1	1.7	13.1	6.9	0.7		
		Turkeys	Retail Ground Turkey (3)	33.3	[0.8 - 90.6]			33.3	33.3					33.3					
	Nalidixic acid	Humans (1191)	25.5	[23.1 - 28.1]										56.7	16.6	1.2	2.0	23.5	
		Chickens	Retail Chickens (421)	16.4	[13.0 - 20.3]									48.0	34.4	1.2	5.2	11.2	
			HACCP (1348)	22.8	[20.6 - 25.1]									60.8	16.2	0.2	0.7	3.9	18.2
		Turkeys	Retail Ground Turkey (3)	33.3	[0.8 - 90.6]								66.7					33.3	
Tetracyclines	Tetracycline	Humans (1191)	47.8	[44.9 - 50.7]			1.3	14.9	21.7	11.1	3.2	1.9	0.5		0.3	1.2	6.0	37.9	
		Chickens	Retail Chickens (421)	49.6	[44.8 - 54.5]			3.3	19.0	18.1	6.4	3.6		0.2		1.9	9.3	17.1	21.1
			HACCP (1348)	50.7	[48.0 - 53.4]			1.6	24.3	15.8	5.1	2.5	0.1	0.3	0.1	1.8	5.9	21.7	20.8
		Turkeys	Retail Ground Turkey (3)	100.0	[29.2 - 100.0]												66.7	33.3	

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Antimicrobial Susceptibility among *Campylobacter jejuni*

MIC Distributions

Table 75a. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (μg/ml) ⁴																
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256		
Aminoglycosides	Gentamicin	Humans (1182)	1.6	[1.0 - 2.5]						0.1	45.8	51.9	0.6	0.1		0.1	1.4				
		Chickens	Retail Chickens (428)	0.5	[0.1 - 1.7]						0.2	15.4	69.9	14.0			0.1		0.5		
			HACCP (788) ⁵	0.4	[0.1 - 1.1]						4.7	38.1	55.6	1.3			0.1		0.3		
			Cecal (11)	0.0	[0.0 - 28.5]						27.3		72.7								
		Turkeys	Retail Ground Turkey (7)	0.0	[0.0 - 41.0]						14.3	28.57	28.57	28.57							
			Cecal (0)	0.0	[0.0 - 100.0]																
		Cattle	Cecal (Beef) (531)	0.0	[0.0 - 0.7]						0.4	3.6	59.3	36.5	0.2						
			Cecal (Dairy) (542)	0.0	[0.0 - 0.7]						0.4	7.0	63.5	29.2							
		Swine	Cecal (Market Hogs) (4)	0.0	[0.0 - 60.2]						100.0										
			Cecal (Sows) (6)	0.0	[0.0 - 45.9]						16.7		66.7	16.7							
Ketolidides	Telithromycin	Humans (1182)	2.0	[1.3 - 3.0]						3.6	22.4	41.7	27.8	2.4	0.3	1.8					
		Chickens	Retail Chickens (428)	0.9	[0.3 - 2.4]						1.6	19.2	46.7	25.5	5.1	0.9	0.9	0.8			
			HACCP (788) ⁵	1.9	[1.1 - 3.1]						4.1	25.8	44.9	19.7	2.7	0.6	1.1	0.8			
			Cecal (11)	0.0	[0.0 - 28.5]						9.1	54.6	27.3	9.1							
		Turkeys	Retail Ground Turkey (7)	0.0	[0.0 - 41.0]						14.3		28.6	42.9	14.3						
			Cecal (0)	0.0	[0.0 - 100.0]																
		Cattle	Cecal (Beef) (531)	0.2	[0.0 - 1.0]						0.4	5.1	44.3	40.5	9.0	0.6			0.2		
			Cecal (Dairy) (542)	0.7	[0.2 - 1.9]						0.2	7.0	45.4	38.8	7.8	0.2	0.6	0.2			
		Swine	Cecal (Market Hogs) (4)	0.0	[0.0 - 60.2]						25.0		50.0	25.0							
			Cecal (Sows) (6)	33.3	[4.3 - 77.7]						50.0		16.7								
Lincosamides	Clindamycin	Humans (1182)	3.2	[2.3 - 4.4]	0.1		5.7	54.0	29.9	7.2	1.0	0.3	0.1	0.9	0.5	0.4					
		Chickens	Retail Chickens (428)	1.2	[0.4 - 2.7]	1.4		25.0	48.4	20.6	3.5	0.5		0.7							
			HACCP (788) ⁵	2.4	[1.5 - 3.7]	4.8		34.4	47.5	9.3	1.6	0.3	0.5	1.4	0.3						
			Cecal (11)	0.0	[0.0 - 28.5]	63.6		36.4													
		Turkeys	Retail Ground Turkey (7)	0.0	[0.0 - 41.0]	28.6		57.1	14.3												
			Cecal (0)	0.0	[0.0 - 100.0]																
		Cattle	Cecal (Beef) (531)	1.3	[0.5 - 2.7]	0.9		19.2	43.1	28.8	6.6	1.1	0.2								
			Cecal (Dairy) (542)	1.3	[0.5 - 2.6]	1.1		23.4	42.4	26.0	5.7	0.9									
		Swine	Cecal (Market Hogs) (4)	0.0	[0.0 - 60.2]	25.0		75.0													
			Cecal (Sows) (6)	33.3	[4.3 - 77.7]	16.7		50.0													
Macrolides	Azithromycin	Humans (1182)	2.2	[1.4 - 3.2]	12.5		45.4	34.3	5.6							0.1	2.1				
		Chickens	Retail Chickens (428)	1.6	[0.7 - 3.3]	9.1	56.5	30.4	2.1	0.2	0.2						0.2	1.2			
			HACCP (788) ⁵	2.3	[1.4 - 3.6]	16.6	54.3	24.6	2.2							0.2	2.3				
			Cecal (11)	0.0	[0.0 - 28.5]	9.1	81.8	9.1													
		Turkeys	Retail Ground Turkey (7)	0.0	[0.0 - 41.0]	57.1		42.9													
			Cecal (0)	0.0	[0.0 - 100.0]																
		Cattle	Cecal (Beef) (531)	0.0	[0.0 - 0.7]	6.4	46.3	42.0	5.3												
			Cecal (Dairy) (542)	0.4	[0.0 - 1.3]	7.6	49.8	36.7	5.4	0.2											
	Swine	Cecal (Market Hogs) (4)	0.0	[0.0 - 60.2]	25.0		50.0	25.0													
		Cecal (Sows) (6)	33.3	[4.3 - 77.7]	16.7	16.7	33.3														
	Erythromycin		Humans (1182)	2.2	[1.4 - 3.2]			0.4	21.2	42.6	29.9	3.4	0.3			0.2	0.1	1.9			
			Chickens	Retail Chickens (428)	1.6	[0.7 - 3.3]			0.5	11.9	47.0	28.7	9.1	1.2			0.2	0.2	1.2		
				HACCP (788) ⁵	2.3	[1.4 - 3.6]	0.1		0.4	14.0	50.1	27.7	5.5					0.3	2.0		
				Cecal (11)	0.0	[0.0 - 28.5]			18.2	72.7	9.1										
Turkeys			Retail Ground Turkey (7)	0.0	[0.0 - 41.0]			28.6		42.9	28.6										
			Cecal (0)	0.0	[0.0 - 100.0]																
Cattle			Cecal (Beef) (531)	0.0	[0.0 - 0.7]			0.2	0.2	38.6	57.8	2.5	0.8								
			Cecal (Dairy) (542)	0.4	[0.0 - 1.3]	[0.0 - 100.0]		0.4	5.4	54.8	32.5	6.1	0.6								
Swine	Cecal (Market Hogs) (4)	0.0	[0.0 - 60.2]			25.0		50.0	25.0												
	Cecal (Sows) (6)	33.3	[4.3 - 77.7]			33.3		16.7	16.7												

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013

Table 75b. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴															
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	
Phenicol	Florfenicol	Humans (1182)	1.2	[0.6 - 2.0]						1.4	76.1	19.5	1.9	1.0	0.2					
		Chickens	Retail Chickens (428)	0.0	[0.0 - 0.9]				0.2	0.5	33.6	60.8	4.7	0.2						
			HACCP (788) ⁵	0.0	[0.0 - 0.5]					0.8	41.5	54.9	2.5	0.3						
			Cecal (11)	0.0	[0.0 - 28.5]						54.6	45.5								
		Turkeys	Retail Ground Turkey (7)	0.0	[0.0 - 41.0]						42.9	57.1								
			Cecal (0)	0.0	[0.0 - 100.0]															
		Cattle	Cecal (Beef) (531)	0.0	[0.0 - 0.7]				0.2		0.2	38.6	57.8	2.5	0.8					
			Cecal (Dairy) (542)	0.0	[0.0 - 0.7]						0.2	37.3	59.4	2.8	0.4					
		Swine	Cecal (Market Hogs) (4)	0.0	[0.0 - 60.2]							50.0	50.0							
			Cecal (Sows) (6)	0.0	[0.0 - 45.9]							16.7	83.3							
Quinolones	Ciprofloxacin	Humans (1182)	22.3	[19.9 - 24.7]			0.3	19.7	47.0	9.5	1.2	0.1	0.1	8.5	8.1	3.0	1.8	0.6		
		Chickens	Retail Chickens (428)	11.2	[8.4 - 14.6]			0.5	16.8	60.1	11.5				4.2	4.7	2.1	0.2		
			HACCP (788) ⁵	24.2	[21.3 - 27.4]	0.1	1.1	38.2	32.7	3.6				0.1	1.6	15.1	7.2	0.1		
			Cecal (11)	36.4	[10.9 - 69.2]				27.3	36.4						27.3	9.1			
		Turkeys	Retail Ground Turkey (7)	14.3	[0.4 - 57.9]					85.7						14.3				
			Cecal (0)	0.0	[0.0 - 100.0]															
		Cattle	Cecal (Beef) (531)	13.7	[10.9 - 17.0]			1.1	27.3	50.9	6.8	0.2			0.6	7.3	5.5	0.4		
			Cecal (Dairy) (542)	8.5	[6.3 - 11.2]			1.5	41.9	43.2	4.8	0.2	0.2		0.7	5.9	1.3	0.4		
		Swine	Cecal (Market Hogs) (4)	25.0	[0.6 - 80.6]				25.0	50.0						25.0				
			Cecal (Sows) (6)	0.0	[0.0 - 45.9]					50.0	50.0									
		Nalidixic acid	Nalidixic acid	Humans (1182)	22.2	[19.8 - 24.6]									63.1	13.9	0.8		0.3	21.9
				Chickens	Retail Chickens (428)	11.2	[8.4 - 14.6]									55.4	33.2	0.2		0.2
	HACCP (788) ⁵				24.4	[21.4 - 27.5]									64.1	11.3	0.3		1.3	6.7
	Cecal (11)				36.4	[10.9 - 69.2]									63.6				9.1	27.3
	Turkeys			Retail Ground Turkey (7)	14.3	[0.4 - 57.9]										71.4	14.3		14.3	
				Cecal (0)	0.0	[0.0 - 100.0]														
	Cattle			Cecal (Beef) (531)	13.7	[10.9 - 17.0]										56.9	28.8	0.6		0.2
		Cecal (Dairy) (542)	8.5	[6.3 - 11.2]										67.0	23.8	0.7		0.4	2.0	
	Swine	Cecal (Market Hogs) (4)	25.0	[0.6 - 80.6]										50.0	25.0				25.0	
Cecal (Sows) (6)		0.0	[0.0 - 45.9]										100.0							
Tetracyclines	Tetracycline	Humans (1182)	49.1	[46.2 - 52.0]			1.4	23.9	20.1	4.1	1.4	0.7	0.1		0.3	0.7	5.3	42.0		
		Chickens	Retail Chickens (428)	48.4	[43.5 - 53.2]			2.1	22.0	18.5	6.1	3.0		0.2	0.2	3.5	5.1	20.3	18.9	
			HACCP (788) ⁵	59.9	[56.4 - 63.3]			2.0	23.1	11.5	2.5	0.9	0.6	0.3	0.5	2.8	9.8	27.3	18.7	
			Cecal (11)	45.5	[16.7 - 76.6]				45.5	9.1							18.2	18.2	9.1	
		Turkeys	Retail Ground Turkey (7)	42.9	[9.9 - 81.6]				42.9	14.3								28.6	14.3	
			Cecal (0)	0.0	[0.0 - 100.0]															
		Cattle	Cecal (Beef) (531)	68.0	[63.8 - 71.9]			1.3	18.8	9.2	2.1	0.6			0.4	1.9	8.3	20.5	36.9	
			Cecal (Dairy) (542)	62.0	[57.8 - 66.1]			2.0	19.5	13.3	2.8	0.4	0.2			2.4	9.4	19.6	30.4	
		Swine	Cecal (Market Hogs) (4)	100.0	[39.8 - 100.0]													25.0	75.0	
			Cecal (Sows) (6)	66.7	[22.3 - 95.7]					16.7	16.7						33.3	16.7	16.7	

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method.

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013.

Resistance by Year

Table 76a. Antimicrobial Resistance among *Campylobacter jejuni* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		329	303	320	788	709	992	1033	1350	1159	1275	1191	1182		
		Chickens	Retail Chickens	198	325	510	403	426	332	329	404	355	393	421	428	
		HACCP	526	374	508	567	228	166	78	117	208	344	1348	788		
		Cecal												11		
	Turkeys	Retail Ground Turkey	2	4	7	10	12	20	10	9	5	13	3	7		
		Cecal												0		
	Cattle	Cecal (Beef)													531	
		Cecal (Dairy)													542	
	Swine	Cecal (Market Hogs)													4	
		Cecal (Sows)													6	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ¹	Isolate Source ²														
Aminoglycosides	Gentamicin (MIC > 2 µg/ml)	Humans	0.0% 0	0.0% 0	2.2% 7	0.1% 1	0.0% 0	0.8% 8	1.1% 11	0.6% 8	0.6% 7	1.0% 13	1.0% 12	1.6% 19		
		Chickens	Retail Chickens	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.5% 2	
			HACCP	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.9% 1	0.5% 1	0.3% 1	0.4% 6	0.4% 3	
			Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
		Cattle	Cecal (Beef)													0.0% 0
			Cecal (Dairy)													0.0% 0
		Swine	Cecal (Market Hogs)													0.0% 0
			Cecal (Sows)													0.0% 0
Ketolides	Telithromycin (MIC > 4 µg/ml)	Humans				0.8% 6	1.0% 7	1.3% 13	2.2% 23	1.9% 25	2.4% 28	2.6% 33	1.4% 17	2.0% 24		
		Chickens	Retail Chickens			0.8% 4	0.5% 2	0.9% 4	0.6% 2	1.2% 4	0.7% 3	0.9% 3	0.5% 2	0.7% 3	0.9% 4	
			HACCP				0.9% 5	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.6% 2	0.5% 7	1.9% 15	
			Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
		Cattle	Cecal (Beef)													0.2% 1
			Cecal (Dairy)													0.7% 4
		Swine	Cecal (Market Hogs)													0.0% 0
			Cecal (Sows)													33.3% 2
Lincosamides	Clindamycin (MIC > 0.5 µg/ml)	Humans	4.3% 14	4.3% 13	5.6% 18	3.2% 25	2.4% 17	3.5% 35	3.8% 39	2.9% 39	14.1% 163	21.5% 274	10.8% 129	3.2% 38		
		Chickens	Retail Chickens			2.2% 11	1.2% 5	0.7% 3	0.6% 2	1.8% 6	1.5% 6	0.6% 2	1.0% 4	1.2% 5	1.2% 5	
			HACCP	2.9% 15	2.7% 10	1.8% 9	1.1% 6	0.4% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	1.2% 4	1.0% 14	2.4% 19	
			Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey			14.3% 1	0.0% 0	0.0% 0	5.0% 1	10.0% 1	11.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
		Cattle	Cecal (Beef)													1.3% 7
			Cecal (Dairy)													1.3% 7
		Swine	Cecal (Market Hogs)													0.0% 0
			Cecal (Sows)													33.3% 2

¹ Percent resistance for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published percentages because breakpoints have been revised for these antimicrobials

² Beginning in 2008, retail ground beef and retail pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports. 150

Table 76b. Antimicrobial Resistance among *Campylobacter jejuni* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		329	303	320	788	709	992	1033	1350	1159	1275	1191	1182		
		Chickens														
	Chickens	Retail Chickens	198	325	510	403	426	332	329	404	355	393	421	428		
		HACCP	526	374	508	567	228	166	78	117	208	344	1348	788		
		Cecal												11		
	Turkeys	Retail Ground Turkey	2	4	7	10	12	20	10	9	5	13	3	7		
		Cecal												0		
	Cattle	Cecal (Beef)													531	
		Cecal (Dairy)													542	
	Swine	Cecal (Market Hogs)													4	
Cecal (Sows)														6		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ¹	Isolate Source ²														
Macrolides	Azithromycin (MIC > 0.25 µg/ml)	Humans	2.1% 7	1.3% 4	9.4% 30	2.7% 21	1.3% 9	1.8% 18	2.6% 27	1.9% 26	2.7% 31	4.9% 63	1.8% 21	2.2% 26		
		Chickens	Retail Chickens			1.8% 9	5.0% 2	0.9% 4	0.6% 2	1.2% 4	1.0% 4	0.6% 2	0.5% 2	1.2% 5	1.6% 7	
			HACCP	2.7% 14	1.6% 6	1.8% 9	1.8% 10	1.3% 3	0.6% 1	1.3% 1	0.0% 0	0.0% 0	0.9% 3	1.0% 14	2.3% 18	
			Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
		Cattle	Cecal (Beef)													0.0% 0
			Cecal (Dairy)													0.4% 2
		Swine	Cecal (Market Hogs)													0.0% 0
			Cecal (Sows)													33.3% 2
	Erythromycin (MIC > 4 µg/ml)	Humans	1.8% 6	0.3% 1	0.9% 3	1.5% 12	0.8% 6	1.6% 16	2.2% 23	1.5% 20	1.2% 14	1.8% 23	1.5% 18	2.2% 26		
		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.8% 4	0.5% 2	0.9% 4	0.6% 2	1.2% 4	1.0% 4	0.6% 2	0.6% 2	0.7% 3	1.6% 7	
			HACCP	0.6% 3	1.6% 6	1.6% 8	1.1% 6	0.4% 1	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.6% 2	1.1% 15	2.3% 18	
			Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	5.0% 1	10.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
		Cattle	Cecal (Beef)													0.0% 0
			Cecal (Dairy)													0.4% 2
		Swine	Cecal (Market Hogs)													0.0% 0
			Cecal (Sows)													33.3% 2
Phenicol	Florfenicol (MIC > 4) ^{3,4}	Humans				0.4% 3	0.0% 0	0.0% 0	0.6% 6	0.6% 8	1.5% 17	2.1% 27	1.4% 17	1.2% 14		
		Chickens	Retail Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			HACCP	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
			Cecal													
		Cattle	Cecal (Beef)													0.0% 0
			Cecal (Dairy)													0.0% 0
		Swine	Cecal (Market Hogs)													0.0% 0
			Cecal (Sows)													0.0% 0

¹ Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

² Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

³ For Humans and Chickens at HACCP, results prior to 2005 are for Chloramphenicol

Table 76c. Antimicrobial Resistance among *Campylobacter jejuni* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans		329	303	320	788	709	992	1033	1350	1159	1275	1191	1182		
	Chickens	Retail Chickens	198	325	510	403	426	332	329	404	355	393	421	428		
		HACCP	526	374	508	567	228	166	78	117	208	344	1348	788		
		Cecal												11		
	Turkeys	Retail Ground Turkey	2	4	7	10	12	20	10	9	5	13	3	7		
		Cecal												0		
	Cattle	Cecal (Beef)													531	
		Cecal (Dairy)													542	
	Swine	Cecal (Market Hogs)													4	
		Cecal (Sows)													6	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ¹	Isolate Source ²														
Quinolones	Ciprofloxacin (MIC > 0.5 µg/ml)	Humans		21.3% 70	17.5% 53	18.1% 58	21.6% 170	19.6% 139	26.0% 258	22.6% 233	23.1% 312	22.0% 255	24.1% 307	25.3% 301	22.3% 263	
		Chickens	Retail Chickens	17.2% 34	14.8% 48	15.1% 77	16.7% 61	17.2% 71	14.6% 57	21.3% 48	22.5% 86	22.7% 80	16.4% 89	16.4% 69	11.2% 48	
			HACCP	18.8% 99	14.7% 55	21.5% 109	15.0% 85	9.6% 22	22.3% 37	32.1% 25	19.7% 23	23.1% 48	19.5% 67	22.6% 305	24.2% 191	
			Cecal													36.4% 4
		Turkeys	Retail Ground Turkey	50.0% 1	0.0% 0	28.6% 2	10.0% 1	50.0% 6	30.0% 6	60.0% 6	44.4% 4	40.0% 2	46.2% 6	33.3% 1	14.3% 1	
			Cecal													
		Cattle	Cecal (Beef)													13.8% 73
			Cecal (Dairy)													8.5% 46
		Swine	Cecal (Market Hogs)													25.0% 1
			Cecal (Sows)													0.0% 0
	Nalidixic acid (MIC ≥ 16 µg/ml)	Humans		21.3% 70	17.8% 54	19.1% 61	22.5% 177	19.5% 138	26.5% 263	22.8% 236	23.1% 312	22.1% 256	24.1% 307	25.5% 304	22.2% 262	
		Chickens	Retail Chickens			15.3% 78	15.1% 61	16.7% 71	.171. 57	14.6% 48	21.3% 86	22.8% 81	21.6% 85	16.4% 69	11.2% 48	
			HACCP	22.8% 120	15.5% 58	21.7% 110	16.9% 96	8.8% 20	22.3% 37	33.3% 26	19.7% 23	23.1% 48	20.3% 70	22.8% 307	24.4% 192	
			Cecal													36.4% 4
		Turkeys	Retail Ground Turkey			28.6% 2	10.0% 1	50.0% 6	30.0% 6	60.0% 6	44.4% 4	40.0% 2	46.2% 6	33.3% 1	14.3% 1	
			Cecal													
		Cattle	Cecal (Beef)													13.7% 73
			Cecal (Dairy)													8.5% 46
		Swine	Cecal (Market Hogs)													25.0% 1
			Cecal (Sows)													0.0% 0
Tetracyclines	Tetracycline ³ (MIC > 1 µg/ml)	Humans		43.2% 142	40.9% 124	47.5% 152	43.7% 344	48.7% 345	45.7% 453	45.3% 468	44.1% 595	44.2% 512	48.3% 616	47.8% 569	49.1% 580	
		Chickens	Retail Chickens	58.1% 115	50.2% 163	50.4% 257	46.9% 189	48.4% 206	48.8% 162	50.5% 166	46.7% 188	36.3% 129	50.1% 197	49.6% 209	48.4% 207	
			HACCP	50.0% 263	50.3% 188	43.5% 221	44.8% 254	58.3% 133	57.8% 96	55.1% 43	51.3% 60	49.5% 103	45.9% 158	50.7% 684	59.9% 472	
			Cecal													45.5% 5
		Turkeys	Retail Ground Turkey	100.0% 2	75.0% 3	42.9% 3	70.0% 7	75.0% 9	90.0% 18	100.0% 10	100.0% 9	80.0% 4	92.3% 12	100.0% 3	42.9% 3	
			Cecal													
		Cattle	Cecal (Beef)													68.0% 361
			Cecal (Dairy)													62.0% 336
		Swine	Cecal (Market Hogs)													100.0% 4
			Cecal (Sows)													66.7% 4

¹ Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

² Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

³ For Retail Chickens and Retail Ground Turkey, results for 2002 and 2003 are for Doxycycline

Antimicrobial Susceptibility among *Campylobacter coli*

MIC Distributions

Table 77a. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																	
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256			
Aminoglycosides	Gentamicin	Humans (134)	6.0	[2.6 - 11.4]					25.4	38.1	29.1	1.5			1.5	4.5						
		Chickens	Retail Chickens (193)	4.1	[1.8 - 8.0]					1.6	73.6	19.7	1.0					4.2				
			HACCP (693)	3.9	[2.6 - 5.6]					10.1	70.9	15.0	0.1					3.9				
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]					66.67		33.33										
Ketolides	Telithromycin	Humans (134)	11.2	[6.4 - 17.8]			0.7	1.5	12.7	25.4	4.5	17.2	26.9	4.5	6.7							
		Chickens	Retail Chickens (193)	14.0	[9.4 - 19.7]					1.0	14.5	2.1	23.8	35.2	9.3	2.1	11.9					
			HACCP (693)	7.1	[5.3 - 9.2]			0.3	3.5	17.6	9.2	31.0	26.3	5.1	1.9	5.2						
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]							100.0										
Lincosamides	Clindamycin	Humans (134)	16.4	[10.6 - 23.8]			0.7	6.7	34.3	24.6	17.2			6.7	0.7	0.7	5.2	3.0				
		Chickens	Retail Chickens (193)	12.4	[8.1 - 17.9]			1.0	19.7	52.3	10.9	3.6			1.6	8.8	1.0			1.0		
			HACCP (693)	8.5	[6.5 - 10.8]			2.2	32.6	47.8	7.6	1.3			1.9	3.6	2.2	0.1	0.7			
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]					33.3	33.3	33.3										
Macrolides	Azithromycin	Humans (134)	9.0	[4.7 - 15.1]			1.5	16.4	36.6	25.4	11.2					1.5	7.5					
		Chickens	Retail Chickens (193)	11.9	[7.7 - 17.3]			6.7	48.2	28.0	5.2							11.4				
			HACCP (693)	8.7	[6.7 - 11.0]	0.7	16.3	58.3	15.3	0.4	0.3	0.1	0.1					0.1	8.2			
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]			100.0														
	Erythromycin	Humans (134)	9.0	[4.7 - 15.1]					0.7	5.2	27.6	21.6	19.4	14.9	1.5			1.5	7.5			
		Chickens	Retail Chickens (193)	11.4	[7.3 - 16.7]					0.5	14.5	23.3	37.8	9.3	1.6	1.6			2.1	9.3		
			HACCP (693)	8.5	[6.5 - 10.8]			0.1	3.2	20.6	28.0	34.9	3.9	0.6	0.1			0.3	0.6	7.6		
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]					66.7		33.3										

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolate with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 77b. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴															
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	
Phenicol	Florfenicol	Humans (134)	1.5	[0.2 - 5.3]						3.7	35.8	42.5	16.4	0.7	0.7					
		Chickens	Retail Chickens (193)	0.0	[0.0 - 1.9]						3.1	76.7	19.7	0.5						
			HACCP (693)	0.0	[0.0 - 0.5]				0.3	8.1	84.1	7.2	0.3							
		Turkeys	Retail Ground Turkey (3)	0.0	[0.0 - 70.8]						100.0									
Quinolones	Ciprofloxacin	Humans (134)	33.6	[25.7 - 42.2]	0.7	1.5	9.0	29.9	20.1	5.2			2.2	5.2	11.2	13.4	1.5			
		Chickens	Retail Chickens (193)	31.1	[24.6 - 38.1]			7.8	30.6	29.0	1.6				7.3	20.2	3.1	0.5		
			HACCP (693)	23.2	[20.1 - 26.6]		0.1	18.3	43.0	14.1	1.2			0.4	12.3	10.0	0.4	0.1		
		Turkeys	Retail Ground Turkey (3)	66.7	[9.4 - 99.2]					33.3				33.3		33.3				
	Nalidixic acid	Humans (134)	33.6	[25.7 - 42.2]									23.1	40.3	3.0		4.5	29.1		
		Chickens	Retail Chickens (193)	31.1	[24.6 - 38.1]									19.7	48.7	0.5		15.5	15.5	
			HACCP (693)	23.5	[20.4 - 26.9]									46.5	30.0		0.4	12.4	10.7	
		Turkeys	Retail Ground Turkey (3)	66.7	[9.4 - 99.2]									33.3			33.3	33.3		
Tetracyclines	Tetracycline	Humans (134)	45.5	[36.9 - 54.3]			1.5	4.5	23.9	15.7	7.5	1.5		0.7		0.7	4.5	39.6		
		Chickens	Retail Chickens (193)	48.7	[41.5 - 56.0]				2.1	30.6	5.7	10.4	2.6		0.5	0.5	0.5	1.6	2.6	43.0
			HACCP (693)	49.2	[45.4 - 53.0]				9.1	27.7	10.5	3.2	0.3		0.3	0.1	1.7	2.0	8.8	36.2
		Turkeys	Retail Ground Turkey (3)	66.7	[9.4 - 99.2]					33.3									66.7	

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Antimicrobial Susceptibility among *Campylobacter coli*

MIC Distributions

Table 78a. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴													
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides	Gentamicin	Humans (142)	2.1	[0.4 - 6.0]														
		Chickens	Retail Chickens (198)	5.6														[2.8 - 9.7]
			HACCP (393) ⁵	2.3														[1.1 - 4.3]
			Cecal (50)	18.0														[8.6 - 31.4]
		Turkeys	Retail Ground Turkey (5)	0.0														[0.0 - 52.2]
			Cecal (18)	22.2														[6.4 - 47.6]
		Cattle	Cecal (Beef) (131)	1.5														[0.2 - 5.4]
			Cecal (Dairy) (98)	0.0														[0.0 - 3.7]
		Swine	Cecal (Market Hogs) (190)	0.0														[0.0 - 1.9]
			Cecal (Sows) (163)	0.0														[0.0 - 2.2]
Ketolides	Telithromycin	Humans (142)	21.8	[15.3 - 29.5]														
		Chickens	Retail Chickens (198)	11.1														[7.1 - 16.3]
			HACCP (393) ⁵	6.9														[4.6 - 9.8]
			Cecal (50)	10.0														[3.3 - 21.8]
		Turkeys	Retail Ground Turkey (5)	0.0														[0.0 - 52.2]
			Cecal (18)	16.7														[3.6 - 41.4]
		Cattle	Cecal (Beef) (131)	3.8														[1.3 - 8.7]
			Cecal (Dairy) (98)	7.1														[2.9 - 14.2]
		Swine	Cecal (Market Hogs) (190)	32.6														[26.0 - 39.8]
			Cecal (Sows) (163)	17.2														[11.7 - 23.9]
Lincosamides	Clindamycin	Humans (142)	21.1	[14.7 - 28.8]														
		Chickens	Retail Chickens (198)	10.1														[6.3 - 15.2]
			HACCP (393) ⁵	10.4														[7.6 - 13.9]
			Cecal (50)	14.0														[5.8 - 26.7]
		Turkeys	Retail Ground Turkey (5)	0.0														[0.0 - 52.2]
			Cecal (18)	16.7														[3.6 - 41.4]
		Cattle	Cecal (Beef) (131)	8.4														[4.3 - 14.5]
			Cecal (Dairy) (98)	4.1														[1.1 - 10.1]
		Swine	Cecal (Market Hogs) (190)	37.9														[31.0 - 45.2]
			Cecal (Sows) (163)	19.6														[13.8 - 26.6]
Macrolides	Azithromycin	Humans (142)	16.9	[11.1 - 24.1]														
		Chickens	Retail Chickens (198)	9.6														[5.9 - 14.6]
			HACCP (393) ⁵	10.7														[7.8 - 14.2]
			Cecal (50)	14.0														[5.8 - 26.7]
		Turkeys	Retail Ground Turkey (5)	0.0														[0.0 - 52.2]
			Cecal (18)	16.7														[3.6 - 41.4]
		Cattle	Cecal (Beef) (131)	4.6														[1.7 - 9.7]
			Cecal (Dairy) (98)	1.0														[0.0 - 5.6]
		Swine	Cecal (Market Hogs) (190)	31.6														[25.0 - 38.7]
	Cecal (Sows) (163)		17.2	[11.7 - 23.9]														
	Erythromycin	Humans (142)	17.6	[11.7 - 24.9]														
		Chickens	Retail Chickens (198)	9.6														[5.9 - 14.6]
			HACCP (393) ⁵	10.7														[7.8 - 14.2]
			Cecal (50)	14.0														[5.8 - 26.7]
		Turkeys	Retail Ground Turkey (5)	0.0														[0.0 - 52.2]
			Cecal (18)	16.7														[3.6 - 41.4]
		Cattle	Cecal (Beef) (131)	4.6														[1.7 - 9.7]
			Cecal (Dairy) (98)	1.0														[0.0 - 5.6]
Swine		Cecal (Market Hogs) (190)	31.6	[25.0 - 38.7]														
	Cecal (Sows) (163)	17.2	[11.7 - 23.9]															

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013

Table 78b. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates) ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴															
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	
Phenicol	Florfenicol	Humans (142)	0.7	[0.0 - 3.9]						1.4	35.9	49.3	12.7	0.7						
		Chickens	Retail Chickens (198)	0.0	[0.0 - 1.8]						5.1	82.3	12.6							
			HACCP (393) ⁵	0.0	[0.0 - 0.9]		0.3			0.5	6.4	84.7	7.6	0.5						
			Cecal (50)	0.0	[0.0 - 7.1]						2.0	80.0	16.0	2.0						
		Turkeys	Retail Ground Turkey (5)	0.0	[0.0 - 52.2]			40.0	60.0											
			Cecal (18)	0.0	[0.0 - 18.5]								88.9	5.6	5.6					
		Cattle	Cecal (Beef) (131)	1.5	[0.2 - 5.4]						6.9	51.2	40.5		0.8		0.8			
			Cecal (Dairy) (98)	0.0	[0.0 - 3.7]						1.0	52.0	45.9	1.0						
		Swine	Cecal (Market Hogs) (190)	0.0	[0.0 - 1.9]						19.5	70.0	10.5							
			Cecal (Sows) (163)	0.0	[0.0 - 2.2]						11.0	78.5	10.4							
Quinolones	Ciprofloxacin	Humans (142)	34.5	[26.7 - 42.9]			4.2	26.1	28.2	7.0			0.7	7.0	13.4	10.6	2.1	0.7		
		Chickens	Retail Chickens (198)	20.2	[14.8 - 26.5]		0.5	7.6	33.8	36.4	1.5				6.1	10.6	3.0	0.5		
			HACCP (393) ⁵	21.9	[17.9 - 26.3]		0.5	14.2	43.0	19.6	0.8			1.0	12.5	7.9	0.3	0.3		
			Cecal (50)	24.0	[13.1 - 38.2]			6.0	34.0	34.0	2.0				6.0	16.0	2.0			
		Turkeys	Retail Ground Turkey (5)	0.0	[0.0 - 52.2]				40.0	60.0										
			Cecal (18)	66.7	[41.0 - 86.7]				11.1	22.2					5.6	38.9	22.2			
		Cattle	Cecal (Beef) (131)	52.7	[43.8 - 61.5]		0.8	3.1	30.5	12.2	0.8				6.9	33.6	9.2	3.1		
			Cecal (Dairy) (98)	30.6	[21.7 - 40.7]		1.0	7.1	48.0	13.3		1.0			1.0	19.4	9.2			
		Swine	Cecal (Market Hogs) (190)	7.4	[4.1 - 12.1]			9.0	53.2	28.4	2.1				1.6	4.7	0.5	0.5		
			Cecal (Sows) (163)	3.7	[1.4 - 7.8]			6.8	60.7	27.0	1.8				0.6	1.8	1.2			
	Nalidixic acid		Humans (142)	35.2	[27.4 - 43.7]									19.0	38.7	7.0	0.7	3.5	31.0	
			Chickens	Retail Chickens (198)	20.2	[14.8 - 26.5]									37.9	41.4	0.5	1.0	13.1	6.1
				HACCP (393) ⁵	22.1	[18.1 - 26.6]									53.7	23.4	0.8	0.8	11.2	10.2
				Cecal (50)	24.0	[13.1 - 38.2]									40.0	34.0	2.0		12.0	12.0
			Turkeys	Retail Ground Turkey (5)	0.0	[0.0 - 52.2]										100.0				
				Cecal (18)	66.7	[41.0 - 86.7]									5.6	27.8			55.6	11.1
			Cattle	Cecal (Beef) (131)	52.7	[43.8 - 61.5]									6.9	24.4	16.0	0.8	3.8	48.1
				Cecal (Dairy) (98)	29.6	[20.8 - 39.7]									10.2	39.8	20.4		4.1	25.5
			Swine	Cecal (Market Hogs) (190)	7.4	[4.1 - 12.1]									17.9	70.5	4.2		1.1	6.3
				Cecal (Sows) (163)	3.7	[1.4 - 7.8]									21.5	72.4	2.5		0.6	3.1
Tetracyclines	Tetracycline	Humans (142)	51.4	[42.9 - 59.9]			4.2	21.8	16.9	5.6				0.7				50.7		
		Chickens	Retail Chickens (198)	47.0	[39.9 - 54.2]			2.5	30.3	17.2	3.0			0.5	2.5	2.0	5.1	36.9		
			HACCP (393) ⁵	58.5	[53.5 - 63.4]			0.3	5.6	23.2	10.2	1.5	0.8	0.5	0.3	1.5	6.4	17.0	32.8	
			Cecal (50)	52.0	[37.4 - 66.3]				4.0	26.0	12.0	6.0		2.0			10.0	40.0		
		Turkeys	Retail Ground Turkey (5)	40.0	[5.3 - 85.3]					40.0	20.0								40.0	
			Cecal (18)	77.8	[52.4 - 93.6]					5.6	16.7					5.6	16.7	55.6		
		Cattle	Cecal (Beef) (131)	74.0	[65.7 - 81.3]			1.5	3.1	11.5	9.9				2.3	1.5	3.8	66.4		
			Cecal (Dairy) (98)	65.3	[55.0 - 74.6]					4.1	21.4	9.2			1.0	1.0	5.1	58.2		
		Swine	Cecal (Market Hogs) (190)	84.2	[78.2 - 89.1]			1.1	7.9	4.2	2.1	0.5			1.6	4.7	12.1	12.6	14.7	38.4
			Cecal (Sows) (163)	76.7	[69.4 - 82.9]			0.6	9.8	9.8	1.8	1.2			2.5	6.1	11.7	11.7	16.6	28.2

¹ Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

² Percent resistant; Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Isolates were susceptibility tested by ARS from Jan-Sept 2013 and by FSIS from Oct-Dec 2013

Resistance by Year

Table 79a. Antimicrobial Resistance among *Campylobacter coli* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	25	22	26	99	97	105	115	142	115	148	134	142		
	Chickens	Retail Chickens	90	142	196	151	145	143	181	176	148	210	193	198	
		HACCP	288	247	186	380	123	76	28	81	100	233	693	393	
		Cecal												50	
	Turkeys	Retail Ground Turkey	2	1	5	9	10	14	19	16	7	18	3	5	
		Cecal												18	
	Cattle	Cecal (Beef)												131	
		Cecal (Dairy)												98	
	Swine	Cecal (Market Hog)												190	
		Cecal (Sow)												163	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ¹	Isolate Source ²													
Aminoglycosides	Gentamicin (MIC > 2 µg/ml)	Humans	0.0%	4.5%	3.8%	3.0%	1.0%	0.0%	1.7%	3.5%	12.2%	12.2%	6.0%	2.1%	
		Chickens	Retail Chickens	0	1	1	3	1	0	2	5	14	18	8	3
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.7%	5.7%	12.8%	18.1%	4.1%	5.6%
			Cecal	0	0	0	0	0	1	3	10	19	38	8	11
		Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal	0	0	0	0	0	0	0	0	0	0	0	22.2%
		Cattle	Cecal (Beef)												1.5%
			Cecal (Dairy)												0
		Swine	Cecal (Market Hog)												0
			Cecal (Sow)												0
Ketolides	Telithromycin (MIC > 4 µg/ml)	Humans				8.1%	9.3%	9.5%	10.4%	7.0%	13.9%	10.8%	11.2%	21.8%	
		Chickens	Retail Chickens			10.7%	9.9%	5.5%	7.0%	9.4%	5.1%	4.1%	5.7%	14.0%	11.1%
			HACCP			21	15	8	10	17	9	6	12	27	22
			Cecal				0.1%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	7.1%	6.9%
		Turkeys	Retail Ground Turkey			0.0%	22.2%	0.0%	0.0%	5.3%	0.0%	14.3%	5.6%	0.0%	0.0%
			Cecal			0	2	0	0	1	0	1	1	0	16.7%
		Cattle	Cecal (Beef)												3.8%
			Cecal (Dairy)												7.1%
		Swine	Cecal (Market Hog)												32.6%
			Cecal (Sow)												62
Lincosamides	Clindamycin (MIC > 1 µg/ml)	Humans	8.0%	18.2%	11.5%	8.1%	14.4%	9.5%	14.8%	7.7%	17.4%	16.9%	16.4%	21.1%	
		Chickens	Retail Chickens	2	4	3	8	14	10	17	11	20	25	22	30
			HACCP			9.2%	10.6%	10.3%	0.6%	8.8%	8.0%	5.4%	5.2%	12.4%	10.1%
			Cecal	15.3%	16.6%	9.7%	10.0%	12.2%	14.5%	10.7%	7.4%	5.0%	2.6%	8.5%	10.4%
		Turkeys	Retail Ground Turkey	44	41	18	38	15	11	3	6	5	6	59	41
			Cecal												14.0%
		Cattle	Retail Ground Turkey			0.0%	22.2%	10.0%	21.4%	10.5%	0.0%	14.3%	5.6%	0.0%	0.0%
			Cecal			0	2	1	3	2	0	1	1	0	16.7%
		Swine	Cecal (Beef)												3
			Cecal (Dairy)												8.4%
	Cecal (Market Hog)												11		
	Cecal (Sow)												4.1%		
	Cecal (Market Hog)												4		
	Cecal (Sow)												37.9%		
													72		
													19.6%		
													32		

¹ Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

² Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

Table 79b. Antimicrobial Resistance among *Campylobacter coli* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Humans		25	22	26	99	97	105	115	142	115	148	134	142	
		Chickens	90	142	196	151	145	143	181	176	148	210	193	198	
	Chickens	HACCP	288	247	186	380	123	76	28	81	100	233	693	393	
		Cecal												50	
	Turkeys	Retail Ground Turkey	2	1	5	9	10	14	19	16	7	18	3	5	
		Cecal												18	
	Cattle	Cecal (Beef)													131
		Cecal (Dairy)													98
	Swine	Cecal (Market Hog)													190
		Cecal (Sow)													163
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ¹	Isolate Source ²													
Macrolides	Azithromycin (MIC > 0.5 µg/ml)	Humans	8.0%	13.6%	3.8%	4.0%	9.3%	5.7%	10.4%	3.5%	7.0%	5.4%	9.0%	16.9%	
			2	3	1	4	9	6	12	5	8	8	12	24	
		Chickens	Retail Chickens			9.7%	9.9%	6.2%	7.0%	9.9%	4.6%	4.1%	4.3%	11.9%	9.6%
						19	15	9	10	18	8	6	9	23	19
			HACCP	19.4%	20.2%	9.1%	8.7%	9.8%	14.5%	10.7%	6.2%	4.0%	3.9%	8.7%	10.7%
			56	50	17	33	12	11	3	5	4	9	60	42	
		Cecal													14.0%
															7
		Turkeys	Retail Ground Turkey			0.0%	22.2%	0.0%	0.0%	5.3%	0.0%	14.3%	5.6%	0.0%	0.0%
						0	2	0	0	1	0	1	1	0	0
	Cecal													16.7%	
														3	
	Cattle	Cecal (Beef)													4.6%
															6
	Cecal (Dairy)														1.0%
															1
	Swine	Cecal (Market Hog)													31.6%
															60
		Cecal (Sow)													17.2%
															28
Erythromycin (MIC > 8 µg/ml)	Humans	4.0%	9.1%	3.8%	4.0%	8.2%	5.7%	10.4%	3.5%	5.2%	2.7%	9.0%	17.6%		
		1	2	1	4	8	6	12	5	6	4	12	25		
	Chickens	Retail Chickens	7.8%	7.8%	9.2%	9.9%	5.5%	7.0%	9.9%	4.6%	4.1%	5.2%	11.4%	9.6%	
			7	11	18	15	8	10	18	8	6	11	22	19	
		HACCP	18.8%	20.2%	9.1%	8.4%	8.9%	14.5%	10.7%	6.2%	4.0%	3.4%	8.5%	10.7%	
		54	50	17	32	11	11	3	5	4	8	59	42		
	Cecal													14.0%	
														7	
	Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	22.2%	0.0%	0.0%	5.3%	0.0%	14.3%	5.6%	0.0%	0.0%	
			0	0	0	2	0	0	1	0	1	1	0	0	
Cecal													16.7%		
													3		
Cattle	Cecal (Beef)													4.6%	
														6	
Cecal (Dairy)														1.0%	
														1	
Swine	Cecal (Market Hog)													31.6%	
														60	
	Cecal (Sow)													17.2%	
														28	
Phenicols	Florfenicol (MIC > 16 µg/ml) ^{3,4}	Humans				1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.5%	0.7%	
						1	0	0	0	0	0	1	2	1	
		Chickens	Retail Chickens			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0	0	0	0	0	0	0	0	0	0
			HACCP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal													0.0%
															0
		Turkeys	Retail Ground Turkey			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0	0	0	0	0	0	0	0	0	0
Cecal													0.0%		
													0		
Cattle	Cecal (Beef)													1.5%	
														2	
Cecal (Dairy)														0.0%	
														0	
Swine	Cecal (Market Hog)													0.0%	
														0	
	Cecal (Sow)													0.0%	
														0	

¹ Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

² Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

³ For Humans and Chickens at HACCP, results prior to 2005 are for Chloramphenicol

⁴ For florfenicol, only a susceptible breakpoint ($\leq 4 \mu\text{g/ml}$) has been established. In this report, isolates with an MIC $\geq 8 \mu\text{g/ml}$ are categorized as resistant.

Table 79c. Antimicrobial Resistance among *Campylobacter coli* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Humans	25	22	26	99	97	105	115	142	115	148	134	142		
	Chickens	Retail Chickens	90	142	196	151	145	143	181	176	148	210	193	198	
		HACCP	288	247	186	380	123	76	28	81	100	233	693	393	
		Cecal												50	
	Turkeys	Retail Ground Turkey	2	1	5	9	10	14	19	16	7	18	3	5	
		Cecal												18	
	Cattle	Cecal (Beef)												131	
		Cecal (Dairy)												98	
Swine	Cecal (Market Hog)												190		
	Cecal (Sow)												163		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ¹	Isolate Source ²													
Quinolones	Ciprofloxacin (MIC > 0.5 µg/ml)	Humans	12.0% 3	22.7% 5	30.8% 8	25.3% 25	21.6% 21	28.6% 30	29.6% 34	23.9% 34	30.4% 35	36.5% 54	33.6% 45	34.5% 49	
		Chickens	Retail Chickens	17.8% 16	13.4% 19	16.8% 33	29.8% 45	22.1% 32	25.9% 37	20.4% 37	18.2% 32	13.5% 20	18.1% 38	31.1% 60	20.2% 40
			HACCP	16.3% 47	20.2% 50	26.9% 50	22.1% 84	15.4% 19	15.8% 12	14.3% 4	22.2% 18	23.0% 23	27.9% 65	23.2% 161	21.9% 86
			Cecal												24.0% 12
		Turkeys	Retail Ground Turkey	50.0% 1	100.0% 1	0.0% 0	55.6% 5	30.0% 3	50.0% 7	47.4% 9	43.8% 7	57.1% 4	50.0% 9	66.7% 2	0.0% 0
			Cecal												66.7% 12
		Cattle	Cecal (Beef)												52.7% 69
			Cecal (Dairy)												30.6% 30
		Swine	Cecal (Market Hog)												7.4% 14
			Cecal (Sow)												3.7% 6
	Nalidixic acid (MIC > 16 µg/ml)	Humans	12.0% 3	22.7% 5	34.6% 9	27.3% 27	23.7% 23	30.5% 32	29.6% 34	24.6% 35	30.4% 35	35.8% 53	33.6% 45	35.2% 50	
		Chickens	Retail Chickens			16.3% 32	29.1% 44	20.7% 30	25.9% 37	20.4% 37	18.2% 32	14.2% 21	18.1% 38	31.1% 60	20.2% 40
			HACCP	18.1% 52	21.9% 54	28.0% 52	22.4% 85	15.4% 19	15.8% 12	14.3% 4	22.2% 18	23.0% 23	27.9% 65	23.5% 163	22.1% 87
			Cecal												24.0% 12
		Turkeys	Retail Ground Turkey			0.0% 0	55.6% 5	30.0% 3	50.0% 7	47.4% 9	43.8% 7	57.1% 4	50.0% 9	66.7% 2	0.0% 0
			Cecal												66.7% 12
		Cattle	Cecal (Beef)												52.7% 69
			Cecal (Dairy)												29.6% 29
		Swine	Cecal (Market Hog)												7.4% 14
			Cecal (Sow)												3.7% 6
Tetracyclines	Tetracycline ³ (MIC > 2 µg/ml)	Humans	40.0% 10	45.5% 10	38.5% 10	31.3% 31	39.2% 38	42.9% 45	39.1% 45	45.1% 64	50.4% 58	50.7% 75	45.5% 61	51.4% 73	
		Chickens	Retail Chickens	44.4% 40	53.5% 76	46.9% 92	44.4% 67	46.9% 68	39.9% 57	48.1% 87	38.6% 68	40.5% 60	51.0% 107	48.7% 94	47.0% 93
			HACCP	51.0% 147	53.0% 131	48.9% 91	42.6% 162	54.5% 67	42.1% 32	60.7% 17	45.7% 37	56.0% 56	42.1% 98	49.2% 341	58.5% 230
			Cecal												52.0% 26
		Turkeys	Retail Ground Turkey	50.0% 1	100.0% 1	0.0% 0	88.9% 8	80.0% 8	64.3% 9	94.7% 18	75.0% 12	100.0% 7	77.8% 14	66.7% 2	40.0% 2
			Cecal												77.8% 14
		Cattle	Cecal (Beef)												74.0% 97
			Cecal (Dairy)												65.3% 64
		Swine	Cecal (Market Hog)												84.2% 160
			Cecal (Sow)												76.7% 125

¹ Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

² Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

³ For Retail Chickens and Turkeys, results for 2002 and 2003 are for Doxycycline

Multidrug Resistance among *Campylobacter* Species

Table 80a. Resistance Patterns among *Campylobacter* Species, 2004-2013

Year			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	<i>C. jejuni</i>	Humans	N/A ¹	788	709	992	1033	1350	1159	1275	1191	1182		
		Chickens	Retail Chickens	510	403	426	332	329	404	355	393	421	428	
			HACCP	N/A ¹	567	228	166	78	117	208	344	1348	788	
			Cecal										11	
		Turkeys	Retail Ground Turkey	7	10	12	20	10	9	5	13	3	7	
			HACCP											
			Cecal										0	
		Cattle	Cecal (Beef)											531
			Cecal (Dairy)											542
	Swine	Cecal (Market Hogs)											4	
		Cecal (Sows)											6	
	<i>C. coli</i>	Humans	N/A ¹	99	97	105	115	142	115	148	134	142		
		Chickens	Retail Chickens	196	151	145	143	181	176	148	210	193	198	
			HACCP	N/A ¹	380	123	76	28	81	100	233	693	393	
			Cecal										50	
		Turkeys	Retail Ground Turkey	5	9	10	14	19	16	7	18	3	5	
			HACCP											
Cecal												18		
Cattle		Cecal (Beef)											131	
		Cecal (Dairy)											98	
Swine	Cecal (Market Hogs)											190		
	Cecal (Sows)											163		
Resistance Pattern	Species	Isolate Source ¹												
1. No Resistance Detected	<i>C. jejuni</i>	Humans		46.3% 365	42.5% 301	44.3% 439	45.2% 467	45.9% 620	39.5% 458	33.0% 421	38.6% 460	44.6% 527		
		Chickens	Retail Chickens	39.8% 203	42.7% 172	43.2% 184	40.1% 133	39.2% 129	40.8% 165	51.3% 182	40.5% 159	42.3% 178	46.3% 198	
			HACCP		45.7% 259	37.7% 86	33.7% 56	32.1% 25	40.2% 47	42.8% 89	47.4% 163	41.3% 557	35.3% 278	
			Cecal										45.5% 5	
		Turkeys	Retail Ground Turkey	42.9% 3	30.0% 3	16.7% 2	10.0% 2	0.0% 0	0.0% 0	20.0% 1	0.0% 0	0.0% 0	57.1% 4	
			Cecal											
			Cattle	Cecal (Beef)										30.7% 163
		Cecal (Dairy)											36.7% 199	
		Swine	Cecal (Market Hogs)										0.0% 0	
	Cecal (Sows)											16.7% 1		
	<i>C. coli</i>	Humans		49.5% 49	43.3% 42	38.1% 40	43.5% 50	43.7% 62	33.9% 39	31.1% 46	42.5% 57	31.7% 45		
		Chickens	Retail Chickens	36.2% 71	34.4% 52	38.6% 56	45.5% 65	38.7% 70	46.6% 82	52.0% 77	40.5% 85	30.1% 58	38.9% 77	
			HACCP		46.1% 175	39.0% 48	43.4% 33	28.6% 8	46.9% 38	33.0% 33	42.1% 98	36.8% 269	30.3% 119	
			Cecal										30.0% 15	
		Turkeys	Retail Ground Turkey	100.0% 5	11.1% 1	20.0% 2	28.6% 4	5.3% 1	18.8% 3	0.0% 0	22.2% 4	0.0% 0	60.0% 3	
			Cecal										16.7% 3	
			Cattle	Cecal (Beef)										12.21% 16
		Cecal (Dairy)											25.5% 25	
		Swine	Cecal (Market Hogs)										10.5% 20	
	Cecal (Sows)											21.5% 35		
	2. Resistance to ≥ 2 Antimicrobial Classes	<i>C. jejuni</i>	Humans		16.2% 128	13.1% 93	18.9% 187	15.8% 163	15.1% 204	19.0% 220	23.5% 300	20.0% 238	17.3% 204	
			Chickens	Retail Chickens	8.4% 43	6.5% 26	9.4% 40	7.2% 24	7.3% 24	10.9% 44	11.6% 41	14.3% 56	10.7% 45	8.9% 38
				HACCP		8.8% 50	6.1% 14	14.5% 24	23.1% 18	12.0% 14	15.9% 33	15.4% 53	15.9% 215	23.0% 181
				Cecal										36.4% 4
			Turkeys	Retail Ground Turkey	28.6% 2	10.0% 1	41.7% 5	30.0% 6	70.0% 7	44.4% 4	40.0% 2	38.5% 5	33.3% 1	14.3% 1
				Cecal										
				Cattle	Cecal (Beef)									
Cecal (Dairy)													9.6% 52	
Swine			Cecal (Market Hogs)										25.0% 1	
		Cecal (Sows)										33.3% 2		
<i>C. coli</i>		Humans		19.2% 19	20.6% 20	21.0% 22	28.7% 33	21.1% 30	38.3% 44	43.2% 64	32.8% 44	35.9% 51		
		Chickens	Retail Chickens	16.3% 32	21.9% 33	20.0% 29	20.3% 29	24.3% 44	17.1% 30	24.3% 36	34.8% 73	30.1% 58	25.8% 51	
			HACCP		22.6% 86	26.8% 33	21.1% 16	25.0% 7	19.8% 16	26.0% 26	18.9% 44	23.7% 164	25.4% 100	
			Cecal										48.0% 24	
		Turkeys	Retail Ground Turkey	0.0% 0	55.6% 5	30.0% 3	42.9% 6	52.6% 10	37.5% 6	71.4% 5	55.6% 10	33.3% 1	0.0% 0	
			Cecal										66.7% 12	
			Cattle	Cecal (Beef)										58.8% 77
		Cecal (Dairy)											34.7% 34	
		Swine	Cecal (Market Hogs)										43.2% 82	
Cecal (Sows)												22.7% 37		

¹ Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth microdilution method was first used

Table 80b. Resistance Patterns among *Campylobacter* Species, 2004-2013

Year			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	C. jejuni	Humans	N/A ¹	788	709	992	1033	1350	1159	1275	1191	1182		
		Chickens	Retail Chickens	510	403	426	332	329	404	355	393	421	428	
			HACCP	N/A ¹	567	228	166	78	117	208	344	1348	788	
			Cecal										11	
		Turkeys	Retail Ground Turkey	7	10	12	20	10	9	5	13	3	7	
			HACCP											
			Cecal										0	
		Cattle	Cecal (Beef)											531
			Cecal (Dairy)											542
		Swine	Cecal (Market Hogs)											4
			Cecal (Sows)											6
		C. coli	Humans	N/A ¹	99	97	105	115	142	115	148	134	142	
			Chickens	Retail Chickens	196	151	145	143	181	176	148	210	193	198
				HACCP	N/A ¹	380	123	76	28	81	100	233	693	393
				Cecal										50
			Turkeys	Retail Ground Turkey	5	9	10	14	19	16	7	18	3	5
				HACCP										
Cecal												0		
Cattle	Cecal (Beef)												131	
	Cecal (Dairy)												98	
Swine	Cecal (Market Hogs)												190	
	Cecal (Sows)												163	
Resistance Pattern	Species		Isolate Source ¹											
3. Resistance to ≥ 3 Antimicrobial Classes	C. jejuni		Humans		2.4%	1.3%	2.0%	3.5%	2.7%	4.2%	7.5%	4.8%	3.1%	
			Chickens	Retail Chickens	1.0%	0.5%	0.7%	0.6%	1.2%	1.0%	0.6%	0.5%	1.0%	1.2%
				HACCP	5	2	3	2	4	4	2	2	4	5
				Cecal		1.4%	0.9%	0.0%	1.3%	0.0%	0.0%	1.2%	1.2%	2.0%
			Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	5.0%	10.0%	11.1%	0.0%	0.0%	0.0%	0.0%
		Cecal		0	0	0	1	1	1	0	0	0	0	
		Cecal (Beef)												13.0%
		Cattle	Cecal (Dairy)											69
			Cecal (Market Hogs)											7.6%
		Swine	Cecal (Sows)											41
			Cecal (Sows)											25.0%
		C. coli	Humans		7.1%	10.3%	8.6%	8.7%	7.0%	13.9%	14.9%	12.7%	21.1%	
			Chickens	Retail Chickens	9.2%	9.9%	6.9%	7.0%	9.9%	5.1%	4.1%	4.8%	11.4%	9.6%
				HACCP	18	15	10	10	18	9	6	10	22	19
				Cecal		8.7%	8.9%	14.5%	7.1%	6.2%	4.0%	4.7%	9.7%	10.2%
			Turkeys	Retail Ground Turkey	0.0%	22.2%	10.0%	21.4%	10.5%	0.0%	14.3%	5.6%	0.0%	0.0%
				Cecal	0	2	1	3	2	0	1	1	0	0
Cecal (Beef)													26.0%	
Cattle	Cecal (Dairy)												13	
	Cecal (Market Hogs)												61.1%	
Swine	Cecal (Sows)												11	
	Cecal (Sows)												43.5%	
4. Resistance to ≥ 4 Antimicrobial Classes	C. jejuni		Humans		1.0%	0.7%	1.3%	1.9%	1.6%	1.9%	3.6%	1.8%	2.2%	
			Chickens	Retail Chickens	0.8%	0.3%	0.7%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%
				HACCP	4	1	3	0	0	0	1	1	0	0
				Cecal		0.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	1.4%
			Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	5.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%
				Cecal	0	0	0	1	1	0	0	0	0	0
		Cecal (Beef)												0.2%
		Cattle	Cecal (Dairy)											1
			Cecal (Market Hogs)											0.6%
		Swine	Cecal (Sows)											3
			Cecal (Sows)											0.0%
		C. coli	Humans		4.0%	6.2%	5.7%	7.0%	4.2%	7.0%	4.7%	9.0%	14.1%	
			Chickens	Retail Chickens	3.6%	6.6%	2.8%	3.5%	2.8%	2.8%	4.1%	3.8%	7.3%	4.6%
				HACCP	7	10	4	5	5	5	6	8	14	9
				Cecal		5.8%	6.5%	5.3%	0.0%	6.2%	0.0%	2.6%	5.6%	4.1%
			Turkeys	Retail Ground Turkey	0.0%	22.2%	0.0%	0.0%	5.3%	0.0%	14.3%	5.6%	0.0%	0.0%
				Cecal	0	2	0	0	1	0	1	1	0	0
Cecal (Beef)													16.0%	
Cattle	Cecal (Dairy)												8	
	Cecal (Market Hogs)												22.2%	
Swine	Cecal (Sows)												4	
	Cecal (Sows)												8.4%	

¹ Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth microdilution method was first used

Table 80c. Resistance Patterns among *Campylobacter* Species, 2004-2013

Year			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	<i>C. jejuni</i>	Humans	N/A ¹	788	709	992	1033	1350	1159	1275	1191	1182		
		Chickens	Retail Chickens	510	403	426	332	329	404	355	393	421	428	
			HACCP	N/A ¹	567	228	166	78	117	208	344	1348	788	
			Cecal										11	
		Turkeys	Retail Ground Turkey	7	10	12	20	10	9	5	13	3	7	
			HACCP											
			Cecal										0	
		Cattle	Cecal (Beef)											531
			Cecal (Dairy)											542
		Swine	Cecal (Market Hogs)											4
	Cecal (Sows)												6	
	<i>C. coli</i>	Humans	N/A ¹	99	97	105	115	142	115	148	134	142		
		Chickens	Retail Chickens	196	151	145	143	181	176	148	210	193	198	
			HACCP	N/A ¹	380	123	76	28	81	100	233	693	393	
			Cecal										50	
		Turkeys	Retail Ground Turkey	5	9	10	14	19	16	7	18	3	5	
			HACCP											
			Cecal										0	
		Cattle	Cecal (Beef)											131
			Cecal (Dairy)											98
Swine		Cecal (Market Hogs)											190	
	Cecal (Sows)											163		
Resistance Pattern	Species	Isolate Source ¹												
5. At least Quinolone and Macrolide Resistant	<i>C. jejuni</i>	Humans		1.4%	0.7%	1.4%	1.5%	1.2%	1.3%	3.0%	1.3%	1.9%		
				11	5	14	15	16	15	38	16	22		
		Chickens	Retail Chickens	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	
			HACCP	2	0	0	0	0	0	0	1	0	0	
			Cecal		0.7%	0.9%	0.0%	1.3%	0.0%	0.0%	0.3%	0.5%	0.1%	
		Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0	0	0	1	0	0	0	0	0	0	
			Cecal										0.0%	
		Cattle	Cecal (Beef)											0.0%
			Cecal (Dairy)											0.4%
	Swine	Cecal (Market Hogs)											0.0%	
		Cecal (Sows)											0.0%	
	<i>C. coli</i>	Humans		2.0%	4.1%	1.9%	4.3%	2.8%	3.5%	3.4%	8.2%	9.2%		
				2	4	2	5	4	4	5	11	13		
		Chickens	Retail Chickens	0.5%	1.3%	0.7%	1.4%	1.1%	1.7%	0.7%	1.0%	6.2%	3.0%	
			HACCP	1	2	1	2	2	3	1	2	12	6	
			Cecal		1.6%	1.6%	5.3%	0.0%	4.9%	0.0%	1.3%	1.7%	2.0%	
		Turkeys	Retail Ground Turkey	0.0%	22.2%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	
			HACCP	0	2	0	0	0	0	1	0	0	0	
			Cecal										16.7%	
Cattle		Cecal (Beef)											0.8%	
		Cecal (Dairy)											0.0%	
Swine	Cecal (Market Hogs)											1.6%		
	Cecal (Sows)											0.6%		
6. At least Quinolone and Tetracycline Resistant	<i>C. jejuni</i>	Humans		14.0%	11.1%	17.4%	13.9%	13.6%	12.7%	15.6%	16.6%	16.6%		
				110	79	173	144	183	147	199	198	196		
		Chickens	Retail Chickens	6.5%	5.5%	8.5%	6.6%	6.1%	9.9%	10.7%	13.7%	9.3%	7.2%	
			HACCP	33	23	36	22	20	40	38	54	39	31	
			Cecal		7.8%	5.7%	13.9%	20.5%	11.1%	15.4%	14.2%	15.0%	20.3%	
		Turkeys	Retail Ground Turkey	14.3%	10.0%	41.7%	30.0%	60.0%	44.4%	40.0%	38.5%	33.3%	14.3%	
			HACCP	1	1	5	6	6	4	2	5	1	1	
			Cecal										27.3%	
		Cattle	Cecal (Beef)											13.0%
			Cecal (Dairy)											69
	Swine	Cecal (Market Hogs)											7.2%	
		Cecal (Sows)											39	
	<i>C. coli</i>	Humans		10.1%	10.3%	13.3%	17.4%	14.8%	19.1%	23.6%	24.6%	23.9%		
				10	10	14	20	21	22	35	33	34		
		Chickens	Retail Chickens	7.1%	12.6%	10.3%	14.7%	13.3%	8.0%	8.8%	10.5%	16.1%	12.1%	
			HACCP	14	19	15	21	24	14	13	22	31	24	
			Cecal		14.5%	10.6%	10.5%	14.3%	16.0%	16.0%	12.0%	13.4%	15.3%	
		Turkeys	Retail Ground Turkey	0.0%	55.6%	30.0%	42.9%	47.4%	37.5%	57.1%	50.0%	33.3%	0.0%	
			HACCP	0	5	3	6	9	6	4	9	1	0	
			Cecal										61.1%	
Cattle		Cecal (Beef)											39.7%	
		Cecal (Dairy)											52	
Swine	Cecal (Market Hogs)											24.5%		
	Cecal (Sows)											24		

¹ Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth microdilution method was first used

Escherichia coli Data

E. coli Isolates Tested

Table 81. Number of *E. coli* Isolates Tested, 2000-2013

Source		Year													
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Chickens	Retail Chickens			282	396	400	393	418	299	306	315	357	341	386	360
	HACCP ¹	285	1989	2100	1365	1697	2232	1357	1510	986	877	941	614	990	
	Cecal														48
Turkeys	Retail Ground Turkey			304	333	376	396	388	315	300	306	369	368	391	374
	Cecal														29
Cattle	Retail Ground Beef			295	311	338	316	295	256	250	247	269	215	271	227
	Cecal (Beef)														293
	Cecal (Dairy)														256
Swine	Retail Pork Chops			184	218	232	205	182	152	146	147	183	146	161	208
	Cecal (Market Hogs)														118
	Cecal (Sows)														120

¹ In 2013, chicken carcass rinsates were not sampled for *E. coli*.

Isolation of *E. coli* from Retail Meats

Table 82. Number and Percent of Retail Meat Samples Culture Positive for *E. coli*, 2012

	Retail Chickens	Retail Ground Turkey	Retail Ground Beef	Retail Pork Chops
Number of Meat Samples Tested	480	476	480	480
Number Positive for <i>E. coli</i>	386	391	371	161
Percent Positive for <i>E. coli</i>	80.4%	82.1%	77.3%	33.5%

Figure 14. Percent of Retail Meat Samples Culture Positive for *E. coli*, 2012

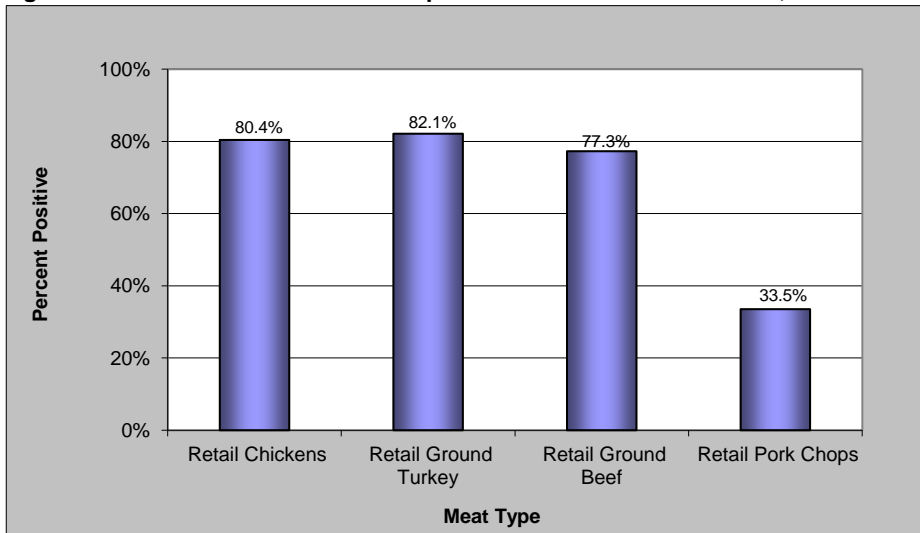
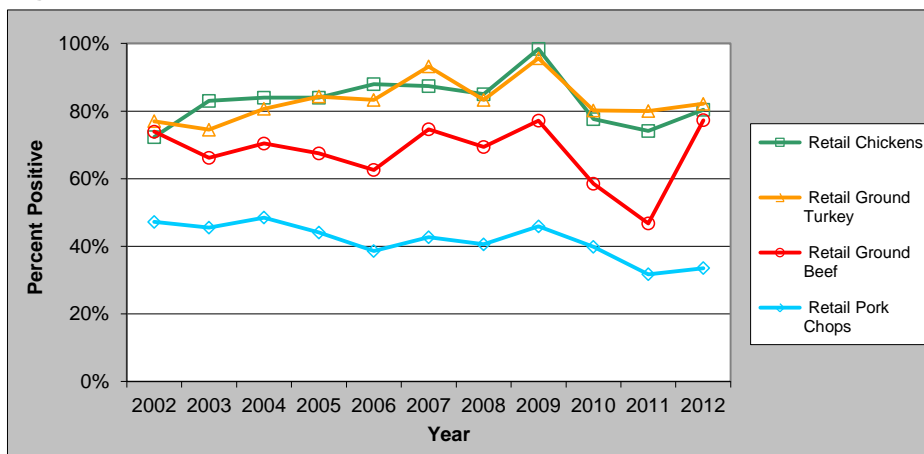


Figure 15. Percent of Retail Meat Samples Culture Positive for *E. coli*, 2002-2012



Isolation of *E. coli* from Retail Meats

Table 83. Number and Percent of Retail Meat Samples Culture Positive for *E. coli*, 2013

	Retail Chickens	Retail Ground Turkey	Retail Ground Beef	Retail Pork Chops
Number of Meat Samples Tested	480	478	480	480
Number Positive for <i>E. coli</i>	360	374	227	208
Percent Positive for <i>E. coli</i>	75.0%	78.2%	47.3%	43.3%

Figure 16. Percent of Retail Meat Samples Culture Positive for *E. coli*, 2013

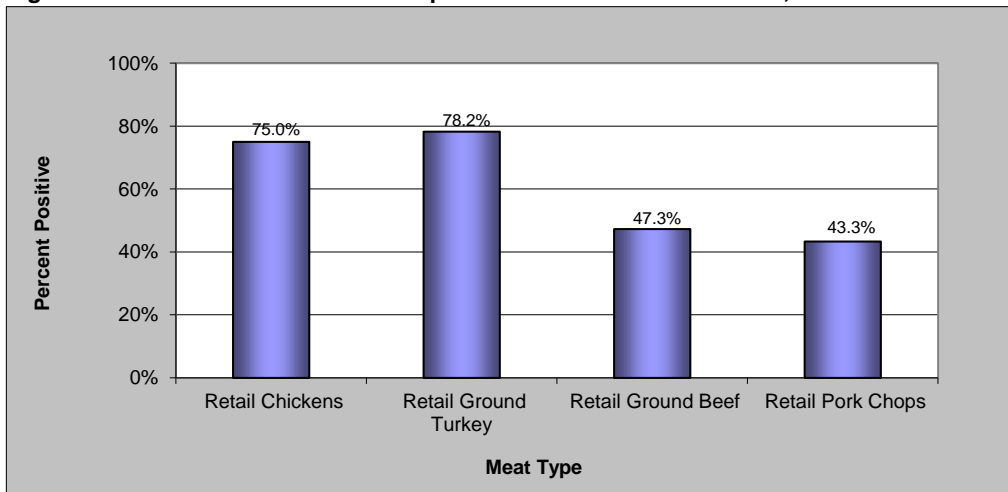
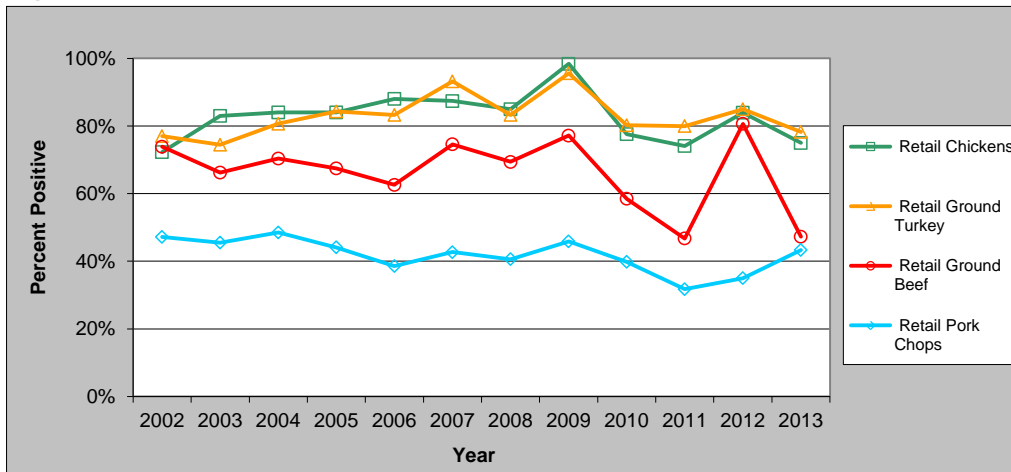


Figure 17. Percent of Retail Meat Samples Culture Positive for *E. coli*, 2002-2013



Antimicrobial Susceptibility among *E. coli*

MIC Distributions

Table 84a. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source		%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																				
		# of Isolates					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024				
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (386)	3.4	30.6	[26.0 - 35.4]	Unshaded							0.3	5.2	53.4	6.5	0.8	3.4	6.2	24.4	Shaded					
			HACCP (990)	3.2	42.1	[39.0 - 42.2]	Unshaded							0.8	21.0	30.2	1.8	0.8	3.2	14.1	28.0	Shaded					
		Turkeys	Retail Ground Turkey (391)	3.6	40.9	[36.0 - 41.1]	Unshaded							0.3	5.1	43.5	6.4	0.3	3.6	6.1	34.8	Shaded					
			Retail Ground Beef (271)	0.0	0.7	[0.1 - 1.0]	Unshaded							0.7	6.3	81.2	10.0	1.1			0.7	Shaded					
		Swine	Retail Pork Chops (161)	0.6	0.6	[0.0 - 1.0]	Unshaded							1.9	11.2	70.2	13.7	1.9	0.6		0.6	Shaded					
	Kanamycin	Chickens	Retail Chickens (386)	0.8	5.7	[3.6 - 5.9]	Unshaded												88.9	4.7	0.8	0.3	5.4	Shaded			
			HACCP (990)	0.1	7.3	[5.7 - 7.3]	Unshaded												88.7	3.9	0.1	0.2	7.1	Shaded			
		Turkeys	Retail Ground Turkey (391)	0.0	22.8	[18.7 - 22.9]	Unshaded												72.1	5.1			22.8	Shaded			
			Retail Ground Beef (271)	0.0	2.2	[0.8 - 2.5]	Unshaded												97.4	0.4			2.2	Shaded			
		Swine	Retail Pork Chops (161)	0.0	5.0	[2.2 - 5.4]	Unshaded												91.9	3.1		0.6	4.4	Shaded			
	Streptomycin	Chickens	Retail Chickens (386)	N/A	39.6	[34.7 - 39.8]	Unshaded														60.4	17.4	22.3	Shaded			
			HACCP (990)	N/A	42.8	[39.7 - 42.9]	Unshaded														57.2	20.8	22.0	Shaded			
		Turkeys	Retail Ground Turkey (391)	N/A	67.0	[62.1 - 67.1]	Unshaded														33.0	21.0	46.0	Shaded			
			Retail Ground Beef (271)	N/A	10.0	[6.7 - 10.2]	Unshaded														90.0	4.8	5.2	Shaded			
		Swine	Retail Pork Chops (161)	N/A	14.9	[9.8 - 15.3]	Unshaded														85.1	7.5	7.5	Shaded			

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 84b. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																			
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024			
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid	Chickens	Retail Chickens (386)	1.6	7.8	[5.3 - 7.9]							2.6	18.4	58.6	11.1	1.6	4.2	3.6						
			HACCP (990)	1.1	9.0	[7.3 - 9.1]							4.8	32.5	42.7	9.8	1.1	6.3	2.7						
		Turkeys	Retail Ground Turkey (391)	14.8	11.8	[8.7 - 11.9]							1.3	10.0	32.5	29.7	14.8	5.6	6.1						
			Retail Ground Beef (271)	0.0	1.5	[0.4 - 1.7]							3.7	22.1	64.2	8.5		1.1	0.4						
		Swine	Retail Pork Chops (161)	1.2	3.1	[1.0 - 3.5]							1.9	20.5	62.1	11.2	1.2	1.2	1.9						
Cephems	Cefoxitin	Chickens	Retail Chickens (386)	1.0	7.8	[5.3 - 7.9]							0.3	8.6	65.8	16.6	1.0	1.0	6.7						
			HACCP (990)	1.0	9.2	[7.5 - 9.3]							0.2	1.1	26.1	51.7	10.7	1.0	3.3	5.9					
		Turkeys	Retail Ground Turkey (391)	1.3	11.3	[8.3 - 11.4]								9.5	62.7	15.4	1.3	1.8	9.5						
			Retail Ground Beef (271)	1.1	1.8	[0.6 - 2.1]							0.4	1.9	19.2	66.1	9.6	1.1	0.7	1.1					
		Swine	Retail Pork Chops (161)	3.1	1.9	[0.4 - 2.3]								16.2	70.2	8.7	3.1	0.6	1.2						
	Ceftiofur	Chickens	Retail Chickens (386)	0.3	7.5	[5.1 - 7.7]									23.6	66.6	1.8	0.3	0.3	2.3	5.2				
			HACCP (990)	0.9	7.6	[6.0 - 7.6]									4.0	47.4	38.4	1.4	0.3	0.9	5.1	2.5			
		Turkeys	Retail Ground Turkey (391)	0.5	9.2	[6.5 - 9.4]									0.3	18.7	65.7	4.6	1.0	0.5	1.3	7.9			
			Retail Ground Beef (271)	0.0	0.0	[0.0 - 0.3]									5.5	31.7	59.8	2.6	0.4						
		Swine	Retail Pork Chops (161)	0.0	1.2	[0.2 - 1.7]									33.5	62.1	2.5	0.6		0.6	0.6				
	Ceftriaxone	Chickens	Retail Chickens (386)	0.3	7.8	[5.3 - 7.9]									91.5	0.3	0.3	0.3		0.8	5.2	1.3	0.3	0.3	
			HACCP (990)	0.1	8.8	[7.1 - 8.9]									90.1	0.5	0.5	0.1	0.5	3.8	4.1	0.3			
		Turkeys	Retail Ground Turkey (391)	0.8	9.7	[7.0 - 9.9]									88.0	0.3	1.3	0.8		1.3	5.4	2.8	0.3		
			Retail Ground Beef (271)	0.4	0.0	[0.0 - 0.3]									99.3		0.4	0.4							
		Swine	Retail Pork Chops (161)	0.6	1.2	[0.2 - 1.7]									97.5	0.6		0.6		0.6	0.6				

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates

Table 84c. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																			
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024			
Folate Pathway Inhibitors	Sulfisoxazole	Chickens	Retail Chickens (386)	N/A	37.8	[33.0 - 38.0]											45.3	15.5	1.3				37.8		
			HACCP (990)	N/A	47.6	[44.4 - 47.6]											45.4	6.1	0.7				0.3	47.6	
		Turkeys	Retail Ground Turkey (391)	N/A	56.8	[51.7 - 56.9]											30.2	11.3	1.8				56.8		
			Retail Ground Beef (271)	N/A	7.4	[4.6 - 7.6]											74.5	17.3	0.7						
		Swine	Retail Pork Chops (161)	N/A	6.8	[3.5 - 7.2]											76.4	15.5	1.2						
	Trimethoprim-Sulfamethoxazole	Chickens	Retail Chickens (386)	N/A	2.6	[1.2 - 2.8]																			
			HACCP (990)	N/A	6.5	[5.0 - 6.5]	74.5	9.7	4.9	3.4	0.9			6.5											
		Turkeys	Retail Ground Turkey (391)	N/A	6.1	[4.0 - 6.3]											72.4	14.1	7.2	0.3			6.1		
			Retail Ground Beef (271)	N/A	0.4	[0.0 - 0.6]											98.2	1.5					0.4		
		Swine	Retail Pork Chops (161)	N/A	1.9	[0.4 - 2.3]											93.2	3.7			0.6	0.6			1.9
Macrolides	Azithromycin	Chickens	Retail Chickens (386)	N/A	0.0	[0.0 - 0.2]																			
			HACCP (990)	N/A	0.5	[0.2 - 0.6]	0.4	2.5	46.2	47.8	2.4	0.2	0.5												
		Turkeys	Retail Ground Turkey (391)	N/A	0.0	[0.0 - 0.2]											0.5	2.8	25.6	65.5	4.9	0.8			
			Retail Ground Beef (271)	N/A	0.0	[0.0 - 0.3]											0.4	0.8	1.5	11.4	70.1	15.5			
		Swine	Retail Pork Chops (161)	N/A	0.0	[0.0 - 0.4]											16.2	62.1	20.5	1.2					
Penicillins	Ampicillin	Chickens	Retail Chickens (386)	N/A	0.3	[0.0 - 0.4]																			
			HACCP (990)	N/A	17.7	[15.3 - 17.7]	15.5	50.2	16.1	0.4	0.2	0.6	17.1												
		Turkeys	Retail Ground Turkey (391)	N/A	55.5	[50.4 - 55.6]											2.3	39.4	51.2	1.3			0.3	5.6	
			Retail Ground Beef (271)	N/A	2.6	[1.0 - 2.8]											2.2	36.2	57.9	2.6					1.1
		Swine	Retail Pork Chops (161)	N/A	13.0	[8.3 - 13.4]											2.5	25.5	64.0	4.4	1.9	1.9			

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates

Table 84d. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																			
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024			
Phenicols	Chloramphenicol	Chickens	Retail Chickens (386)	1.8	0.3	[0.0 - 0.4]							1.6	43.3	53.1	1.8			0.3						
			HACCP (990)	0.6	1.9	[1.2 - 2.0]							10.5	67.0	20.0	0.6			1.9						
		Turkeys	Retail Ground Turkey (391)	1.3	5.9	[3.8 - 6.0]							2.3	39.4	51.2	1.3	0.3			5.6					
			Retail Ground Beef (271)	2.6	1.1	[0.2 - 1.4]							2.2	36.2	57.9	2.6			1.1						
		Swine	Retail Pork Chops (161)	4.4	3.7	[1.4 - 4.1]							2.5	25.5	64.0	4.4	1.9	1.9							
Quinolones	Ciprofloxacin	Chickens	Retail Chickens (386)	1.6	0.0	[0.0 - 0.2]	93.5	4.4	0.5	0.3	1.0	0.3													
			HACCP (990)	1.9	0.5	[0.2 - 0.6]	96.9	0.5	0.2	0.8	1.0	0.1													
		Turkeys	Retail Ground Turkey (391)	1.5	0.3	[0.0 - 0.4]	91.6	6.7			1.3	0.3													
			Retail Ground Beef (271)	1.1	0.0	[0.0 - 0.3]	97.8	0.7	0.4			0.7	0.4												
		Swine	Retail Pork Chops (161)	1.2	0.0	[0.0 - 0.4]	93.2	5.0	0.6	0.6															
	Nalidixic Acid	Chickens	Retail Chickens (386)	N/A	1.8	[0.7 - 2.0]							14.8	67.4	15.8	0.3			0.3	1.6					
			HACCP (990)	N/A	2.4	[1.6 - 2.5]							1.1	32.8	60.0	3.5	0.1			0.9	1.5				
		Turkeys	Retail Chickens (386)	N/A	1.8	[0.7 - 2.0]							0.3	11.0	69.3	17.1	0.5			0.3	1.5				
			Retail Ground Beef (271)	N/A	1.5	[0.4 - 1.7]							0.4	8.9	67.9	21.0	0.4			0.7	0.7				
		Swine	Retail Pork Chops (161)	N/A	0.0	[0.0 - 0.4]							1.2	11.2	62.1	24.8	0.6								
Tetracyclines	Tetracycline	Chickens	Retail Chickens (386)	1.6	39.4	[34.5 - 39.5]							59.1	1.6	0.3	2.9	36.3								
			HACCP (990)	1.4	45.4	[42.2 - 45.4]							53.2	1.4	1.7	11.8	31.8								
		Turkeys	Retail Chickens (386)	0.8	77.2	[72.8 - 77.3]							22.0	0.8	0.3	4.1	72.9								
			Retail Ground Beef (271)	3.0	22.1	[17.3 - 22.4]							74.9	3.0	0.7	0.7	20.7								
		Swine	Retail Pork Chops (161)	0.0	39.1	[31.5 - 39.5]							60.9		1.9	3.1	34.2								

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Antimicrobial Susceptibility among *E. coli*

MIC Distributions

Table 85a. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																				
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024				
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (360)	3.9	30.8	[26.1 - 35.9]					0.8	25.6	35.3	2.5	1.1	3.9	8.1	22.8								
			Cecal (48)	6.3	35.4	[22.2 - 50.5]						18.8	37.5	2.1		6.3	6.3	29.2								
		Turkeys	Retail Ground Turkey (374)	2.4	27.0	[22.6 - 31.8]					0.3	23.3	44.9	2.1		2.4	7.2	19.8								
			Cecal (29)	3.5	37.9	[20.7 - 57.7]						24.1	34.5			3.5	20.7	17.2								
		Cattle	Retail Ground Beef (227)	0.4	0.0	[0.0 - 1.6]							33.9	59.0	6.6		0.4									
			Cecal (Beef) (293)	0.0	0.3	[0.0 - 1.9]					0.7	48.8	48.1	2.1				0.3								
			Cecal (Dairy) (256)	0.0	0.0	[0.0 - 1.4]						47.7	49.2	3.1												
		Swine	Retail Pork Chops (208)	0.0	1.0	[0.1 - 3.4]							35.1	59.6	3.9	0.5		0.5	0.5							
			Cecal (Market Hogs) (118)	0.0	0.8	[0.0 - 4.6]						0.9	38.1	54.2	5.1	0.9		0.9								
	Cecal (Sows) (120)		0.0	0.0	[0.0 - 3.0]							40.8	54.2	4.2	0.8											
	Kanamycin ⁵	Chickens	Retail Chickens (271)	0.7	10.3	[7.0 - 14.6]											84.1	4.8	0.7						10.3	
			Cecal (48)	0.0	4.2	[0.5 - 14.3]											83.3	12.5							4.2	
		Turkeys	Retail Ground Turkey (273)	0.4	24.2	[19.2 - 29.7]											74.7	0.7	0.4							24.2
			Cecal (29)	0.0	17.2	[5.8 - 35.8]											82.8									17.2
		Cattle	Retail Ground Beef (166)	0.0	1.2	[0.1 - 4.3]											98.9									1.2
			Cecal (Beef) (293)	0.0	1.4	[0.4 - 3.5]											98.6									1.4
			Cecal (Dairy) (256)	0.0	1.6	[0.4 - 4.0]											98.4									1.6
		Swine	Retail Pork Chops (144)	0.0	5.6	[2.4 - 10.7]											94.4									5.6
			Cecal (Market Hogs) (118)	0.0	11.0	[6.0 - 18.1]											89.0									11.0
	Cecal (Sows) (120)		0.0	6.7	[2.9 - 12.7]											93.3									6.7	
	Streptomycin ⁶	Chickens	Retail Chickens (360)	N/A	38.9	[33.8 - 44.1]													61.1	16.7	22.2					
			Cecal (48)	N/A	31.3	[18.7 - 46.3]													68.8	8.3	22.9					
		Turkeys	Retail Ground Turkey (373)	N/A	54.2	[48.9 - 59.3]													45.8	20.6	33.5					
			Cecal (29)	N/A	55.2	[35.7 - 73.6]													44.8	17.2	37.9					
		Cattle	Retail Ground Beef (227)	N/A	8.4	[5.1 - 12.8]													91.6	2.2	6.2					
			Cecal (Beef) (293)	N/A	8.9	[5.9 - 12.7]													91.1	3.8	5.1					
			Cecal (Dairy) (256)	N/A	6.3	[3.6 - 10.0]													93.7	2.4	3.9					
Swine		Retail Pork Chops (208)	N/A	17.8	[12.8 - 23.7]													82.2	8.7	9.1						
		Cecal (Market Hogs) (118)	N/A	18.6	[12.1 - 26.9]													81.4	9.3	9.3						
	Cecal (Sows) (120)	N/A	23.3	[16.1 - 31.9]													76.7	10	13.33							

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

⁵ Kanamycin results are unavailable for all retail meat isolates due to a change in the panel used for testing

⁶ Streptomycin results are unavailable for one retail meat turkey isolate

Table 85b. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																														
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024														
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid	Chickens	Retail Chickens (360)	1.7	5.6	[3.4 - 8.4]							3.3	26.9	45.6	16.9	1.7	2.8	2.8																	
			Cecal (48)	0.0	2.1	[0.1 - 11.1]							8.3	27.1	52.1	10.4	2.1																			
		Turkeys	Retail Ground Turkey (374)	11.0	8.8	[6.2 - 12.2]							2.7	9.9	34.5	33.2	11.0	6.4	2.4																	
			Cecal (29)	10.3	6.9	[0.8 - 22.8]							10.3	20.7	51.7	10.3	6.9																			
		Cattle	Retail Ground Beef (227)	0.0	1.8	[0.5 - 4.5]							4.0	26.0	59.9	8.4	1.8																			
			Cecal (Beef) (293)	0.0	0.0	[0.0 - 1.3]							4.4	12.3	69.3	14.0																				
			Cecal (Dairy) (256)	0.0	1.6	[0.4 - 4.0]							2.3	15.6	66.4	14.1	0.8	0.8																		
		Swine	Retail Pork Chops (208)	1.0	1.0	[0.1 - 3.4]							26.4	57.7	13.9	1.0	1.0																			
			Cecal (Market Hogs) (118)	1.7	0.8	[0.0 - 4.6]							3.4	20.3	56.8	17.0	1.7	0.9																		
			Cecal (Sows) (120)	0.8	0.8	[0.0 - 4.6]							2.5	19.2	56.7	20.0	0.8	0.8																		
		Cephems	Cefoxitin	Chickens	Retail Chickens (360)	0.3							5.0	[3.0 - 7.8]										0.3	0.3	11.7	69.7	12.8	0.3	1.9	3.1					
					Cecal (48)	2.1							2.1	[0.1 - 11.1]										4.2	12.5	62.5	16.7	2.1	2.1							
Turkeys	Retail Ground Turkey (374)			1.1	7.8	[5.3 - 10.9]	14.7	66.3	10.2	1.1	2.1	5.6																								
	Cecal (29)			3.5	3.4	[0.1 - 17.8]	13.8	65.5	13.8	3.5	3.5																									
Cattle	Retail Ground Beef (227)			0.9	1.3	[0.3 - 3.8]	2.2	31.3	56.0	8.4	0.9	0.4	0.9																							
	Cecal (Beef) (293)			1.4	0.0	[0.0 - 1.3]	0.3	1.4	19.5	63.8	13.7	1.4																								
	Cecal (Dairy) (256)			0.4	1.2	[0.2 - 3.4]	18.4	69.9	10.2	0.4	0.4	0.8																								
Swine	Retail Pork Chops (208)			0.0	1.0	[0.1 - 3.4]	0.5	20.7	71.2	6.7	0.5	0.5																								
	Cecal (Market Hogs) (118)			0.0	0.8	[0.0 - 4.6]	15.3	72.9	11.0	0.9	0.9																									
	Cecal (Sows) (120)			0.8	0.8	[0.0 - 4.6]	20.0	71.7	6.7	0.8	0.8																									
Ceftiofur	Chickens			Retail Chickens (360)	0.0	4.4	[2.6 - 7.1]							2.2							27.5	63.1	2.2	0.6	2.2	2.2										
				Cecal (48)	0.0	2.1	[0.1 - 11.1]							4.2							35.4	56.3	2.1	2.1												
	Turkeys		Retail Ground Turkey (374)	0.3	6.4	[4.2 - 9.4]	1.3							30.0	58.6	2.4	1.1	0.3	1.6	4.8																
			Cecal (29)	0.0	3.4	[0.1 - 17.8]	17.2							75.9	3.5	3.5																				
	Cattle		Retail Ground Beef (227)	0.4	1.8	[0.5 - 4.5]	6.2							40.5	50.7	0.4	0.4	1.3																		
			Cecal (Beef) (293)	0.0	0.0	[0.0 - 1.3]	2.7							30.4	65.2	1.7																				
			Cecal (Dairy) (256)	0.0	1.2	[0.2 - 3.4]	2.0							26.2	68.8	1.6	0.4	0.8	0.4																	
	Swine		Retail Pork Chops (208)	0.0	1.4	[0.3 - 4.2]	2.4							43.8	51.0	1.4	1.0	0.5																		
			Cecal (Market Hogs) (118)	0.0	0.8	[0.0 - 4.6]	0.9							33.9	61.9	2.5	0.9	0.9																		
			Cecal (Sows) (120)	0.0	0.8	[0.0 - 4.6]	0.8							40.8	55.8	1.7	0.8	0.8																		
	Ceftriaxone		Chickens	Retail Chickens (360)	0.3	4.4	[2.6 - 7.1]													94.4	0.3	0.6	0.3	0.3	1.1	2.5					0.3	0.3				
				Cecal (48)	0.0	2.1	[0.1 - 11.1]													97.9	2.1															
Turkeys			Retail Ground Turkey (374)	0.5	6.7	[4.4 - 9.7]	91.4	0.8	0.5	0.5	1.3	3.2	1.9							0.3																
			Cecal (29)	0.0	3.4	[0.1 - 17.8]	89.7	3.5	3.5	3.5																										
Cattle		Retail Ground Beef (227)	0.0	2.2	[0.7 - 5.1]	97.8	1.8	0.4																												
		Cecal (Beef) (293)	0.0	0.0	[0.0 - 1.3]	100.0																														
		Cecal (Dairy) (256)	0.0	1.6	[0.4 - 4.0]	98.4	0.8	0.8																												
Swine		Retail Pork Chops (208)	0.0	1.4	[0.3 - 4.2]	98.6	1.0	0.5																												
		Cecal (Market Hogs) (118)	0.0	0.8	[0.0 - 4.6]	99.2	0.9	0.9																												
		Cecal (Sows) (120)	0.0	0.8	[0.0 - 4.6]	99.2	0.8	0.8																												

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s, to the right of the double vertical bars, are due to rounding.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 85c. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway Inhibitors	Sulfisoxazole	Chickens	Retail Chickens (360)	N/A	39.2	[34.1 - 44.4]																
			Cecal (48)	N/A	37.5	[24.0 - 52.6]																
		Turkeys	Retail Ground Turkey (374)	N/A	50.0	[44.8 - 55.2]																
			Cecal (29)	N/A	55.2	[35.7 - 73.6]																
		Cattle	Retail Ground Beef (227)	N/A	7.9	[4.8 - 12.2]																
			Cecal (Beef) (293)	N/A	9.2	[6.2 - 13.1]																
			Cecal (Dairy) (256)	N/A	5.5	[3.0 - 9.0]																
		Swine	Retail Pork Chops (208)	N/A	10.1	[6.4 - 15.0]																
			Cecal (Market Hogs) (118)	N/A	19.5	[12.8 - 27.8]																
	Cecal (Sows) (120)		N/A	13.3	[7.8 - 20.7]																	
	Trimethoprim-Sulfamethoxazole	Chickens	Retail Chickens (360)	N/A	3.1	[1.5 - 5.4]																
			Cecal (48)	N/A	4.2	[0.5 - 14.3]																
		Turkeys	Retail Ground Turkey (374)	N/A	3.7	[2.1 - 6.2]																
			Cecal (29)	N/A	10.3	[2.2 - 27.4]																
		Cattle	Retail Ground Beef (227)	N/A	1.8	[0.5 - 4.5]																
			Cecal (Beef) (293)	N/A	0.0	[0.0 - 1.3]																
			Cecal (Dairy) (256)	N/A	0.0	[0.0 - 1.4]																
		Swine	Retail Pork Chops (208)	N/A	1.4	[0.3 - 4.2]																
Cecal (Market Hogs) (118)			N/A	3.4	[0.9 - 8.5]																	
Cecal (Sows) (120)	N/A		1.7	[0.2 - 5.9]																		
Macrolides	Azithromycin	Chickens	Retail Chickens (360)	N/A	0.0	[0.0 - 1.0]																
			Cecal (48)	N/A	0.0	[0.0 - 7.4]																
		Turkeys	Retail Ground Turkey (374)	N/A	0.0	[0.0 - 1.0]																
			Cecal (29)	N/A	0.0	[0.0 - 11.9]																
		Cattle	Retail Ground Beef (227)	N/A	0.9	[0.1 - 3.1]																
			Cecal (Beef) (293)	N/A	0.0	[0.0 - 1.3]																
			Cecal (Dairy) (256)	N/A	0.0	[0.0 - 1.4]																
		Swine	Retail Pork Chops (208)	N/A	0.0	[0.0 - 1.8]																
			Cecal (Market Hogs) (118)	N/A	0.0	[0.0 - 3.1]																
			Cecal (Sows) (120)	N/A	0.0	[0.0 - 3.0]																
		Penicillins	Ampicillin	Chickens	Retail Chickens (360)	N/A	20.8	[16.8 - 25.4]														
					Cecal (48)	N/A	10.4	[3.5 - 22.7]														
Turkeys	Retail Ground Turkey (374)			N/A	54.0	[48.8 - 59.1]																
	Cecal (29)			N/A	69.0	[49.2 - 84.7]																
Cattle	Retail Ground Beef (227)			N/A	4.8	[2.4 - 8.5]																
	Cecal (Beef) (293)			N/A	3.8	[1.9 - 6.6]																
	Cecal (Dairy) (256)			N/A	3.1	[1.4 - 6.1]																
Swine	Retail Pork Chops (208)			N/A	11.5	[7.5 - 16.7]																
	Cecal (Market Hogs) (118)			N/A	15.3	[9.3 - 23.0]																
	Cecal (Sows) (120)			N/A	22.5	[15.4 - 31.0]																

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 85d. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																	
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	
Phenicol	Chloramphenicol	Chickens	Retail Chickens (360)	0.3	1.7	[0.6 - 3.6]																	
			Cecal (48)	2.1	0.0	[0.0 - 7.4]																	
		Turkeys	Retail Ground Turkey (374)	0.3	5.3	[3.3 - 8.1]																	
			Cecal (29)	3.5	0.0	[0.0 - 11.9]																	
		Cattle	Retail Ground Beef (227)	0.9	4.0	[1.8 - 7.4]																	
			Cecal (Beef) (293)	2.4	3.8	[1.9 - 6.6]																	
			Cecal (Dairy) (256)	1.2	2.3	[0.9 - 5.0]																	
		Swine	Retail Pork Chops (208)	1.9	2.4	[0.8 - 5.5]																	
			Cecal (Market Hogs) (118)	2.5	5.1	[1.9 - 10.7]																	
			Cecal (Sows) (120)	0.0	5.8	[2.4 - 11.6]																	
Quinolones	Ciprofloxacin	Chickens	Retail Chickens (360)	2.2	0.6	[0.1 - 2.0]	92.5	4.7						0.6									
			Cecal (48)	2.1	0.0	[0.0 - 7.4]	93.8	2.1	2.1														
		Turkeys	Retail Ground Turkey (374)	1.6	0.3	[0.0 - 1.5]	94.1	4.0			0.3	1.3			0.3								
			Cecal (29)	0.0	0.0	[0.0 - 11.9]	96.6	3.5															
		Cattle	Retail Ground Beef (227)	0.4	0.0	[0.0 - 1.6]	98.2	1.3					0.4										
			Cecal (Beef) (293)	0.0	0.0	[0.0 - 1.3]	98.6	1.4															
			Cecal (Dairy) (256)	0.4	0.0	[0.0 - 1.4]	98.1	1.6					0.4										
		Swine	Retail Pork Chops (208)	0.0	0.0	[0.0 - 1.8]	98.6	1.4															
			Cecal (Market Hogs) (118)	2.5	1.7	[0.2 - 6.0]	94.1	1.7					2.5	0.9									
			Cecal (Sows) (120)	1.7	0.0	[0.0 - 3.0]	97.5	0.8					1.7										
	Nalidixic Acid		Chickens	Retail Chickens (360)	N/A	2.5	[1.1 - 4.7]					1.4	16.1	69.2	10.3	0.3	0.3	0.3	2.2				
				Cecal (48)	N/A	2.1	[0.1 - 11.1]					2.1	14.6	60.4	18.8			2.1					
			Turkeys	Retail Chickens (360)	N/A	1.9	[0.8 - 3.8]					0.3	14.7	74.9	8.3			0.3	1.6				
				Cecal (48)	N/A	0.0	[0.0 - 11.9]							13.8	75.9	10.3							
			Cattle	Retail Ground Beef (227)	N/A	0.4	[0.0 - 2.4]							13.2	78.0	8.4							
				Cecal (Beef) (293)	N/A	0.0	[0.0 - 1.3]					0.7	4.8	78.8	15.4	0.3							
				Cecal (Dairy) (256)	N/A	0.0	[0.0 - 1.4]					0.4	4.7	77.3	17.2			0.4					
			Swine	Retail Pork Chops (208)	N/A	0.0	[0.0 - 1.8]					1.4	13.0	74.1	11.5								
				Cecal (Market Hogs) (118)	N/A	1.7	[0.2 - 6.0]							5.1	72.0	18.6	2.5						
				Cecal (Sows) (120)	N/A	0.8	[0.0 - 4.6]							7.5	76.7	14.2			0.8				
Tetracyclines	Tetracycline	Chickens	Retail Chickens (360)	0.6	43.3	[38.1 - 48.6]						56.7			0.6	3.1	39.7						
			Cecal (48)	0.0	29.2	[17.0 - 44.1]						68.8	2.1			2.1	27.1						
		Turkeys	Retail Chickens (360)	1.1	74.3	[69.6 - 78.7]						24.6	1.1	1.1	5.6	67.7							
			Cecal (48)	0.0	69.0	[49.2 - 84.7]								31.0									
		Cattle	Retail Ground Beef (227)	2.2	22.5	[17.2 - 28.5]						72.7	4.9	2.2	3.1	17.2							
			Cecal (Beef) (293)	1.0	25.9	[21.0 - 31.4]						70.0	4.1	1.0	1.7	23.2							
			Cecal (Dairy) (256)	0.8	0.4	[0.0 - 2.2]						80.1	3.1	0.8	0.4	15.6							
		Swine	Retail Pork Chops (208)	1.4	51.4	[44.4 - 58.4]						48.1	0.5	1.4	1.9	48.1							
			Cecal (Market Hogs) (118)	0.0	63.6	[54.2 - 72.2]						34.8	1.7			5.1	58.5						
			Cecal (Sows) (120)	0.8	70.8	[61.8 - 78.8]								29.2			0.8	5.0	65				

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Resistance by Year

Table 86a. Antimicrobial Resistance among *E. coli* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Chickens	Retail Chickens	282	396	400	393	418	299	306	315	357	341	386	360
		HACCP ¹	2100	1365	1697	2232	1357	1510	986	877	941	614	990	48
		Cecal												
	Turkeys	Retail Ground Turkey	304	333	376	396	388	315	300	306	369	368	391	374
		Cecal												29
	Cattle	Retail Ground Beef	295	311	338	316	295	256	250	247	269	215	271	227
		Cecal (Beef)												293
		Cecal (Dairy)												256
	Swine	Retail Pork Chops	184	218	232	205	182	152	146	147	183	146	161	208
		Cecal (Market Hogs)												118
Cecal (Sows)													120	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Gentamicin (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	23.1%	29.3%	30.0%	37.7%	37.3%	34.4%	34.0%	34.3%	31.9%	38.4%	30.6%
HACCP			65	116	120	148	156	103	104	108	114	131	118	111
Cecal			38.0%	38.8%	39.1%	36.7%	33.1%	38.0%	44.5%	43.3%	43.0%	42.8%	42.1%	35.4%
Turkeys		Retail Ground Turkey	27.0%	29.7%	29.3%	27.5%	29.6%	27.0%	37.0%	37.9%	24.9%	32.6%	40.9%	27.0%
		Cecal	82	99	110	109	115	85	111	116	92	120	160	101
Cattle		Retail Ground Beef	0.3%	1.0%	0.6%	0.0%	4.1%	0.0%	2.0%	0.8%	0.4%	0.5%	0.7%	0.0%
		Cecal (Beef)	1	3	2	0	12	0	5	2	1	1	2	0
		Cecal (Dairy)												0.3%
Swine		Retail Pork Chops	1.1%	1.4%	1.3%	0.0%	1.1%	1.3%	1.4%	4.1%	2.7%	0.7%	0.6%	1.0%
		Cecal (Market Hogs)	2	3	3	0	2	2	2	6	5	1	1	2
	Cecal (Sows)												0.8%	
Kanamycin ² (MIC ≥ 64 µg/ml)	Chickens	Retail Chickens	6.0%	6.8%	6.8%	7.1%	11.5%	9.0%	6.9%	5.4%	6.2%	5.6%	5.7%	7.8%
		HACCP	17	27	27	28	48	27	21	17	22	19	22	28
		Cecal	11.6%	10.3%	11.5%	10.3%	9.1%	7.7%	10.2%	7.9%	6.4%	5.7%	7.3%	4.2%
	Turkeys	Retail Ground Turkey	13.2%	16.8%	16.0%	11.4%	14.7%	15.6%	19.0%	20.6%	21.4%	24.7%	22.8%	17.6%
		Cecal	40	56	60	45	57	49	57	63	79	91	89	66
	Cattle	Retail Ground Beef	2.4%	2.9%	2.4%	0.6%	4.7%	1.6%	4.0%	2.0%	3.7%	1.4%	2.2%	0.9%
		Cecal (Beef)	7	9	8	2	14	4	10	5	10	3	6	2
		Cecal (Dairy)												1.4%
	Swine	Retail Pork Chops	5.4%	8.7%	8.2%	7.3%	6.0%	4.6%	6.2%	6.1%	7.7%	1.4%	5.0%	3.8%
		Cecal (Market Hogs)	10	19	19	15	11	7	9	9	14	2	8	8
Cecal (Sows)													11.0%	
Streptomycin ³ (MIC ≥ 64 µg/ml)	Chickens	Retail Chickens	49.3%	56.1%	56.8%	50.6%	48.1%	46.8%	43.8%	38.1%	39.2%	43.4%	39.6%	38.9%
		HACCP	139	222	227	199	201	140	134	120	140	148	153	140
		Cecal	65.1%	64.2%	64.1%	58.0%	49.5%	47.0%	54.6%	49.8%	49.1%	50.8%	42.8%	31.3%
	Turkeys	Retail Ground Turkey	57.6%	54.7%	49.2%	43.4%	43.8%	44.8%	57.3%	57.5%	47.7%	60.3%	67.0%	54.0%
		Cecal	175	182	185	172	170	141	172	176	176	222	262	202
	Cattle	Retail Ground Beef	9.5%	9.0%	11.8%	5.4%	14.2%	6.3%	10.4%	8.1%	9.3%	6.5%	10.0%	8.4%
		Cecal (Beef)	28	28	40	17	42	16	26	20	25	14	27	19
		Cecal (Dairy)												8.9%
	Swine	Retail Pork Chops	22.3%	19.7%	21.1%	13.2%	13.7%	13.8%	19.9%	19.7%	19.7%	15.1%	14.9%	17.8%
		Cecal (Market Hogs)	41	43	49	27	25	21	29	29	36	22	24	37
Cecal (Sows)													18.6%	
β-Lactam/β-Lactamase Inhibitor Combinations	Chickens	Retail Chickens	12.1%	13.6%	10.0%	12.2%	11.5%	7.4%	11.8%	13.3%	6.7%	14.1%	7.8%	5.6%
		HACCP	34	54	40	48	48	22	36	42	24	48	30	20
		Cecal	10.9%	11.1%	8.8%	10.6%	16.0%	11.2%	13.7%	12.4%	12.4%	9.4%	9.0%	2.1%
	Turkeys	Retail Ground Turkey	5.6%	3.0%	5.3%	3.8%	6.7%	6.3%	8.3%	9.8%	10.0%	13.0%	11.8%	8.8%
		Cecal	17	10	20	15	26	20	25	30	37	48	46	33
	Cattle	Retail Ground Beef	2.0%	2.3%	3.9%	1.3%	2.4%	0.8%	2.4%	1.6%	1.1%	0.5%	1.5%	1.8%
		Cecal (Beef)	6	7	13	4	7	2	6	4	3	1	4	4
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops	5.4%	5.1%	5.6%	2.9%	2.2%	0.7%	3.4%	6.8%	2.2%	0.0%	3.1%	1.0%
		Cecal (Market Hogs)	10	11	13	6	4	1	5	10	4	0	5	2
Cecal (Sows)													0.8%	

¹ In 2013, chicken carcass rinsates were not sampled for *E. coli*

² Kanamycin results are unavailable for all retail meat isolates due to a change in the panel used for testing

³ Streptomycin results are unavailable for one 2013 retail meat turkey isolate

Table 86b. Antimicrobial Resistance among *E. coli* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Chickens	Retail Chickens	282	396	400	393	418	299	306	315	357	341	386	360			
		HACCP ¹	2100	1365	1697	2232	1357	1510	986	877	941	614	990				
		Cecal												48			
	Turkeys	Retail Ground Turkey	304	333	376	396	388	315	300	306	369	368	391	374			
		Cecal												29			
	Cattle	Retail Ground Beef	295	311	338	316	295	256	250	247	269	215	271	227			
		Cecal (Beef) Cecal (Dairy)												293 256			
	Swine	Retail Pork Chops	184	218	232	205	182	152	146	147	183	146	161	208			
		Cecal (Market Hogs) Cecal (Sows)												118 120			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	11.0%	9.3%	8.3%	11.2%	11.2%	7.4%	11.8%	13.3%	6.7%	13.2%	7.8%	5.0%		
			HACCP	31	37	33	44	47	22	36	42	24	45	30	18		
			Cecal	8.5%	8.3%	8.2%	9.9%	15.0%	10.3%	13.8%	11.4%	12.5%	9.1%	9.2%			
		Turkeys	Retail Ground Turkey	3.3%	1.2%	4.5%	3.3%	6.2%	6.3%	6.3%	7.8%	9.2%	12.5%	11.3%	7.8%		
			Cecal	10	4	17	13	24	20	19	24	34	46	44	29		
		Cattle	Retail Ground Beef	1.4%	0.3%	1.2%	1.0%	2.0%	0.8%	2.4%	1.6%	1.1%	0.5%	1.8%	1.3%		
			Cecal (Beef)	4	1	4	3	6	2	6	4	3	1	5	3		
			Cecal (Dairy)												0.0%		
		Swine	Retail Pork Chops	3.3%	2.3%	2.2%	1.5%	1.6%	0.7%	3.4%	6.8%	0.5%	0.0%	1.9%	1.0%		
			Cecal (Market Hogs)	6	5	5	3	3	1	5	10	1	0	3	2		
			Cecal (Sows)												0.8%		
		Ceftiofur	(MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	7.1%	7.6%	5.8%	8.7%	8.6%	6.0%	10.8%	11.8%	5.6%	12.3%	7.5%	4.4%
					HACCP	20	30	23	34	36	18	33	37	20	42	29	16
					Cecal	5.5%	7.1%	4.9%	6.5%	10.2%	7.0%	10.5%	9.5%	10.0%	6.8%	7.6%	
				Turkeys	Retail Ground Turkey	1.0%	0.3%	1.1%	1.8%	3.1%	6.0%	3.7%	6.2%	7.9%	9.8%	9.2%	6.4%
					Cecal	3	1	4	7	12	19	11	19	29	36	36	24
				Cattle	Retail Ground Beef	0.0%	0.3%	0.9%	0.6%	1.0%	0.8%	1.6%	0.8%	1.1%	0.9%	0.0%	1.8%
					Cecal (Beef)	0	1	3	2	3	2	4	2	3	2	0	4
Cecal (Dairy)															0.0%		
Swine	Retail Pork Chops			0.5%	0.9%	0.4%	0.0%	0.0%	0.7%	3.4%	6.8%	0.0%	0.0%	1.2%	1.4%		
	Cecal (Market Hogs)			1	2	1	0	0	1	5	10	0	0	2	3		
	Cecal (Sows)														0.8%		
Ceftriaxone	(MIC ≥ 4 µg/ml)			Chickens	Retail Chickens	7.8%	9.1%	6.5%	10.2%	9.1%	6.4%	11.1%	12.4%	6.4%	12.6%	7.8%	4.4%
					HACCP	22	36	26	40	38	19	34	39	23	43	30	16
					Cecal	8.6%	9.4%	7.2%	9.0%	14.7%	10.3%	13.5%	11.5%	12.3%	9.3%	8.8%	
				Turkeys	Retail Ground Turkey	1.3%	0.3%	1.3%	2.3%	3.1%	6.0%	3.7%	6.9%	8.9%	10.1%	9.7%	6.7%
					Cecal	4	1	5	9	12	19	11	21	33	37	38	25
				Cattle	Retail Ground Beef	0.0%	0.3%	1.5%	1.9%	1.7%	0.8%	1.6%	0.8%	1.1%	0.5%	0.0%	2.2%
					Cecal (Beef)	0	1	5	6	5	2	4	2	3	1	0	5
		Cecal (Dairy)													0.0%		
		Swine	Retail Pork Chops	0.5%	0.9%	0.4%	0.5%	0.6%	0.7%	3.4%	6.8%	0.0%	0.0%	1.2%	1.4%		
			Cecal (Market Hogs)	1	2	1	1	1	1	5	10	0	0	2	3		
			Cecal (Sows)												0.8%		
		Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Chickens	Retail Chickens	32.3%	38.4%	41.3%	48.1%	46.9%	42.1%	39.2%	40.6%	38.9%	44.3%	37.8%	39.2%
					HACCP	91	152	165	189	196	126	120	128	139	151	146	141
					Cecal	46.1%	43.9%	53.2%	51.9%	48.6%	53.2%	52.7%	52.6%	51.8%	54.7%	47.6%	
				Turkeys	Retail Ground Turkey	48.0%	51.7%	48.4%	48.0%	48.5%	48.9%	51.0%	53.9%	44.7%	51.9%	56.8%	50.0%
					Cecal	146	172	182	190	188	154	153	165	165	191	222	187
				Cattle	Retail Ground Beef	9.8%	10.3%	13.0%	7.0%	12.5%	9.4%	11.6%	7.7%	12.6%	7.9%	7.4%	7.9%
					Cecal (Beef)	29	32	44	22	37	24	29	19	34	17	20	18
Cecal (Dairy)															9.2%		
Swine	Retail Pork Chops			12.5%	15.1%	19.4%	14.1%	20.3%	11.8%	16.4%	14.3%	16.4%	10.3%	6.8%	10.1%		
	Cecal (Market Hogs)			23	33	45	29	37	18	24	21	30	15	11	21		
	Cecal (Sows)														19.5%		
															23		
															13.3%		
															16		

¹ In 2013, chicken carcass rinsates were not sampled for *E. coli*

² Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

Table 86c. Antimicrobial Resistance among *E. coli* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Chickens	Retail Chickens	282	396	400	393	418	299	306	315	357	341	386	360			
		HACCP ¹	2100	1365	1697	2232	1357	1510	986	877	941	614	990	48			
		Cecal															
	Turkeys	Retail Ground Turkey	304	333	376	396	388	315	300	306	369	368	391	374			
		Cecal												29			
	Cattle	Retail Ground Beef	295	311	338	316	295	256	250	247	269	215	271	227			
		Cecal (Beef) Cecal (Dairy)												293 256			
	Swine	Retail Pork Chops	184	218	232	205	182	152	146	147	183	146	161	208			
		Cecal (Market Hogs) Cecal (Sows)												118 120			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
	Folate Pathway Inhibitors	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Chickens	Retail Chickens	3.6%	7.1%	4.3%	7.4%	8.9%	5.0%	3.6%	2.2%	4.2%	2.3%	2.6%	3.1%	
HACCP				10	28	17	29	37	15	11	7	15	8	10	11		
Cecal				10.4%	10.5%	10.7%	10.4%	8.4%	7.9%	9.1%	7.0%	6.4%	4.2%	6.5%	4.2%		
Turkeys			Retail Ground Turkey	4.0%	6.9%	3.7%	5.1%	8.0%	7.9%	5.3%	5.9%	5.1%	4.3%	6.1%	3.7%		
			Cecal	12	23	14	20	31	25	16	18	19	16	24	14		
Cattle			Retail Ground Beef	0.7%	0.3%	0.6%	0.6%	1.4%	1.2%	2.0%	2.0%	0.7%	2.3%	0.4%	1.8%		
			Cecal (Beef)	2	1	2	2	4	3	5	5	2	5	1	4		
			Cecal (Dairy)												0.0%		
Swine			Retail Pork Chops	1.1%	2.8%	3.9%	1.5%	2.2%	1.3%	6.2%	2.7%	3.8%	3.4%	1.9%	1.4%		
			Cecal (Market Hogs)	2	6	9	3	4	2	9	4	7	5	3	3		
			Cecal (Sows)												3.4%		
Macrolides			Azithromycin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens									0.0%	0.0%	0.0%	
					HACCP										0	0	
					Cecal										0.2%	0.5%	0.0%
				Turkeys	Retail Ground Turkey										0.0%	0.0%	0.0%
					Cecal										0	0	0.0%
				Cattle	Retail Ground Beef										0.0%	0.0%	0.9%
					Cecal (Beef)										0	0	2
					Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops											0.0%	0.0%	0.0%		
		Cecal (Market Hogs)											0	0	0		
		Cecal (Sows)													0.0%		
	Penicillins	Ampicillin (MIC ≥ 32 µg/ml)		Chickens	Retail Chickens	21.6%	25.3%	17.0%	24.7%	20.1%	18.1%	23.5%	22.2%	16.5%	26.4%	0.3%	20.8%
					HACCP	61	100	68	97	84	54	72	70	59	90	1	75
					Cecal	19.0%	18.6%	17.6%	22.0%	25.6%	18.7%	23.5%	19.8%	22.2%	16.0%	17.7%	10.4%
				Turkeys	Retail Ground Turkey	31.3%	35.7%	33.2%	38.1%	42.0%	48.3%	58.0%	56.2%	52.6%	51.6%	55.5%	54.0%
					Cecal	95	119	125	151	163	152	174	172	194	190	217	202
				Cattle	Retail Ground Beef	6.1%	5.1%	5.3%	3.5%	9.2%	6.6%	6.4%	4.9%	4.8%	3.7%	2.6%	4.8%
					Cecal (Beef)	18	16	18	11	27	17	16	12	13	8	7	11
					Cecal (Dairy)												3.8%
Swine			Retail Pork Chops	13.6%	13.3%	15.1%	16.1%	15.9%	15.8%	15.1%	11.6%	19.1%	13.0%	13.0%	11.5%		
			Cecal (Market Hogs)	25	29	35	33	29	24	22	17	35	19	21	24		
			Cecal (Sows)												15.3%		
Phenicol			Chloramphenicol (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.7%	0.0%	1.8%	0.5%	2.6%	2.0%	1.0%	0.6%	1.2%	0.3%	1.7%	
					HACCP	2	0	7	2	11	6	3	2	5	4	1	6
					Cecal	1.8%	1.3%	1.0%	1.0%	1.9%	2.3%	1.0%	1.1%	0.7%	2.1%	1.9%	0.0%
				Turkeys	Retail Ground Turkey	0.3%	3.6%	0.8%	4.0%	2.3%	2.9%	3.7%	3.3%	3.5%	4.9%	5.9%	5.3%
					Cecal	1	12	3	16	9	9	11	10	13	18	23	20
				Cattle	Retail Ground Beef	1.0%	2.3%	3.6%	1.6%	1.4%	3.9%	0.8%	2.4%	2.6%	1.4%	1.1%	4.0%
					Cecal (Beef)	3	7	12	5	4	10	2	6	7	3	3	9
					Cecal (Dairy)												3.8%
	Swine	Retail Pork Chops		1.6%	4.1%	4.3%	3.4%	6.6%	3.9%	3.4%	4.8%	1.6%	2.7%	3.7%	2.4%		
		Cecal (Market Hogs)		3	9	10	7	12	6	5	7	3	4	6	5		
		Cecal (Sows)													5.1%		
															5.8%		
															7		

¹ In 2013, chicken carcass rinsates were not sampled for *E. coli*

Table 86d. Antimicrobial Resistance among *E. coli* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Chickens	Retail Chickens	282	396	400	393	418	299	306	315	357	341	386	360	
		HACCP ¹	2100	1365	1697	2232	1357	1510	986	877	941	614	990		
		Cecal												48	
	Turkeys	Retail Ground Turkey	304	333	376	396	388	315	300	306	369	368	391	374	
		Cecal												29	
	Cattle	Retail Ground Beef	295	311	338	316	295	256	250	247	269	215	271	227	
		Cecal (Beef) Cecal (Dairy)												293 256	
	Swine	Retail Pork Chops	184	218	232	205	182	152	146	147	183	146	161	208	
		Cecal (Market Hogs) Cecal (Sows)												118 120	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Quinolones	Ciprofloxacin (MIC ≥ 1 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.6%
				HACCP	0	0	0	0	0	0	0	1	1	0	0
Cecal				0.3%	0.2%	0.2%	0.5%	0.1%	0.1%	0.6%	0.5%	0.2%	0.3%	0.5%	
Turkeys			Retail Ground Turkey	6	3	3	11	1	1	6	4	2	2	5	
			Cecal												0.0%
Cattle			Retail Ground Turkey	0.0%	0.3%	0.8%	0.0%	0.5%	0.3%	0.0%	0.7%	0.5%	0.0%	0.3%	0.3%
			Cecal	0	1	3	0	2	1	0	2	2	0	1	1
Cattle			Retail Ground Beef												0.0%
			Cecal (Beef) Cecal (Dairy)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Swine			Retail Pork Chops	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Market Hogs) Cecal (Sows)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nalidixic Acid (MIC ≥ 32 µg/ml)			Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP		0	0	0	0	0	0	0	0	0	0	0	0
		Cecal		2.8%	4.0%	7.0%	6.6%	5.0%	3.0%	2.9%	2.9%	3.6%	2.3%	1.8%	2.5%
		Turkeys	Retail Ground Turkey	8	16	28	26	21	9	9	9	13	8	7	9
			Cecal	6.8%	6.2%	6.8%	7.5%	5.4%	4.2%	6.0%	3.2%	3.4%	2.3%	2.4%	
		Cattle	Retail Ground Turkey	142	84	115	168	73	64	59	28	32	14	24	
			Cecal												2.1%
		Swine	Retail Ground Turkey	4.3%	11.7%	10.6%	10.4%	5.2%	2.2%	3.7%	2.6%	2.7%	1.6%	0.3%	1.9%
			Cecal	13	39	40	41	20	7	11	8	10	6	1	7
		Cattle	Retail Ground Beef												0.0%
			Cecal (Beef) Cecal (Dairy)	0.0%	1.0%	1.5%	1.3%	0.7%	0.4%	0.4%	0.4%	0.0%	0.0%	0.0%	0.4%
		Swine	Retail Pork Chops	0	3	5	4	2	1	1	1	0	0	0	0
Cecal (Market Hogs) Cecal (Sows)			0.5%	0.5%	0.0%	1.5%	0.5%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	46.1%	42.9%	48.0%	46.6%	50.5%	40.5%	43.8%	41.6%	38.9%	40.8%	39.4%	43.3%
			HACCP	130	170	192	183	211	121	134	131	139	139	152	156
			Cecal	58.6%	52.2%	50.3%	48.9%	49.0%	40.2%	47.4%	49.1%	42.9%	46.6%	45.4%	
		Turkeys	Retail Ground Turkey	1231	713	853	1092	665	607	467	431	404	286	449	
			Cecal												29.2%
		Cattle	Retail Ground Turkey	77.0%	77.8%	74.2%	78.0%	76.5%	80.0%	85.7%	82.0%	69.4%	79.9%	77.2%	74.3%
			Cecal	234	259	279	309	297	252	257	251	256	294	302	278
		Swine	Retail Ground Beef												69.0%
			Cecal (Beef) Cecal (Dairy)	30.9%	25.1%	22.8%	16.5%	25.4%	21.9%	24.0%	18.6%	22.7%	17.7%	22.1%	22.5%
		Swine	Retail Pork Chops	91	78	77	52	75	56	60	62	61	38	60	51
			Cecal (Market Hogs) Cecal (Sows)	52.7%	46.3%	56.0%	45.9%	52.7%	50.0%	54.8%	46.9%	44.3%	46.6%	39.1%	51.4%
				97	101	130	94	96	76	80	69	81	68	63	107
													63.6%		
													75		
													70.8%		
													85		

¹ In 2013, chicken carcass rinsates were not sampled for *E. coli*

Table 87b. Resistance Patterns among *E. coli* Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Chickens	Retail Chickens	282	396	400	393	418	299	306	315	357	341	386	351
		HACCP ¹	2100	1365	1697	2232	1357	1510	986	877	941	614	990	
		Cecal												48
	Turkeys	Retail Ground Turkey	304	333	376	396	388	315	300	306	369	368	391	374
		Cecal												29
	Cattle	Retail Ground Beef	295	311	338	316	295	256	250	247	269	215	271	227
		Cecal (Beef)												293
		Cecal (Dairy)												256
	Swine	Retail Pork Chops	184	218	232	205	182	152	146	147	183	146	161	208
		Cecal (Market Hogs)												118
		Cecal (Sows)												120
	Resistance Pattern													
Source														
5. At Least ACSSuT² Resistant														
Chickens	Retail Chickens	0.4%	0.0%	1.3%	0.3%	1.4%	2.0%	1.0%	0.6%	1.1%	1.2%	0.3%	0.8%	
	HACCP	1	0	5	1	6	6	3	2	4	4	1	3	
	Cecal												0	
Turkeys	Retail Ground Turkey	0.0%	2.7%	0.5%	1.8%	0.8%	1.9%	2.0%	2.3%	2.2%	3.0%	5.1%	3.2%	
	Cecal	0	9	2	7	3	6	6	7	8	11	20	12	
Cattle	Retail Ground Beef	0.3%	1.0%	1.5%	0.6%	0.3%	0.4%	0.0%	0.0%	0.4%	0.9%	0.0%	2.2%	
	Cecal (Beef)	1	3	5	2	1	1	0	0	1	2	0	5	
	Cecal (Dairy)												0.7%	
Swine	Retail Pork Chops	0.5%	1.4%	1.3%	1.0%	1.1%	0.7%	1.4%	2.0%	0.5%	0.0%	0.6%	0.5%	
	Cecal (Market Hogs)	1	3	3	2	2	1	2	3	1	0	1	1	
	Cecal (Sows)												0.8%	
6. At Least ACT/S³ Resistant														
Chickens	Retail Chickens	0.0%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%	0.8%	
	HACCP	0	0	1	0	0	1	0	0	1	0	0	3	
	Cecal												0.0%	
Turkeys	Retail Ground Turkey	0.0%	0.9%	0.0%	0.8%	0.3%	0.3%	0.0%	0.3%	1.1%	0.0%	1.0%	0.3%	
	Cecal	0	3	0	3	1	1	0	1	4	0	4	1	
Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	
	Cecal (Beef)	0	0	0	1	1	0	0	0	0	0	0	2	
	Cecal (Dairy)												0.0%	
Swine	Retail Pork Chops	0.5%	0.0%	0.4%	0.5%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.6%	0.5%	
	Cecal (Market Hogs)	1	0	1	1	0	0	0	1	0	0	1	1	
	Cecal (Sows)												0.8%	
7. At Least ACSSuTAuCx⁴ Resistant														
Chickens	Retail Chickens	0.4%	0.0%	1.0%	0.3%	1.0%	0.7%	0.7%	0.6%	0.8%	0.0%	0.3%	0.0%	
	HACCP	1	0	4	1	4	2	2	2	3	0	1	0	
	Cecal												0.0%	
Turkeys	Retail Ground Turkey	0.0%	0.3%	0.0%	0.3%	0.0%	1.3%	1.3%	1.0%	1.1%	0.0%	1.0%	0.3%	
	Cecal	0	1	0	1	0	4	4	3	4	0	4	1	
Cattle	Retail Ground Beef	0.0%	0.0%	0.9%	0.3%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	1.3%	
	Cecal (Beef)	0	0	3	1	0	0	0	0	1	0	0	3	
	Cecal (Dairy)												0.0%	
Swine	Retail Pork Chops	0.0%	0.5%	0.4%	0.0%	0.0%	0.7%	0.7%	2.0%	0.0%	0.0%	0.6%	0.0%	
	Cecal (Market Hogs)	0	1	1	0	0	1	1	3	0	0	1	0	
	Cecal (Sows)												0.0%	
8. At Least Ceftriaxone and Nalidixic Acid Resistant														
Chickens	Retail Chickens	0.7%	0.5%	1.5%	0.3%	0.2%	0.0%	1.0%	1.0%	0.3%	0.0%	0.5%	0.3%	
	HACCP	2	2	6	1	1	0	3	3	1	0	2	1	
	Cecal												0.0%	
Turkeys	Retail Ground Turkey	0.3%	0.3%	0.3%	0.3%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	
	Cecal	1	1	1	1	0	2	0	0	0	0	3	0	
Cattle	Retail Ground Beef	0.0%	0.0%	0.3%	0.3%	0.3%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	
	Cecal (Beef)	0	0	1	1	1	0	0	1	0	0	0	0	
	Cecal (Dairy)												0.0%	
Swine	Retail Pork Chops	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Cecal (Market Hogs)	1	0	0	0	0	0	0	0	0	0	0	0	
	Cecal (Sows)												0.0%	

¹ In 2013, chicken carcass rinsates were not sampled for *E. coli*
² ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline
³ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole
⁴ ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Table 88. Distribution of MICs and Occurrence of Resistance to Selected β -Lactam Agents among *E. coli* Isolates Resistant to Ceftiofur or Ceftriaxone, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹ (or S-DD) ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (μ g/ml) ⁵												
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64
β -Lactam/ β -Lactamase Inhibitor Combinations	Piperacillin-tazobactam	Chickens Retail Chickens (29)	0.0	0.0	[0.0 - 11.9]													
		Chickens HACCP (87)	0.0	0.0	[0.0 - 4.2]													
		Turkeys Retail Ground Turkey (37)	2.7	0.0	[0.0 - 9.5]													
		Cattle Retail Ground Beef (0)	N/A	N/A	N/A													
		Swine Retail Pork Chops (2)	0.0	0.0	[0.0 - 84.2]													
Cepheids	Cefepime	Chickens Retail Chickens (29)	6.8	0.0	[0.0 - 11.9]													
		Chickens HACCP (87)	0.0	0.0	[0.0 - 4.2]													
		Turkeys Retail Ground Turkey (37)	0.0	0.0	[0.0 - 9.5]													
		Cattle Retail Ground Beef (0)	N/A	N/A	N/A													
		Swine Retail Pork Chops (2)	0.0	0.0	[0.0 - 84.2]													
	Cefotaxime	Chickens Retail Chickens (29)	0.0	100.0	[88.1 - 100.0]													
		Chickens HACCP (87)	3.4	87.4	[78.5 - 93.5]													
		Turkeys Retail Ground Turkey (37)	2.7	97.3	[85.8 - 99.9]													
		Cattle Retail Ground Beef (0)	N/A	N/A	N/A													
		Swine Retail Pork Chops (2)	0.0	100.0	[15.8 - 100.0]													
	Ceftazidime	Chickens Retail Chickens (29)	44.9	44.8	[26.4 - 64.3]													
		Chickens HACCP (87)	48.3	32.2	[22.6 - 43.1]													
		Turkeys Retail Ground Turkey (37)	43.2	54.1	[36.9 - 70.5]													
		Cattle Retail Ground Beef (0)	N/A	N/A	N/A													
		Swine Retail Pork Chops (2)	50.0	50.0	[1.3 - 98.7]													
	Monobactam	Aztreonam	Chickens Retail Chickens (29)	37.9	0.0	[0.0 - 11.9]												
			Chickens HACCP (87)	12.6	1.1	[0.0 - 6.2]												
			Turkeys Retail Ground Turkey (37)	37.8	10.8	[3.0 - 25.4]												
			Cattle Retail Ground Beef (0)	N/A	N/A	N/A												
			Swine Retail Pork Chops (2)	50.0	0.0	[0.0 - 84.2]												
Penems	Imipenem	Chickens Retail Chickens (29)	0.0	0.0	[0.0 - 11.9]													
		Chickens HACCP (87)	0.0	0.0	[0.0 - 4.2]													
		Turkeys Retail Ground Turkey (37)	0.0	0.0	[0.0 - 9.5]													
		Cattle Retail Ground Beef (0)	N/A	N/A	N/A													
		Swine Retail Pork Chops (2)	0.0	0.0	[0.0 - 84.2]													

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that are susceptible-dose dependent (S-DD). Cefepime MIC's above the susceptible range but below the resistant range are designed by CLSI to be S-DD.

³ Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

⁴ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁵ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Table 89. Distribution of MICs and Occurrence of Resistance to Selected beta-Lactam Agents among *E. coli* Isolates Resistant to Ceftiofur or Ceftriaxone, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹ (or S-DD) ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵																								
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024								
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	Chickens	Retail Chickens (15)	0.0	0.0	[0.0 - 21.8]																								
			Cecal (1)	0.0	0.0	[0.0 - 97.5]																								
		Turkeys	Retail Ground Turkey (24)	0.0	0.0	[0.0 - 14.2]																								
			Cecal (1)	0.0	0.0	[0.0 - 97.5]																								
		Cattle	Retail Ground Beef (5)	0.0	0.0	[0.0 - 52.2]																								
			Cecal (Beef) (0)	N/A	N/A	N/A																								
			Cecal (Dairy) (4)	0.0	0.0	[0.0 - 60.2]																								
		Swine	Retail Pork Chops (3)	0.0	0.0	[0.0 - 70.8]																								
			Cecal (Market Hogs) (1)	0.0	0.0	[0.0 - 97.5]																								
			Cecal (Sows) (1)	0.0	0.0	[0.0 - 97.5]																								
		Cephems	Cefepime	Chickens	Retail Chickens (15)	6.7												0.0	[0.0 - 21.8]											
					Cecal (1)	0.0												0.0	[0.0 - 97.5]											
Turkeys	Retail Ground Turkey (24)			0.0	4.2	[0.1 - 21.1]																								
	Cecal (1)			0.0	0.0	[0.0 - 97.5]																								
Cattle	Retail Ground Beef (5)			0.0	20.0	[0.5 - 71.6]																								
	Cecal (Beef) (0)			N/A	N/A	N/A																								
	Cecal (Dairy) (4)			0.0	0.0	[0.0 - 60.2]																								
Swine	Retail Pork Chops (3)			33.3	0.0	[0.0 - 70.8]																								
	Cecal (Market Hogs) (1)			0.0	0.0	[0.0 - 97.5]																								
	Cecal (Sows) (1)			0.0	0.0	[0.0 - 97.5]																								
Cefotaxime	Chickens			Retail Chickens (15)	0.0	100.0	[78.2 - 100.0]																							
				Cecal (1)	0.0	100.0	[2.5 - 100.0]																							
	Turkeys		Retail Ground Turkey (24)	0.0	100.0	[85.8 - 100.0]																								
			Cecal (1)	0.0	100.0	[2.5 - 100.0]																								
	Cattle		Retail Ground Beef (5)	0.0	100.0	[47.8 - 100.0]																								
			Cecal (Beef) (0)	N/A	N/A	N/A																								
			Cecal (Dairy) (4)	0.0	100.0	[39.8 - 100.0]																								
	Swine		Retail Pork Chops (3)	0.0	100.0	[29.2 - 100.0]																								
			Cecal (Market Hogs) (1)	0.0	0.0	[0.0 - 97.5]																								
			Cecal (Sows) (1)	0.0	100.0	[2.5 - 100.0]																								
	Ceftazidime		Chickens	Retail Chickens (15)	46.7	46.7	[21.3 - 73.4]																							
				Cecal (1)	0.0	100.0	[2.5 - 100.0]																							
Turkeys			Retail Ground Turkey (24)	54.2	41.7	[22.1 - 63.4]																								
			Cecal (1)	0.0	100.0	[2.5 - 100.0]																								
Cattle		Retail Ground Beef (5)	40.0	60.0	[14.7 - 94.7]																									
		Cecal (Beef) (0)	N/A	N/A	N/A																									
		Cecal (Dairy) (4)	50.0	50.0	[6.8 - 93.2]																									
Swine		Retail Pork Chops (3)	33.3	33.3	[0.8 - 90.6]																									
		Cecal (Market Hogs) (1)	0.0	100.0	[2.5 - 100.0]																									
		Cecal (Sows) (1)	0.0	100.0	[2.5 - 100.0]																									
Monobactam		Aztreonam	Chickens	Retail Chickens (15)	26.7	6.7	[0.2 - 31.9]																							
				Cecal (1)	100.0	100.0	[2.5 - 100.0]																							
	Turkeys		Retail Ground Turkey (24)	58.3	4.2	[0.1 - 21.1]																								
			Cecal (1)	100.0	0.0	[0.0 - 97.5]																								
	Cattle		Retail Ground Beef (5)	20.0	20.0	[0.5 - 71.6]																								
			Cecal (Beef) (0)	N/A	N/A	N/A																								
			Cecal (Dairy) (4)	25.0	0.0	[0.0 - 60.2]																								
	Swine		Retail Pork Chops (3)	0.0	0.0	[0.0 - 70.8]																								
			Cecal (Market Hogs) (1)	100.0	0.0	[0.0 - 97.5]																								
			Cecal (Sows) (1)	100.0	0.0	[0.0 - 97.5]																								
	Penems		Imipenem	Chickens	Retail Chickens (15)	0.0	0.0												[0.0 - 21.8]											
					Cecal (1)	0.0	100.0												[2.5 - 100.0]											
Turkeys		Retail Ground Turkey (24)		4.2	0.0	[0.0 - 14.2]																								
		Cecal (1)		0.0	100.0	[2.5 - 100.0]																								
Cattle		Retail Ground Beef (5)		0.0	0.0	[0.0 - 52.2]																								
		Cecal (Beef) (0)		N/A	N/A	N/A																								
		Cecal (Dairy) (4)		0.0	0.0	[0.0 - 60.2]																								
Swine		Retail Pork Chops (3)		0.0	0.0	[0.0 - 70.8]																								
		Cecal (Market Hogs) (1)		0.0	0.0	[0.0 - 97.5]																								
		Cecal (Sows) (1)		0.0	100.0	[2.5 - 100.0]																								

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that are susceptible-dose dependent (S-DD). Cefepime MIC's above the susceptible range but below the resistant range are designed by CLSI to be S-DD.

³ Percent of isolates with resistance. Discrepancies between %R and sums of distribution %, to the right of the double vertical bars, are due to rounding

⁴ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁵ The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration.

Enterococcus Data

Enterococcus Isolates Tested

Table 90. Number of *Enterococcus* Isolates Tested, 2002-2013

Source		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Chickens	Retail Chickens	381	466	466	457	469	339	348	349	439	433	456	439
	HACCP ¹		2043	2456	3035	2120	1571	916	832	948	524		
Turkeys	Cecal												46
	Retail Ground Turkey	395	447	466	470	465	348	360	360	460	480	476	457
Cattle	Cecal												30
	Retail Ground Beef	383	432	448	447	438	334	337	327	415	423	453	454
	Cecal (Beef)												261
Swine	Cecal (Dairy)												256
	Retail Pork Chops	387	418	437	452	435	329	343	328	417	435	460	391
	Cecal (Market Hogs)												107
	Cecal (Sows)												102

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Isolation of *Enterococcus* from Retail Meats

Table 91. Number and Percent of Retail Meat Samples Culture Positive for *Enterococcus*, 2012

	Retail Chickens	Retail Ground Turkeys	Retail Ground Beef	Retail Pork Chops
Number of Meat Samples Tested	480	476	480	480
Number Positive for <i>Enterococcus</i>	456	460	453	416
Percent Positive for <i>Enterococcus</i>	95.0%	96.6%	94.4%	86.7%

Figure 18. Percent of Retail Meat Samples Culture Positive for *Enterococcus*, 2012

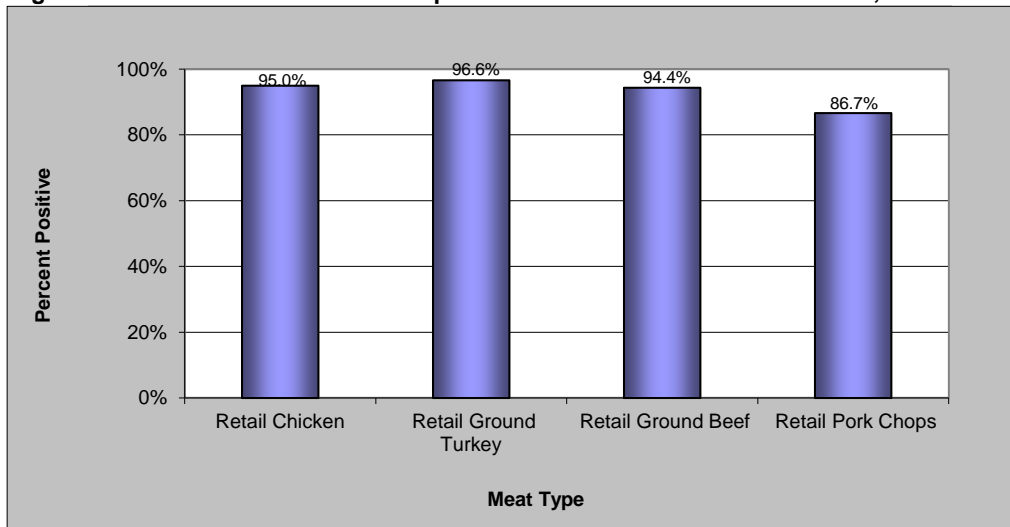
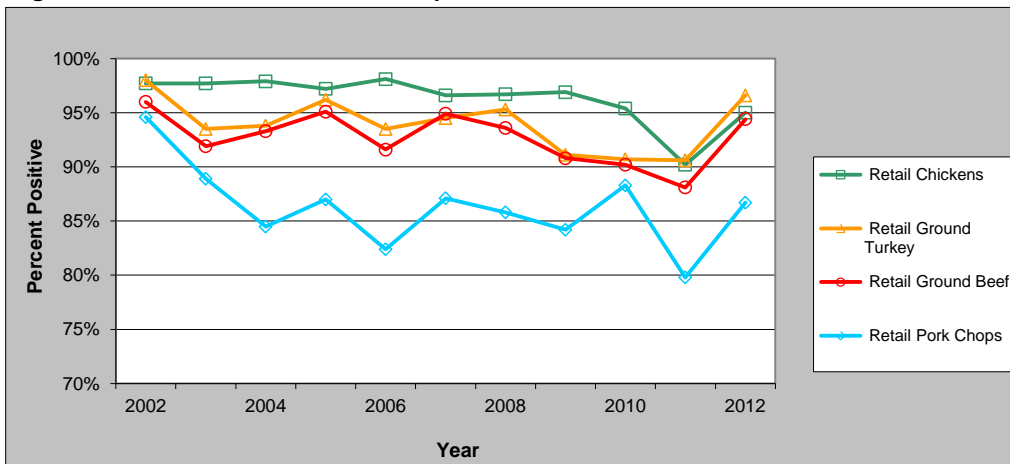


Figure 19. Percent of Retail Meat Samples Culture Positive for *Enterococcus*, 2002-2012



Isolation of *Enterococcus* from Retail Meats

Table 92. Number and Percent of Retail Meat Samples Culture Positive for *Enterococcus*, 2013

	Retail Chickens	Retail Ground Turkey	Retail Ground Beef	Retail Pork Chops
Number of Meat Samples Tested	480	478	480	480
Number Positive for <i>Enterococcus</i>	439	457	454	391
Percent Positive for <i>Enterococcus</i>	91.5%	95.6%	94.6%	81.5%

Figure 20. Percent of Retail Meat Samples Culture Positive for *Enterococcus*, 2013

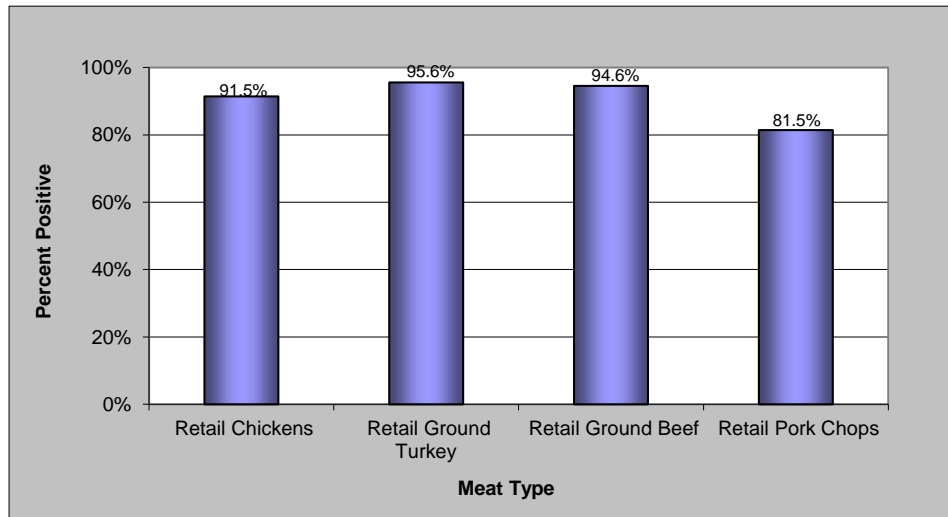
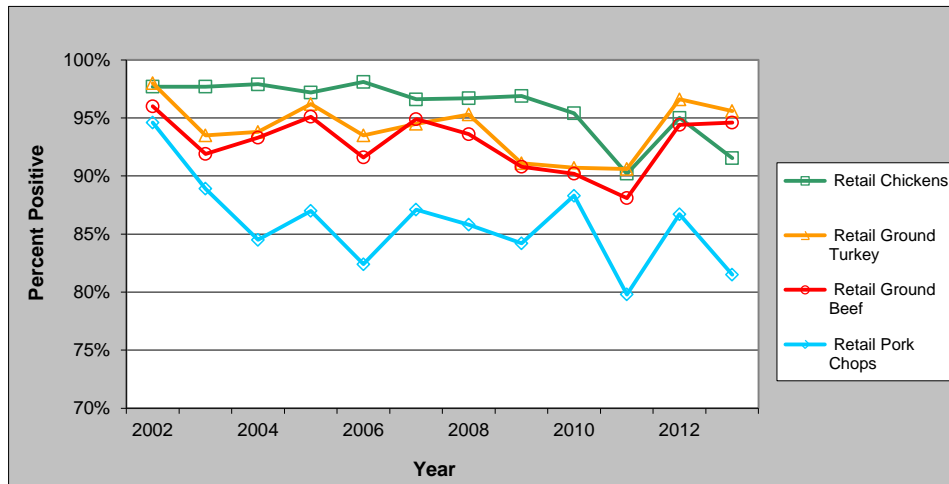


Figure 21. Percent of Retail Meat Samples Culture Positive for *Enterococcus*, 2002-2013

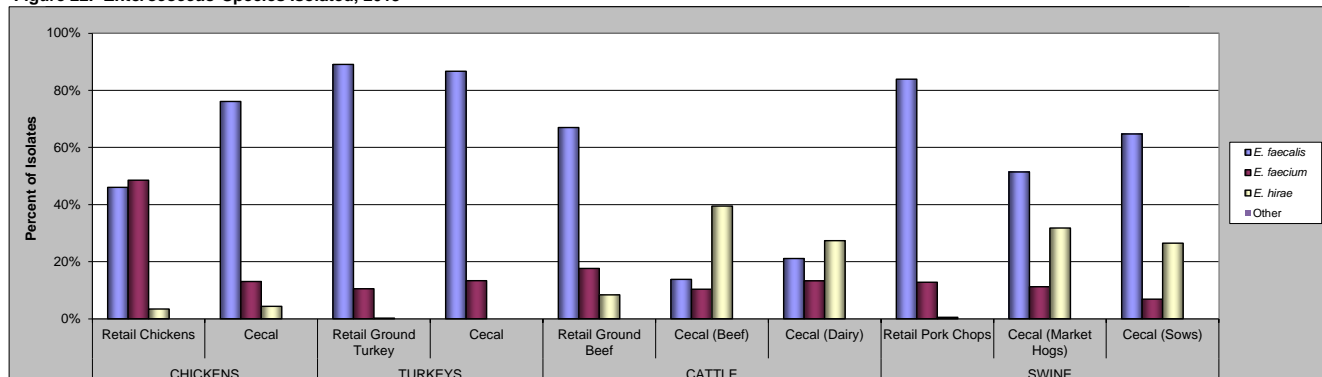


Enterococcus Species

Table 93. Enterococcus Species Isolated, 2013

Enterococcus Species	Chickens		Turkeys		Cattle			Swine		
	Retail Chickens (n=439)	Cecal (n=46)	Retail Ground Turkey (n=457)	Cecal (n=30)	Retail Ground Beef (n=454)	Cecal (Beef) (n=261)	Cecal (Dairy) (n=256)	Retail Pork Chops (n=391)	Cecal (Market Hogs) (n=107)	Cecal (Sows) (n=102)
<i>E. faecalis</i>	46.0%	76.1%	89.1%	86.7%	67.0%	13.8%	21.1%	83.9%	51.4%	64.7%
	202	35	407	26	304	36	54	328	55	66
<i>E. faecium</i>	48.5%	13.0%	10.5%	13.3%	17.6%	10.3%	13.3%	12.8%	11.2%	6.9%
	213	6	48	4	80	27	34	50	12	7
<i>E. hirae</i>	3.4%	4.3%	0.2%	0.0%	8.4%	39.5%	27.3%	0.5%	31.8%	26.5%
	15	2	1	0	38	103	70	2	34	27
<i>E. durans</i>	0.9%	4.3%	0.0%	0.0%	5.9%	10.7%	8.6%	0.8%	4.7%	1.0%
	4	2	0	0	27	28	22	3	5	1
<i>E. gallinarum</i>	0.5%	0.0%	0.0%	0.0%	0.4%	1.1%	2.7%	0.5%	0.9%	1.0%
	2	0	0	0	2	3	7	2	1	1
<i>E. avium</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	0.0%	0.0%	0.0%
	0	0	0	0	0	1	1	0	0	0
<i>E. casseliflavus</i>	0.0%	2.2%	0.0%	0.0%	0.0%	10.7%	13.7%	0.0%	0.0%	0.0%
	0	1	0	0	0	28	35	0	0	0
<i>E. mundtii</i>	0.0%	0.0%	0.0%	0.0%	0.0%	9.2%	9.8%	0.0%	0.0%	0.0%
	0	0	0	0	0	24	25	0	0	0
Enterococcus spp.	0.7%	0.0%	0.2%	0.0%	0.7%	4.2%	3.1%	1.5%	0.0%	0.0%
	3	0	1	0	3	11	8	6	0	0

Figure 22. Enterococcus Species Isolated, 2013



Antimicrobial Susceptibility among *Enterococcus faecalis*

MIC Distributions

Table 94a. Distribution of MICs and Occurrence among *Enterococcus faecalis* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source				Distribution (%) of MICs (μg/ml) ⁴																				
		(# of Isolates)	% ¹	%R ²	[95% CI] ³	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048		
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (204)	N/A	29.4	[23.3 - 36.2]														67.8	2.9		3.9	25.5		
		Turkeys	Retail Ground Turkey (384)	N/A	32.6	[27.9 - 37.5]															67.2	0.3	0.3		32.3	
		Cattle	Retail Ground Beef (277)	N/A	0.0	[0.0 - 1.3]															100.0					
		Swine	Retail Pork Chops (350)	N/A	1.7	[0.6 - 3.7]															98.0	0.3		0.9	0.9	
	Kanamycin	Chickens	Retail Chickens (204)	N/A	34.8	[28.3 - 41.8]															64.2	0.5	0.5	2.0	32.8	
		Turkeys	Retail Ground Turkey (384)	N/A	38.5	[33.6 - 43.6]															60.9	0.3	0.3	0.3	38.3	
		Cattle	Retail Ground Beef (277)	N/A	0.0	[0.0 - 1.3]															64.8	25.3	4.4	2.2	3.3	
		Swine	Retail Pork Chops (350)	N/A	2.0	[0.8 - 4.1]															98.0				2.0	
	Streptomycin	Chickens	Retail Chickens (204)	N/A	17.6	[12.7 - 23.6]																	82.4	0.5	1.0	16.2
		Turkeys	Retail Ground Turkey (384)	N/A	20.6	[16.6 - 25.0]																	79.4		0.5	20.1
		Cattle	Retail Ground Beef (277)	N/A	1.8	[0.6 - 4.2]																	98.2		1.1	0.7
		Swine	Retail Pork Chops (350)	N/A	4.0	[2.2 - 6.6]																	96.0		1.1	2.9
Glycopeptides	Vancomycin	Chickens	Retail Chickens (204)	0.0	0.0	[0.0 - 1.8]					1.0	52.9	46.1													
		Turkeys	Retail Ground Turkey (384)	0.0	0.0	[0.0 - 1.0]					0.3	65.4	33.3	1.0												
		Cattle	Retail Ground Beef (277)	0.0	0.0	[0.0 - 1.3]					0.4	54.5	44.4	0.7												
		Swine	Retail Pork Chops (350)	0.0	0.0	[0.0 - 1.0]					0.6	62.9	35.4	1.1												
	Tigecycline	Chickens	Retail Chickens (204)	N/A	0.0	[0.0 - 1.8]					28.4	53.9	17.6													
		Turkeys	Retail Ground Turkey (384)	N/A	0.0	[0.0 - 1.0]					0.3	9.1	71.3	19.3												
		Cattle	Retail Ground Beef (277)	N/A	0.0	[0.0 - 1.3]					1.1	42.2	36.5	20.2												
		Swine	Retail Pork Chops (350)	N/A	0.0	[0.0 - 1.0]					15.1	64.6	20.3													
Lincosamides	Lincomycin	Chickens	Retail Chickens (204)	0.0	99.0	[96.5 - 99.9]						1.0												99.0		
		Turkeys	Retail Ground Turkey (384)	0.3	98.7	[97.0 - 99.6]						1.0		0.3											98.7	
		Cattle	Retail Ground Beef (277)	0.0	98.9	[96.9 - 99.8]						1.1													98.9	
		Swine	Retail Pork Chops (350)	0.0	98.0	[95.9 - 99.2]						2.0													98.0	

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

⁵ Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin

Table 94b. Distribution of MICs and Occurrence among *Enterococcus faecalis* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source				Distribution (%) of MICs (µg/ml) ⁴																			
		# of Isolates	% ¹	%R ²	[95% CI] ³	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	
Lipopeptides	Daptomycin	Chickens	Retail Chickens (204)	N/A	0.0	[0.0 - 1.8]						3.4	54.4	40.7	1.5										
		Turkeys	Retail Ground Turkey (384)	N/A	0.0	[0.0 - 1.0]					0.8	3.9	58.1	35.9	1.3										
		Cattle	Retail Ground Beef (277)	N/A	98.9	[96.9 - 99.8]					0.4	2.5	49.1	45.8	2.2										
		Swine	Retail Pork Chops (350)	N/A	0.0	[0.0 - 1.0]					1.4	2.3	41.1	52.3	2.9										
Macrolides	Erythromycin	Chickens	Retail Chickens (204)	44.1	34.3	[27.8 - 41.3]					16.2	5.4	28.4	14.7	1.0		34.3								
		Turkeys	Retail Ground Turkey (384)	32.3	37.0	[32.1 - 42.0]					25.3	5.5	18.2	13.8	0.3		37.0								
		Cattle	Retail Ground Beef (277)	72.5	0.0	[0.0 - 1.3]					17.0	10.5	46.9	23.8	1.8										
		Swine	Retail Pork Chops (350)	74.6	5.1	[3.1 - 8.0]					8.3	12.0	44.9	22.0	7.7	0.3	4.9								
	Tylosin	Chickens	Retail Chickens (204)	0.0	34.3	[27.8 - 41.3]					0.5	10.3	52.9	2.0									34.3		
		Turkeys	Retail Ground Turkey (384)	0.0	37.0	[32.1 - 42.0]						10.9	48.2	3.9										37.0	
		Cattle	Retail Ground Beef (277)	0.0	0.0	[0.0 - 1.3]					0.4	7.2	91.3	1.1											
		Swine	Retail Pork Chops (350)	3.9	5.1	[3.1 - 8.0]					1.9	3.9	11.5	44.2	34.6	3.9									
Nitrofurans	Nitrofurantoin	Chickens	Retail Chickens (204)	3.4	0.0	[0.0 - 1.8]										33.8	60.8	2.0	3.4						
		Turkeys	Retail Ground Turkey (384)	1.8	0.0	[0.0 - 1.0]										39.8	57.3	1.0	1.8						
		Cattle	Retail Ground Beef (277)	0.0	0.0	[0.0 - 1.3]										0.4	25.6	73.6	0.4						
		Swine	Retail Pork Chops (350)	0.0	0.3	[0.0 - 1.6]										37.4	62.3						0.3		
Oxazolidinones	Linezolid	Chickens	Retail Chickens (204)	0.0	0.0	[0.0 - 1.8]						49.5	50.5												
		Turkeys	Retail Ground Turkey (384)	0.3	0.0	[0.0 - 1.0]					0.3	52.3	47.1	0.3											
		Cattle	Retail Ground Beef (277)	0.0	0.0	[0.0 - 1.3]					0.7	30.7	68.6												
		Swine	Retail Pork Chops (350)	0.0	0.0	[0.0 - 1.0]						36.3	63.7												
Penicillins	Penicillin	Chickens	Retail Chickens (204)	N/A	0.0	[0.0 - 1.8]						1.0	17.6	80.9	0.5										
		Turkeys	Retail Ground Turkey (384)	N/A	0.3	[0.0 - 1.4]						2.1	21.6	76.0	0.3										
		Cattle	Retail Ground Beef (277)	N/A	0.0	[0.0 - 1.3]							22.7	76.9	0.4										
		Swine	Retail Pork Chops (350)	N/A	0.0	[0.0 - 1.0]						1.4	28.3	70.3											

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

⁵ Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin

Table 94c. Distribution of MICs and Occurrence among *Enterococcus faecalis* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																					
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048			
Phenicols	Chloramphenicol	Chickens Retail Chickens (204)	4.4	0.0	[0.0 - 1.8]									3.9	91.7	4.4											
		Turkeys Retail Ground Turkey (384)	5.0	0.3	[0.0 - 1.4]									2.6	92.2	5.0			0.3								
		Cattle Retail Ground Beef (277)	0.0	0.0	[0.0 - 1.3]									3.6	96.4												
		Swine Retail Pork Chops (350)	0.3	2.3	[1.0 - 4.5]									4.0	93.4	0.3	0.6	1.7									
Quinolones	Ciprofloxacin	Chickens Retail Chickens (204)	46.1	0.0	[0.0 - 1.8]					0.5	53.4	46.1															
		Turkeys Retail Ground Turkey (384)	43.8	0.0	[0.0 - 1.0]					1.3	54.9	43.8															
		Cattle Retail Ground Beef (277)	50.9	1.1	[0.2 - 3.1]					1.1	46.9	50.9	1.1														
		Swine Retail Pork Chops (350)	42.9	0.3	[0.0 - 1.6]					4.9	52.0	42.9	0.3														
Streptogramins	Quinupristin-Dalfopristin ⁵	Chickens Retail Chickens (204)	N/A	N/A	N/A																						
		Turkeys Retail Ground Turkey (384)	N/A	N/A	N/A																						
		Cattle Retail Ground Beef (277)	N/A	N/A	N/A																						
		Swine Retail Pork Chops (350)	N/A	N/A	N/A																						
Tetracyclines	Tetracycline	Chickens Retail Chickens (204)	0.0	56.9	[49.8 - 63.8]						42.6	0.5				0.5	4.4	52.0									
		Turkeys Retail Ground Turkey (384)	1.6	88.8	[85.2 - 91.8]						8.9	0.8	1.6			2.1	86.7										
		Cattle Retail Ground Beef (277)	0.0	21.7	[17.0 - 27.0]						77.6	0.4				0.4	1.8	19.9									
		Swine Retail Pork Chops (350)	0.3	81.7	[77.3 - 85.6]						17.7	0.3	0.3			4.0	77.7										

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

⁵ Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin

Table 95a. Distribution of MICs and Occurrence among *Enterococcus faecalis* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (% of MICs (µg/ml)) ⁴																
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (202)	N/A	24.3	[18.5 - 30.8]																
			Cecal (35)	N/A	45.7	[28.8 - 63.4]																
		Turkeys	Retail Ground Turkey (407)	N/A	33.7	[29.1 - 38.5]																
			Cecal (26)	N/A	38.5	[20.2 - 59.4]																
		Cattle	Retail Ground Beef (304)	N/A	0.7	[0.1 - 2.4]																
			Cecal (Beef) (36)	N/A	2.8	[0.1 - 14.5]																
			Cecal (Dairy) (54)	N/A	0.0	[0.0 - 6.6]																
		Swine	Retail (328)	N/A	0.9	[0.2 - 2.6]																
			Cecal (Market Hogs) (55)	N/A	9.1	[3.0 - 20.0]																
			Cecal (Sows) (66)	N/A	16.7	[8.6 - 27.9]																
		Kanamycin	Chickens	Retail Chickens (202)	N/A	26.7	[20.8 - 33.4]															
				Cecal (35)	N/A	48.6	[31.4 - 66.0]															
	Turkeys		Retail Ground Turkey (407)	N/A	42.8	[37.9 - 47.7]																
			Cecal (26)	N/A	42.3	[23.4 - 63.1]																
	Cattle		Retail Ground Beef (304)	N/A	2.3	[0.9 - 4.7]																
			Cecal (Beef) (36)	N/A	5.6	[0.7 - 18.7]																
			Cecal (Dairy) (54)	N/A	1.9	[0.0 - 9.9]																
	Swine		Retail (328)	N/A	2.7	[1.3 - 5.1]																
			Cecal (Market Hogs) (55)	N/A	21.8	[11.8 - 35.0]																
			Cecal (Sows) (66)	N/A	39.4	[27.6 - 52.2]																
	Streptomycin		Chickens	Retail Chickens (202)	N/A	17.3	[12.4 - 23.3]															
				Cecal (35)	N/A	11.4	[3.2 - 26.7]															
		Turkeys	Retail Ground Turkey (407)	N/A	26.0	[21.8 - 30.6]																
			Cecal (26)	N/A	30.8	[14.3 - 51.8]																
		Cattle	Retail Ground Beef (304)	N/A	3.6	[1.8 - 6.4]																
			Cecal (Beef) (36)	N/A	5.6	[0.7 - 18.7]																
			Cecal (Dairy) (54)	N/A	1.9	[0.0 - 9.9]																
		Swine	Retail (328)	N/A	4.9	[2.8 - 7.8]																
			Cecal (Market Hogs) (55)	N/A	27.3	[16.1 - 41.0]																
			Cecal (Sows) (66)	N/A	27.3	[17.0 - 39.6]																
Glycopeptides		Vancomycin	Chickens	Retail Chickens (202)	0.0	0.0	[0.0 - 1.8]															
				Cecal (35)	0.0	0.0	[0.0 - 10.0]															
	Turkeys		Retail Ground Turkey (407)	0.0	0.0	[0.0 - 0.9]																
			Cecal (26)	0.0	0.0	[0.0 - 13.2]																
	Cattle		Retail Ground Beef (304)	0.0	0.0	[0.0 - 1.2]																
			Cecal (Beef) (36)	2.8	0.0	[0.0 - 9.7]																
			Cecal (Dairy) (54)	0.0	0.0	[0.0 - 6.6]																
	Swine		Retail (328)	0.3	0.0	[0.0 - 1.1]																
			Cecal (Market Hogs) (55)	0.0	0.0	[0.0 - 6.5]																
			Cecal (Sows) (66)	0.0	0.0	[0.0 - 5.4]																
	Tigecycline		Chickens	Retail Chickens (202)	N/A	0.0	[0.0 - 1.8]															
				Cecal (35)	N/A	0.0	[0.0 - 10.0]															
		Turkeys	Retail Ground Turkey (407)	N/A	0.0	[0.0 - 0.9]																
			Cecal (26)	N/A	0.0	[0.0 - 13.2]																
		Cattle	Retail Ground Beef (304)	N/A	0.0	[0.0 - 1.2]																
			Cecal (Beef) (36)	N/A	0.0	[0.0 - 9.7]																
			Cecal (Dairy) (54)	N/A	0.0	[0.0 - 6.6]																
		Swine	Retail (328)	N/A	0.0	[0.0 - 1.1]																
			Cecal (Market Hogs) (55)	N/A	0.0	[0.0 - 6.5]																
			Cecal (Sows) (66)	N/A	0.0	[0.0 - 5.4]																
		Lincosamides	Lincomycin	Chickens	Retail Chickens (202)	0.0	100.0	[98.2 - 100.0]														
					Cecal (35)	0.0	100.0	[90.0 - 100.0]														
	Turkeys			Retail Ground Turkey (407)	0.0	99.8	[98.6 - 100.0]															
				Cecal (26)	0.0	100.0	[86.8 - 100.0]															
Cattle	Retail Ground Beef (304)			0.0	96.7	[94.0 - 98.4]																
	Cecal (Beef) (36)			0.0	100.0	[90.3 - 100.0]																
	Cecal (Dairy) (54)			0.0	98.1	[90.1 - 100.0]																
Swine	Retail (328)			0.0	99.4	[97.8 - 99.9]																
	Cecal (Market Hogs) (55)			0.0	100.0	[93.5 - 100.0]																
	Cecal (Sows) (66)			0.0	100.0	[94.6 - 100.0]																

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

⁵ Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin

Table 95c. Distribution of MICs and Occurrence among *Enterococcus faecalis* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴															
						0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512
Phenicol	Chloramphenicol	Chickens	Retail Chickens (202)	4.5	0.5	[0.0 - 2.7]	<div style="display: flex; justify-content: space-between;"> 0.0150.030.060.1250.250.50124816326412825651210242048>2048 </div>														
			Cecal (35)	0.0	0.0	[0.0 - 10.0]															
		Turkeys	Retail Ground Turkey (407)	3.0	0.7	[0.2 - 2.1]															
			Cecal (26)	0.0	0.0	[0.0 - 13.2]															
		Cattle	Retail Ground Beef (304)	0.0	0.3	[0.0 - 1.8]															
			Cecal (Beef) (36)	0.0	2.8	[0.1 - 14.5]															
			Cecal (Dairy) (54)	0.0	0.0	[0.0 - 6.6]															
		Swine	Retail (328)	0.6	2.1	[0.9 - 4.3]															
			Cecal (Market Hogs) (55)	1.8	14.5	[6.5 - 26.7]															
			Cecal (Sows) (66)	4.6	21.2	[12.1 - 33.0]															
Quinolones	Ciprofloxacin	Chickens	Retail Chickens (202)	33.2	0.5	[0.0 - 2.7]	<div style="display: flex; justify-content: space-between;"> 0.0150.030.060.1250.250.50124816326412825651210242048>2048 </div>														
			Cecal (35)	25.7	0.0	[0.0 - 10.0]															
		Turkeys	Retail Ground Turkey (407)	33.9	0.0	[0.0 - 0.9]															
			Cecal (26)	30.8	0.0	[0.0 - 13.2]															
		Cattle	Retail Ground Beef (304)	39.8	0.0	[0.0 - 1.2]															
			Cecal (Beef) (36)	61.1	0.0	[0.0 - 9.7]															
			Cecal (Dairy) (54)	61.1	3.7	[0.5 - 12.7]															
		Swine	Retail (328)	27.7	0.0	[0.0 - 1.1]															
			Cecal (Market Hogs) (55)	65.5	0.0	[0.0 - 6.5]															
			Cecal (Sows) (66)	37.9	0.0	[0.0 - 5.4]															
Streptogramins	Quinupristin-Dalopristin ⁵	Chickens	Retail Chickens (202)	N/A	N/A	N/A	<div style="display: flex; justify-content: space-between;"> 0.0150.030.060.1250.250.50124816326412825651210242048>2048 </div>														
			Cecal (35)	N/A	N/A	N/A															
		Turkeys	Retail Ground Turkey (407)	N/A	N/A	N/A															
			Cecal (26)	N/A	N/A	N/A															
		Cattle	Retail Ground Beef (304)	N/A	N/A	N/A															
			Cecal (Beef) (36)	N/A	N/A	N/A															
			Cecal (Dairy) (54)	N/A	N/A	N/A															
		Swine	Retail (328)	N/A	N/A	N/A															
			Cecal (Market Hogs) (55)	N/A	N/A	N/A															
			Cecal (Sows) (66)	N/A	N/A	N/A															
Tetracyclines	Tetracycline	Chickens	Retail Chickens (202)	0.0	62.4	[55.3 - 69.1]	<div style="display: flex; justify-content: space-between;"> 0.0150.030.060.1250.250.50124816326412825651210242048>2048 </div>														
			Cecal (35)	0.0	68.6	[50.7 - 83.1]															
		Turkeys	Retail Ground Turkey (407)	1.2	87.5	[83.9 - 90.5]															
			Cecal (26)	0.0	92.3	[74.9 - 99.1]															
		Cattle	Retail Ground Beef (304)	0.0	21.4	[16.9 - 26.4]															
			Cecal (Beef) (36)	0.0	25.0	[12.1 - 42.2]															
			Cecal (Dairy) (54)	0.0	13.0	[5.4 - 24.9]															
		Swine	Retail (328)	0.0	82.3	[77.7 - 86.3]															
			Cecal (Market Hogs) (55)	0.0	72.7	[59.0 - 83.9]															
			Cecal (Sows) (66)	0.0	77.3	[65.3 - 86.7]															

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method.

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

⁵ Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalopristin

Resistance by Year

Table 96a. Antimicrobial Resistance among *Enterococcus faecalis* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Chickens	Retail Chickens	134	188	88	116	126	123	165	138	214	186	204	202		
		HACCP ¹		1285	1440	1839	1150	776	501	418	420	275			35	
		Cecal													407	
	Turkeys	Retail Ground Turkey	294	289	260	339	291	261	271	260	369	392	384	407		
		Cecal												26		
	Cattle	Retail Ground Beef	210	224	194	226	227	206	202	227	285	269	277	304		
		Cecal (Beef) Cecal (Dairy)												36 54		
	Swine	Retail Pork Chops	255	313	313	320	301	263	263	259	353	334	350	328		
		Cecal (Market Hogs) Cecal (Sows)												55 66		
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
	Aminoglycosides	Gentamicin (MIC >500 µg/ml)	Chickens	Retail Chickens	22.4%	20.2%	19.3%	18.1%	23.0%	19.5%	19.4%	25.4%	31.8%	26.9%	29.4%	24.3%
				HACCP	30	38	17	21	29	24	32	35	68	50	60	49
Cecal					25.1%	28.1%	25.8%	27.6%	31.4%	35.9%	32.8%	34.8%	36.7%			45.7%
Turkeys			Retail Ground Turkey	22.1%	27.7%	24.6%	20.1%	22.0%	42.1%	41.3%	30.0%	37.4%	33.7%	32.6%	33.7%	
			Cecal	65	80	64	68	64	110	112	78	138	132	125	137	
Cattle			Retail Ground Beef	2.4%	1.8%	1.0%	1.8%	0.9%	0.5%	2.0%	0.9%	0.4%	0.0%	0.0%	0.7%	
			Cecal (Beef)	5	4	2	4	2	1	4	2	1	0	0	2	
			Cecal (Dairy)												2.8%	
Swine			Retail Pork Chops	2.7%	0.3%	1.9%	1.6%	0.7%	0.8%	0.4%	1.9%	1.4%	0.9%	1.7%	0.9%	
			Cecal (Market Hogs)	7	1	6	5	2	2	1	5	5	3	6	3	
			Cecal (Sows)												9.1%	
Kanamycin (MIC ≥ 1024 µg/ml)			Chickens	Retail Chickens	32.1%	27.1%	22.7%	26.7%	30.2%	28.5%	29.7%	30.4%	36.0%	33.3%	34.8%	26.7%
		HACCP		43	51	20	31	38	35	49	42	77	62	71	54	
		Cecal			35.6%	36.4%	36.5%	37.9%	39.7%	44.1%	35.6%	39.8%	43.3%			48.6%
		Turkeys	Retail Ground Turkey	26.2%	36.0%	29.6%	27.4%	32.0%	50.2%	55.4%	35.9%	44.7%	42.9%	38.5%	42.8%	
			Cecal	77	104	77	93	93	131	150	101	165	168	148	174	
		Cattle	Retail Ground Beef	1.9%	3.1%	3.1%	4.0%	2.6%	2.0%	4.0%	1.8%	0.7%	1.5%	0.0%	2.3%	
			Cecal (Beef)	4	7	6	9	6	4	8	4	2	4	0	7	
			Cecal (Dairy)												5.6%	
		Swine	Retail Pork Chops	4.7%	4.8%	2.6%	3.1%	2.3%	2.3%	3.0%	2.7%	1.7%	2.4%	2.0%	2.7%	
			Cecal (Market Hogs)	12	15	8	10	7	6	8	7	6	8	7	9	
			Cecal (Sows)												21.8%	
		Streptomycin (MIC ≥ 1000 µg/ml)	Chickens	Retail Chickens	29.1%	22.9%	18.2%	18.1%	10.3%	17.9%	10.9%	13.0%	15.4%	19.4%	17.7%	17.3%
HACCP				39	43	16	21	13	22	18	18	33	36	36	35	
Cecal					20.7%	17.8%	21.2%	18.6%	14.4%	17.0%	16.7%	19.5%	21.8%			11.4%
Turkeys			Retail Ground Turkey	24.1%	30.4%	26.9%	21.5%	20.3%	36.4%	39.1%	27.7%	27.9%	19.4%	17.7%	26.0%	
			Cecal	71	88	70	73	59	95	106	72	103	108	79	106	
Cattle			Retail Ground Beef	4.8%	5.4%	7.7%	8.4%	5.7%	4.9%	1.5%	5.3%	1.4%	1.9%	1.8%	3.6%	
			Cecal (Beef)	10	12	15	19	13	10	3	12	4	5	5	11	
			Cecal (Dairy)												5.6%	
Swine			Retail Pork Chops	10.6%	7.3%	9.3%	7.8%	7.6%	8.7%	10.3%	8.9%	6.8%	5.7%	4.0%	4.9%	
			Cecal (Market Hogs)	27	23	29	25	23	23	27	23	24	19	14	16	
			Cecal (Sows)												27.3%	
Glycopeptides			Vancomycin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		HACCP			0	0	0	0	0	0	0	0	0	0	0	0
		Cecal				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
	Turkeys	Retail Ground Turkey		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal		0	0	0	0	0	0	0	0	0	0	0	0	
	Cattle	Retail Ground Beef		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)		0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Dairy)													0.0%	
	Swine	Retail Pork Chops		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)		0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Sows)													0.0%	

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Table 96b. Antimicrobial Resistance among *Enterococcus faecalis* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Chickens	Retail Chickens	134	188	88	116	126	123	165	138	214	186	204	202	
		HACCP ¹		1285	1440	1839	1150	776	501	418	420	275			35
		Cecal													
	Turkeys	Retail Ground Turkey	294	289	260	339	291	261	271	260	369	392	384	407	
		Cecal												26	
	Cattle	Retail Ground Beef	210	224	194	226	227	206	202	227	285	269	277	304	
		Cecal (Beef) Cecal (Dairy)												36 54	
	Swine	Retail Pork Chops	255	313	313	320	301	263	263	259	353	334	350	328	
		Cecal (Market Hogs)												55	
		Cecal (Sows)												66	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
	Glycylcycline	Tigecycline (MIC ≥ 0.25 µg/ml) ¹	Chickens	Retail Chickens				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP								0.2%	1.0%	0.0%	0.0%	0.0%	0.0%		
Cecal															0.0%
Turkeys			Retail Ground Turkey				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
			Cecal										1	0	0.0%
Cattle			Retail Ground Beef				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)												0.0%
			Cecal (Dairy)												0.0%
Swine			Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
			Cecal (Market Hogs)										1	0	0.0%
			Cecal (Sows)												0.0%
Lincosamides			Lincomycin (MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	99.3%	99.5%	98.9%	99.1%	100.0%	99.2%	100.0%	98.6%	99.1%	98.9%
	HACCP	133			187	87	115	126	122	165	136	212	184	202	202
	Cecal				99.6%	99.4%	99.1%	99.7%	100.0%	99.8%	99.0%	99.5%	99.6%		100.0%
	Turkeys	Retail Ground Turkey		97.3%	99.0%	98.8%	97.3%	98.6%	98.9%	99.3%	97.7%	97.3%	98.5%	98.7%	99.8%
		Cecal		286	286	257	330	287	258	269	254	359	386	379	406
	Cattle	Retail Ground Beef		98.6%	96.4%	97.4%	97.8%	97.8%	97.6%	99.0%	97.8%	99.0%	97.4%	98.9%	96.7%
		Cecal (Beef)		207	216	189	221	222	201	200	222	282	262	274	294
		Cecal (Dairy)													100.0%
	Swine	Retail Pork Chops		99.2%	98.1%	94.9%	95.3%	97.3%	97.7%	97.3%	97.3%	97.2%	97.0%	98.0%	99.4%
		Cecal (Market Hogs)		253	307	297	305	293	257	256	252	343	324	343	326
		Cecal (Sows)													100.0%
	Lipopeptides	Daptomycin (MIC ≥ 4 µg/ml) ²		Chickens	Retail Chickens			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP						0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Cecal						1	0	0	0	0	0	0	0		0.0%
Turkeys			Retail Ground Turkey			0.0%	0.3%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal			0	1	0	0	1	0	0	0	0	0.0%
Cattle			Retail Ground Beef			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)												0.0%
			Cecal (Dairy)												1.9%
Swine			Retail Pork Chops			0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Market Hogs)			0	0	1	0	0	0	0	0	0	0.0%
			Cecal (Sows)												0.0%
Macrolides			Erythromycin (MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	45.5%	43.1%	35.2%	37.1%	34.9%	44.7%	32.7%	39.9%	32.2%	35.5%
	HACCP	61			81	31	43	44	55	54	55	69	66	70	71
	Cecal				37.8%	35.5%	37.8%	47.0%	38.1%	48.5%	40.9%	42.4%	39.6%		37.1%
	Turkeys	Retail Ground Turkey		31.0%	43.6%	33.8%	38.3%	47.1%	48.7%	51.7%	37.7%	40.4%	47.2%	37.0%	39.3%
		Cecal		91	126	88	130	137	127	140	98	149	185	142	160
	Cattle	Retail Ground Beef		1.4%	4.9%	3.6%	4.4%	4.0%	2.4%	2.5%	2.6%	0.7%	3.0%	0.0%	3.0%
		Cecal (Beef)		3	11	7	10	9	5	5	6	2	8	0	9
		Cecal (Dairy)													11.1%
	Swine	Retail Pork Chops		9.0%	7.0%	9.9%	5.9%	6.6%	9.1%	8.0%	6.9%	4.5%	4.5%	5.1%	7.0%
		Cecal (Market Hogs)		23	22	31	19	20	24	21	18	16	15	18	23
		Cecal (Sows)													52.7%
															29
													53.0%		
													35		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Percent non-susceptible is reported rather than percent resistance as no CLSI breakpoint has been established. NARMS breakpoint established to determine resistance.

Table 96c. Antimicrobial Resistance among *Enterococcus faecalis* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Chickens	Retail Chickens	134	188	88	116	126	123	165	138	214	186	204	202			
		HACCP ¹		1285	1440	1839	1150	776	501	418	420	275			35		
		Cecal													407		
	Turkeys	Retail Ground Turkey	294	289	260	339	291	261	271	260	369	392	384	277	304		
		Cecal													26		
			210	224	194	226	227	206	202	227	285	269	277	304	36		
	Cattle	Retail Ground Beef													54		
		Cecal (Beef)													36		
		Cecal (Dairy)													54		
	Swine	Retail Pork Chops	255	313	313	320	301	263	263	259	353	334	350	328	328		
		Cecal (Market Hogs)													55		
		Cecal (Sows)													66		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source															
Macrolides	Tylosin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	48.5%	42.6%	34.1%	37.1%	36.5%	44.7%	32.7%	39.9%	32.4%	35.5%	34.3%	35.1%		
			HACCP	65	80	30	43	46	55	54	55	69	66	70	71		
			Cecal													48.6%	
		Turkeys	Retail Ground Turkey	32.0%	43.9%	34.6%	38.3%	47.1%	49.4%	51.3%	37.7%	40.4%	47.2%	37.0%	39.1%		
			Cecal	94	127	90	130	137	129	139	98	149	185	142	159		
		Cattle	Retail Ground Beef	1.9%	4.9%	3.6%	5.8%	4.0%	2.4%	3.0%	2.2%	0.7%	3.0%	0.0%	3.0%		
			Cecal (Beef)	4	11	7	13	9	5	6	5	2	8	0	9		
			Cecal (Dairy)												11.1%		
		Swine	Retail Pork Chops	9.0%	7.0%	9.9%	6.3%	7.3%	9.1%	7.6%	6.6%	4.5%	4.8%	5.1%	7.0%		
			Cecal (Market Hogs)	23	22	31	20	22	24	20	17	16	16	18	23		
			Cecal (Sows)												52.7%		
		Nitrofurans	Nitrofurantoin (MIC ≥ 128 µg/ml)	Chickens	Retail Chickens	0.7%	1.1%	1.1%	4.3%	0.0%	0.0%	1.2%	0.0%	0.0%	0.5%	0.0%	
					HACCP	1	2	1	5	0	0	2	0	0	1	0	0
					Cecal												0.0%
				Turkeys	Retail Ground Turkey	2.0%	1.4%	1.2%	2.4%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%
					Cecal	6	4	3	8	0	0	0	1	0	0	0	0
				Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
					Cecal (Beef)	0	0	0	2	0	0	1	0	0	0	0	0
Cecal (Dairy)															0.0%		
Swine	Retail Pork Chops			0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%		
	Cecal (Market Hogs)			0	0	1	1	0	0	0	0	0	0	1	0		
	Cecal (Sows)														0.0%		
Oxazolidinones	Linezolid (MIC ≥ 8 µg/ml)			Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
					HACCP	0	0	0	0	0	0	0	0	0	0	0	0
					Cecal												0.0%
				Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
					Cecal	0	0	0	0	0	0	0	0	0	0	0	0
				Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
					Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
		Cecal (Dairy)													0.0%		
		Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0		
			Cecal (Sows)												1.5%		
		Penicillins	Penicillin (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	
					HACCP	0	0	0	0	0	0	0	1	0	0	0	
					Cecal												0.0%
				Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	1.5%	0.3%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%
					Cecal	0	0	0	5	1	0	0	0	1	0	1	0
				Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%
					Cecal (Beef)	0	0	0	0	0	0	0	1	0	0	0	0
Cecal (Dairy)															0.0%		
Swine	Retail Pork Chops			0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.4%	0.4%	0.3%	0.0%	0.0%	0.0%		
	Cecal (Market Hogs)			0	0	0	4	0	0	1	1	1	0	0	0		
	Cecal (Sows)														0.0%		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Table 96d. Antimicrobial Resistance among *Enterococcus faecalis* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Chickens	Retail Chickens	134	188	88	116	126	123	165	138	214	186	204	202			
		HACCP ¹		1285	1440	1839	1150	776	501	418	420	275					
		Cecal												35			
	Turkeys	Retail Ground Turkey	294	289	260	339	291	261	271	260	369	392	384	407			
		Cecal												26			
	Cattle	Retail Ground Beef	210	224	194	226	227	206	202	227	285	269	277	304			
		Cecal (Beef) Cecal (Dairy)												36 54			
	Swine	Retail Pork Chops	255	313	313	320	301	263	263	259	353	334	350	328			
		Cecal (Market Hogs)												55			
		Cecal (Sows)												66			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
	Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.9%	0.0%	0.0%	0.5%		
HACCP				0	0	0	0	0	0	0	2	2	0	0	1		
Cecal															0.0%		
Turkeys			Retail Ground Turkey	0.3%	0.0%	0.0%	0.0%	0.0%	0.8%	0.4%	0.0%	0.3%	0.3%	0.3%	0.7%		
			Cecal	1	0	0	0	0	2	1	0	1	1	1	3		
Cattle			Retail Ground Beef	0.0%	0.0%	0.0%	0.4%	1.3%	1.0%	0.0%	0.0%	0.7%	0.7%	0.0%	0.3%		
			Cecal (Beef)	0	0	0	1	3	2	0	0	2	2	0	1		
			Cecal (Dairy)												2.8%		
Swine			Retail Pork Chops	0.4%	1.0%	0.6%	1.3%	1.0%	0.4%	0.4%	1.2%	0.0%	0.9%	2.3%	2.1%		
			Cecal (Market Hogs)	1	3	2	4	3	1	1	3	0	3	8	7		
			Cecal (Sows)												14.6%		
Quinolones			Ciprofloxacin (MIC ≥ 4 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	8.0%	0.9%	0.8%	0.0%	3.0%	0.0%	0.0%	0.0%	0.5%	
					HACCP	0	0	7	1	1	0	5	0	0	0	0	1
					Cecal												0.0%
				Turkeys	Retail Ground Turkey	0.3%	0.0%	5.8%	2.4%	0.7%	0.0%	3.3%	0.8%	0.0%	0.3%	0.0%	0.0%
					Cecal	1	0	15	8	2	0	9	2	0	1	0	0
				Cattle	Retail Ground Beef	0.0%	0.4%	12.9%	0.9%	0.0%	0.0%	4.0%	1.3%	0.4%	0.0%	1.1%	0.0%
					Cecal (Beef)	0	1	25	2	0	0	8	3	1	0	3	0
	Cecal (Dairy)														3.7%		
	Swine	Retail Pork Chops		1.2%	0.0%	6.1%	2.5%	0.3%	0.0%	4.6%	1.5%	0.0%	0.3%	0.3%	0.0%		
		Cecal (Market Hogs)		3	0	19	8	1	0	12	4	0	1	1	0		
		Cecal (Sows)													0.0%		
	Streptogramins	Quinupristin-Dalfopristin (MIC ≥ 4 µg/ml) ²		Chickens	Retail Chickens	-	-	-	-	-	-	-	-	-	-		
					HACCP												
					Cecal											-	
				Turkeys	Retail Ground Turkey	-	-	-	-	-	-	-	-	-	-	-	-
					Cecal												-
				Cattle	Retail Ground Beef	-	-	-	-	-	-	-	-	-	-	-	-
					Cecal (Beef)												-
Cecal (Dairy)															-		
Swine			Retail Pork Chops	-	-	-	-	-	-	-	-	-	-	-	-		
			Cecal (Market Hogs)												-		
			Cecal (Sows)												-		
Tetracyclines			Tetracycline (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	67.2%	68.6%	63.6%	75.0%	70.6%	65.9%	69.1%	72.5%	63.4%	56.9%	62.4%	
	HACCP	90			129	56	87	89	81	114	100	155	118	116	126		
	Cecal														68.6%		
	Turkeys	Retail Ground Turkey		85.0%	87.9%	88.1%	84.4%	85.9%	94.3%	90.0%	85.8%	87.8%	92.4%	88.8%	87.5%		
		Cecal		250	254	229	286	250	246	244	223	324	362	341	356		
	Cattle	Retail Ground Beef		18.6%	20.5%	25.3%	34.1%	22.5%	32.5%	31.7%	21.1%	16.5%	18.2%	22.0%	21.4%		
		Cecal (Beef)		39	46	49	77	51	67	64	48	47	49	61	65		
		Cecal (Dairy)													25.0%		
	Swine	Retail Pork Chops		80.4%	78.0%	75.7%	86.3%	81.4%	90.1%	77.2%	83.8%	79.0%	79.3%	81.7%	82.3%		
		Cecal (Market Hogs)		205	244	237	276	245	237	203	217	279	265	286	270		
		Cecal (Sows)													72.7%		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin

Multidrug Resistance

Table 97a. Resistance Patterns among *Enterococcus faecalis* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of Isolates Tested	Chickens	Retail Chickens	134	188	88	116	126	123	165	138	214	186	204	202
		HACCP ¹		1285	1440	1839	1150	776	501	418	420	275		
	Turkeys	Retail Ground Turkey	294	289	260	339	291	261	271	260	369	392	384	407
		Cecal												26
Cattle	Retail Ground Beef	210	224	194	226	227	206	202	227	285	269	277	304	
	Cecal (Beef)												36	
Swine	Retail Pork Chops	255	313	313	320	301	263	263	259	353	334	350	328	
	Cecal (Market Hogs)												55	
		Cecal (Sows)											66	
Resistance Pattern ²	Source													
1. No Resistance Detected	Chickens	Retail Chickens	0.8%	0.5%	0.0%	0.9%	0.0%	0.0%	0.0%	0.7%	0.5%	0.5%	1.0%	0.0%
		HACCP	1	1	0	1	0	0	0	1	1	1	2	0
		Cecal												0.0%
	Turkeys	Retail Ground Turkey	1.4%	1.0%	0.4%	0.6%	0.3%	0.0%	0.0%	1.5%	2.2%	0.8%	0.5%	0.3%
		Cecal	4	3	1	2	1	0	0	4	8	3	2	1
	Cattle	Retail Ground Beef	0.0%	2.7%	1.5%	1.3%	1.8%	2.0%	0.5%	1.8%	0.7%	2.2%	1.1%	3.3%
		Cecal (Beef)	0	6	3	3	4	4	1	4	2	6	3	10
		Cecal (Dairy)												0.0%
	Swine	Retail Pork Chops	0.4%	0.0%	0.6%	1.3%	0.0%	0.4%	0.4%	0.4%	0.3%	0.6%	0.9%	0.0%
		Cecal (Market Hogs)	1	0	2	4	0	1	1	1	1	2	3	0
		Cecal (Sows)												0.0%
	2. Resistance to ≥ 3 Antimicrobial Classes	Chickens	Retail Chickens	52.2%	47.9%	42.1%	50.0%	43.7%	45.5%	40.6%	43.5%	39.7%	41.4%	37.3%
HACCP			70	90	37	58	55	56	67	60	85	77	76	77
Cecal				50.8%	52.3%	51.2%	58.7%	51.4%	57.9%	52.9%	54.8%	59.3%		
Turkeys		Retail Ground Turkey	49.3%	54.3%	52.7%	43.4%	56.7%	67.0%	69.7%	50.0%	58.5%	60.2%	53.7%	58.0%
		Cecal	145	157	137	147	165	175	189	130	216	236	206	236
Cattle		Retail Ground Beef	4.8%	6.7%	10.8%	10.2%	7.5%	6.8%	5.5%	6.6%	2.5%	3.7%	1.8%	3.6%
		Cecal (Beef)	10	15	21	23	17	14	11	15	7	10	5	11
		Cecal (Dairy)												13.9%
Swine		Retail Pork Chops	15.7%	9.9%	18.8%	14.4%	12.3%	16.3%	17.5%	14.7%	9.3%	8.4%	8.6%	8.2%
		Cecal (Market Hogs)	40	31	59	46	37	43	46	38	33	28	30	27
		Cecal (Sows)												56.4%
3. Resistant to ≥ 4 Antimicrobial Classes		Chickens	Retail Chickens	32.1%	19.1%	18.2%	20.7%	19.8%	22.8%	21.2%	21.7%	23.8%	23.1%	21.1%
	HACCP		43	36	16	24	25	28	35	30	51	43	43	39
	Cecal			22.5%	22.9%	23.1%	28.4%	22.9%	29.5%	23.4%	27.1%	27.6%		
	Turkeys	Retail Ground Turkey	17.7%	31.1%	22.3%	25.7%	22.7%	36.4%	42.8%	28.1%	29.5%	30.9%	23.7%	26.5%
		Cecal	52	90	58	87	66	95	116	73	109	121	91	108
	Cattle	Retail Ground Beef	1.9%	3.1%	3.1%	4.4%	2.2%	1.5%	2.0%	1.3%	0.7%	1.5%	0.0%	2.6%
		Cecal (Beef)	4	7	6	10	5	3	4	3	2	4	0	8
		Cecal (Dairy)												5.6%
	Swine	Retail Pork Chops	4.7%	5.1%	5.8%	4.4%	3.3%	2.3%	4.9%	3.9%	2.5%	3.3%	3.1%	4.3%
		Cecal (Market Hogs)	12	16	18	14	10	6	13	10	9	11	11	14
		Cecal (Sows)												30.9%
	4. Resistant to ≥ 5 Antimicrobial Classes	Chickens	Retail Chickens	0.0%	0.5%	1.1%	0.9%	0.0%	0.0%	1.2%	1.4%	0.9%	0.0%	0.0%
HACCP			0	1	1	1	0	0	2	2	2	0	0	1
Cecal				0.0%	0.8%	0.5%	1.0%	0.9%	0.6%	0.2%	0.2%	3.3%		
Turkeys		Retail Ground Turkey	0.7%	0.7%	0.0%	1.5%	0.3%	0.0%	0.7%	0.0%	0.0%	0.8%	0.0%	0.3%
		Cecal	2	2	0	5	1	0	2	0	0	3	0	1
Cattle		Retail Ground Beef	0.0%	0.0%	0.0%	0.4%	0.4%	0.5%	0.0%	0.0%	0.0%	0.7%	0.0%	0.3%
		Cecal (Beef)	0	0	0	1	1	1	0	0	0	2	0	1
		Cecal (Dairy)												2.8%
Swine		Retail Pork Chops	0.4%	0.6%	1.0%	1.3%	0.7%	0.4%	0.8%	0.8%	0.0%	0.6%	0.9%	1.2%
		Cecal (Market Hogs)	1	2	3	4	2	1	2	2	0	2	3	4
		Cecal (Sows)												12.7%
														7
													18.2%	
													12	

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Resistance patterns do not include Quinuoristin-Dalfooristin as *E. faecalis* is considered intrinsically resistant

Table 97b. Resistance Patterns among *Enterococcus faecalis* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Chickens	Retail Chickens HACCP ¹ Cecal	134 188 1285	88 1440	116 1839	126 1150	123 776	165 501	138 418	214 420	186 2	204	202	
	Turkeys	Retail Ground Turkey Cecal	294 289	260 339	291 261	271 260	260 369	392 384	407 26					
	Cattle	Retail Ground Beef Cecal (Beef) Cecal (Dairy)	210 224	194 226	227 206	202 227	285 269	277 304 36 54						
	Swine	Retail Pork Chops Cecal (Market Hogs) Cecal (Sows)	255 313	313 320	301 263	263 259	353 334	350 328 55 66						
Resistance Pattern		Source												
4. Resistant to ≥ 6² Antimicrobial Classes	Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		HACCP		0.0% 0	0.1% 2	0.1% 1	0.2% 2	0.0% 0	0.2% 1	0.0% 0	0.0% 0	0.7% 2		
		Cecal												0.0% 0
	Turkeys	Retail Ground Turkey	0.3% 1	0.0% 0	0.0% 0	1.2% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												0.0% 0
	Cattle	Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Market Hogs)												0.0% 0
		Cecal (Sows)												0.0% 0
	6. At Least Pencillin G, High Level Gentamicin, and Daptomycin Resistant	Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
Cecal														0.0% 0
Turkeys		Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												0.0% 0
Cattle		Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
Swine		Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Market Hogs)												0.0% 0
		Cecal (Sows)												0.0% 0
7. At Least Pencillin G High Level Gentamicin, and Linezolid Resistant		Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Cecal													0.0% 0
	Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												0.0% 0
	Cattle	Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
	Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Market Hogs)												0.0% 0
		Cecal (Sows)												0.0% 0
	8. At Least Pencillin G, High Level Gentamicin, and Tigecycline Resistant	Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
HACCP				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
Cecal														0.0% 0
Turkeys		Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal												0.0% 0
Cattle		Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												0.0% 0
		Cecal (Dairy)												0.0% 0
Swine		Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Market Hogs)												0.0% 0
		Cecal (Sows)												0.0% 0

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Resistance patterns do not include Quinupristin-Dalfopristin as *E. faecalis* is considered intrinsically resistant

Antimicrobial Susceptibility among *Enterococcus faecium*

MIC Distributions

Table 98a. Distribution of MICs and Occurrence among *Enterococcus faecium* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	95% CI ³	Distribution (%) of MICs (µg/ml) ⁴														
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Aminoglycosides	Gentamicin	Chickens Retail Chickens (235)	N/A	6.8	[3.9 - 10.8]															
		Turkeys Retail Ground Turkey (73)	N/A	13.7	[6.8 - 23.8]															
		Cattle Retail Ground Beef (91)	N/A	0.0	[0.0 - 4.0]															
		Swine Retail Pork Chops (52)	N/A	0.0	[0.0 - 6.8]															
	Kanamycin	Chickens Retail Chickens (235)	N/A	8.1	[4.9 - 12.3]															
		Turkeys Retail Ground Turkey (73)	N/A	26.0	[16.5 - 37.6]															
		Cattle Retail Ground Beef (91)	N/A	5.5	[1.8 - 12.4]															
		Swine Retail Pork Chops (52)	N/A	0.0	[0.0 - 6.8]															
	Streptomycin	Chickens Retail Chickens (235)	N/A	17.9	[13.2 - 23.4]															
		Turkeys Retail Ground Turkey (73)	N/A	47.9	[36.1 - 60.0]															
		Cattle Retail Ground Beef (91)	N/A	3.3	[0.7 - 9.3]															
		Swine Retail Pork Chops (52)	N/A	0.0	[0.0 - 6.8]															
Glycopeptides	Vancomycin	Chickens Retail Chickens (235)	0.0	0.0	[0.0 - 1.6]															
		Turkeys Retail Ground Turkey (73)	0.0	0.0	[0.0 - 4.9]															
		Cattle Retail Ground Beef (91)	0.0	0.0	[0.0 - 4.0]															
		Swine Retail Pork Chops (52)	0.0	0.0	[0.0 - 6.8]															
	Tigecycline	Chickens Retail Chickens (235)	N/A	0.0	[0.0 - 1.6]	4.7	43.8	41.3	10.2											
		Turkeys Retail Ground Turkey (73)	N/A	0.0	[0.0 - 4.9]	1.4	47.9	45.2	5.5											
		Cattle Retail Ground Beef (91)	N/A	0.0	[0.0 - 4.0]	2.2	63.7	22.0	12.1											
		Swine Retail Pork Chops (52)	N/A	0.0	[0.0 - 6.8]	3.9	57.7	26.9	11.5											
Lincosamides	Lincomycin	Chickens Retail Chickens (235)	0.0	78.7	[72.9 - 83.8]															
		Turkeys Retail Ground Turkey (73)	2.7	83.6	[73.0 - 91.2]															
		Cattle Retail Ground Beef (91)	1.1	72.5	[62.2 - 81.4]															
		Swine Retail Pork Chops (52)	0.0	90.4	[79.0 - 96.8]															

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

Table 98b. Distribution of MICs and Occurrence among *Enterococcus faecium* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	95% CI ³	Distribution (%) of MICs (µg/ml) ⁴																														
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048												
Lipopeptides	Daptomycin ⁵	Chickens Retail Chickens (235)	N/A	N/A	N/A										4.7	10.2	79.6	5.5																		
		Turkeys Retail Ground Turkey (73)	N/A	N/A	N/A											1.4	13.7	63.0	20.5	1.4																
		Cattle Retail Ground Beef (91)	N/A	N/A	N/A											1.1	31.9	65.9	1.1																	
		Pork Retail Pork Chops (52)	N/A	N/A	N/A											1.9	46.2	50.0	1.9																	
Macrolides	Erythromycin	Chickens Retail Chickens (235)	51.9	21.3	[16.2 - 27.1]					14.5	13.3	15.7	29.8	6.4	0.4	20.9																				
		Turkeys Retail Ground Turkey (73)	45.2	27.4	[17.6 - 39.1]					20.6	6.8	21.9	11.0	12.3	4.1	23.3																				
		Cattle Retail Ground Beef (91)	80.3	3.3	[0.7 - 9.3]					15.4	1.1	20.9	29.7	29.7	1.1	2.2																				
		Pork Retail Pork Chops (52)	94.2	1.9	[0.0 - 10.3]					3.9		19.2	36.5	38.5		1.9																				
	Tylosin	Chickens Retail Chickens (235)	1.3	20.9	[15.8 - 26.6]											12.3	24.7	28.5	12.3	1.3							20.9									
		Turkeys Retail Ground Turkey (73)	0.0	17.8	[9.8 - 28.5]						1.4	4.1	21.9	47.9	6.9												17.8									
		Cattle Retail Ground Beef (91)	9.9	2.2	[0.3 - 7.7]							7.7	27.5	33.0	19.8		9.9										2.2									
		Pork Retail Pork Chops (52)	3.9	0.0	[0.0 - 6.8]						1.9	3.9	11.5	44.2	34.6		3.9										0.0									
Nitrofurans	Nitrofurantoin	Chickens Retail Chickens (235)	60.4	36.6	[30.4 - 43.1]														0.4	2.6	60.4	36.6														
		Turkeys Retail Ground Turkey (73)	54.8	39.7	[28.5 - 51.9]														1.4	4.1	54.8	39.7														
		Cattle Retail Ground Beef (91)	73.6	22.0	[14.0 - 31.9]															1.1	3.3	73.6	22.0													
		Pork Retail Pork Chops (52)	86.5	5.8	[1.2 - 15.9]															1.9	5.8	86.5	5.8													
Oxazolidinones	Linezolid	Chickens Retail Chickens (235)	0.4	0.0	[0.0 - 1.6]										37.5	62.1	0.4																			
		Turkeys Retail Ground Turkey (73)	0.0	0.0	[0.0 - 4.9]											45.2	54.8																			
		Cattle Retail Ground Beef (91)	1.1	0.0	[0.0 - 4.0]											16.5	82.4	1.1																		
		Pork Retail Pork Chops (52)	0.0	0.0	[0.0 - 6.8]											28.9	71.1																			
Penicillins	Penicillin	Chickens Retail Chickens (235)	N/A	11.9	[8.1 - 16.8]					2.1	3.4	2.1	28.1	44.3	8.1	6.8	5.1																			
		Turkeys Retail Ground Turkey (73)	N/A	68.5	[56.6 - 78.9]						1.4	6.8	4.1	17.8	1.4	17.8	50.7																			
		Cattle Retail Ground Beef (91)	N/A	3.3	[0.7 - 9.3]					18.7	3.3	5.5	12.1	45.1	12.1	3.3																				
		Pork Retail Pork Chops (52)	N/A	0.0	[0.0 - 6.8]					15.4	3.9	17.3	25.0	28.8	9.6																					

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

⁵ There are no established CLSI breakpoints for daptomycin

Table 98c. Distribution of MICs and Occurrence among *Enterococcus faecium* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																						
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048				
Phenicol	Chloramphenicol	Chickens Retail Chickens (235)	0.9	0.0	[0.0 - 1.6]												28.5	70.6	0.9									
		Turkeys Retail Ground Turkey (73)	0.0	1.4	[0.0 - 7.4]												41.1	57.5	1.4									
		Cattle Retail Ground Beef (91)	0.0	1.1	[0.0 - 6.0]												11.0	87.9	1.1									
		Pork Retail Pork Chops (52)	0.0	0.0	[0.0 - 6.8]												34.6	65.4										
Quinolones	Ciprofloxacin	Chickens Retail Chickens (235)	46.8	39.6	[33.3 - 46.1]												0.4	0.9	12.3	46.8	34.9	4.7						
		Turkeys Retail Ground Turkey (73)	24.7	54.8	[42.7 - 66.5]												8.2	12.3	24.7	49.3	5.5							
		Cattle Retail Ground Beef (91)	26.4	12.1	[6.2 - 20.6]												16.5	45.0	26.4	12.1								
		Pork Retail Pork Chops (52)	30.8	3.8	[0.5 - 13.2]												13.5	11.5	40.4	30.8	3.8							
Streptogramins	Quinupristin-Dalfopristin	Chickens Retail Chickens (235)	39.1	37.4	[31.2 - 44.0]												20.9	2.6	39.1	8.5	17.5	4.3	7.2					
		Turkeys Retail Ground Turkey (73)	2.7	64.4	[52.3 - 75.3]												6.9	2.7	26.0	12.3	17.8	23.3	11.0					
		Cattle Retail Ground Beef (91)	44.0	26.4	[17.7 - 36.7]												22.0	7.7	44.0	25.3	1.1							
		Pork Retail Pork Chops (52)	67.3	23.1	[12.5 - 36.8]												3.8	5.8	67.3	21.2	1.9							
Tetracyclines	Tetracycline	Chickens Retail Chickens (235)	1.7	55.7	[49.1 - 62.2]												39.1	1.3	2.1	1.7	1.3	54.5						
		Turkeys Retail Ground Turkey (73)	0.0	78.1	[66.9 - 86.9]												20.5	1.4	78.1									
		Cattle Retail Ground Beef (91)	0.0	23.1	[14.9 - 33.1]												76.9	23.1										
		Pork Retail Pork Chops (52)	0.0	30.8	[18.7 - 45.1]												69.2	30.8										

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

Table 99a. Distribution of MICs and Occurrence among *Enterococcus faecium* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source			Distribution (%) of MICs (µg/ml) ⁴																			
		(# of Isolates)	% ¹	%R ²	[95% CI] ³	0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (213)	N/A	7.0	[4.0 - 11.3]																		
			Cecal (6)	N/A	0.0	[0.0 - 45.9]																		
		Turkeys	Retail Ground Turkey (48)	N/A	8.3	[2.3 - 20.0]																		
			Cecal (4)	N/A	0.0	[0.0 - 60.2]																		
		Cattle	Retail Ground Beef (80)	N/A	0.0	[0.0 - 4.5]																		
			Cecal (Beef) (27)	N/A	0.0	[0.0 - 12.8]																		
			Cecal (Dairy) (34)	N/A	0.0	[0.0 - 10.3]																		
		Swine	Retail Pork Chops (50)	N/A	0.0	[0.0 - 7.1]																		
			Cecal (Market Hogs) (12)	N/A	0.0	[0.0 - 26.5]																		
	Cecal (Sows) (7)		N/A	0.0	[0.0 - 41.0]																			
	Kanamycin	Chickens	Retail Chickens (213)	N/A	9.4	[5.8 - 14.1]																		
			Cecal (6)	N/A	33.3	[4.3 - 77.7]																		
		Turkeys	Retail Ground Turkey (48)	N/A	27.1	[15.3 - 41.8]																		
			Cecal (4)	N/A	0.0	[0.0 - 60.2]																		
		Cattle	Retail Ground Beef (80)	N/A	3.8	[0.8 - 10.6]																		
			Cecal (Beef) (27)	N/A	0.0	[0.0 - 12.8]																		
			Cecal (Dairy) (34)	N/A	2.9	[0.1 - 15.3]																		
		Swine	Retail Pork Chops (50)	N/A	4.0	[0.5 - 13.7]																		
			Cecal (Market Hogs) (12)	N/A	0.0	[0.0 - 26.5]																		
	Cecal (Sows) (7)		N/A	28.6	[3.7 - 71.0]																			
	Streptomycin	Chickens	Retail Chickens (213)	N/A	17.4	[12.5 - 23.1]																		
			Cecal (6)	N/A	0.0	[0.0 - 45.9]																		
		Turkeys	Retail Ground Turkey (48)	N/A	37.5	[24.0 - 52.6]																		
			Cecal (4)	N/A	0.0	[0.0 - 60.2]																		
Cattle		Retail Ground Beef (80)	N/A	2.5	[0.3 - 8.7]																			
		Cecal (Beef) (27)	N/A	0.0	[0.0 - 12.8]																			
		Cecal (Dairy) (34)	N/A	2.9	[0.1 - 15.3]																			
Swine		Retail Pork Chops (50)	N/A	4.0	[0.5 - 13.7]																			
		Cecal (Market Hogs) (12)	N/A	25.0	[5.5 - 57.2]																			
	Cecal (Sows) (7)	N/A	42.9	[9.9 - 81.6]																				
Glycopeptides	Vancomycin	Chickens	Retail Chickens (213)	0.0	0.0	[0.0 - 1.7]																		
			Cecal (6)	0.0	0.0	[0.0 - 45.9]																		
		Turkeys	Retail Ground Turkey (48)	0.0	0.0	[0.0 - 7.4]																		
			Cecal (4)	0.0	0.0	[0.0 - 60.2]																		
		Cattle	Retail Ground Beef (80)	0.0	0.0	[0.0 - 4.5]																		
			Cecal (Beef) (27)	0.0	0.0	[0.0 - 12.8]																		
			Cecal (Dairy) (34)	0.0	0.0	[0.0 - 10.3]																		
		Swine	Retail Pork Chops (50)	0.0	0.0	[0.0 - 7.1]																		
			Cecal (Market Hogs) (12)	0.0	0.0	[0.0 - 26.5]																		
	Cecal (Sows) (7)		0.0	0.0	[0.0 - 41.0]																			
	Tigecycline	Chickens	Retail Chickens (213)	N/A	0.0	[0.0 - 1.7]	8.9	48.8	35.2	7.0														
			Cecal (6)	N/A	0.0	[0.0 - 45.9]																		
		Turkeys	Retail Ground Turkey (48)	N/A	0.0	[0.0 - 7.4]	6.2	41.7	35.4	16.7														
			Cecal (4)	N/A	0.0	[0.0 - 60.2]																		
		Cattle	Retail Ground Beef (80)	N/A	0.0	[0.0 - 4.5]	20.0	50.0	20.0	10.0														
			Cecal (Beef) (27)	N/A	0.0	[0.0 - 12.8]																		
			Cecal (Dairy) (34)	N/A	0.0	[0.0 - 10.3]																		
		Swine	Retail Pork Chops (50)	N/A	0.0	[0.0 - 7.1]	10.0	42.0	42.0	6.0														
Cecal (Market Hogs) (12)			N/A	0.0	[0.0 - 26.5]																			
Cecal (Sows) (7)	N/A		0.0	[0.0 - 41.0]	28.6	57.1	14.3																	
Lincosamides	Lincomycin	Chickens	Retail Chickens (213)	0.0	83.1	[77.4 - 87.9]																		
			Cecal (6)	0.0	100.0	[54.1 - 100.0]																		
		Turkeys	Retail Ground Turkey (48)	2.1	91.7	[80.0 - 97.7]																		
			Cecal (4)	0.0	75.0	[19.4 - 99.4]																		
		Cattle	Retail Ground Beef (80)	1.3	58.8	[47.2 - 69.6]																		
			Cecal (Beef) (27)	0.0	81.5	[61.9 - 93.7]																		
			Cecal (Dairy) (34)	0.0	67.6	[49.5 - 82.6]																		
		Swine	Retail Pork Chops (50)	2.0	84.0	[70.9 - 92.8]																		
			Cecal (Market Hogs) (12)	0.0	83.3	[51.6 - 97.9]																		
Cecal (Sows) (7)	0.0		85.7	[42.1 - 99.6]	16.0	0.9			0.9	82.2														

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.
² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.
³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method.
⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

Table 99c. Distribution of MICs and Occurrence among *Enterococcus faecium* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)				Distribution (%) of MICs (µg/ml) ⁴																
		%I ¹	%R ²	[95% CI] ³	0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048
Phenicol	Chloramphenicol	Chickens	Retail Chickens (213)	0.9	0.0	[0.0 - 1.7]																
			Cecal (6)	16.7	0.0	[0.0 - 45.9]																
		Turkeys	Retail Ground Turkey (48)	0.0	0.0	[0.0 - 7.4]																
			Cecal (4)	0.0	0.0	[0.0 - 60.2]																
		Cattle	Retail Ground Beef (80)	0.0	1.3	[0.0 - 6.8]																
			Cecal (Beef) (27)	0.0	0.0	[0.0 - 12.8]																
			Cecal (Dairy) (34)	0.0	0.0	[0.0 - 10.3]																
		Swine	Retail Pork Chops (50)	0.0	0.0	[0.0 - 7.1]																
			Cecal (Market Hogs) (12)	0.0	0.0	[0.0 - 26.5]																
			Cecal (Sows) (7)	0.0	0.0	[0.0 - 41.0]																
Quinolones	Ciprofloxacin	Chickens	Retail Chickens (213)	49.8	39.0	[32.4 - 45.9]																
			Cecal (6)	0.0	50.0	[11.8 - 88.2]																
		Turkeys	Retail Ground Turkey (48)	37.5	35.4	[22.2 - 50.5]																
			Cecal (4)	0.0	50.0	[6.8 - 93.2]																
		Cattle	Retail Ground Beef (80)	22.5	25.0	[16.0 - 35.9]																
			Cecal (Beef) (27)	37.0	33.3	[16.5 - 54.0]																
			Cecal (Dairy) (34)	38.2	50.0	[32.4 - 67.6]																
		Swine	Retail Pork Chops (50)	22.0	16.0	[7.2 - 29.1]																
			Cecal (Market Hogs) (12)	16.7	25.0	[5.5 - 57.2]																
			Cecal (Sows) (7)	28.6	0.0	[0.0 - 41.0]																
Streptogramins	Quinupristin-Dalfopristin	Chickens	Retail Chickens (213)	43.2	28.2	[22.2 - 34.7]																
			Cecal (6)	66.7	33.3	[4.3 - 77.7]																
		Turkeys	Retail Ground Turkey (48)	52.1	41.7	[27.6 - 56.8]																
			Cecal (4)	75.0	0.0	[0.0 - 60.2]																
		Cattle	Retail Ground Beef (80)	41.3	18.8	[10.9 - 29.0]																
			Cecal (Beef) (27)	51.9	29.6	[13.8 - 50.2]																
			Cecal (Dairy) (34)	52.9	8.8	[1.9 - 23.7]																
		Swine	Retail Pork Chops (50)	72.0	8.0	[2.2 - 19.2]																
			Cecal (Market Hogs) (12)	58.3	25.0	[5.5 - 57.2]																
			Cecal (Sows) (7)	42.9	28.6	[3.7 - 71.0]																
Tetracyclines	Tetracycline	Chickens	Retail Chickens (213)	0.9	58.7	[51.8 - 65.4]																
			Cecal (6)	0.0	66.7	[22.3 - 95.7]																
		Turkeys	Retail Ground Turkey (48)	2.1	75.0	[60.4 - 86.4]																
			Cecal (4)	0.0	25.0	[0.6 - 80.6]																
		Cattle	Retail Ground Beef (80)	0.0	20.0	[11.9 - 30.4]																
			Cecal (Beef) (27)	0.0	29.6	[13.8 - 50.2]																
			Cecal (Dairy) (34)	0.0	11.8	[3.3 - 27.5]																
		Swine	Retail Pork Chops (50)	0.0	64.0	[49.2 - 77.1]																
			Cecal (Market Hogs) (12)	0.0	41.7	[15.2 - 72.3]																
			Cecal (Sows) (7)	0.0	71.4	[29.0 - 96.3]																

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

Resistance by Year

Table 100a. Antimicrobial Resistance among *Enterococcus faecium* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Chickens	Retail Chickens HACCP ¹ Cecal	231 248 377	348 564	307 670	315 477	189 349	163 191	202 185	197 285	221 128	235	213 6		
	Turkeys	Retail Ground Turkey Cecal	89 118	172	107	139	65	70	66	45	40	73	48 4		
	Cattle	Retail Ground Beef Cecal (Beef) Cecal (Dairy)	93 112	162	129	125	69	73	59	61	82	91	80 27 34		
	Swine	Retail Pork Chops Cecal (Market Hogs) Cecal (Sows)	93 97	75	75	70	33	35	26	32	37	52	50 12 7		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source													
Aminoglycosides	Gentamicin (MIC >500 µg/ml)	Chickens	Retail Chickens	3.0% 7	5.6% 14	4.3% 15	6.2% 19	6.0% 19	9.5% 18	11.7% 19	6.1% 12	9.5% 21	6.8% 16	7.0% 15	
		HACCP		14.9% 56	12.1% 68	13.4% 90	11.9% 57	13.5% 47	15.7% 30	16.8% 31	14.7% 42	14.1% 18			
		Cecal												0.0% 0	
		Turkeys	Retail Ground Turkey	15.7% 14	12.7% 15	13.4% 23	12.1% 12	15.1% 21	1.5% 1	10.0% 7	18.2% 12	6.7% 3	10.0% 4	13.7% 10	8.3% 4
		Cecal												0.0% 0	
		Cattle	Retail Ground Beef	1.1% 1	0.0% 0	0.0% 0	0.8% 1	0.0% 0	0.0% 0	0.0% 0	1.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Beef)												0.0% 0	
		Cecal (Dairy)												0.0% 0	
		Swine	Retail Pork Chops	1.1% 1	0.0% 0	0.0% 0	0.0% 0	1.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cecal (Market Hogs)												0.0% 0	
		Cecal (Sows)												0.0% 0	
		Kanamycin (MIC ≥ 1024 µg/ml)	Chickens	Retail Chickens	6.5% 15	10.5% 26	9.5% 33	10.7% 33	6.3% 20	12.2% 23	11.7% 19	9.9% 20	5.6% 11	9.5% 21	8.0% 19
	HACCP				19.1% 72	15.1% 85	18.5% 124	15.7% 75	15.2% 53	26.7% 51	15.7% 29	15.8% 45	21.1% 27		33.3% 2
	Cecal														0.0% 0
	Turkeys		Retail Ground Turkey	39.3% 35	28.0% 33	35.5% 61	29.9% 32	33.8% 47	7.7% 5	12.9% 9	33.3% 22	15.6% 7	25.0% 10	26.0% 19	27.1% 13
	Cecal														0.0% 0
	Cattle		Retail Ground Beef	4.3% 4	8.0% 9	8.6% 14	3.9% 5	1.6% 2	0.0% 0	5.5% 4	6.8% 4	8.2% 5	6.1% 5	5.5% 5	3.8% 3
	Cecal (Beef)														0.0% 0
	Cecal (Dairy)														2.9% 1
	Swine		Retail Pork Chops	3.2% 3	2.1% 2	2.7% 2	8.0% 6	2.9% 2	3.0% 1	5.7% 2	0.0% 0	3.1% 1	5.4% 2	0.0% 0	4.0% 2
	Cecal (Market Hogs)														0.0% 0
	Cecal (Sows)														28.6% 2
	Streptomycin (MIC ≥ 1000 µg/ml)		Chickens	Retail Chickens	16.9% 39	16.9% 42	8.3% 29	14.0% 43	3.8% 12	3.7% 7	6.7% 11	30.2% 61	26.4% 52	27.2% 60	17.9% 42
		HACCP			14.6% 55	17.6% 99	23.3% 156	11.5% 55	9.2% 32	15.2% 29	21.6% 40	26.0% 74	23.4% 30		
Cecal														0.0% 0	
Turkeys		Retail Ground Turkey	39.3% 35	32.2% 38	34.3% 59	34.6% 37	22.3% 31	16.9% 11	17.1% 12	51.5% 34	29.9% 13	55.0% 22	48.0% 35	37.5% 18	
Cecal														0.0% 0	
Cattle		Retail Ground Beef	3.2% 3	2.7% 3	5.6% 9	1.6% 2	0.8% 1	0.0% 0	2.7% 2	8.5% 5	3.3% 2	6.1% 5	3.3% 3	2.5% 2	
Cecal (Beef)														0.0% 0	
Cecal (Dairy)														2.9% 1	
Swine		Retail Pork Chops	5.4% 5	3.1% 3	6.7% 5	6.7% 5	2.9% 2	0.0% 0	0.0% 0	3.8% 1	3.1% 1	5.4% 2	0.0% 0	4.0% 2	
Cecal (Market Hogs)														25.0% 3	
Cecal (Sows)														42.9% 3	
Glycopeptides		Vancomycin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	HACCP			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0			
	Cecal													0.0% 0	
	Turkeys		Retail Ground Turkey	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Cecal													0.0% 0	
	Cattle		Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Cecal (Beef)													0.0% 0	
	Cecal (Dairy)													0.0% 0	
	Swine		Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cecal (Market Hogs)														0.0% 0
	Cecal (Sows)														0.0% 0

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Table 100b. Antimicrobial Resistance among *Enterococcus faecium* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Chickens	Retail Chickens	231	248	348	307	315	189	163	202	197	221	235	213			
		HACCP ¹	0	377	564	670	477	349	191	185	285	128		6			
		Cecal															
	Turkeys	Retail Ground Turkey	89	118	172	107	139	65	70	66	45	40	73	48			
		Cecal												4			
	Cattle	Retail Ground Beef	93	112	162	129	125	69	73	59	61	82	91	80			
		Cecal (Beef) Cecal (Dairy)												27 34			
	Swine	Retail Pork Chops	93	97	75	75	70	33	35	26	32	37	52	50			
		Cecal (Market Hogs) Cecal (Sows)												12 7			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
Glycylcycline	Tigecycline (MIC ≥ 0.25 µg/ml) ²	Chickens	Retail Chickens				0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%			
			HACCP				0	0	0	3	0	0	0	0			
			Cecal												0.0%		
		Turkeys	Retail Ground Turkey				0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal				0	0	0	2	0	0	0	0	0.0%		
		Cattle	Retail Ground Beef				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Beef)				0	0	0	0	0	0	0	0	0.0%		
			Cecal (Dairy)												0.0%		
		Swine	Retail Pork Chops				0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Market Hogs)				0	0	0	1	0	0	0	0	0.0%		
			Cecal (Sows)												0.0%		
		Lincosamides	Lincomycin (MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	87.0%	86.7%	83.3%	78.2%	74.9%	84.1%	81.0%	83.2%	82.2%	81.9%	78.7%	
					HACCP	201	215	290	240	236	159	132	168	162	181	185	83.1%
					Cecal		353	479	584	405	300	171	165	250	119		100.0%
				Turkeys	Retail Ground Turkey	94.4%	89.0%	88.4%	92.5%	97.8%	92.3%	91.4%	93.9%	86.7%	87.5%	83.6%	91.7%
Cecal	84				105	152	99	136	60	64	62	39	35	61	44		
Cattle	Retail Ground Beef			76.3%	58.9%	67.9%	74.4%	41.6%	56.5%	75.3%	79.7%	73.8%	79.3%	72.5%	58.8%		
	Cecal (Beef)			71	66	110	96	52	39	55	47	45	65	66	47		
	Cecal (Dairy)														81.5%		
Swine	Retail Pork Chops			90.3%	89.7%	84.0%	88.0%	64.3%	66.7%	54.3%	84.6%	78.1%	73.0%	90.4%	84.0%		
	Cecal (Market Hogs)			84	87	63	66	45	22	19	22	25	27	47	42		
	Cecal (Sows)														83.3%		
Lipopeptides	Daptomycin ³			Chickens	Retail Chickens			-	-	-	-	-	-	-	-		
					HACCP												
					Cecal												
				Turkeys	Retail Ground Turkey			-	-	-	-	-	-	-	-	-	
		Cecal															
		Cattle	Retail Ground Beef			-	-	-	-	-	-	-	-	-			
			Cecal (Beef)														
			Cecal (Dairy)														
		Swine	Retail Pork Chops			-	-	-	-	-	-	-	-	-			
			Cecal (Market Hogs)														
			Cecal (Sows)														
		Macrolides	Erythromycin (MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	25.5%	17.3%	12.6%	13.7%	9.5%	19.6%	22.1%	19.8%	13.7%	21.7%	29.6%	
					HACCP	59	43	44	42	30	37	36	40	27	48	50	63
					Cecal		28.6%	23.6%	27.8%	29.4%	28.9%	28.8%	29.7%	21.4%	24.2%		16.7%
				Turkeys	Retail Ground Turkey	50.6%	44.1%	43.0%	41.1%	44.6%	23.1%	37.1%	56.1%	33.3%	32.5%	27.4%	39.6%
Cecal	45				52	74	44	62	15	26	37	15	13	20	19		
Cattle	Retail Ground Beef			11.8%	8.9%	9.3%	4.7%	7.2%	4.3%	13.7%	5.1%	6.6%	6.1%	3.3%	7.5%		
	Cecal (Beef)			11	10	15	6	9	3	10	3	4	5	3	6		
	Cecal (Dairy)														3.7%		
Swine	Retail Pork Chops			20.4%	6.2%	5.3%	9.3%	7.1%	3.0%	14.3%	3.8%	9.4%	1.8%	1.9%	4.0%		
	Cecal (Market Hogs)			19	6	4	7	5	1	5	1	3	4	1	2		
	Cecal (Sows)														16.7%		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Percent non-susceptible is reported rather than percent resistance as no CLSI breakpoint has been established. NARMS breakpoint established to determine resistance.

³ Resistance data are not presented because there are no established CLSI breakpoints for daptomycin

Table 100c. Antimicrobial Resistance among *Enterococcus faecium* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Chickens	Retail Chickens	231	248	348	307	315	189	163	202	197	221	235	213			
		HACCP ¹	0	377	564	670	477	349	191	185	285	128		6			
		Cecal												4			
	Turkeys	Retail Ground Turkey	89	118	172	107	139	65	70	66	45	40	73	48			
		Cecal												4			
	Cattle	Retail Ground Beef	93	112	162	129	125	69	73	59	61	82	91	80			
		Cecal (Beef) Cecal (Dairy)												27 34			
	Swine	Retail Pork Chops	93	97	75	75	70	33	35	26	32	37	52	50			
		Cecal (Market Hogs) Cecal (Sows)												12 7			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
Macrolides	Tylosin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	21.2%	12.5%	10.3%	12.4%	7.9%	19.0%	20.2%	19.3%	12.2%	20.4%	20.9%	27.7%		
			HACCP	49	31	36	38	25	36	33	39	24	45	49	59		
			Cecal		26.3%	17.7%	23.9%	26.6%	20.9%	28.3%	24.9%	17.5%	21.9%				
		Turkeys	Retail Ground Turkey	36.0%	27.1%	35.5%	29.9%	36.0%	13.8%	12.9%	24.2%	15.6%	22.5%	17.8%	20.8%		
			Cecal	32	32	61	32	50	9	9	16	7	9	13	10		
		Cattle	Retail Ground Beef	6.5%	0.9%	5.6%	2.3%	4.8%	2.9%	4.1%	3.4%	3.3%	3.7%	2.2%	5.0%		
			Cecal (Beef)	6	1	9	3	6	2	3	2	2	3	2	4		
			Cecal (Dairy)												0.0%		
		Swine	Retail Pork Chops	9.7%	2.1%	0.0%	5.3%	5.7%	3.0%	5.7%	0.0%	3.1%	5.4%	0.0%	4.0%		
			Cecal (Market Hogs)	9	2	0	4	4	1	2	0	1	2	0	2		
			Cecal (Sows)												8.3%		
		Nitrofurans	Nitrofurantoin (MIC ≥ 128 µg/ml)	Chickens	Retail Chickens	54.5%	64.5%	85.3%	54.7%	38.4%	32.8%	46.0%	51.5%	40.1%	41.6%	36.6%	23.0%
					HACCP	126	160	297	168	121	62	75	104	79	92	86	49
					Cecal		196	334	366	249	176	110	96	141	57		0.0%
				Turkeys	Retail Ground Turkey	50.6%	52.5%	66.9%	43.0%	22.3%	12.3%	27.1%	40.9%	22.2%	40.0%	39.7%	29.2%
					Cecal	45	62	115	46	31	8	19	27	10	16	29	14
Cattle	Retail Ground Beef			18.3%	36.6%	51.9%	18.6%	12.8%	4.3%	20.5%	16.9%	6.6%	28.1%	22.0%	20.0%		
	Cecal (Beef)			17	41	84	24	16	3	15	10	4	23	20	16		
	Cecal (Dairy)														0.0%		
Swine	Retail Pork Chops			5.4%	16.5%	37.3%	10.7%	4.3%	9.1%	8.6%	11.5%	6.3%	18.9%	5.8%	16.0%		
	Cecal (Market Hogs)			5	16	28	8	3	3	3	3	2	7	3	8		
	Cecal (Sows)														0.0%		
Oxazolidinones	Linezolid (MIC ≥ 8 µg/ml)			Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
					HACCP	0	0	0	1	0	0	0	0	0	0	0	0
					Cecal		0	0	0	0	0	0	0	0	0	0	0.0%
				Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
					Cecal	0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0		
			Cecal (Dairy)												0.0%		
		Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0		
			Cecal (Sows)												0.0%		
		Penicillins	Penicillin (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	44.2%	51.2%	39.1%	31.9%	22.2%	12.2%	27.6%	23.3%	24.4%	18.6%	11.9%	
					HACCP	102	127	136	98	70	23	45	47	48	41	28	21
					Cecal		159	180	236	140	122	71	64	73	31		0.0%
				Turkeys	Retail Ground Turkey	66.3%	65.3%	61.6%	59.8%	67.6%	60.0%	61.4%	69.7%	48.9%	75.0%	68.5%	54.2%
					Cecal	59	77	106	64	94	39	43	46	22	30	50	26
Cattle	Retail Ground Beef			0.0%	8.0%	3.1%	2.3%	4.8%	1.4%	9.6%	6.8%	3.3%	3.7%	3.3%	5.0%		
	Cecal (Beef)			0	9	5	3	6	1	7	4	2	3	3	4		
	Cecal (Dairy)														0.0%		
Swine	Retail Pork Chops			3.2%	1.0%	8.0%	1.3%	1.4%	0.0%	0.0%	7.7%	6.3%	2.7%	0.0%	4.0%		
	Cecal (Market Hogs)			3	1	6	1	1	0	0	2	2	1	0	2		
	Cecal (Sows)														0.0%		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Table 100d. Antimicrobial Resistance among *Enterococcus faecium* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013				
Number of Isolates Tested	Chickens	Retail Chickens	231	248	348	307	315	189	163	202	197	221	235	213			
		HACCP ¹	0	377	564	670	477	349	191	185	285	128		6			
		Cecal															
	Turkeys	Retail Ground Turkey	89	118	172	107	139	65	70	66	45	40	73	48			
		Cecal												4			
	Cattle	Retail Ground Beef	93	112	162	129	125	69	73	59	61	82	91	80			
		Cecal (Beef) Cecal (Dairy)												27 34			
	Swine	Retail Pork Chops	93	97	75	75	70	33	35	26	32	37	52	50			
		Cecal (Market Hogs) Cecal (Sows)												12 7			
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source														
	Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%			
				HACCP	0	0	0	0	0	0	1	0	0	0	0		
				Cecal											0.0%		
Turkeys			Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%		
			Cecal	0	0	0	0	0	0	0	0	0	0	1	0.0%		
Cattle			Retail Ground Beef	1.1%	0.0%	1.2%	0.0%	0.0%	0.0%	1.4%	0.0%	1.6%	0.0%	1.1%	1.3%		
			Cecal (Beef)	1	0	2	0	0	0	1	0	1	0	1	0.0%		
			Cecal (Dairy)												0.0%		
Swine			Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%		
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	1	0	0.0%		
			Cecal (Sows)												0.0%		
Quinolones			Ciprofloxacin (MIC ≥ 4 µg/ml)	Chickens	Retail Chickens	13.0%	21.8%	52.3%	33.9%	37.5%	19.6%	43.6%	34.2%	32.5%	33.5%	39.0%	
					HACCP	30	54	182	104	118	37	71	69	64	74	93	83
					Cecal		24.7%	38.1%	32.1%	29.6%	30.1%	44.5%	42.7%	36.8%	46.1%		50.0%
				Turkeys	Retail Ground Turkey	22.5%	39.0%	53.5%	43.9%	37.4%	35.4%	54.3%	40.9%	42.2%	57.5%	54.8%	35.4%
					Cecal	20	46	92	47	52	23	38	27	19	23	40	17
				Cattle	Retail Ground Beef	12.9%	33.0%	27.2%	20.9%	21.6%	10.1%	26.0%	18.6%	14.8%	17.1%	12.1%	25.0%
					Cecal (Beef)	12	37	44	27	27	7	19	11	9	14	11	20
	Cecal (Dairy)														33.3%		
	Swine	Retail Pork Chops		4.3%	6.2%	17.3%	9.3%	4.3%	9.1%	14.3%	7.7%	12.5%	10.8%	3.9%	16.0%		
		Cecal (Market Hogs)		4	6	13	7	3	3	5	2	4	4	2	8		
		Cecal (Sows)													25.0%		
	Streptogramins	Quinupristin-Dalfopristin (MIC ≥ 4 µg/ml)		Chickens	Retail Chickens	55.4%	59.7%	31.6%	39.1%	36.5%	57.1%	54.6%	50.0%	28.9%	32.1%	37.5%	
					HACCP	128	148	110	120	115	108	89	101	57	71	88	60
					Cecal		49.3%	41.8%	43.9%	56.8%	40.4%	47.6%	59.5%	44.9%	64.1%		33.3%
				Turkeys	Retail Ground Turkey	82.0%	79.7%	64.5%	63.6%	75.5%	76.9%	68.6%	69.7%	57.8%	55.0%	64.4%	41.7%
					Cecal	73	94	111	68	105	50	48	46	26	22	47	20
				Cattle	Retail Ground Beef	47.3%	50.0%	6.2%	7.8%	6.4%	5.8%	16.4%	18.6%	0.0%	11.0%	26.4%	18.8%
					Cecal (Beef)	44	56	10	10	8	4	12	11	0	9	24	15
Cecal (Dairy)															29.6%		
Swine			Retail Pork Chops	24.7%	64.9%	6.7%	13.3%	10.0%	3.0%	5.7%	19.2%	3.1%	13.5%	23.1%	8.0%		
			Cecal (Market Hogs)	23	63	5	10	7	1	2	5	1	5	12	4		
			Cecal (Sows)												25.0%		
Tetracyclines			Tetracycline (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	56.7%	51.6%	45.1%	54.4%	53.0%	66.1%	64.4%	56.9%	35.5%	43.4%	55.7%	
					HACCP	131	128	157	167	167	125	105	115	70	96	131	125
					Cecal		51.2%	54.8%	57.8%	68.8%	63.0%	67.5%	69.2%	62.8%	73.4%		66.7%
				Turkeys	Retail Ground Turkey	88.8%	91.5%	86.6%	91.6%	92.8%	96.9%	81.4%	92.4%	71.1%	82.5%	78.1%	75.0%
					Cecal	79	108	149	98	129	63	57	61	32	33	57	36
				Cattle	Retail Ground Beef	22.6%	28.6%	24.7%	28.7%	20.0%	18.8%	28.8%	39.0%	27.9%	22.0%	23.1%	20.0%
					Cecal (Beef)	21	32	40	37	25	13	21	23	17	18	21	16
	Cecal (Dairy)														29.6%		
	Swine	Retail Pork Chops		68.8%	69.1%	72.0%	56.0%	54.3%	33.3%	45.7%	50.0%	50.0%	48.7%	30.8%	64.0%		
		Cecal (Market Hogs)		64	67	54	42	38	11	16	13	16	18	16	32		
		Cecal (Sows)													41.7%		

¹In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Multidrug Resistance

Table 101a. Resistance Patterns among *Enterococcus faecium* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Chickens	Retail Chickens	231	248	348	307	315	189	163	202	197	221	235	213	
		HACCP ¹		377	564	670	477	349	191	185	285	128			6
	Turkeys	Retail Ground Turkey	89	118	172	107	139	65	70	66	45	40	73	48	
		Cecal												4	
	Cattle	Retail Ground Beef	93	112	162	129	125	70	73	59	61	82	91	80	
Cecal (Beef)													27		
Swine	Retail Pork Chops	93	97	75	75	70	33	35	26	32	37	52	50		
	Cecal (Market Hogs)												12		
Swine	Cecal (Sows)												7		
	Cecal (Sows)														
Resistance Pattern ²		Source													
1. No Resistance Detected	Chickens	Retail Chickens	3.5%	1.2%	1.1%	9.8%	10.8%	9.0%	4.9%	4.5%	6.1%	5.0%	3.4%	7.0%	
		HACCP	8	3	4	30	34	17	8	9	12	11	8	15	
		Cecal		2.9%	3.0%	6.1%	6.5%	3.4%	3.1%	3.2%	3.2%	0.8%			
	Turkeys	Retail Ground Turkey	0.0%	0.0%	0.6%	0.0%	0.0%	1.5%	2.9%	1.5%	6.7%	5.0%	1.4%	2.1%	
		Cecal	0	0	1	0	0	1	2	1	3	2	1	0	
	Cattle	Retail Ground Beef	16.1%	10.7%	9.9%	9.3%	40.0%	38.6%	8.2%	3.4%	11.5%	7.3%	11.0%	15.0%	
		Cecal (Beef)	15	12	16	12	50	27	6	2	7	6	10	12	
		Cecal (Dairy)												0.0%	
	Swine	Retail Pork Chops	4.3%	3.1%	1.3%	6.7%	21.4%	18.2%	17.1%	11.5%	15.6%	10.8%	5.8%	6.0%	
		Cecal (Market Hogs)	4	3	1	5	15	6	6	3	5	4	3	3	
		Cecal (Sows)												8.3%	
	2. Resistance to ≥ 3 Antimicrobial Classes	Chickens	Retail Chickens	71.9%	79.4%	75.9%	63.2%	53.3%	66.7%	63.8%	65.8%	48.7%	54.8%	60.0%	62.9%
			HACCP	166	197	264	194	168	126	104	133	96	121	141	134
			Cecal		73.2%	73.0%	71.8%	75.1%	71.6%	78.0%	78.9%	71.2%	80.5%		
		Turkeys	Retail Ground Turkey	86.5%	88.1%	91.9%	86.9%	93.5%	90.8%	85.7%	92.4%	75.6%	85.0%	84.9%	79.2%
Cecal			77	104	158	93	130	59	60	61	34	34	62	38	
Cattle		Retail Ground Beef	31.2%	40.2%	27.2%	15.5%	9.6%	7.2%	27.4%	20.3%	9.8%	20.7%	22.0%	16.3%	
		Cecal (Beef)	29	45	44	20	12	5	20	12	6	17	20	13	
		Cecal (Dairy)												18.5%	
Swine		Retail Pork Chops	33.3%	54.6%	41.3%	21.3%	12.9%	3.0%	17.1%	23.1%	12.5%	16.2%	7.7%	18.0%	
		Cecal (Market Hogs)	31	53	31	16	9	1	6	6	4	6	4	9	
		Cecal (Sows)												41.7%	
3. Resistant to ≥ 4 Antimicrobial Classes		Chickens	Retail Chickens	49.4%	52.8%	52.6%	43.7%	36.5%	38.6%	51.5%	56.4%	38.1%	42.1%	44.3%	36.2%
			HACCP	114	131	183	134	115	73	84	114	75	93	104	77
			Cecal		54.1%	52.7%	54.9%	57.0%	53.3%	60.7%	64.3%	56.1%	68.8%		
		Turkeys	Retail Ground Turkey	78.7%	72.9%	82.6%	73.8%	82.0%	75.4%	80.0%	86.4%	64.4%	75.0%	75.3%	64.6%
	Cecal		70	86	142	79	114	49	56	57	29	30	55	31	
	Cattle	Retail Ground Beef	11.8%	18.8%	9.9%	6.2%	4.8%	4.3%	15.1%	13.6%	3.3%	7.3%	7.7%	8.8%	
		Cecal (Beef)	11	21	16	8	6	3	11	8	2	6	7	7	
		Cecal (Dairy)												3.7%	
	Swine	Retail Pork Chops	8.6%	7.2%	12.0%	9.3%	4.3%	3.0%	5.7%	3.8%	9.4%	10.8%	0.0%	10.0%	
		Cecal (Market Hogs)	8	7	9	7	3	1	2	1	3	4	0	5	
		Cecal (Sows)												25.0%	
	4. Resistant to ≥ 5 Antimicrobial Classes	Chickens	Retail Chickens	30.3%	35.5%	28.7%	28.3%	16.8%	16.9%	34.4%	39.1%	25.4%	23.1%	19.6%	14.6%
			HACCP	70	88	100	87	53	32	56	79	50	51	46	31
			Cecal		33.4%	31.7%	37.2%	36.3%	30.4%	43.5%	47.6%	34.0%	44.5%		
		Turkeys	Retail Ground Turkey	66.3%	68.7%	62.2%	57.0%	57.6%	38.5%	55.7%	65.2%	42.2%	62.5%	56.2%	43.8%
Cecal			59	81	107	61	80	25	39	43	19	25	41	21	
Cattle		Retail Ground Beef	5.4%	8.0%	5.6%	4.7%	4.0%	0.0%	8.2%	1.7%	1.6%	3.7%	3.3%	5.0%	
		Cecal (Beef)	5	9	9	6	5	0	6	1	1	3	3	4	
		Cecal (Dairy)												0.0%	
Swine		Retail Pork Chops	4.3%	5.2%	4.0%	6.7%	4.3%	0.0%	2.9%	3.8%	6.3%	8.1%	0.0%	4.0%	
		Cecal (Market Hogs)	4	5	3	5	3	0	1	1	2	3	0	2	
		Cecal (Sows)												0.0%	
Swine		Cecal (Sows)												28.6%	
		Cecal (Sows)												2	

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*
² Resistance patterns do not include daptomycin as there are no established CLSI breakpoints

Table 101b. Resistance Patterns among *Enterococcus faecium* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Chickens	Retail Chickens	231	248	348	307	315	189	163	202	197	221	235	213		
		HACCP ¹		377	564	670	477	349	191	185	285	128			6	
		Cecal														
	Turkeys	Retail Ground Turkey	89	118	172	107	139	65	70	66	45	40	73	48		
		Cecal												4		
	Cattle	Retail Ground Beef	93	112	162	129	125	70	73	59	61	82	91	80		
		Cecal (Beef)												27		
	Swine	Cecal (Dairy)												34		
		Retail Pork Chops	93	97	75	75	70	33	35	26	32	37	52	50		
	Resistance Pattern ²	Cecal (Market Hogs)												12		
		Cecal (Sows)												7		
	4. Resistant to ≥ 6 Antimicrobial Classes	Chickens	Retail Chickens	12.1%	12.9%	14.9%	15.0%	9.8%	10.6%	23.3%	14.4%	12.2%	11.8%	8.1%	7.5%	
HACCP			28	32	52	46	31	20	38	29	24	26	19	16		
Cecal				59	86	138	85	43	48	49	44	24			16.7%	
Turkeys		Retail Ground Turkey	47.2%	43.2%	44.8%	38.3%	30.9%	15.4%	30.0%	47.0%	24.4%	50.0%	32.9%	29.2%		
		Cecal	42	51	77	41	43	10	21	31	11	20	24	14	0.0%	
Cattle		Retail Ground Beef	0.0%	4.5%	4.3%	0.0%	2.4%	0.0%	4.1%	1.7%	1.6%	2.4%	1.1%	3.8%		
		Cecal (Beef)	0	5	7	0	3	0	3	1	1	2	1	3	0.0%	
		Cecal (Dairy)												0.0%		
Swine		Retail Pork Chops	1.1%	1.0%	0.0%	2.7%	1.4%	0.0%	2.9%	3.9%	3.1%	2.7%	0.0%	4.0%		
		Cecal (Market Hogs)	1	1	0	2	1	0	1	1	1	1	0	2	0.0%	
		Cecal (Sows)												0.0%		
6. At Least Penicillin G and High Level Gentamicin		Chickens	Retail Chickens	1.7%	3.2%	3.5%	3.3%	3.2%	3.7%	7.4%	3.0%	2.5%	3.6%	0.9%	1.4%	
			HACCP	4	8	12	10	10	7	12	6	5	8	2	3	
			Cecal		28	22	38	29	24	15	15	14	6			0.0%
		Turkeys	Retail Ground Turkey	4.5%	7.6%	10.5%	9.4%	7.2%	1.5%	7.1%	13.6%	2.2%	5.0%	13.7%	2.1%	
			Cecal	4	9	18	10	10	1	5	9	1	2	10	1	0.0%
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	
			Cecal (Beef)	0	0	0	0	0	0	0	1	0	0	0	0	0.0%
			Cecal (Dairy)												0.0%	
		Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
			Cecal (Sows)												0.0%	
		7. At Least Penicillin G High Level Gentamicin, and Linezolid Resistant	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP				0	0	0	0	0	0	0	0	0	0	0	0	
Cecal				0	0	0	0	0	0	0	0	0	0	0	0.0%	
Turkeys	Retail Ground Turkey		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Cecal		0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Cattle	Retail Ground Beef		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Cecal (Beef)		0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
	Cecal (Dairy)													0.0%		
Swine	Retail Pork Chops		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Cecal (Market Hogs)		0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
	Cecal (Sows)													0.0%		
8. At Least Penicillin G, High Level Gentamicin, and Tigecycline Resistant	Chickens		Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		HACCP	0	0	0	0	0	0	0	0	0	0	0	0		
		Cecal		0	0	0	0	0	0	0	0	0	0	0	0.0%	
	Turkeys	Retail Ground Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
	Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
		Cecal (Dairy)												0.0%		
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
		Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
		Cecal (Sows)												0.0%		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Resistance patterns do not include daptomycin as there are no established CLSI breakpoints

MIC Distributions

Table 102a. Distribution of MICs and Occurrence among *Enterococcus hirae* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	% ¹	%R ²	95% CI ³	Distribution (%) of MICs (µg/ml) ⁴													
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (10)	N/A	20.0	[2.5 - 55.6]													
		Turkeys	Retail Ground Turkey (3)	N/A	0.0	[0.0 - 70.8]													
		Cattle	Retail Ground Beef (57)	N/A	0.0	[0.0 - 6.3]													
		Swine	Retail Pork Chops (5)	N/A	0.0	[0.0 - 52.2]													
	Kanamycin	Chickens	Retail Chickens (10)	N/A	20.0	[2.5 - 55.6]													
		Turkeys	Retail Ground Turkey (3)	N/A	0.0	[0.0 - 70.8]													
		Cattle	Retail Ground Beef (57)	N/A	0.0	[0.0 - 6.3]													
		Swine	Retail Pork Chops (5)	N/A	0.0	[0.0 - 52.2]													
	Streptomycin	Chickens	Retail Chickens (10)	N/A	0.0	[0.0 - 30.8]													
		Turkeys	Retail Ground Turkey (3)	N/A	0.0	[0.0 - 70.8]													
		Cattle	Retail Ground Beef (57)	N/A	1.8	[0.0 - 9.4]													
		Swine	Retail Pork Chops (5)	N/A	0.0	[0.0 - 52.2]													
Glycopeptides	Vancomycin	Chickens	Retail Chickens (10)	0.0	0.0	[0.0 - 30.8]													
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]													
		Cattle	Retail Ground Beef (57)	0.0	0.0	[0.0 - 6.3]													
		Swine	Retail Pork Chops (5)	0.0	0.0	[0.0 - 52.2]													
	Tigecycline	Chickens	Retail Chickens (10)	N/A	0.0	[0.0 - 30.8]													
		Turkeys	Retail Ground Turkey (3)	N/A	0.0	[0.0 - 70.8]													
		Cattle	Retail Ground Beef (57)	N/A	0.0	[0.0 - 6.3]													
		Swine	Retail Pork Chops (5)	N/A	0.0	[0.0 - 52.2]													
Lincosamides	Lincomycin	Chickens	Retail Chickens (10)	0.0	100.0	[69.2 - 100.0]													
		Turkeys	Retail Ground Turkey (3)	0.0	66.7	[9.4 - 99.2]													
		Cattle	Retail Ground Beef (57)	0.0	93.0	[83.0 - 98.1]													
		Swine	Retail Pork Chops (5)	0.0	80.0	[28.4 - 99.5]													
Lipopeptides	Daptomycin ⁵	Chickens	Retail Chickens (10)	N/A	N/A	N/A													
		Turkeys	Retail Ground Turkey (3)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (57)	N/A	N/A	N/A													
		Swine	Retail Pork Chops (5)	N/A	N/A	N/A													
Macrolides	Erythromycin	Chickens	Retail Chickens (10)	0.0	20.0	[2.5 - 55.6]													
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]													
		Cattle	Retail Ground Beef (57)	0.0	14.0	[6.3 - 25.8]													
		Swine	Retail Pork Chops (5)	0.0	20.0	[0.5 - 71.6]													

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.
² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.
³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method.
⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MICs greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MICs equal to or less than the lowest tested concentration.
⁵ There are no established CLSI breakpoints for daptomycin

Table 102b. Distribution of MICs and Occurrence among *Enterococcus hirae* Isolates, 2012

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	%I ¹	%R ²	95% CI ³	Distribution (%) of MICs (µg/ml) ⁴																				
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048		
Macrolides	Tylosin	Chickens	Retail Chickens (10)	0.0	20.0	[2.5 - 55.6]							70.0	10.0			20.0									
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]							33.3	66.7												
		Cattle	Retail Ground Beef (57)	0.0	14.0	[6.3 - 25.8]							5.3	77.2	3.5			14.0								
		Swine	Retail Pork Chops (5)	0.0	20.0	[0.5 - 71.6]							20.0	60.0			20.0									
Nitrofurans	Nitrofurantoin	Chickens	Retail Chickens (10)	10.0	10.0	[0.3 - 44.5]										80.0	10.0	10.0								
		Turkeys	Retail Ground Turkey (3)	33.3	0.0	[0.0 - 70.8]							33.3			33.3	33.3									
		Cattle	Retail Ground Beef (57)	40.4	42.1	[29.1 - 55.9]										1.8	56.1	40.4	1.8							
		Swine	Retail Pork Chops (5)	20.0	0.0	[0.0 - 52.2]										80.0	20.0									
Oxazolidinones	Linezolid	Chickens	Retail Chickens (10)	0.0	0.0	[0.0 - 30.8]							70.0	30.0												
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]							33.3	66.7												
		Cattle	Retail Ground Beef (57)	1.8	0.0	[0.0 - 6.3]							33.3	64.9	1.8											
		Swine	Retail Pork Chops (5)	0.0	0.0	[0.0 - 52.2]							40.0	60.0												
Penicillins	Penicillin	Chickens	Retail Chickens (10)	N/A	10.0	[0.3 - 44.5]							10.0	20.0	40.0	10.0	10.0			10.0						
		Turkeys	Retail Ground Turkey (3)	N/A	0.0	[0.0 - 70.8]							33.3	33.3	33.3											
		Cattle	Retail Ground Beef (57)	N/A	0.0	[0.0 - 6.3]							12.3	7.0	50.9	22.8	7.0									
		Swine	Retail Pork Chops (5)	N/A	0.0	[0.0 - 52.2]										80.0	20.0									
Phenicol	Chloramphenicol	Chickens	Retail Chickens (10)	0.0	0.0	[0.0 - 30.8]										80.0	20.0									
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]							33.3	33.3	33.3											
		Cattle	Retail Ground Beef (57)	0.0	0.0	[0.0 - 6.3]										57.9	42.1									
		Swine	Retail Pork Chops (5)	0.0	0.0	[0.0 - 52.2]										40.0	60.0									
Quinolones	Ciprofloxacin	Chickens	Retail Chickens (10)	0.0	0.0	[0.0 - 30.8]							40.0	60.0												
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]							33.3	66.7												
		Cattle	Retail Ground Beef (57)	0.0	0.0	[0.0 - 6.3]										73.7	26.3									
		Swine	Retail Pork Chops (5)	0.0	0.0	[0.0 - 52.2]										60.0	40.0									
Streptogramins	Quinupristin-Dalfopristin	Chickens	Retail Chickens (10)	60.0	20.0	[2.5 - 55.6]							20.0	60.0	10.0		10.0									
		Turkeys	Retail Ground Turkey (3)	66.7	0.0	[0.0 - 70.8]							33.3	66.7												
		Cattle	Retail Ground Beef (57)	71.9	12.3	[5.1 - 23.7]							8.8	7.0	71.9	12.3										
		Swine	Retail Pork Chops (5)	40.0	20.0	[0.5 - 71.6]							20.0	20.0	40.0	20.0										
Tetracyclines	Tetracycline	Chickens	Retail Chickens (10)	0.0	90.0	[55.5 - 99.7]							10.0			10.0	80.0									
		Turkeys	Retail Ground Turkey (3)	0.0	0.0	[0.0 - 70.8]							66.7			33.3										
		Cattle	Retail Ground Beef (57)	0.0	66.7	[52.9 - 78.6]							33.3	1.8		24.6	40.4									
		Swine	Retail Pork Chops (5)	0.0	80.0	[28.4 - 99.5]							20.0			20.0	60.0									

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.
² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.
³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method.
⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MICs greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MICs equal to or less than the lowest tested concentration.

Table 103a. Distribution of MICs and Occurrence among *Enterococcus hirae* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	% ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴													
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides	Gentamicin	Chickens	Retail Chickens (15)	N/A	26.7	[7.8 - 55.1]													
			Cecal (2)	N/A	0.0	[0.0 - 84.2]													
		Turkeys	Retail Ground Turkey (1)	N/A	0.0	[0.0 - 97.5]													
			Cecal (0)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (38)	N/A	0.0	[0.0 - 9.3]													
			Cecal (Beef) (103)	N/A	0.0	[0.0 - 3.5]													
			Cecal (Dairy) (70)	N/A	0.0	[0.0 - 5.1]													
		Swine	Retail Pork Chops (2)	N/A	0.0	[0.0 - 84.2]													
			Cecal (Market Hogs) (34)	N/A	0.0	[0.0 - 10.3]													
	Cecal (Sows) (27)		N/A	0.0	[0.0 - 12.8]														
	Kanamycin	Chickens	Retail Chickens (15)	N/A	26.7	[7.8 - 55.1]													
			Cecal (2)	N/A	0.0	[0.0 - 84.2]													
		Turkeys	Retail Ground Turkey (1)	N/A	0.0	[0.0 - 97.5]													
			Cecal (0)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (38)	N/A	0.0	[0.0 - 9.3]													
			Cecal (Beef) (103)	N/A	0.0	[0.0 - 3.5]													
			Cecal (Dairy) (70)	N/A	0.0	[0.0 - 5.1]													
		Swine	Retail Pork Chops (2)	N/A	0.0	[0.0 - 84.2]													
			Cecal (Market Hogs) (34)	N/A	2.9	[0.1 - 15.3]													
	Cecal (Sows) (27)		N/A	3.7	[0.1 - 19.0]														
	Streptomycin	Chickens	Retail Chickens (15)	N/A	13.3	[1.7 - 40.5]													
			Cecal (2)	N/A	0.0	[0.0 - 84.2]													
		Turkeys	Retail Ground Turkey (1)	N/A	0.0	[0.0 - 97.5]													
			Cecal (0)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (38)	N/A	5.3	[0.6 - 17.7]													
			Cecal (Beef) (103)	N/A	1.0	[0.0 - 5.3]													
			Cecal (Dairy) (70)	N/A	0.0	[0.0 - 5.1]													
		Swine	Retail Pork Chops (2)	N/A	0.0	[0.0 - 84.2]													
Cecal (Market Hogs) (34)			N/A	5.9	[0.7 - 19.7]														
Cecal (Sows) (27)	N/A		29.6	[13.8 - 50.2]															
Glycopeptides	Vancomycin	Chickens	Retail Chickens (15)	0.0	0.0	[0.0 - 21.8]													
			Cecal (2)	0.0	0.0	[0.0 - 84.2]													
		Turkeys	Retail Ground Turkey (1)	0.0	0.0	[0.0 - 97.5]													
			Cecal (0)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (38)	0.0	0.0	[0.0 - 9.3]													
			Cecal (Beef) (103)	0.0	0.0	[0.0 - 3.5]													
			Cecal (Dairy) (70)	0.0	0.0	[0.0 - 5.1]													
		Swine	Retail Pork Chops (2)	0.0	0.0	[0.0 - 84.2]													
			Cecal (Market Hogs) (34)	0.0	0.0	[0.0 - 10.3]													
	Cecal (Sows) (27)		0.0	0.0	[0.0 - 12.8]														
	Tigecycline	Chickens	Retail Chickens (15)	N/A	0.0	[0.0 - 21.8]													
			Cecal (2)	N/A	0.0	[0.0 - 84.2]													
		Turkeys	Retail Ground Turkey (1)	N/A	0.0	[0.0 - 97.5]													
			Cecal (0)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (38)	N/A	0.0	[0.0 - 9.3]													
			Cecal (Beef) (103)	N/A	0.0	[0.0 - 3.5]													
			Cecal (Dairy) (70)	N/A	0.0	[0.0 - 5.1]													
		Swine	Retail Pork Chops (2)	N/A	0.0	[0.0 - 84.2]													
Cecal (Market Hogs) (34)			N/A	0.0	[0.0 - 10.3]														
Cecal (Sows) (27)	N/A		0.0	[0.0 - 12.8]															
Lincosamides	Lincomycin	Chickens	Retail Chickens (15)	0.0	100.0	[78.2 - 100.0]													
			Cecal (2)	0.0	100.0	[15.8 - 100.0]													
		Turkeys	Retail Ground Turkey (1)	0.0	100.0	[2.5 - 100.0]													
			Cecal (0)	N/A	N/A	N/A													
		Cattle	Retail Ground Beef (38)	0.0	92.1	[78.6 - 98.3]													
			Cecal (Beef) (103)	0.0	93.2	[86.5 - 97.2]													
			Cecal (Dairy) (70)	0.0	94.3	[86.0 - 98.4]													
		Swine	Retail Pork Chops (2)	0.0	100.0	[15.8 - 100.0]													
			Cecal (Market Hogs) (34)	8.8	73.5	[55.6 - 87.1]													
			Cecal (Sows) (27)	7.4	92.6	[75.7 - 99.1]													

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method.⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

Table 103c. Distribution of MICs and Occurrence among *Enterococcus hirae* Isolates, 2013

Antimicrobial Class	Antimicrobial Agent	Isolate Source (# of Isolates)	% ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																										
						0.02	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048								
Phenicol	Chloramphenicol	Chickens	Retail Chickens (15)	0.0	0.0	[0.0 - 21.8]																										
			Cecal (2)	0.0	0.0	[0.0 - 84.2]																										
		Turkeys	Retail Ground Turkey (1)	0.0	0.0	[0.0 - 97.5]																										
			Cecal (0)	0.0	0.0	[0.0 - 100.0]																										
		Cattle	Retail Ground Beef (38)	0.0	0.0	[0.0 - 9.3]														73.3	26.7											
			Cecal (Beef) (103)	0.0	0.0	[0.0 - 3.5]														100.0												
			Cecal (Dairy) (70)	0.0	0.0	[0.0 - 5.1]														100.0												
		Swine	Retail Pork Chops (2)	0.0	0.0	[0.0 - 84.2]														68.4	31.6											
			Cecal (Market Hogs) (34)	0.0	2.9	[0.1 - 15.3]														61.2	38.8											
Cecal (Sows) (27)	0.0		0.0	[0.0 - 12.8]	95.7	4.3																										
Quinolones	Ciprofloxacin	Chickens	Retail Chickens (15)	0.0	0.0	[0.0 - 21.8]																										
			Cecal (2)	0.0	0.0	[0.0 - 84.2]																										
		Turkeys	Retail Ground Turkey (1)	0.0	0.0	[0.0 - 97.5]																										
			Cecal (0)	0.0	0.0	[0.0 - 100.0]																										
		Cattle	Retail Ground Beef (38)	0.0	0.0	[0.0 - 9.3]														13.3	80.0	6.7										
			Cecal (Beef) (103)	0.0	0.0	[0.0 - 3.5]														50.0	50.0											
			Cecal (Dairy) (70)	0.0	0.0	[0.0 - 5.1]														100.0												
		Swine	Retail Pork Chops (2)	0.0	0.0	[0.0 - 84.2]														2.6	60.5	36.8										
			Cecal (Market Hogs) (34)	2.9	0.0	[0.0 - 10.3]														1.9	53.4	44.7										
Cecal (Sows) (27)	0.0		0.0	[0.0 - 12.8]	1.4	67.1	31.4																									
Streptogramins	Quinupristin-Dalfopristin	Chickens	Retail Chickens (15)	60.0	40.0	[16.3 - 67.7]																										
			Cecal (2)	50.0	50.0	[1.3 - 98.7]																										
		Turkeys	Retail Ground Turkey (1)	100.0	0.0	[0.0 - 97.5]																										
			Cecal (0)	0.0	0.0	[0.0 - 100.0]																										
		Cattle	Retail Ground Beef (38)	73.7	15.8	[6.0 - 31.3]														60.0	13.3	13.3	13.3									
			Cecal (Beef) (103)	71.9	14.6	[8.4 - 22.9]														50.0	50.0											
			Cecal (Dairy) (70)	78.6	2.9	[0.3 - 9.9]														100.0												
		Swine	Retail Pork Chops (2)	100.0	0.0	[0.0 - 84.2]														73.7	15.8											
			Cecal (Market Hogs) (34)	50.0	20.6	[8.7 - 37.9]														8.7	4.9	71.9	13.6	1.0								
Cecal (Sows) (27)	63.0		25.9	[11.1 - 46.3]	5.7	12.9	78.6	2.9																								
Tetracyclines	Tetracycline	Chickens	Retail Chickens (15)	0.0	80.0	[51.9 - 95.7]																										
			Cecal (2)	0.0	50.0	[1.3 - 98.7]																										
		Turkeys	Retail Ground Turkey (1)	0.0	100.0	[2.5 - 100.0]																										
			Cecal (0)	0.0	0.0	[0.0 - 100.0]																										
		Cattle	Retail Ground Beef (38)	0.0	68.4	[51.3 - 82.5]														20.0												
			Cecal (Beef) (103)	0.0	59.2	[49.1 - 68.8]														50.0												
			Cecal (Dairy) (70)	0.0	44.3	[32.4 - 56.7]														31.6	2.6	10.5	55.3									
		Swine	Retail Pork Chops (2)	0.0	100.0	[15.8 - 100.0]														40.8	1.0	11.7	46.6									
			Cecal (Market Hogs) (34)	0.0	61.8	[43.6 - 77.8]														100.0												
Cecal (Sows) (27)	0.0		81.5	[61.9 - 93.7]	38.2	5.9	55.9																									
					18.5	81.5																										

¹ Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

² Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

³ 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test isolates. Single vertical lines indicate the breakpoints for susceptibility, while double vertical lines indicate the breakpoints for resistance. Numbers in the shaded areas indicate percentage of isolates with MIC's greater than the highest concentrations on the plate. Numbers listed for the lowest tested concentrations represent the percentage of isolates with MIC's equal to or less than the lowest tested concentration.

Resistance by Year

Table 104a. Antimicrobial Resistance among *Enterococcus hirae* Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Chickens	Retail Chickens	12	28	27	30	27	22	16	8	24	18	10	15	
		HACCP ¹		83	101	169	119	110	35	53	56	39			
		Cecal												2	
	Turkeys	Retail Ground Turkey	2	3	0	1	3	2	0	0	2	0	3	1	
		Cecal												0	
	Cattle	Retail Ground Beef	76	84	88	82	77	57	49	26	41	44	57	38	
		Cecal (Beef)												103	
		Cecal (Dairy)												70	
	Swine	Retail Pork Chops	12	14	14	4	8	6	5	2	7	2	5	2	
		Cecal (Market Hogs)												34	
		Cecal (Sows)												27	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Gentamicin (MIC >500 µg/ml)	Chickens	Retail Chickens	8.3%	0.0%	0.0%	10.0%	3.7%	4.5%	6.3%	12.5%	4.2%	11.1%	20.0%	26.7%
			HACCP	1	0	0	3	1	1	1	1	2	2	4	
			Cecal												
		Turkeys	Retail Ground Turkey	0.0%	0.0%		0.0%	33.3%	0.0%			0.0%		0.0%	0.0%
			Cecal	0	0		0	1	0		0		0		0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	1.2%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	0	0	1	1	0	0	0	0	0	0	0
			Cecal (Dairy)												0.0%
		Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0
			Cecal (Sows)												0.0%
		Kanamycin (MIC ≥ 1024 µg/ml)	Chickens	Retail Chickens	16.7%	28.6%	3.7%	26.7%	3.7%	18.2%	12.5%	12.5%	4.2%	16.7%	20.0%
	HACCP			2	8	1	8	1	4	2	2	1	3	2	4
	Cecal				34.9%	26.7%	20.1%	16.8%	23.6%	20.0%	17.0%	8.9%	23.1%		0.0%
	Turkeys		Retail Ground Turkey	0.0%	66.7%		0.0%	33.3%	0.0%			0.0%		0.0%	0.0%
			Cecal	0	2		0	1	0		0		0		0
	Cattle		Retail Ground Beef	0.0%	3.6%	0.0%	1.2%	1.3%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	3	0	1	1	0	1	0	0	0	0	0
			Cecal (Dairy)												0.0%
	Swine		Retail Pork Chops	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Market Hogs)	0	0	1	0	0	0	0	0	0	0	0	2.9%
			Cecal (Sows)												3.7%
	Streptomycin (MIC ≥ 1000 µg/ml)		Chickens	Retail Chickens	16.7%	42.9%	22.2%	23.3%	18.5%	9.1%	25.0%	25.0%	8.3%	5.6%	0.0%
		HACCP		2	12	6	7	5	2	4	2	2	1	0	2
		Cecal			36.1%	16.8%	27.2%	8.4%	11.8%	2.9%	1.9%	5.4%	2.6%		0.0%
		Turkeys	Retail Ground Turkey	50.0%	0.0%		0.0%	33.3%	0.0%			0.0%		0.0%	0.0%
			Cecal	1	0		0	1	0			0		0	0
		Cattle	Retail Ground Beef	2.6%	3.6%	0.0%	4.9%	2.6%	1.8%	0.0%	0.0%	0.0%	0.0%	1.8%	5.3%
			Cecal (Beef)	2	3	0	4	2	1	0	0	0	0	1	2
			Cecal (Dairy)												1.0%
		Swine	Retail Pork Chops	0.0%	0.0%	0.0%	25.0%	0.0%	16.7%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%
			Cecal (Market Hogs)	0	0	0	1	0	1	0	0	0	1	0	2
			Cecal (Sows)												29.6%
		Glycopeptides	Vancomycin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	HACCP				0	0	0	0	0	0	0	0	0	0	0
	Cecal														
Turkeys	Retail Ground Turkey			0.0%	0.0%		0.0%	0.0%	0.0%			0.0%		0.0%	0.0%
	Cecal			0	0		0	0	0		0		0		0
Cattle	Retail Ground Beef			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cecal (Beef)			0	0	0	0	0	0	0	0	0	0	0	0
	Cecal (Dairy)														0.0%
Swine	Retail Pork Chops			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cecal (Market Hogs)			0	0	0	0	0	0	0	0	0	0	0	0
	Cecal (Sows)														0.0%

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Table 104b. Antimicrobial Resistance among *Enterococcus hirae* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Chickens	Retail Chickens	12	28	27	30	27	22	16	8	24	18	10	15	
		HACCP ¹		83	101	169	119	110	35	53	56	39		2	
		Cecal													0
	Turkeys	Retail Ground Turkey	2	3	0	1	3	2	0	0	2	0	3	1	
		Cecal												0	
	Cattle	Retail Ground Beef	76	84	88	82	77	57	49	26	41	44	57	38	
		Cecal (Beef)												103	
		Cecal (Dairy)												70	
	Swine	Retail Pork Chops	12	14	14	4	8	6	5	2	7	2	5	2	
		Cecal (Market Hogs)												34	
		Cecal (Sows)												27	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Glycylcycline	Tigecycline (MIC ≥ 0.25 µg/ml) ²	Chickens	Retail Chickens				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP				0	0	0	0	0	0	0	0	
			Cecal												0.0%
		Turkeys	Retail Ground Turkey				0.0%	0.0%	0.0%			0.0%		0.0%	0.0%
			Cecal				0	0	0			0		0	0
		Cattle	Retail Ground Beef				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)				0	0	0	0	0	0	0	0	0
			Cecal (Dairy)												0.0%
		Swine	Retail Pork Chops				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Market Hogs)				0	0	0	0	0	0	0	0	0
			Cecal (Sows)												0.0%
		Lincosamides	Lincomycin (MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	100.0%	100.0%	92.6%	100.0%	77.8%	95.5%	100.0%	100.0%	100.0%	100.0%
HACCP	12				28	25	30	21	21	16	8	24	18	10	15
Cecal															100.0%
Turkeys	Retail Ground Turkey			100.0%	100.0%		100.0%	100.0%	100.0%			50.0%		66.7%	100.0%
	Cecal			2	3		1	3	2			1		2	1
Cattle	Retail Ground Beef			93.4%	91.7%	85.2%	98.8%	81.8%	96.5%	91.8%	88.5%	95.1%	84.1%	93.0%	92.1%
	Cecal (Beef)			71	77	75	81	63	55	45	23	39	37	53	35
	Cecal (Dairy)														93.2%
Swine	Retail Pork Chops			100.0%	100.0%	71.4%	100.0%	87.5%	83.3%	100.0%	100.0%	100.0%	100.0%	80.0%	100.0%
	Cecal (Market Hogs)			12	14	10	4	7	5	5	2	7	2	4	2
	Cecal (Sows)														73.5%
Lipopeptides	Daptomycin ³			Chickens	Retail Chickens			-	-	-	-	-	-	-	-
		HACCP													
		Cecal													
		Turkeys	Retail Ground Turkey				-	-	-	-	-	-	-	-	
			Cecal												
		Cattle	Retail Ground Beef				-	-	-	-	-	-	-	-	
			Cecal (Beef)												
			Cecal (Dairy)												
		Swine	Retail Pork Chops				-	-	-	-	-	-	-	-	
			Cecal (Market Hogs)												
			Cecal (Sows)												
		Macrolides	Erythromycin (MIC ≥ 8 µg/ml)	Chickens	Retail Chickens	16.7%	67.9%	11.1%	63.3%	14.8%	45.5%	37.5%	25.0%	41.7%	16.7%
HACCP	2				19	3	19	4	10	6	2	10	3	2	4
Cecal					44	45	63	39	36	8	19	10	7		0.0%
Turkeys	Retail Ground Turkey			0.0%	66.7%		0.0%	66.7%	0.0%			50.0%		0.0%	0.0%
	Cecal			0	2		0	2	0			1		0	0
Cattle	Retail Ground Beef			19.7%	15.5%	8.0%	17.1%	14.3%	17.5%	12.2%	3.8%	14.6%	13.6%	14.0%	21.1%
	Cecal (Beef)			15	13	7	14	11	10	6	1	6	6	8	8
	Cecal (Dairy)														22.3%
Swine	Retail Pork Chops			0.0%	7.1%	0.0%	25.0%	25.0%	33.3%	60.0%	0.0%	0.0%	50.0%	20.0%	0.0%
	Cecal (Market Hogs)			0	1	0	1	2	2	3	0	0	1	1	0
	Cecal (Sows)														11.8%

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Percent non-susceptible is reported rather than percent resistance as no CLSI breakpoint has been established. NARMS breakpoint established to determine resistance

³ Resistance data are not presented because there are no established CLSI breakpoints for daptomycin

Table 104c. Antimicrobial Resistance among *Enterococcus hirae* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Chickens	Retail Chickens	12	28	27	30	27	22	16	8	24	18	10	15			
		HACCP ¹		83	101	169	119	110	35	53	56	39					
		Cecal												2			
	Turkeys	Retail Ground Turkey	2	3	0	1	3	2	0	0	2	0	3	1			
		Cecal												0			
	Cattle	Retail Ground Beef	76	84	88	82	77	57	49	26	41	44	57	38			
		Cecal (Beef)												103			
		Cecal (Dairy)												70			
	Swine	Retail Pork Chops	12	14	14	4	8	6	5	2	7	2	5	2			
		Cecal (Market Hogs)												34			
Cecal (Sows)													27				
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source															
Macrolides	Tylosin (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	16.7% 2	64.3% 18	11.1% 3	60.0% 18	18.5% 5	45.5% 10	37.5% 6	25.0% 2	41.7% 10	16.7% 3	20.0% 2	26.7% 4		
			HACCP		53.0% 44	46.5% 47	37.3% 63	33.6% 40	32.7% 36	22.9% 8	35.8% 19	17.9% 10	12.8% 5				
			Cecal													0.0% 0	
		Turkeys	Retail Ground Turkey	0.0% 0	66.7% 2		0.0% 0	66.7% 2	0.0% 0				50.0% 1		0.0% 0	0.0% 0	
			Cecal														
		Cattle	Retail Ground Beef	19.7% 15	15.5% 13	8.0% 7	17.1% 14	15.6% 12	19.3% 11	12.2% 6	3.8% 1	14.6% 6	13.6% 6	14.0% 8	21.1% 8		
			Cecal (Beef)												23.3% 24		
			Cecal (Dairy)												2.9% 2		
		Swine	Retail Pork Chops	0.0% 0	7.1% 1	0.0% 0	25.0% 1	25.0% 2	33.3% 2	40.0% 2	0.0% 0	0.0% 0	50.0% 1	20.0% 1	0.0% 0		
			Cecal (Market Hogs)												11.8% 4		
			Cecal (Sows)												29.6% 8		
		Nitrofurans	Nitrofurantoin (MIC ≥ 128 µg/ml)	Chickens	Retail Chickens	8.3% 1	10.7% 3	14.8% 4	6.7% 2	7.4% 2	0.0% 0	0.0% 0	0.0% 0	4.2% 1	5.6% 1	10.0% 1	13.3% 2
					HACCP		15.7% 13	13.9% 14	7.1% 12	17.6% 21	11.8% 13	8.6% 3	9.4% 5	7.1% 4	5.1% 2		
Cecal																0.0% 0	
Turkeys	Retail Ground Turkey			50.0% 1	0.0% 0		0.0% 0	66.7% 2	0.0% 0				0.0% 0		0.0% 0	0.0% 0	
	Cecal																
Cattle	Retail Ground Beef			0.0% 0	0.0% 0	6.8% 6	4.9% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.3% 1	1.8% 1	2.6% 1		
	Cecal (Beef)														0.0% 0		
	Cecal (Dairy)														1.4% 1		
Swine	Retail Pork Chops			0.0% 0	7.1% 1	21.4% 3	25.0% 1	0.0% 0	0.0% 0	20.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Cecal (Market Hogs)														0.0% 0		
	Cecal (Sows)														3.7% 1		
Oxazolidinones	Linezolid (MIC ≥ 8 µg/ml)			Chickens	Retail Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
					HACCP		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Cecal													0.0% 0		
		Turkeys	Retail Ground Turkey	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0				0.0% 0		0.0% 0		
			Cecal														
		Cattle	Retail Ground Beef	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal (Beef)												0.0% 0		
			Cecal (Dairy)												0.0% 0		
		Swine	Retail Pork Chops	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
			Cecal (Market Hogs)												0.0% 0		
			Cecal (Sows)												0.0% 0		
		Penicillins	Penicillin (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	8.3% 1	7.1% 2	25.9% 7	0.0% 0	7.4% 2	4.5% 1	0.0% 0	0.0% 0	8.3% 2	5.6% 1	10.0% 1	13.3% 2
					HACCP		8.4% 7	6.9% 7	3.6% 6	5.0% 6	5.5% 6	8.6% 3	5.7% 3	10.7% 6	2.6% 1		
Cecal																0.0% 0	
Turkeys	Retail Ground Turkey			0.0% 0	0.0% 0		0.0% 0	66.7% 2	100.0% 2				0.0% 0		0.0% 0		
	Cecal																
Cattle	Retail Ground Beef			0.0% 0	0.0% 0	1.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Cecal (Beef)														0.0% 0		
	Cecal (Dairy)														0.0% 0		
Swine	Retail Pork Chops			0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Cecal (Market Hogs)														0.0% 0		
	Cecal (Sows)														7.4% 2		

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Table 104d. Antimicrobial Resistance among *Enterococcus hirae* Isolates, 2002-2013

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Number of Isolates Tested	Chickens	Retail Chickens	12	28	27	30	27	22	16	8	24	18	10	15	
		HACCP ¹		83	101	169	119	110	35	53	56	39		2	
		Cecal													0
	Turkeys	Retail Ground Turkey	2	3	0	1	3	2	0	0	0	2	0	3	1
		Cecal													0
	Cattle	Retail Ground Beef	76	84	88	82	77	57	49	26	41	44	57	38	
		Cecal (Beef)												103	
		Cecal (Dairy)												70	
	Swine	Retail Pork Chops	12	14	14	4	8	6	5	2	7	2	5	2	
		Cecal (Market Hogs)												34	
		Cecal (Sows)												27	
	Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Phenolics	Chloramphenicol (MIC ≥ 32 µg/ml)	Chickens	Retail Chickens	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0	1	0	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%		
			Cecal												0.0%
		Turkeys	Retail Ground Turkey	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%		0.0%	0.0%
			Cecal	0	0		0	0	0			0		0	0
		Cattle	Retail Ground Beef	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	1	0	0	0	0	0	0	0	0	0	0	0.0%
			Cecal (Dairy)												0.0%
		Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	2.9%
			Cecal (Sows)												1
		Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Chickens	Retail Chickens	8.3%	0.0%	3.7%	0.0%	14.8%	4.5%	0.0%	0.0%	0.0%	0.0%
HACCP	1				0	1	0	4	1	0	0	0	0	0	
Cecal															0.0%
Turkeys	Retail Ground Turkey			0.0%	0.0%		0.0%	33.3%	100.0%			0.0%		0.0%	0.0%
	Cecal			0	0		0	1	2			0		0	0
Cattle	Retail Ground Beef			0.0%	0.0%	1.1%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cecal (Beef)			0	0	1	0	0	1	0	0	0	0	0	0.0%
	Cecal (Dairy)														0.0%
Swine	Retail Pork Chops			0.0%	0.0%	7.1%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cecal (Market Hogs)			0	0	1	0	1	0	0	0	0	0	0	0.0%
	Cecal (Sows)														0.0%
Streptogramins	Quinupristin-Dalfopristin (MIC ≥ 4 µg/ml)			Chickens	Retail Chickens	66.7%	82.1%	7.4%	40.0%	18.5%	40.9%	18.8%	25.0%	16.7%	5.6%
		HACCP	8		23	2	12	5	9	3	2	4	1	2	
		Cecal			47.0%	32.7%	28.4%	43.7%	32.7%	28.6%	50.9%	28.6%	48.7%		50.0%
		Turkeys	Retail Ground Turkey	50.0%	66.7%		0.0%	33.3%	0.0%			50.0%		0.0%	0.0%
			Cecal	1	2		0	1	0			1		0	0
		Cattle	Retail Ground Beef	44.7%	60.7%	10.2%	11.0%	5.2%	5.3%	4.1%	7.7%	7.3%	9.1%	12.3%	15.8%
			Cecal (Beef)	34	51	9	9	4	3	2	2	3	4	7	6
			Cecal (Dairy)												14.6%
		Swine	Retail Pork Chops	25.0%	35.7%	0.0%	25.0%	0.0%	0.0%	20.0%	0.0%	0.0%	50.0%	20.0%	0.0%
			Cecal (Market Hogs)	3	5	0	1	0	0	1	0	0	1	1	0
			Cecal (Sows)												20.6%
		Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Chickens	Retail Chickens	83.3%	64.3%	51.9%	46.7%	33.3%	81.8%	43.8%	62.5%	50.0%	72.2%
HACCP	10				18	14	14	9	18	7	5	12	13	9	
Cecal					62.7%	57.4%	47.3%	58.0%	55.5%	57.1%	73.6%	67.9%	64.1%		50.0%
Turkeys	Retail Ground Turkey			100.0%	0.0%		0.0%	66.7%	100.0%			50.0%		33.3%	100.0%
	Cecal			2	0		0	2	2			1		1	1
Cattle	Retail Ground Beef			60.5%	46.4%	53.4%	65.9%	53.2%	52.6%	53.1%	50.0%	43.9%	38.6%	66.7%	68.4%
	Cecal (Beef)			46	39	47	54	41	30	26	13	18	17	38	26
	Cecal (Dairy)														59.2%
Swine	Retail Pork Chops			66.7%	14.3%	35.7%	50.0%	50.0%	83.3%	60.0%	100.0%	85.7%	50.0%	80.0%	100.0%
	Cecal (Market Hogs)			8	2	5	2	4	5	3	2	6	1	4	2
	Cecal (Sows)														61.8%

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

Multidrug Resistance

Table 105a. Resistance Patterns among *Enterococcus hirae* Isolates, 2002-2013

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013		
Number of Isolates Tested	Chickens	Retail Chickens	12	28	27	30	27	22	16	8	24	18	10	15	
		HACCP ¹		83	101	169	119	110	35	53	56	39		2	
		Cecal													
	Turkeys	Retail Ground Turkey	2	3	0	1	3	2	0	0	2	0	3	1	
		Cecal												0	
	Cattle	Retail Ground Beef	76	84	88	82	77	57	49	26	41	44	57	38	
		Cecal (Beef)												103	
		Cecal (Dairy)												70	
	Swine	Retail Pork Chops	12	14	14	4	8	6	5	2	7	2	5	2	
		Cecal (Market Hogs)												34	
		Cecal (Sows)												27	
	Resistance Pattern ²	Source													
	1. No Resistance Detected	Chickens	Retail Chickens	0.0%	0.0%	3.7%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HACCP			0	0	1	0	3	0	0	0	0	0	0	0	
Cecal														0.0%	
Turkeys		Retail Ground Turkey	0.0%	0.0%		0.0%	0.0%	0.0%			50.0%		33.3%	0.0%	
		Cecal	0	0		0	0	0			1		1	0	
Cattle		Retail Ground Beef	1.3%	3.6%	6.8%	0.0%	11.7%	0.0%	4.1%	7.7%	4.9%	11.4%	3.5%	2.6%	
		Cecal (Beef)	1	3	6	0	9	0	2	2	2	5	2	1	
		Cecal (Dairy)												2.9%	
Swine		Retail Pork Chops	0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	2	0	0	0	0	0	0	0	0	0	
		Cecal (Sows)												8.8%	
2. Resistance to ≥ 3 Antimicrobial Classes		Chickens	Retail Chickens	66.7%	92.9%	37.0%	50.0%	22.2%	68.2%	37.5%	37.5%	20.8%	16.7%	50.0%	53.3%
			HACCP	8	26	10	15	6	15	6	3	5	3	5	8
			Cecal		67.5%	55.4%	47.3%	56.3%	50.0%	45.7%	66.0%	48.2%	59.0%		50.0%
		Turkeys	Retail Ground Turkey	50.0%	66.7%		0.0%	66.7%	100.0%			50.0%		0.0%	0.0%
			Cecal	1	2		0	2	2			1		0	0
		Cattle	Retail Ground Beef	39.5%	36.9%	15.9%	19.5%	13.0%	17.5%	12.2%	3.9%	14.6%	15.9%	14.0%	21.1%
			Cecal (Beef)	30	31	14	16	10	10	6	1	6	7	8	8
	Cecal (Dairy)													21.4%	
	Swine	Retail Pork Chops	16.7%	14.3%	14.3%	25.0%	12.5%	33.3%	40.0%	0.0%	0.0%	50.0%	20.0%	0.0%	
		Cecal (Market Hogs)	2	2	2	1	1	2	2	0	0	1	1	0	
		Cecal (Sows)												17.7%	
	3. Resistant to ≥ 4 Antimicrobial Classes	Chickens	Retail Chickens	25.0%	67.9%	14.8%	36.7%	14.8%	40.9%	6.3%	12.5%	12.5%	11.1%	30.0%	33.3%
			HACCP	3	19	4	11	4	9	1	1	3	2	3	5
			Cecal		48.2%	28.7%	25.4%	33.6%	30.0%	20.0%	24.5%	14.3%	20.5%		0.0%
		Turkeys	Retail Ground Turkey	50.0%	66.7%		0.0%	66.7%	100.0%			50.0%		0.0%	0.0%
			Cecal	1	2		0	2	2			1		0	0
		Cattle	Retail Ground Beef	14.5%	14.3%	6.8%	12.2%	3.9%	5.3%	4.1%	3.9%	7.3%	2.3%	10.5%	13.2%
			Cecal (Beef)	11	12	6	10	3	3	2	1	3	1	6	5
Cecal (Dairy)														12.6%	
Swine		Retail Pork Chops	0.0%	7.1%	7.1%	25.0%	0.0%	16.7%	20.0%	0.0%	0.0%	50.0%	20.0%	0.0%	
		Cecal (Market Hogs)	0	1	1	1	0	1	1	0	0	1	1	0	
		Cecal (Sows)												8.8%	
4. Resistant to ≥ 5 Antimicrobial Classes		Chickens	Retail Chickens	16.7%	32.1%	0.0%	20.0%	11.1%	0.0%	0.0%	0.0%	4.2%	11.1%	0.0%	26.7%
			HACCP	2	9	0	6	3	0	0	0	1	2	0	4
			Cecal		28.9%	11.9%	12.4%	13.4%	13.6%	2.9%	11.3%	1.8%	10.3%		0.0%
		Turkeys	Retail Ground Turkey	50.0%	0.0%		0.0%	66.7%	0.0%			0.0%		0.0%	0.0%
			Cecal	1	0		0	2	0			0		0	0
		Cattle	Retail Ground Beef	0.0%	1.2%	1.1%	2.4%	1.3%	1.8%	0.0%	0.0%	0.0%	0.0%	1.8%	5.3%
			Cecal (Beef)	0	1	1	2	1	1	0	0	0	0	1	2
	Cecal (Dairy)													1.0%	
	Swine	Retail Pork Chops	0.0%	0.0%	7.1%	25.0%	0.0%	0.0%	20.0%	0.0%	0.0%	50.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	1	1	0	0	1	0	0	1	0	0	
		Cecal (Sows)												2.9%	

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Resistance patterns do not include daptomycin as there are no established CLSI breakpoints

Table 105b. Resistance Patterns among *Enterococcus hirae* Isolates, 2002-2013

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Number of Isolates Tested	Chickens	Retail Chickens	12	28	27	30	27	22	16	8	24	18	10	15	
		HACCP ¹		83	101	169	119	110	35	53	56	39		2	
		Cecal													
	Turkeys	Retail Ground Turkey	2	3	0	1	3	2	0	0	2	0	3	1	
		Cecal												0	
	Cattle	Retail Ground Beef	76	84	88	82	77	57	49	26	41	44	57	38	
		Cecal (Beef)												103	
		Cecal (Dairy)												70	
	Swine	Retail Pork Chops	12	14	14	4	8	6	5	2	7	2	5	2	
		Cecal (Market Hogs)												34	
		Cecal (Sows)												27	
	Resistance Pattern²	Source													
4. Resistant to ≥ 6 Antimicrobial Classes	Chickens	Retail Chickens	8.3%	0.0%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%	6.7%	
		HACCP	1	0	0	3	0	0	0	0	1	0	0	1	
		Cecal		2.4%	3.0%	1.8%	0.8%	2.7%	0.0%	3.8%	0.0%	2.6%		0.0%	
	Turkeys	Retail Ground Turkey	0.0%	0.0%		0.0%	33.3%	0.0%			0.0%		0.0%	0.0%	
		Cecal	0	0		0	1	0			0		0	0	
	Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Beef)	0	0	0	1	0	0	0	0	0	0	0	0	
		Cecal (Dairy)												0.0%	
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	0	1	0	0	0	0	0	0	0	0	
		Cecal (Sows)												2.9%	
	6. At Least Pencillin G and High Level Gentamicin	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%
			HACCP	0	0	0	0	0	1	0	0	0	0	0	1
			Cecal		3.6%	1.0%	1.2%	0.8%	0.9%	0.0%	0.0%	1.8%	2.6%		0.0%
		Turkeys	Retail Ground Turkey	0.0%	0.0%		0.0%	33.3%	0.0%			0.0%		0.0%	0.0%
			Cecal	0	0		0	1	0			0		0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
Cecal (Dairy)														0.0%	
Swine		Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Sows)												0.0%	
7. At Least Pencillin G High Level Gentamicin, and Linezolid Resistant		Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0	0	0	0	0	0	0	0	0	0	0	
			Cecal		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
		Turkeys	Retail Ground Turkey	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%		0.0%	0.0%
			Cecal	0	0		0	0	0			0		0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
	Cecal (Dairy)													0.0%	
	Swine	Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Sows)												0.0%	
	8. At Least Pencillin G, High Level Gentamicin, and Tigecycline Resistant	Chickens	Retail Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
			HACCP	0	0	0	0	0	0	0	0	0	0	0	
			Cecal		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
		Turkeys	Retail Ground Turkey	0.0%	0.0%		0.0%	0.0%	0.0%			0.0%		0.0%	0.0%
			Cecal	0	0		0	0	0			0		0	0
		Cattle	Retail Ground Beef	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			Cecal (Beef)	0	0	0	0	0	0	0	0	0	0	0	0
Cecal (Dairy)														0.0%	
Swine		Retail Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cecal (Market Hogs)	0	0	0	0	0	0	0	0	0	0	0	0	
		Cecal (Sows)												0.0%	

¹ In 2012 and 2013, chicken carcass rinsates were not sampled for *Enterococcus*

² Resistance patterns do not include daptomycin as there are no established CLSI breakpoints

Appendix A

Table A1. Concentration Ranges Used for Susceptibility Testing of *Salmonella* and *E. coli*, 2012-2013

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
Aminoglycosides	Gentamicin	0.25 - 16
	Kanamycin ¹	8 - 64
	Streptomycin ²	32 - 64
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	1 / 0.5 - 32 / 16
Cephems	Cefoxitin	0.5 - 32
	Ceftiofur	0.12 - 8
	Ceftriaxone	0.25 - 64
Folate Pathway Inhibitors	Sulfisoxazole	16 - 256
	Trimethoprim–Sulfamethoxazole	0.12 / 2.4 - 4 / 76
Macrolides	Azithromycin	0.12 - 16
Penicillins	Ampicillin	1 - 32
Phenicol	Chloramphenicol	2 - 32
Quinolones	Ciprofloxacin	0.015 - 4
	Nalidixic acid	0.5 - 32
Tetracyclines	Tetracycline	4 - 32

Table A2. Concentration Ranges Used for Susceptibility Testing of *Campylobacter*, 2012-2013

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
Aminoglycosides	Gentamicin	0.12 - 32
Ketolides	Telithromycin	0.015 - 8
Lincosamides	Clindamycin	0.03 - 16
Macrolides	Azithromycin	0.015 - 64
	Erythromycin	0.03 - 64
Phenicol	Florfenicol	0.03 - 64
Quinolones	Ciprofloxacin	0.015 - 64
	Nalidixic acid	4 - 64
Tetracyclines	Tetracycline	0.06 - 64

Table A3. Concentration Ranges Used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli* Resistant to Ceftriaxone or Ceftiofur, 2011-2013

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	0.5 - 128
Cephems	Cefepime	0.125 - 32
	Cefotaxime	0.125 - 128
	Ceftazidime	0.125 - 128
Monobactams	Aztreonam	0.125 - 32
Penems	Imipenem	0.125 - 16

Table A4. Concentration Ranges Used for Susceptibility Testing of *Enterococcus*, 2012-2013

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
Aminoglycosides	Gentamicin	128 - 1024
	Kanamycin	128 - 1024
	Streptomycin	512 - 2048
Glycopeptides	Vancomycin	0.25 - 32
Glycylcyclines	Tigecycline	0.015 - 0.5
Lincosamides	Lincomycin	1 - 8
Lipopeptides	Daptomycin	0.25 - 16
Macrolides	Erythromycin	0.25 - 8
	Tylosin	0.25 - 32
Nitrofurans	Nitrofurantoin	2 - 64
Oxazolidinones	Linezolid	0.5 - 8
Penicillins	Penicillin	0.25 - 16
Phenicol	Chloramphenicol	2 - 32
Quinolones	Ciprofloxacin	0.12 - 4
Streptogramins	Quinupristin-Dalfopristin	0.5 - 32
Tetracyclines	Tetracycline	1 - 32

Appendix B

Table B1. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Salmonella* and *E. coli* Isolates, 1996-2013^{1,2}

Antimicrobial Class	Method Sensititre® Plate Name	Broth Microdilution																	
		CMV1CCDC ³ CMV3CNCD	CMV3CNCD		CMV4CNCD	CMV5CNCD	CMV6CNCD	CMV7CNCD		CMV1AGNF							CMV2AGNF		
		Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Antimicrobial Class	Antimicrobial Agent																		
Aminocyclitols	Apramycin	√	√	√	√	√	√												
Aminoglycosides	Amikacin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			
	Gentamicin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Kanamycin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Streptomycin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Cephems	Cefoxitin					√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Ceftiofur	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Ceftriaxone	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Cephalothin	√	√	√	√	√	√	√	√										
Coumarins	Novobiocin	√																	
Folate Pathway Inhibitors	Sulfamethoxazole	√	√	√	√	√	√	√	√										
	Sulfisoxazole									√	√	√	√	√	√	√	√	√	√
	Trimethoprim–Sulfamethoxazole	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Macrolides	Azithromycin																√	√	√
Penems	Imipenem							√											
Penicillins	Ampicillin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Ticarcillin	√	√	√															
Phenicol	Chloramphenicol	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Florfenicol				√														
Quinolones	Ciprofloxacin	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Nalidixic acid	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Tetracyclines	Tetracycline	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

¹ Testing of *Salmonella* isolates from humans, food animals, and retail meats began in 1996, 1997, and 2002, respectively
² Testing of *E. coli* isolates from chickens and retail meats began in 2000 and 2002, respectively. Testing of *E. coli* O157 isolates from humans began in 1996 and a study of *E. coli* isolates from people in the community began in 2004
³ In 1996, most isolates were tested using Sensititre® plate CMV1CCDC, but a few isolates were tested using Sensititre® plate CMV3CNCD

Table B2. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Campylobacter* Isolates from Humans and Chickens, 1997-2013¹

Antimicrobial Class	Method	Year	E-Test [®]								Broth Microdilution Sensititre [®] Plate: CAMPY								
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Antimicrobial Class	Antimicrobial Agent																		
Aminoglycosides	Gentamicin			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Ketolides	Telithromycin										√	√	√	√	√	√	√	√	√
Lincosamides	Clindamycin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Macrolides	Azithromycin			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Erythromycin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Penems	Meropenem																		
Phenolics	Chloramphenicol		√	√	√	√	√	√	√										
	Florfenicol									√	√	√	√	√	√	√	√	√	√
Quinolones	Ciprofloxacin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Nalidixic acid		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Tetracyclines	Doxycycline																		
	Tetracycline		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

¹ Testing of *Campylobacter* isolates from humans and chickens began in 1997 and 1998, respectively

Table B3. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Campylobacter* Isolates from Retail Meats, 2002-2013

Antimicrobial Class	Method	Year	Agar Dilution				Broth Microdilution Sensititre [®] Plate: CAMPY												
			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013					
Antimicrobial Class	Antimicrobial Agent																		
Aminoglycosides	Gentamicin					√	√	√	√	√	√	√	√	√	√	√	√	√	√
Ketolides	Telithromycin							√	√	√	√	√	√	√	√	√	√	√	√
Lincosamides	Clindamycin							√	√	√	√	√	√	√	√	√	√	√	√
Macrolides	Azithromycin								√	√	√	√	√	√	√	√	√	√	√
	Erythromycin							√	√	√	√	√	√	√	√	√	√	√	√
Penems	Meropenem							√	√										
Phenolics	Chloramphenicol																		
	Florfenicol							√	√	√	√	√	√	√	√	√	√	√	√
Quinolones	Ciprofloxacin							√	√	√	√	√	√	√	√	√	√	√	√
	Nalidixic acid									√	√	√	√	√	√	√	√	√	√
Tetracyclines	Doxycycline							√	√										
	Tetracycline									√	√	√	√	√	√	√	√	√	√

Table B4. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Enterococcus* Isolates, 2001-2013¹

Antimicrobial Class	Method	Broth Microdilution						
		Sensititre® Plate Name	CMV4ACDC ²	CMV5ACDC	CMV1AGPF	CMV1AGPF ³	CMV2AGPF	CMV3AGPF
		Year	2001	2002 - 2003	2004	2005	2006 - 2008	2009 - 2013
Antimicrobial Agent	Concentration Range (µg/ml)							
Aminoglycosides	Gentamicin	√	√	√	√	√	√	√
	Kanamycin	√	√	√	√	√	√	√
	Streptomycin	√	√	√	√	√	√	√
Glycopeptides	Vancomycin	√	√	√	√	√	√	√
Glycylcyclines	Tigecycline					√		√
Ionophores	Salinomycin	√	√					
Lincosamides	Lincomycin	√	√		√	√	√	√
Lipopeptides	Daptomycin				√	√	√	√
Macrolides	Erythromycin	√	√		√	√	√	√
	Tylosin	√	√		√	√	√	√
Nitrofurans	Nitrofurantoin		√		√	√	√	√
Oxazolidinones	Linezolid		√		√	√	√	√
Penicillins	Penicillin	√	√		√	√	√	√
Phenicols	Chloramphenicol	√	√		√	√	√	√
Phosphoglycolipids	Flavomycin	√	√		√	√	√ ⁴	
Polypeptides	Bacitracin	√	√		√	√		
Quinolones	Ciprofloxacin	√	√		√	√	√	√
Streptogramins	Quinupristin-Dalfopristin	√	√		√	√	√	√
	Virginiamycin							
Tetracyclines	Tetracycline	√	√		√	√	√	√

¹ Testing of *Enterococcus* isolates from retail meats and chickens began in 2002 and 2003, respectively. A study of *Enterococcus* isolates from people in the community began in 2001

² In 2001, most isolates were tested using Sensititre® plate CMV5ACDC, but a few isolates were tested using Sensititre® plate CMV4ACDC

³ In 2005, isolates from chickens and most isolates from humans were tested with Sensititre® plate CMV1AGPF, while isolates from retail meats were tested with Sensititre® plate CMV2AGPF

⁴ Flavomycin was not available for all of the plates used to test isolates from 2008

Table B5. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for *Salmonella* and *E. coli* Resistant to Ceftriaxone or Ceftiofur, 2011-2013

Antimicrobial Class	Antimicrobial Agent	Method														Broth Microdilution		
		Sensititre® Plate Name														CMV2DW		
		Year														2011	2012	2013
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam															√	√	√
Cephems	Cefepime															√	√	√
	Cefotaxime															√	√	√
	Ceftazidime															√	√	√
Monobactams	Aztreonam															√	√	√
Penems	Imipenem															√	√	√