

# EXHIBIT V

**TO DECLARATION OF  
JENNIFER A. SORENSON**

National Antimicrobial Resistance Monitoring System  
2009 Retail Meat Report



# 2009

## Retail Meat Report

**National Antimicrobial Resistance Monitoring System**



# NARMS

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## ABBREVIATIONS USED IN THE REPORT, 2009

### General Abbreviations

AR	Antimicrobial Resistance
BAP	Blood Agar Plate
CCA	Campy-Cefex Agar Plate
CDC	Centers for Disease Control and Prevention
CLSI	Clinical and Laboratory Standards Institute
CVM	Center for Veterinary Medicine
EAP	Enterococcosel Agar Plate
EIP	Emerging Infections Program
EMB	Eosin Methylene Blue
FDA	Food and Drug Administration
FoodNet	Foodborne Diseases Active Surveillance Network
MIC	Minimum Inhibitory Concentration
NARMS	National Antimicrobial Resistance Monitoring System
PCR	Polymerase Chain Reaction
PFGE	Pulsed Field Gel Electrophoresis
PulseNet	National Molecular Subtyping Network for Foodborne Disease Surveillance
QC	Quality Control
RVR10	Rappaport-Vassiliadis Medium
USDA	United States Department of Agriculture
XLD	Xylose Lysine Deoxycholate

### Antimicrobial Abbreviations

AMC	Amoxicillin/Clavulanic Acid	GEN	Gentamicin
AMI	Amikacin	KAN	Kanamycin
AMP	Ampicillin	LIN	Lincomycin
AXO	Ceftriaxone	LZD	Linezolid
AZI	Azithromycin	NAL	Nalidixic Acid
CHL	Chloramphenicol	NIT	Nitrofurantoin
CIP	Ciprofloxacin	PEN	Penicillin
CLI	Clindamycin	QDA	Quinupristin/Dalfopristin
COT	Trimethoprim/Sulfamethoxazole	STR	Streptomycin
DAP	Daptomycin	TEL	Telithromycin
DOX	Doxycycline	TET	Tetracycline
ERY	Erythromycin	TGC	Tigecycline
FFN	Florfenicol	TYL	Tylosin
FIS	Sulfisoxazole	TIO	Ceftiofur
FOX	Cefoxitin	VAN	Vancomycin

### Meat Types Abbreviations

CB	Chicken Breast	GT	Ground Turkey
GB	Ground Beef	PC	Pork Chop

### State Abbreviations

CA	California	NM	New Mexico
CO	Colorado	NY	New York
CT	Connecticut	OR	Oregon
GA	Georgia	PA	Pennsylvania
MD	Maryland	TN	Tennessee
MN	Minnesota		

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## NARMS Retail Meat Annual Report 2009

### Introduction

The primary purpose of the NARMS retail meat surveillance program is to monitor the prevalence of antimicrobial resistance among foodborne bacteria, specifically, *Salmonella*, *Campylobacter*, *Enterococcus* and *Escherichia coli*. The results generated by the NARMS retail meat program serve as a reference point for identifying and analyzing trends in antimicrobial resistance among these organisms.

NARMS retail meat surveillance is an ongoing collaboration between the U.S. Food and Drug Administration/Center for Veterinary Medicine (FDA/CVM), the Centers for Disease Control and Prevention (CDC), the 2009 FoodNet laboratories and an additional State Department of Public Health Laboratory: California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, Tennessee, and Pennsylvania. From January to December, each site purchased approximately 40 food samples per month, which are comprised of 10 samples each from chicken breast, ground turkey, ground beef, and pork chops. All sites culture the meat and poultry samples for *Salmonella* and only poultry samples are cultured for *Campylobacter*. In 2009, 3 of the 10 participating FoodNet laboratories (Georgia, Oregon, and Tennessee) also cultured meat and poultry samples for *E. coli* and *Enterococcus*. Bacterial isolates were sent to FDA/CVM for confirmation of species and serotypes, antimicrobial susceptibility testing, and genetic analysis.

As a public health monitoring system, the primary objectives of NARMS are to:

- Monitor trends in antimicrobial resistance among foodborne bacteria from humans, retail meats, and animals
- Disseminate timely information on antimicrobial resistance to promote interventions that reduce resistance among foodborne bacteria
- Conduct research to better understand the emergence, persistence, and spread of antimicrobial resistance
- Assist the FDA in making decisions related to the approval of safe and effective antimicrobial drugs for animals

## What is New in the NARMS Retail Meat Report for 2009

A total of 5,280 meat samples were collected in 2009, compared with 5,236 in 2008. The Pennsylvania Department of Public Health Laboratory joined the NARMS retail meat surveillance program in 2008 but was only testing meat samples for *Salmonella*. As of 2009, Pennsylvania has increased their testing to include *Campylobacter* isolation from poultry samples.

In 2008, both CMV2AGPF and CMV3AGPF Sensititre™ plates were used for *Enterococcus* testing and the smaller range from either plate was used in the report. In 2009, all *Enterococcus* testing were performed using the CMV3AGPF Sensititre™ plate. Resistance data for flavomycin was excluded from this report as the new CMV3AGPF plate does not include this antimicrobial. Flavomycin resistance data can be found in prior NARMS Retail Meat Reports. The CMV3AGPF range of dilutions tested expanded for daptomycin, erythromycin, penicillin, quinupristin-dalfopristin and tetracycline, while ranges decreased for lincomycin and vancomycin.

Prior to 2009 NARMS reports used ceftiofur (an extended-spectrum cephalosporin used in food animals) to represent resistance to third-generation cephalosporins in the multidrug resistance patterns. In 2009 ceftriaxone replaced ceftiofur in the multidrug resistance patterns presented in this report, resulting from revised ceftriaxone breakpoints where ceftriaxone resistance (MIC  $\geq 4$   $\mu\text{g/ml}$ ) is nearly identical to ceftiofur resistance.

A new table (Table 6.) was added to the *Salmonella* multidrug resistance section of this report. This table highlights the number of resistant isolates by *Salmonella* serotype for each retail meat. This table is very useful for comparing the distribution of *Salmonella* serotype specific resistance among the different classes of antimicrobials. *Salmonella* antigenic formulas I 4,12:i:- and I 4,5,12:i:- were included with serotype I 4,[5],12:i:- to correspond with the NARMS Executive Report.



## Highlights of the NARMS Retail 2009 Report

### Salmonella<sup>1</sup>

*Salmonella* serotypes Typhimurium, Saintpaul, and Heidelberg account for 53% of retail meat isolates (Table 4). *S. Typhimurium* and *S. Saintpaul* increased markedly from an average of 11.4% and 8.9% from 2002–2008 to 25.6% and 16.4% in 2009, respectively. In 2009 *S. Saintpaul* became the most common serotype in ground turkey. Also never seen before was a higher prevalence of *S. Heidelberg* among chicken breast over ground turkey. *S. Heidelberg* prevalence among all retail meat continued to decrease from 22.8–11.5% from 2002–2009.

First-line antimicrobial agents recommended for treating salmonellosis are ciprofloxacin, ceftriaxone and trimethoprim-sulfamethoxazole.<sup>2</sup>

- Quinolones - Resistance to nalidixic acid corresponds to decreased fluoroquinolone susceptibility; however, fluoroquinolone resistance has never been detected in *Salmonella* recovered from any retail meat since the program began in 2002. Only 0.8% of *Salmonella* (4/489) were nalidixic acid resistant (Table 5). Nalidixic acid resistance was detected for the first time in ground beef and 2 of 3 ground beef isolates resistant to nalidixic acid were also ceftriaxone resistant.
- Cephalosporins – Third-generation cephalosporin resistance rose in all retail meats compared to 2008, with > 10% increases detected in chicken breast.
- There were highly significant increases in ampicillin resistance among chicken breast (16.7–45.8%) and ground turkey isolates (16.2–57.9%) from 2002 to 2009.
- Trimethoprim-Sulfamethoxazole - Resistance to this antimicrobial is extremely rare and 6 (of 489) isolates were resistant in 2009 compared to only 1 in 2008.
- Multidrug Resistance – 48.4% of chicken breast isolates were resistant to ≥ 3 antimicrobial classes in 2009 compared to 26.3% in ground turkey, which is an increase in chicken breast from previous years (ranging 20–38.2%). More than 30% of chicken breast isolates showed resistance to ≥ 5 classes in 2009 (Table 8), to which *S. Typhimurium* accounts for more than half of them (Table 6).
- *Salmonella* isolates susceptible to all antimicrobials (Table 8) decreased in chicken breast (45.7–29.2%), ground beef (79.2–57.1%), and pork chops (65.2–50%) from 2008 to 2009. Meanwhile, *Salmonella* pansusceptibility slightly increased among ground turkey (20.8–22.1%) isolates.

### Campylobacter<sup>3</sup>

More than 90% of *Campylobacter* are recovered from chicken breast each year and of those isolates, the proportion of *C. jejuni* to *C. coli* is about 2:1 (Table 10).

Macrolides and fluoroquinolones are used in the treatment of *Campylobacter* infections. It is well known that *C. coli* tend to be more resistant than *C. jejuni* regardless of source, and this is reflected in the 2009 NARMS retail data with the exception of quinolones and tetracycline.

- Macrolide resistance in chicken breast isolates was seen in 4.5% of *C. coli* and 1% of *C. jejuni* in 2009, with no significant changes over time (Table 13).

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<sup>1</sup> Nearly all salmonellae were recovered from poultry. Due to the low recovery from ground beef and pork chops (< 2%), statistical analysis of trends in resistance from these sources should be considered with caution.

<sup>2</sup> IDSA, Practice Guidelines for the Management of Infectious Diarrhea. *Clinical Infectious Diseases* 2001; 32:331–50.

<sup>3</sup> Ground beef and pork chop samples are no longer cultured for *Campylobacter*, due to their low recovery (<0.5%) from 2002–2007.

- Ciprofloxacin resistance in *C. coli* from chicken breast rose from 10% in 2002 to its highest peak of 29.1% in 2005. Since the fluoroquinolone ban in September 2005, ciprofloxacin resistance in *C. coli* has decreased to 18.4% in 2009 (Table 13), while *C. jejuni* significantly increased from 15.2–21.1% from 2002 to 2009 ( $p=0.0296$ ).
- Tetracycline resistance decreased in both *C. jejuni* (49.8–46.2%) and *C. coli* (46.4–38%) compared to 2008.
- Gentamicin resistance in *C. coli* has increased with 5.6% in 2009, up from 1.7% in 2008 ( $p<0.0001$ ).
- Multidrug resistance is rare in *Campylobacter*. There were only 9 (of 606) *Campylobacter* isolates resistant to  $\geq 3$  antimicrobial classes in 2009 (Table 14).

#### Enterococcus

*E. faecalis* (67.6% [884/1307]) was more prevalent than *E. faecium* (27% [353/1307]) in 2009 (Table 16). Chicken breast was the only meat type where *E. faecium* was more prevalent than *E. faecalis*.

*Enterococcus* is used as a sentinel for antibiotic selection pressures by compounds with gram-positive activity. This spectrum of activity is exhibited by many antimicrobials used in food animal production; and the same classes of antibiotics are also used to treat human infections.

- No isolates were resistant to vancomycin or linezolid. These classes of compounds are critically important in human medicine but are not used in food animal production (Table 17).
- Since 2002, streptogramin resistance has decreased in ground beef (46.2–13%) and pork chop (27.2–11.4%) but has remained above 50% in poultry isolates.
- *E. faecalis* from poultry showed markedly higher aminoglycoside and macrolide resistance than *E. faecium*, with exception of streptomycin. *E. faecium* had much higher resistance to nitrofurantoin, penicillin and ciprofloxacin from all sources compared to *E. faecalis* (Table 18a-b).
- Multidrug resistance from 2002–2009 was highest in *E. faecium* isolates from poultry which more than doubled the amount of multidrug resistant *E. faecalis* (Table 19a-b).

#### Escherichia coli

*E. coli* are common in all retail meat products tested in NARMS. Nearly 71% of the 1,440 retail meats tested in 2009 were culture positive for *E. coli*, with pork chops having the lowest prevalence (40.8%) and chicken breasts the highest (87.5%).

- Ceftriaxone resistance among *E. coli* isolates from chicken breast is consistently higher than any other retail meat tested. Chicken breast (7.8–12.4%), Ground turkey (1.3–6.9%), and pork chop (0.5–6.8%) had statistically significant trends in ceftriaxone resistance from 2002–2009 at the  $p < 0.05$  level (Table 22).
- Ciprofloxacin resistance remained low ( $< 1.0\%$ ) among *E. coli* isolates (Table 22).
- From 2002–2005, nalidixic acid resistance in *E. coli* from chicken breast increased from 2.8–6.6% and increased in ground turkey from 4.3–10.4%. Since the fluoroquinolone ban in September 2005, resistance has decreased to 2.9% in chicken breast and 2.6% in ground turkey (Table 22). Nalidixic acid resistance in ground beef and pork chops remains  $< 2\%$ .
- Gentamicin resistance is much higher in retail poultry isolates ( $> 20\%$ ) than ground beef and pork chop isolates ( $< 5\%$ ), with a statistically significant increase among chicken breast at the  $p < 0.05$  level (Table 22).
- A highly statistically significant trend ( $p<0.0001$ ) in ampicillin resistance was seen among ground turkey with 56.2% resistance in 2009, up from 31.3% in 2002.

**Table 3. Percent Positive Samples by Bacterium and Meat Type, 2002-2009**

2002	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (2513)	616	288	(46.8)	642	4	(1.0)	642	-	-	613	5	(0.8)
<i>Salmonella</i> (2513)	616	60	(9.7)	642	74	(11.5)	642	9	(1.4)	613	10	(1.6)
<i>Enterococcus</i> (1574)	390	381	(97.7)	395	387	(98.0)	399	383	(96.0)	390	369	(94.6)
<i>Escherichia coli</i> (1574)	390	282	(72.3)	395	304	(77.0)	399	295	(73.9)	390	184	(47.2)

2003	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (3533)	897	469	(52.3)	857	5	(0.6)	880	1	(0.1)	899	4	(0.4)
<i>Salmonella</i> (3533)	897	83	(9.3)	857	114	(13.3)	880	10	(1.1)	899	5	(0.6)
<i>Enterococcus</i> (1873)	477	466	(97.7)	447	418	(93.5)	470	432	(91.9)	479	426	(88.9)
<i>Escherichia coli</i> (1873)	477	396	(83.0)	447	333	(74.5)	470	311	(66.2)	479	218	(45.5)

2004	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (4699)	1172	706	(60.2)	1165	12	(1.0)	1186	-	-	1176	3	(0.3)
<i>Salmonella</i> (4699)	1172	157	(13.4)	1165	142	(12.2)	1186	14	(1.2)	1176	11	(0.9)
<i>Enterococcus</i> (1900)	476	466	(97.9)	466	437	(93.8)	480	448	(93.3)	478	404	(84.5)
<i>Escherichia coli</i> (1900)	476	400	(84.0)	466	376	(80.7)	480	338	(70.4)	478	232	(48.5)

2005	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (4777)	1190	554	(46.6)	1195	20	(1.7)	1196	-	-	1196	2	(0.2)
<i>Salmonella</i> (4781)	1194	153	(12.8)	1195	183	(15.3)	1196	8	(0.7)	1196	9	(0.8)
<i>Enterococcus</i> (1880)	470	457	(97.2)	470	452	(96.2)	470	447	(95.1)	470	409	(87.0)
<i>Escherichia coli</i> (1871)	468	393	(84.0)	470	396	(84.3)	468	316	(67.5)	465	205	(44.1)

2006	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (4766)	1193	572	(47.9)	1185	24	(2.0)	1196	-	-	1192	3	(0.3)
<i>Salmonella</i> (4769)	1196	152	(12.7)	1185	159	(13.4)	1196	19	(1.6)	1192	8	(0.7)
<i>Enterococcus</i> (1893)	478	469	(98.1)	465	435	(93.5)	478	438	(91.6)	472	389	(82.4)
<i>Escherichia coli</i> (1884)	475	418	(88.0)	466	388	(83.3)	471	295	(62.6)	472	182	(38.6)

2007	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (4278)	1070	475	(44.4)	1065	34	(3.2)	1071	5	(0.5)	1072	4	(0.4)
<i>Salmonella</i> (4282)	1072	99	(9.2)	1066	190	(17.8)	1071	13	(1.2)	1073	18	(1.7)
<i>Enterococcus</i> (1407)	351	342	(97.4)	348	341	(98.0)	352	336	(95.5)	356	313	(87.9)
<i>Escherichia coli</i> (1379)	342	299	(87.4)	338	315	(93.2)	343	256	(74.6)	356	152	(42.7)

2008	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (2379)	1190	510	(42.9)	1189	31	(2.6)						
<i>Salmonella</i> (5236)	1310	199	(15.2)	1309	245	(18.7)	1310	24	(1.8)	1307	23	(1.8)
<i>Enterococcus</i> (1440)	360	346	(96.1)	360	345	(95.8)	360	336	(93.3)	360	310	(86.1)
<i>Escherichia coli</i> (1440)	360	306	(85.0)	360	300	(83.3)	360	250	(69.4)	360	146	(40.6)

2009	Chicken Breast			Ground Turkey			Ground Beef			Pork Chop		
	N	n	(%)	N	n	(%)	N	n	(%)	N	n	(%)
<i>Campylobacter</i> (2640)	1320	582	(44.1)	1320	24	(1.8)						
<i>Salmonella</i> (5280)	1320	277	(21.0)	1320	190	(14.4)	1320	14	(1.1)	1320	8	(0.6)
<i>Enterococcus</i> (1440)	360	349	(96.9)	360	328	(91.1)	360	327	(90.8)	360	303	(84.2)
<i>Escherichia coli</i> (1440)	360	315	(87.5)	360	306	(85.0)	360	247	(68.6)	360	147	(40.8)

A = Total number of meat sampled  
 N = Number of samples tested  
 n = Number of isolates  
 Where % = Number of isolates (n) / number of samples per meat type (N)  
 Dashes indicate no positive isolates.  
 Gray area indicates not tested.

Table 5. Trends in Antimicrobial Resistance among *Salmonella* by Meat Type, 2002-2009<sup>1</sup>

Meat Type	Year (N)	Aminoglycosides				Penicillins	β-Lactamase Inhibitor Combinations	Cepheems			Folate Pathway Inhibitors		Phenicol	Quinolones		Tetra-cyclines
		AMI (MIC ≥ 64)	GEN (MIC ≥ 16)	KAN (MIC ≥ 64)	STR (MIC ≥ 64)	AMP (MIC ≥ 32)	AMC (MIC ≥ 32)	TIO (MIC ≥ 32)	AXO (MIC ≥ 4)	FOX (MIC ≥ 32)	FIS <sup>2</sup> (MIC ≥ 512)	COT (MIC ≥ 4)	CHL (MIC ≥ 512)	CIP (MIC ≥ 4)	NAL (MIC ≥ 32)	TET (MIC ≥ 16)
Chicken Breast	2002 (60)	–	10.0%	6.7%	28.3%	16.7%	10.0%	10.0%	10.0%	16.7%	–	–	–	–	33.3%	
	2003 (83)	–	6.0%	4.8%	26.5%	33.7%	25.3%	26.5%	25.3%	14.5%	–	2.4%	–	1.2%	27.7%	
	2004 (157)	–	3.8%	11.5%	28.0%	30.6%	24.8%	24.8%	24.8%	28.7%	–	1.9%	–	–	46.5%	
	2005 (153)	–	3.3%	4.6%	30.1%	26.8%	21.6%	21.6%	20.9%	17.0%	–	0.7%	–	0.7%	43.8%	
	2006 (152)	–	9.2%	9.9%	36.2%	22.4%	19.1%	19.1%	18.4%	23.0%	1.3%	2.6%	–	0.7%	46.7%	
	2007 (99)	–	6.1%	5.1%	30.3%	18.2%	16.2%	16.2%	15.2%	25.3%	–	1.0%	–	–	41.4%	
	2008 (199)	–	7.0%	10.6%	23.6%	29.2%	22.6%	22.6%	21.6%	39.2%	–	0.5%	–	–	46.7%	
	2009 (277)	–	3.6%	15.2%	23.1%	45.8%	37.2%	36.8%	37.5%	32.5%	48.0%	0.4%	–	–	0.4%	59.9%
	Z Statistic	N/A <sup>4</sup>	<b>0.7344</b>	<b>-2.8960</b>	<b>1.6064</b>	<b>-3.9729</b>	<b>-3.8154</b>	<b>-3.7823</b>	<b>-5.2988</b>	<b>-2.7345</b>	<b>-7.7961</b>	<b>-0.5376</b>	<b>1.8103</b>	N/A	<b>0.5126</b>	<b>-4.9733</b>
P Value <sup>3</sup>	N/A	<b>0.4627</b>	<b>0.0038</b>	<b>0.1082</b>	<b>&lt;0.0001</b>	<b>0.0001</b>	<b>0.0002</b>	<b>&lt;0.0001</b>	<b>0.0062</b>	<b>&lt;0.0001</b>	<b>0.5909</b>	<b>0.0702</b>	N/A	<b>0.6082</b>	<b>&lt;0.0001</b>	
Ground Turkey	2002 (74)	–	14.9%	18.9%	37.8%	16.2%	12.2%	8.1%	8.1%	8.1%	20.3%	1.4%	1.4%	–	8.1%	55.4%
	2003 (114)	–	22.8%	27.2%	45.6%	28.9%	11.4%	2.6%	2.6%	2.6%	33.3%	–	0.9%	–	4.4%	39.5%
	2004 (142)	–	20.4%	18.3%	34.5%	20.4%	7.7%	4.9%	5.6%	4.9%	28.2%	–	2.8%	–	–	56.3%
	2005 (183)	–	26.8%	20.2%	44.3%	26.8%	8.7%	7.1%	7.1%	7.1%	34.4%	0.5%	0.5%	–	1.1%	39.9%
	2006 (159)	–	28.9%	15.1%	40.9%	25.8%	5.0%	5.0%	5.0%	5.0%	32.1%	–	0.6%	–	–	56.0%
	2007 (190)	–	24.7%	23.7%	45.8%	42.6%	5.3%	5.3%	5.8%	5.3%	34.7%	0.5%	1.6%	–	2.6%	67.4%
	2008 (245)	–	27.8%	18.0%	58.8%	50.6%	5.3%	4.5%	4.5%	4.5%	27.4%	0.4%	1.6%	–	0.4%	66.1%
	2009 (190)	–	18.4%	6.8%	27.9%	57.9%	5.8%	5.8%	5.8%	5.8%	20.0%	1.6%	1.6%	–	–	65.3%
	Z Statistic	N/A	<b>-0.7436</b>	<b>3.1403</b>	<b>-0.6484</b>	<b>-9.5415</b>	<b>2.7790</b>	<b>0.1584</b>	<b>0.2268</b>	<b>0.1584</b>	<b>1.3050</b>	<b>-1.1119</b>	<b>-0.2226</b>	N/A	<b>3.9396</b>	<b>-5.5360</b>
P Value	N/A	<b>0.4571</b>	<b>0.0017</b>	<b>0.5167</b>	<b>&lt;0.0001</b>	<b>0.0055</b>	<b>0.8741</b>	<b>0.8206</b>	<b>0.8741</b>	<b>0.1919</b>	<b>0.2662</b>	<b>0.8238</b>	N/A	<b>&lt;0.0001</b>	<b>&lt;0.0001</b>	
Ground Beef	2002 (9)	–	–	–	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	–	22.2%	–	–	22.2%	
	2003 (10)	–	–	–	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	–	40.0%	–	–	40.0%	
	2004 (14)	–	–	–	14.3%	21.4%	14.3%	14.3%	14.3%	14.3%	7.1%	14.3%	–	–	14.3%	
	2005 (8)	–	25.0%	25.0%	25.0%	25.0%	–	–	–	25.0%	–	12.5%	–	–	12.5%	
	2006 (19)	–	–	5.3%	10.5%	10.5%	–	–	–	10.5%	–	5.3%	–	–	21.1%	
	2007 (13)	–	7.7%	–	–	–	–	–	–	7.7%	–	–	–	–	–	
	2008 (24)	–	8.3%	8.3%	20.8%	12.5%	8.3%	8.3%	8.3%	8.3%	–	12.5%	–	–	20.8%	
	2009 (14)	–	14.3%	14.3%	28.6%	28.6%	14.3%	14.3%	14.3%	14.3%	–	21.4%	–	14.3%	42.9%	
	Z Statistic	N/A	<b>-1.5925</b>	<b>-1.4143</b>	<b>0.4633</b>	<b>1.1473</b>	<b>1.9680</b>	<b>1.9680</b>	<b>1.9680</b>	<b>1.9680</b>	<b>0.0221</b>	<b>0.9210</b>	<b>1.2510</b>	N/A	<b>-1.9480</b>	<b>-0.2929</b>
P Value	N/A	<b>0.1113</b>	<b>0.1573</b>	<b>0.6431</b>	<b>0.2513</b>	<b>0.0491</b>	<b>0.0491</b>	<b>0.0491</b>	<b>0.0491</b>	<b>0.9823</b>	<b>0.3571</b>	<b>0.2109</b>	N/A	<b>0.0514</b>	<b>0.7696</b>	
Pork Chop	2002 (10)	–	30.0%	10.0%	70.0%	40.0%	20.0%	20.0%	20.0%	20.0%	20.0%	40.0%	–	–	70.0%	
	2003 (5)	–	–	–	40.0%	40.0%	20.0%	20.0%	20.0%	20.0%	–	40.0%	–	–	80.0%	
	2004 (11)	–	–	9.1%	27.3%	9.1%	–	–	–	18.2%	–	18.2%	–	–	54.5%	
	2005 (9)	–	–	–	33.3%	22.2%	–	–	–	33.3%	11.1%	22.2%	–	–	55.6%	
	2006 (8)	–	50.0%	25.0%	25.0%	25.0%	–	–	–	75.0%	50.0%	–	–	–	25.0%	
	2007 (18)	–	5.6%	5.6%	16.7%	5.6%	–	–	–	16.7%	5.6%	–	–	–	50.0%	
	2008 (23)	–	13.0%	–	13.0%	13.0%	–	–	–	30.4%	–	–	–	–	34.8%	
	2009 (8)	–	–	12.5%	37.5%	37.5%	25.0%	25.0%	25.0%	37.5%	25.0%	12.5%	–	–	37.5%	
	Z Statistic	N/A	<b>0.7698</b>	<b>0.4114</b>	<b>2.7069</b>	<b>1.2488</b>	<b>1.0744</b>	<b>1.0744</b>	<b>1.0744</b>	<b>1.0744</b>	<b>1.5624</b>	<b>0.3396</b>	<b>3.7087</b>	N/A	N/A	<b>2.2864</b>
P Value	N/A	<b>0.4414</b>	<b>0.6808</b>	<b>0.0068</b>	<b>0.2117</b>	<b>0.2827</b>	<b>0.2827</b>	<b>0.2827</b>	<b>0.2827</b>	<b>0.1182</b>	<b>0.7341</b>	<b>0.0002</b>	N/A	N/A	<b>0.0222</b>	

<sup>1</sup> Dashes indicate 0.0% resistance to antimicrobial. Where % resistance = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type).

<sup>2</sup> Sulfisoxazole replaced Sulfamethoxazole on NARMS panel in 2004.

<sup>3</sup> P value for percent resistant trend was calculated using the Cochran-Armitage Trend Test method.

<sup>4</sup> N/A = No Z statistic or P value could be calculated.

Table 8. Multidrug Resistance among *Salmonella* Isolates by Antimicrobial Class, 2002-2009<sup>1</sup>

Year		2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested by Source	Chicken Breast	60	83	157	153	152	99	199	277
	Ground Turkey	74	114	142	183	159	190	245	190
	Ground Beef	9	10	14	8	19	13	24	14
	Pork Chop	10	5	11	9	8	18	23	8
Resistance Pattern <sup>2</sup>	Isolate Source								
1. No Resistance Detected	Chicken Breast	51.7% 31	45.8% 38	40.1% 63	46.4% 71	38.8% 59	47.5% 47	45.7% 91	29.4% 81
	Ground Turkey	37.8% 28	34.2% 39	28.9% 41	30.1% 55	17.6% 28	15.3% 29	20.8% 51	22.1% 42
	Ground Beef	77.8% 7	60.0% 6	78.6% 11	75.0% 6	73.7% 14	92.3% 12	79.2% 19	57.1% 8
	Pork Chop	20.0% 2	20.0% 1	45.5% 5	44.4% 4	25.0% 2	44.4% 8	65.2% 15	50.0% 4
2. Resistant to ≥ 3 Antimicrobial Classes	Chicken Breast	20.0% 12	30.1% 25	34.4% 54	25.5% 39	24.3% 37	25.3% 25	38.2% 76	48.4% 134
	Ground Turkey	20.3% 15	29.0% 33	26.1% 37	29.0% 53	24.5% 39	42.6% 81	51.0% 125	26.3% 50
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	25.0% 2	10.5% 2	– <sup>2</sup>	20.8% 5	35.7% 5
	Pork Chop	60.0% 6	40.0% 2	18.2% 2	22.2% 2	25.0% 2	5.6% 1	17.4% 4	50.0% 4
3. Resistant to ≥ 4 Antimicrobial Classes	Chicken Breast	5.0% 3	16.9% 14	24.2% 38	18.3% 28	15.1% 23	13.1% 13	23.1% 46	34.7% 96
	Ground Turkey	13.5% 10	24.6% 28	12.7% 18	7.7% 14	8.2% 13	14.7% 28	15.1% 37	12.1% 23
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	–	12.5% 3	35.7% 5
	Pork Chop	40.0% 4	40.0% 2	18.2% 2	22.2% 2	25.0% 2	5.6% 1	13.0% 3	25.0% 2
4. Resistant to ≥ 5 Antimicrobial Classes	Chicken Breast	3.3% 2	13.3% 11	22.3% 35	17.7% 27	14.5% 22	12.1% 12	19.1% 38	31.4% 87
	Ground Turkey	12.2% 9	14.0% 16	4.9% 7	2.7% 5	3.1% 5	3.2% 6	2.9% 7	3.7% 7
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	–	12.5% 3	14.3% 2
	Pork Chop	40.0% 4	40.0% 2	9.1% 1	22.2% 2	–	–	–	25.0% 2
5. Resistant to ≥ 6 Antimicrobial Classes	Chicken Breast	–	4.8% 4	5.7% 9	3.9% 6	5.9% 9	4.0% 4	4.0% 8	11.2% 31
	Ground Turkey	10.8% 8	3.5% 4	2.8% 4	2.2% 4	1.9% 3	2.1% 4	2.0% 5	2.6% 5
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	–	–	–	8.3% 2	14.3% 2
	Pork Chop	20.0% 2	40.0% 2	–	–	–	–	–	12.5% 1

<sup>1</sup> Dashes indicate 0.0% resistance.

<sup>2</sup> Cephem class includes Cephalothin for 2002 and 2003.

Table 13. Trends in Antimicrobial Resistance among *Campylobacter* Species from Chicken Breast, 2002-2009<sup>1</sup>

Species	Year (N)		Aminoglycosides	Ketolides	Lincosamides	Macrolides		Phenicols	Quinolones		Tetracyclines <sup>2</sup>
			GEN (MIC ≥ 8)	TEL (MIC ≥ 16)	CLI (MIC ≥ 8)	AZI (MIC ≥ 8)	ERY (MIC ≥ 32)	FFN <sup>3</sup> (MIC > 4)	CIP (MIC ≥ 4)	NAL (MIC ≥ 64)	TET (MIC ≥ 16)
<i>C. jejuni</i>	2002 (198)	n (%R <sup>4</sup> )	–	Not Tested	Not Tested	Not Tested	–	Not Tested	30 (15.2)	Not Tested	76 (38.4)
	2003 (325)		1 (0.3)	Not Tested	Not Tested	Not Tested	–	Not Tested	47 (14.5)	Not Tested	132 (40.6)
	2004 (510)		–	2 (0.4)	2 (0.4)	4 (0.8)	4 (0.8)	–	77 (15.1)	77 (15.1)	256 (50.2)
	2005 (403)		–	2 (0.5)	2 (0.5)	2 (0.5)	2 (0.5)	–	61 (15.1)	60 (14.9)	187 (46.4)
	2006 (426)		–	3 (0.7)	3 (0.7)	4 (0.9)	4 (0.9)	–	71 (16.7)	71 (16.7)	201 (47.2)
	2007 (332)		–	2 (0.6)	2 (0.6)	2 (0.6)	2 (0.6)	–	57 (17.2)	57 (17.2)	161 (48.5)
	2008 (329)		–	1 (0.3)	3 (0.9)	4 (1.2)	4 (1.2)	–	48 (14.6)	48 (14.6)	164 (49.8)
	2009 (403)		–	1 (0.2)	2 (0.5)	4 (1.0)	4 (1.0)	–	85 (21.1)	85 (21.1)	186 (46.2)
	<b>Z Statistic</b>		<b>1.2403</b>	<b>0.4375*</b>	<b>-0.5290*</b>	<b>-0.7058*</b>	<b>-1.9629</b>	<b>N/A<sup>6</sup></b>	<b>-2.1757</b>	<b>-2.0382*</b>	<b>-1.8933</b>
<b>P Value<sup>5</sup></b>		<b>0.2149</b>	<b>0.6617</b>	<b>0.5968</b>	<b>0.4803</b>	<b>0.0497</b>	<b>N/A</b>	<b>0.0296</b>	<b>0.0415</b>	<b>0.0583</b>	
<i>C. coli</i>	2002 (90)	n (%R)	–	Not Tested	Not Tested	Not Tested	7 (7.8)	Not Tested	9 (10.0)	Not Tested	40 (44.4)
	2003 (142)		–	Not Tested	Not Tested	Not Tested	10 (7.0)	Not Tested	19 (13.4)	Not Tested	72 (50.7)
	2004 (196)		–	16 (18.2)	14 (7.1)	18 (9.2)	18 (9.2)	–	32 (16.3)	32 (16.3)	91 (46.4)
	2005 (151)		–	12 (7.9)	13 (8.6)	15 (9.9)	15 (9.9)	–	44 (29.1)	44 (29.1)	64 (42.4)
	2006 (145)		–	7 (4.8)	7 (4.8)	8 (5.5)	8 (5.5)	–	32 (22.1)	30 (20.7)	68 (46.9)
	2007 (143)		1 (0.7)	10 (7.0)	7 (4.9)	9 (6.3)	9 (6.3)	–	37 (25.9)	37 (25.9)	57 (39.9)
	2008 (181)		3 (1.7)	14 (7.7)	9 (5.0)	18 (9.9)	18 (9.9)	–	37 (20.4)	37 (20.4)	84 (46.4)
	2009 (179)		10 (5.6)	8 (4.5)	6 (3.4)	8 (4.5)	8 (4.5)	–	33 (18.4)	33 (18.4)	68 (38.0)
	<b>Z Statistic</b>		<b>-4.8698</b>	<b>1.1070*</b>	<b>2.0125*</b>	<b>1.3466*</b>	<b>0.8853</b>	<b>N/A</b>	<b>-2.1215</b>	<b>0.2090</b>	<b>1.6998</b>
<b>P Value</b>		<b>&lt;0.0001</b>	<b>0.2683</b>	<b>0.0442</b>	<b>0.1781</b>	<b>0.3760</b>	<b>N/A</b>	<b>0.0339</b>	<b>0.8344</b>	<b>0.0892</b>	

<sup>1</sup> Dashes indicate 0.0% resistance.

<sup>2</sup> Results for 2002 and 2003 are for Doxycycline.

<sup>3</sup> Percent non susceptible is reported rather than percent resistant as no CLSI breakpoint has been established. NARMS breakpoint established to determine resistance.

<sup>4</sup> % R = the number of resistant isolates (n) / the number of positive isolates (N).

<sup>5</sup> P value for percent resistant for trend was calculated using Cochran-Armitage trend test method.

<sup>6</sup> N/A = Z Statistic and P value could not be calculated due to insufficient data or no resistance observed.

\* Z statistic and P value calculated based on 6 years data.

Table 22. Trends in Antimicrobial Resistance among *Escherichia coli* by Meat Type, 2002-2009<sup>1</sup>

Meat Type	Year (N)	Aminoglycosides				Penicillins	β-Lactamase Inhibitor Combinations	Cepheems			Folate Pathway Inhibitors		Phenicols	Quinolones		Tetra-cyclines
		AMI (MIC ≥ 64)	GEN (MIC ≥ 16)	KAN (MIC ≥ 64)	STR (MIC ≥ 64)	AMP (MIC ≥ 32)	AMC (MIC ≥ 32)	TIO (MIC ≥ 32)	AXO (MIC ≥ 4)	FOX (MIC ≥ 32)	FIS <sup>2</sup> (MIC ≥ 512)	COT (MIC ≥ 4)	CHL (MIC ≥ 512)	CIP (MIC ≥ 4)	NAL (MIC ≥ 32)	TET (MIC ≥ 16)
Chicken Breast	2002 (282)	–	23.1%	6.0%	49.3%	21.6%	12.1%	7.1%	7.8%	11.0%	32.3%	3.6%	0.7%	–	2.8%	46.1%
	2003 (396)	–	29.3%	6.8%	56.1%	25.3%	13.6%	7.6%	9.1%	9.3%	38.4%	7.1%	–	–	4.0%	42.9%
	2004 (400)	–	30.0%	6.8%	56.8%	17.0%	10.0%	5.8%	6.5%	8.3%	41.3%	4.3%	1.8%	–	7.0%	48.0%
	2005 (393)	–	37.7%	7.1%	50.6%	24.7%	12.2%	8.7%	10.2%	11.2%	48.1%	7.4%	0.5%	–	6.6%	46.6%
	2006 (418)	–	37.3%	11.5%	48.1%	20.1%	11.5%	8.6%	9.1%	11.2%	46.9%	8.9%	2.6%	–	5.0%	50.5%
	2007 (299)	–	34.4%	9.0%	46.8%	18.1%	7.4%	6.0%	6.4%	7.4%	42.1%	5.0%	2.0%	–	3.0%	40.5%
	2008 (306)	–	34.0%	6.9%	43.8%	23.5%	11.8%	10.8%	11.1%	11.8%	39.2%	3.6%	1.0%	–	2.9%	43.8%
	2009 (315)	–	34.3%	5.4%	38.1%	22.2%	13.3%	11.7%	12.4%	13.3%	40.6%	2.2%	0.6%	0.3%	2.9%	41.6%
	Z Statistic	N/A <sup>3</sup>	-1.8718	-0.4489	5.0655	0.2597	0.4139	-2.5399	-1.9681	-1.3229	-1.7099	1.4534	-1.0737	-1.6400	1.4100	1.1513
P Value <sup>4</sup>	N/A	0.0612	0.6535	<0.0001	0.7951	0.6789	0.0111	0.0491	0.1859	0.0873	0.1461	0.2830	0.1010	0.1585	0.2496	
Ground Turkey	2002 (304)	–	27.0%	13.2%	57.6%	31.3%	5.6%	1.0%	1.3%	3.3%	48.0%	4.0%	0.3%	–	4.3%	77.0%
	2003 (333)	–	29.7%	16.8%	54.7%	35.7%	3.0%	0.3%	0.3%	1.2%	51.7%	6.9%	3.6%	0.3%	11.7%	77.8%
	2004 (376)	–	29.3%	16.0%	49.2%	33.2%	5.3%	1.1%	1.3%	4.5%	48.4%	3.7%	0.8%	0.8%	10.6%	74.2%
	2005 (396)	–	27.5%	11.4%	43.4%	38.1%	3.8%	1.8%	2.3%	3.3%	48.0%	5.1%	4.0%	–	10.4%	78.0%
	2006 (388)	–	29.6%	14.7%	43.8%	42.0%	6.7%	3.1%	3.1%	6.2%	48.5%	8.0%	2.3%	0.5%	5.2%	76.5%
	2007 (315)	–	27.0%	15.6%	44.8%	48.3%	6.3%	6.0%	6.0%	6.3%	48.9%	7.9%	2.9%	0.3%	2.2%	80.0%
	2008 (300)	–	37.0%	19.0%	57.3%	58.0%	8.3%	3.7%	3.7%	6.3%	51.0%	5.3%	3.7%	–	3.7%	85.7%
	2009 (306)	–	37.9%	20.6%	57.5%	56.2%	9.8%	6.2%	6.9%	7.8%	53.9%	5.9%	3.3%	0.7%	2.6%	82.0%
	Z Statistic	N/A	-3.1541	-2.3795	0.0369	-9.2751	-3.6245	-5.8556	-5.7139	-4.2615	-1.0620	-1.3181	-2.1290	-0.4651	4.7865	-3.0311
P Value	N/A	0.0016	0.0173	0.9705	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.2882	0.1874	0.0333	0.6419	<0.0001	0.0024	
Ground Beef	2002 (295)	–	0.3%	2.4%	9.5%	6.1%	2.0%	–	–	1.4%	9.8%	0.7%	1.0%	–	–	30.9%
	2003 (311)	–	1.0%	2.9%	9.0%	5.1%	2.3%	0.3%	0.3%	0.3%	10.3%	0.3%	2.3%	–	1.0%	25.1%
	2004 (338)	–	0.6%	2.4%	11.8%	5.3%	3.9%	0.9%	1.5%	1.2%	13.0%	0.6%	3.6%	–	1.5%	22.8%
	2005 (316)	–	–	0.6%	5.4%	3.5%	1.3%	0.6%	1.9%	1.0%	7.0%	0.6%	1.6%	–	1.3%	16.5%
	2006 (295)	–	4.1%	4.7%	14.2%	9.2%	2.4%	1.0%	1.7%	2.0%	12.5%	1.4%	1.4%	–	0.7%	25.4%
	2007 (256)	–	–	1.6%	6.3%	6.6%	0.8%	0.8%	0.8%	0.8%	9.4%	1.2%	3.9%	–	0.4%	21.9%
	2008 (250)	–	2.0%	4.0%	10.4%	6.4%	2.4%	1.6%	1.6%	2.4%	11.6%	2.0%	0.8%	–	0.4%	24.0%
	2009 (247)	–	0.8%	2.0%	8.1%	4.9%	1.6%	0.8%	0.8%	1.6%	7.7%	2.0%	2.4%	–	0.4%	18.6%
	Z Statistic	N/A	-1.4761	-0.4190	0.4405	-0.4781	0.9595	-1.8333	-1.2963	-1.3887	0.5706	-2.5432	-0.2672	N/A	0.5612	2.5861
P Value	N/A	0.1615	0.6752	0.6596	0.6326	0.3373	0.0668	0.1949	0.1649	0.5683	0.0110	0.7893	N/A	0.5747	0.0097	
Pork Chop	2002 (184)	–	1.1%	5.4%	22.3%	13.6%	5.4%	0.5%	0.5%	3.3%	12.5%	1.1%	1.6%	–	0.5%	52.7%
	2003 (218)	–	1.4%	8.7%	19.7%	13.3%	5.1%	0.9%	0.9%	2.3%	15.1%	2.8%	4.1%	–	0.5%	46.3%
	2004 (232)	–	1.3%	8.2%	21.1%	15.1%	5.6%	0.4%	0.4%	2.2%	19.4%	3.9%	4.3%	–	–	56.0%
	2005 (205)	–	–	7.3%	13.2%	16.1%	2.9%	–	0.5%	1.5%	14.2%	1.5%	3.4%	–	1.5%	45.9%
	2006 (182)	–	1.1%	6.0%	13.7%	15.9%	2.2%	–	0.6%	1.6%	20.3%	2.2%	6.6%	–	0.5%	52.7%
	2007 (152)	–	1.3%	4.6%	13.8%	15.8%	0.7%	0.7%	0.7%	0.7%	11.8%	1.3%	3.9%	–	–	50.0%
	2008 (146)	–	1.4%	6.2%	19.9%	15.1%	3.4%	3.4%	3.4%	3.4%	16.4%	6.2%	3.4%	–	–	54.8%
	2009 (147)	–	4.1%	6.1%	19.7%	11.6%	6.8%	6.8%	6.8%	6.8%	14.3%	2.7%	4.8%	–	–	46.9%
	Z Statistic	N/A	-1.7338	0.8817	1.2484	-0.0126	0.9516	-4.5868	-4.4349	-1.4454	-0.1036	-1.1923	-1.0975	N/A	0.9618	0.1653
P Value	N/A	0.0829	0.3779	0.2119	0.9900	0.3413	<0.0001	<0.0001	0.1483	0.9175	0.2332	0.2724	N/A	0.3362	0.8687	

<sup>1</sup> Dashes indicate 0.0% resistance to antimicrobial. Where % resistance = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type).

<sup>2</sup> Sulfisoxazole replaced Sulfamethoxazole on the NARMS panel in 2004.

<sup>3</sup> N/A = No Z statistic or P value could be calculated.

<sup>4</sup> P value for percent resistant trend was calculated using the Cochran-Armitage Trend Test method.

**Table 24. Multidrug Resistance among *Escherichia coli* Isolates by Antimicrobial Class, 2002-2009<sup>1</sup>**

Year		2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested by Source	Chicken Breast	282	396	400	393	418	299	306	315
	Ground Turkey	304	333	376	396	388	315	300	306
	Ground Beef	295	311	338	316	295	256	250	247
	Pork Chop	184	218	232	205	182	152	146	147
<b>Resistance Pattern<sup>2</sup></b>	<b>Isolate Source</b>								
1. No Resistance Detected		27.0%	20.5%	20.8%	20.6%	23.7%	29.1%	33.3%	34.3%
	Chicken Breast	76	81	83	81	99	87	102	108
	Ground Turkey	16.8%	14.7%	19.1%	16.2%	16.0%	13.0%	8.3%	11.8%
	Ground Turkey	51	49	72	64	62	41	25	36
2. Resistance to ≥ 3 Antimicrobial Classes	Ground Beef	63.1%	66.9%	73.1%	80.4%	71.5%	77.0%	73.2%	78.1%
	Ground Beef	186	208	247	254	211	197	183	193
	Pork Chop	41.3%	44.5%	37.9%	48.8%	42.9%	48.0%	43.8%	51.0%
	Pork Chop	76	97	88	100	78	73	64	75
3. Resistance to ≥ 4 Antimicrobial Classes	Chicken Breast	36.2%	42.2%	35.3%	45.0%	43.3%	33.8%	36.6%	37.5%
	Chicken Breast	102	167	141	177	181	101	112	118
	Ground Turkey	55.6%	55.6%	51.9%	52.8%	55.2%	57.5%	63.7%	66.3%
	Ground Turkey	169	185	195	209	214	181	191	203
4. Resistance to ≥ 5 Antimicrobial Classes	Ground Beef	10.2%	7.4%	10.4%	5.4%	11.5%	9.0%	11.2%	6.9%
	Ground Beef	30	23	35	17	34	23	28	17
	Pork Chop	17.4%	17.9%	21.1%	16.1%	15.9%	15.1%	17.8%	15.0%
	Pork Chop	32	39	49	33	29	23	26	22
5. Resistance to ≥ 6 Antimicrobial Classes	Chicken Breast	13.8%	13.6%	12.5%	12.2%	14.6%	10.4%	13.7%	13.7%
	Chicken Breast	39	54	50	48	61	31	42	43
	Ground Turkey	23.0%	30.0%	24.5%	24.2%	25.8%	27.0%	32.3%	38.9%
	Ground Turkey	70	100	92	96	100	85	97	119
6. Resistance to ≥ 7 Antimicrobial Classes	Ground Beef	1.7%	4.2%	4.7%	1.9%	5.8%	4.7%	4.4%	3.6%
	Ground Beef	5	13	16	6	17	12	11	9
	Pork Chop	5.4%	6.9%	7.8%	4.9%	7.7%	3.3%	7.5%	10.9%
	Pork Chop	10	15	18	10	14	5	11	16
7. Resistance to ≥ 8 Antimicrobial Classes	Chicken Breast	6.0%	7.3%	6.0%	5.9%	7.4%	5.7%	8.2%	6.3%
	Chicken Breast	17	29	24	23	31	17	25	20
	Ground Turkey	9.2%	14.7%	6.9%	6.3%	5.7%	4.1%	6.3%	7.8%
	Ground Turkey	28	49	26	25	22	13	19	24
8. Resistance to ≥ 9 Antimicrobial Classes	Ground Beef	0.3%	2.6%	2.7%	1.0%	2.4%	0.4%	2.0%	1.2%
	Ground Beef	1	8	9	3	7	1	5	3
	Pork Chop	3.3%	2.8%	2.2%	1.5%	3.3%	1.3%	4.1%	5.4%
	Pork Chop	6	6	5	3	6	2	6	8
9. Resistance to ≥ 10 Antimicrobial Classes	Chicken Breast	3.9%	3.5%	3.3%	3.6%	5.3%	3.3%	6.2%	4.4%
	Chicken Breast	11	14	13	14	22	10	19	14
	Ground Turkey	2.6%	4.2%	3.2%	1.8%	3.1%	2.9%	4.0%	3.6%
	Ground Turkey	8	14	12	7	12	9	12	11
10. Resistance to ≥ 11 Antimicrobial Classes	Ground Beef	0.3%	1.3%	2.1%	0.6%	1.7%	— <sup>2</sup>	1.6%	0.4%
	Ground Beef	1	4	7	2	5		4	1
	Pork Chop	1.6%	1.8%	0.4%	0.5%	1.1%	0.7%	2.1%	4.1%
	Pork Chop	3	4	1	1	2	1	3	6

<sup>1</sup> Dashes indicate 0.0% resistance.

<sup>2</sup> Cephem class includes Cephalothin for 2002 and 2003.