

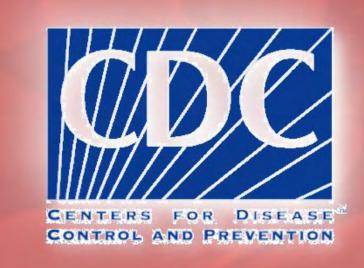
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ational Antimicrobial Resistance Monitoring S ystem

> Executive Report









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I. Introduction

A. Executive Report

This report summarizes, in an integrated format, National Antimicrobial Resistance Monitoring System data on *Salmonella* and *Campylobacter* isolates recovered in 2006 from food animals at federally inspected slaughter and processing plants, retail meats, and human clinical cases. In addition, the report includes susceptibility data for *Escherichia coli* isolates recovered from retail meats and chickens in 2006. Summary data from prior years are also included.

Suggested Citation: FDA. National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS): 2006 Executive Report. Rockville, MD: U.S. Department of Health and Human Services, Food and Drug Administration, 2009.

B. NARMS Program

The National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS) is a national public health surveillance system in the United States that tracks changes in the susceptibility of certain enteric bacteria to antimicrobial agents of human and veterinary medical importance. The NARMS program was established in 1996 as a collaboration between three federal agencies: the U.S. Food and Drug Administration (FDA), the Centers for Disease Control and Prevention (CDC), and the U.S. Department of Agriculture (USDA). NARMS also collaborates with scientists monitoring antimicrobial resistance in other countries.

NARMS monitors antimicrobial susceptibility among enteric bacteria from humans, retail meats, and food animals. Monitoring is conducted for several enteric bacteria, including *Salmonella*, *Campylobacter*, *Escherichia coli*, and *Enterococcus*. Testing of *Salmonella* and *Campylobacter* isolates began in 1996 and 1997, respectively. *E. coli* and *Enterococcus* were later added due to their ubiquitous presence in animals, foods, and humans and their potential to serve as reservoirs of antimicrobial resistance genes for bacterial pathogens.

In addition to monitoring antimicrobial susceptibility, NARMS conducts epidemiologic and microbiologic research studies. Some studies examine isolates of a particular serotype or those exhibiting a particular resistance pattern. Other studies focus on improving culture, isolation, genetic typing, or antimicrobial susceptibility testing methods. Additionally, NARMS examines Salmonella and Campylobacter isolates for genetic relatedness using pulsed-field gel electrophoresis (PFGE). PFGE patterns are entered into CDC's PulseNet database or USDA's VetNet database.

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

C. NARMS Components

The NARMS program has three components which are briefly described below.

1. Human Component

The human component of NARMS was launched in 1996 within the framework of CDC's Emerging Infections Program and the Foodborne Diseases Active Surveillance Network (FoodNet). Initially, it included non-Typhi *Salmonella* and *E. coli* O157 isolates from 14 state and local health departments. Surveillance later expanded to include additional bacteria and testing sites. In 1999, testing of *Salmonella* Typhi and *Shigella* isolates was added. By 2003, NARMS conducted nationwide surveillance for non-Typhi *Salmonella*, *Salmonella* Typhi, *Shigella*, and *E. coli* O157 from humans. Testing of *Campylobacter* isolates from humans began in five FoodNet sites in 1997 and expanded to 10 FoodNet sites by 2003. Antimicrobial susceptibility testing of NARMS human isolates was performed at CDC's laboratories in the National Center for Zoonotic, Vector-Borne, and Enteric Diseases (NCZVED) in Atlanta, Georgia.

2. Retail Meat Component

The retail meat component of NARMS was launched in 2002, following a 15-month pilot study in lowa. Retail meat surveillance was conducted through an ongoing collaboration between FDA's Center for Veterinary Medicine (CVM), CDC, and FoodNet laboratories. Participating FoodNet sites purchased chicken breasts, ground turkey, ground beef, and pork chops at retail stores and cultured them for *Salmonella* and *Campylobacter*. Four sites also cultured retail meats for *E. coli* and *Enterococcus*. Isolates were sent to CVM's Office of Research in Laurel, Maryland for species and serotype confirmation, antimicrobial susceptibility testing, and genetic analysis.

3. Animal Component

Antimicrobial susceptibility testing for the animal component of NARMS was conducted at the USDA's Agricultural Research Service (ARS) Bacterial Epidemiology and Antimicrobial Resistance Research Unit at the Russell Research Center in Athens, Georgia. The animal component of NARMS was launched in 1997 and initially included monitoring of *Salmonella* isolates. The NARMS animal component was later expanded to include monitoring of resistance among *Campylobacter* (1998), *E. coli* (2000), and *Enterococcus* (2003) isolates from chicken carcass rinsates. This report includes data for *Salmonella* isolates from chickens, turkeys, cattle, and swine at slaughter and data for *Campylobacter* and *E. coli* isolates from chicken carcass rinsates. The isolates were recovered from samples obtained at federally inspected slaughter and processing plants.

D. Links to Additional Information

Additional information about NARMS, including comprehensive annual reports for each NARMS component, can be found on the FDA, CDC, and USDA websites listed below. The FDA website also includes NARMS Executive Reports.

FDA: http://www.fda.gov/AnimalVeterinary/SafetyHealth/AntimicrobialResistance/NationalAntimicrobialResistance/NationalAntimicrobialResistanceMonitoringSystem/default.htm

CDC: http://www.cdc.gov/narms

USDA: http://ars.usda.gov/Main/docs.htm?docid=6750

Information about the Foodborne Diseases Active Surveillance Network (FoodNet) can be found on the following CDC website: http://www.cdc.gov/foodnet/

II. Methods

A. Sampling Methodology

Sample collection is an integral part of public health surveillance systems, including NARMS. Because NARMS isolates originate from three distinct sources, sampling strategies differ among the three components of NARMS. Sampling methods for each component are described below.

1. Human Component

Sampling for the human pathogens depends on public health laboratory-based surveillance and is driven by the occurrence of laboratory-confirmed cases. NARMS testing of non-Typhi *Salmonella* began in 1996 with isolates from 14 sites, and by 2003, expanded to include state and local health departments in all 50 states. Participating public health laboratories serotyped the isolates prior to shipment to CDC for susceptibility testing. From 1996 through 2002, participating sites submitted every tenth non-Typhi *Salmonella* they received to CDC for antimicrobial susceptibility testing. Beginning in 2003, participating sites submitted every 20th isolate.

NARMS *Campylobacter* surveillance began in 1997 with five FoodNet sites and expanded to 10 sites (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee) by 2003. From 1997 to 2004, one isolate per week was submitted from each site to CDC. In 2005 and 2006, FoodNet sites submitted all *Campylobacter* isolates (Georgia, Maryland, New Mexico, Oregon, Tennessee), every other isolate (California, Colorado, Connecticut, New York), or every fifth isolate (Minnesota) to NARMS.

2. Retail Meat Component

Retail meat sampling began in January 2002 with FoodNet laboratories in Connecticut, Georgia, Maryland, Minnesota, and Tennessee; Oregon joined in September. FoodNet laboratories in California and New York joined in 2003, and FoodNet laboratories in Colorado and New Mexico joined in 2004. Each month, participating FoodNet sites purchased approximately 40 meat samples, comprising 10 samples each of chicken breasts, ground turkey, ground beef, and pork chops. All sites cultured the meats for *Salmonella* and *Campylobacter*. In addition, four sites (Georgia, Maryland, Oregon, and Tennessee) cultured the meats for *E. coli* and *Enterococcus*. Isolates were sent to CVM for species/serotype confirmation and antimicrobial susceptibility testing.

3. Animal Component

The animal component of NARMS began with *Salmonella* surveillance in 1997 after pilot studies were conducted in 1995 and 1996. The *Salmonella* isolates included in this report were recovered by FSIS from carcass rinsates (chicken), carcass swabs (turkey, cattle, and swine), and ground products (chicken, turkey, and beef) collected by USDA's Food Safety Inspection Service (FSIS) from federally inspected slaughter and processing plants throughout the United States as part of the Pathogen Reduction/Hazard Analysis and Critical Control Point (PR/HACCP) *Salmonella* verification testing program. ARS conducted susceptibility testing for

the Salmonella isolates, while the National Veterinary Services Laboratories (NVSL) serotyped the isolates.

Sampling methods used by FSIS for the PR/HACCP *Salmonella* verification testing program have changed since NARMS animal testing began. Prior to June of 2006, there were two phases of the FSIS regulatory program for *Salmonella* in raw products: non-targeted and targeted testing. Non-targeted or "A" set tests were collected at establishments randomly selected from the population of eligible establishments, with a goal of scheduling every eligible establishment at least once a year. Other codes (such as "B", "C", and "D") represented sample sets collected from establishments targeted for follow-up testing following a failed set. All sets were included in NARMS testing, but most isolates were from "A" set samples. Beginning in June of 2006, establishments were scheduled using risk-based criteria designed to focus FSIS resources on establishments with the most samples positive for *Salmonella* and the greatest number of samples with serotypes most frequently associated with human salmonellosis. NARMS animal isolates for 2006 were from both non-targeted and targeted testing conducted by FSIS.

In 1998, Campylobacter isolates from chickens were submitted to ARS from the Eastern FSIS laboratory, and in 1999 and 2000, Campylobacter isolates were obtained from all three FSIS laboratories (Eastern, Midwestern, and Western laboratories). FSIS cultured samples for Campylobacter using the most probable number method described in the FSIS Microbiology Laboratory Guidebook.² Nalidixic acid susceptibility and cephalothin resistance were initially used as identification criteria for Campylobacter jejuni/coli, which likely resulted in an underreporting of quinolone resistant Campylobacter. A new ARS method was adopted in July of 2001, after which Campylobacter were isolated by ARS from chicken carcass rinsates submitted by the Eastern FSIS laboratory. This Executive Report contains data on Campylobacter recovered from chicken carcass rinsates for the period July 2001 through December 2006, when the new ARS isolation method was used. The rinsates were collected as part of the Salmonella PR/HACCP verification testing program described above.

USDA began testing *E. coli* isolates for antimicrobial susceptibility in 2000. ARS isolated *E. coli* from chicken carcass rinsates submitted by the Eastern FSIS laboratory. The rinsates were collected as part of the *Salmonella* PR/HACCP verification testing program.

B. Antimicrobial Susceptibility Testing Methods

The dilution schemes and antimicrobial content of the susceptibility testing panels have undergone several design iterations as the NARMS program has matured. This has resulted in testing panels that now meet international standards for quality control. The content of the panels has changed to accommodate new antimicrobial agents, to omit those no longer available or used, or to adjust dilution ranges. For example, in 2004, cephalothin was omitted and sulfamethoxazole was replaced with sulfisoxazole on the *Salmonella/E. coli* panel.

Antimicrobial minimal inhibitory concentrations (MICs) for *Salmonella* and *E. coli* were determined according to manufacturer instructions using the Sensititre® semi-automated antimicrobial susceptibility system (Trek Diagnostic Systems, Westlake, Ohio). In 2006,

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¹ http://www.fsis.usda.gov/Science/Serotypes Profile Salmonella Isolates/index.asp

² http://www.fsis.usda.gov/Science/Microbiological Lab Guidebook/index.asp

Salmonella and E. coli isolates were tested using a custom panel developed for Gram negative bacteria (catalog # CMV1AGNF). The quality control organisms included Escherichia coli ATCC 25922, Enterococcus faecalis ATCC 29212, Staphylococcus aureus ATCC 29213, and Pseudomonas aeruginosa ATCC 27853 according to Clinical and Laboratory Standards Institute (CLSI) recommendations.^{1,2}

Methods used to determine MICs for Campylobacter have changed over time. Through 2004. the human and animal components of NARMS used Etest® (AB Biodisk, Solna, Sweden). The antimicrobial agents tested using Etest® included: azithromycin, chloramphenicol, ciprofloxacin, clindamycin, erythromycin, gentamicin, nalidixic acid, and tetracycline. Based on Etest[®] manufacturer recommendations, MIC results that fell between the two-fold dilutions described in CLSI documents were rounded up to next two-fold dilution before interpretation.³ The retail component used the agar dilution method in 2002 and 2003. The antimicrobial agents tested using agar dilution included: ciprofloxacin, doxycycline, erythromycin, and gentamicin. Recognizing the need for a standardized semi-automated method, CVM developed a broth microdilution method which was approved and published by CLSI in 2006.⁴ The retail component began using this method in 2004 and the human and food animal components adopted the method in 2005. Testing was done using the Sensititre[®] semi-automated antimicrobial susceptibility system (Trek Diagnostic Systems, Westlake, Ohio) and a custom panel developed for Campylobacter (catalog # CAMPY). The antimicrobial agents included in broth microdilution testing were: azithromycin, ciprofloxacin, clindamycin, erythromycin, florfenicol, gentamicin, nalidixic acid, telithromycin, and tetracycline. Campylobacter jejuni ATCC 33560 was used as the quality control organism.

C. Breakpoints

The breakpoints used in this report are shown in Tables 1 and 2. CLSI-approved breakpoints were used when available. For *Salmonella* and *E. coli*, CLSI breakpoints were available for all antimicrobials tested except streptomycin.^{5,6} For *Campylobacter*, CLSI breakpoints were available only for ciprofloxacin, doxycycline, erythromycin, and tetracycline.⁴ NARMS breakpoints were used when CLSI breakpoints were not available. NARMS breakpoints were established based on the MIC distributions of NARMS isolates and the presence of known resistance genes/mutations. After the NARMS 2003 Executive Report was published in 2006, there were changes in the breakpoints for *Campylobacter* for the following antimicrobial agents: azithromycin, clindamycin, doxycycline, erythromycin, gentamicin, and nalidixic acid. Resistance data for all years were recalculated using the new breakpoints.

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NCCLS. 2002. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard—Second Edition. NCCLS document M31-A2. NCCLS, Wayne, PA.

² CLSI. 2006. Performance Standards for Antimicrobial Susceptibility Testing; Sixteenth Informational Supplement. CLSI document M100-S16. CLSI, Wayne, PA.

³ In USDA's NARMS annual reports, MIC values were not rounded up prior to interpretation.

⁴ **CLSI**. 2006. Methods for Antimicrobial Dilution and Disk Susceptibility Testing of Infrequently Isolated or Fastidious Bacteria; Approved Guideline. CLSI document M45-A. CLSI, Wayne, PA.

⁵ CLSI. 2009. Performance Standards for Antimicrobial Susceptibility Testing; Nineteenth Informational Supplement. CLSI document M100-S19. CLSI, Wayne, PA.

⁶ CLSI. 2008. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard—Third Edition. CLSI document M31-A3. CLSI, Wayne, PA.

C. Breakpoints

Table 1. Breakpoints Used for Susceptibility Testing of Salmonella and E. coli¹

		Br	eakpoints (µg/ı	ml)
Antimicrobial Class	Antimicrobial Agent	Susceptible	Intermediate	Resistant
Aminoglycosides	Amikacin	≤ 16	32	≥ 64
	Gentamicin	≤ 4	8	≥ 16
	Kanamycin	≤ 16	32	≥ 64
	Streptomycin	≤ 32	N/A	≥ 64
Aminopenicillins	Ampicillin	≤ 8	16	≥ 32
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	≤ 8 / 4	16 / 8	≥ 32 / 16
Cephalosporins	Ceftiofur	≤ 2	4	≥ 8
	Ceftriaxone	≤ 8	16 - 32	≥ 64
Cephamycins	Cefoxitin	≤ 8	16	≥ 32
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ²	≤ 256	N/A	≥ 512
	Trimethoprim-Sulfamethoxazole	≤ 2 / 38	N/A	≥ 4 / 76
Phenicols	Chloramphenicol	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin	≤ 1	2	≥ 4
	Nalidixic acid	≤ 16	N/A	≥ 32
Tetracyclines	Tetracycline	≤ 4	8	≥ 16

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

 $^{^{2}}$ Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

Table 2. Breakpoints Used for Susceptibility Testing of Campylobacter¹

		Br	eakpoints (μg/ι	ml)
Antimicrobial Class	Antimicrobial Agent	Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin	≤ 2	4	≥ 8
Ketolides	Telithromycin	≤ 4	8	≥ 16
Lincosamides	Clindamycin	≤ 2	4	≥ 8
Macrolides	Azithromycin	≤ 2	4	≥ 8
	Erythromycin	≤ 8	16	≥ 32
Phenicols	Chloramphenicol	≤ 8	16	≥ 32
	Florfenicol ²	≤ 4	N/A	N/A
Quinolones	Ciprofloxacin	≤ 1	2	≥ 4
	Nalidixic acid	≤ 16	32	≥ 64
Tetracyclines	Doxycycline	≤ 2	4	≥ 8
	Tetracycline	≤ 4	8	≥ 16

¹ Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute), when available

 $^{^2}$ For florfenicol, only a susceptible breakpoint ($\leq 4~\mu g/ml)$ has been established. In this report, isolates with an MIC $\geq 8~\mu g/ml$ are categorized as resistant

D. Reporting Methods

The remaining three sections of this report contain NARMS surveillance data for *Salmonella*, *Campylobacter*, and *E. coli*. Section III contains data for *Salmonella* isolates recovered from food animals at slaughter, retail meats, and humans. Antimicrobial susceptibility data are first presented for all non-Typhi *Salmonella*. Data are then presented separately for the top five *Salmonella* serotypes in humans: Enteritidis, Typhimurium, Newport, I 4,[5],12;i:-, and Heidelberg.

Salmonella serotype I 4,[5]12:i:- includes Salmonella isolates with the antigenic formulas I 4,12:i:- or I 4,5,12:i:-. Food animal data for Salmonella I 4,[5],12:i:- isolates are not available prior to 2004 because NVSL, which serotyped the Salmonella isolates, did not determine antigenic formulas for most monophasic Salmonella at that time. Because of increased submissions of Salmonella I 4,[5],12:i:- from humans in 2006 and recognition of the possibility that this serotype may have been underreported in previous years, isolates from humans reported as serogroup B and tested in NARMS during the period 1996 through 2006 were reviewed for additional information; isolates that could be clearly identified as serogroup B, first-phase flagellar antigen "i" and second flagellar antigen absent are categorized in this report as Salmonella I 4,[5],12:i:-.

Section IV of the report contains data for *Campylobacter* isolates recovered from humans, retail meats, and chicken carcass rinsates. Antimicrobial susceptibility data for *C. jejuni* and *C. coli* are presented separately. Section V contains susceptibility data for *E. coli* isolates from retail meats and chicken carcass rinsates.

Each section begins with a table that shows the number of isolates tested by source and year. This is followed by a table and two figures that show the percentages of retail meats that tested positive. Data are also provided on the distribution of *Salmonella* serotypes and *Campylobacter* species isolated from humans, retail meats, and food animals.

Data on antimicrobial susceptibility testing follows. MIC tables are presented for non-Typhi *Salmonella*, *C. jejuni*, *C. coli*, and *E. coli*. The tables include MIC distributions, percentages of isolates displaying intermediate susceptibility and resistance, and 95% confidence intervals for the percent resistant, by source for 2006. Confidence intervals were calculated using the Clopper-Pearson exact method.¹ The unshaded areas in the MIC tables indicate the range of concentrations tested for each antimicrobial.² Single vertical bars indicate breakpoints for susceptibility, while double vertical bars indicate breakpoints for resistance.

The MIC distributions are followed by tables that show the numbers and percentages of isolates that were resistant, by year, through 2006.³ The total number of isolates tested per year for each source is listed at the top of each table. An empty cell in this area indicates that surveillance was not conducted for that particular source, whereas a zero indicates that surveillance was conducted, but no isolates were available for testing. Below the section containing the number of isolates tested, empty shaded boxes indicate that there are no data to

¹ Newcombe RG. Two-sided confidence intervals for the single proportion: comparison of seven methods. Statistics in Medicine 1998: 17(8): 857-872.

² The concentration ranges are also listed in the Appendix.

³ Data on *Campylobacter* recovered from chickens is presented only for the period of July 2001 through December 2006, as described in Section IIA.

report because surveillance was not conducted or isolates were not available for testing. Similar tables are presented for *Salmonella* serotypes Enteritidis, Typhimurium, Newport, I 4,[5],12;i:-, and Heidelberg.

Resistance to ceftiofur and nalidixic acid among *Salmonella* isolates is highlighted in several pie charts and graphs (Figures 6-16). Third-generation cephalosporins (such as ceftriaxone) and fluoroquinolones (such as ciprofloxacin) are antimicrobial agents commonly used for the treatment of severe *Salmonella* infections in humans. In the United States, elevated MICs (\geq 8 µg/ml) to ceftiofur are usually indicative of the presence of an AmpC beta-lactamase gene (bla_{CMY}), which also confers decreased susceptibility (MIC \geq 2 µg/ml) to ceftriaxone. Similarly, resistance to the quinolone nalidixic acid (MIC \geq 32 µg/ml) correlates with mutations causing decreased susceptibility to ciprofloxacin (MIC \geq 0.125 µg/ml). Finally, *Salmonella* and *E. coli* data on multidrug resistance phenotypes of public health importance are presented (Tables 13-17, 20, 23, 26, 29, 32, and 47).

The data contained in this report may, in a few cases, differ from those previously reported. These differences may be due to changes in breakpoints (*Campylobacter*) and/or the dynamic nature of the data, which are updated if new information is obtained about the bacterial isolates under surveillance or when specific isolates are retested. In a few cases, differences may be due to other reasons. For example, *Salmonella* variants are grouped together in this report (e.g., Typhimurium var. 5- is grouped with Typhimurium, and Anatum var. 15+ is grouped with Anatum), while USDA's annual report lists *Salmonella* variants separately.

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¹ Note that the scales vary from figure to figure, based on the maximum percent resistance.

² Below each graph is a table that shows the number of isolates tested. Empty grey boxes indicate that surveillance was not conducted, while boxes with zeros indicate that there were no isolates available for testing.

III. Salmonella (non-Typhi) Data

A. Salmonella (non-Typhi) Isolates Tested

Table 3. Number of Salmonella (non-Typhi) Isolates Tested, by Source and Year, 1996-2006

						Year					
Source	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
Chicken Breasts							60	83	157	153	152
Ground Turkey							74	114	142	183	159
Ground Beef							9	10	14	8	19
Pork Chops							10	5	11	9	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
Turkeys		107	240	713	518	550	244	262	236	227	304
Cattle		24	284	1610	1388	893	1008	670	607	329	389
Swine		111	793	876	451	418	379	211	308	301	304

B. Isolation of Salmonella (non-Typhi) from Retail Meats

Table 4. Number and Percent of Retail Meat Samples Positive for Salmonella, 2006

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	1196	1185	1196	1192
Number Positive for Salmonella	152	159	19	8
Percent Positive for Salmonella	12.7%	13.4%	1.6%	0.7%

Figure 1. Percent of Retail Meat Samples Positive for Salmonella, 2006

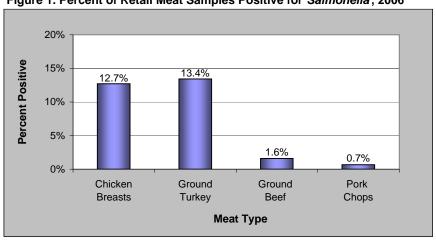
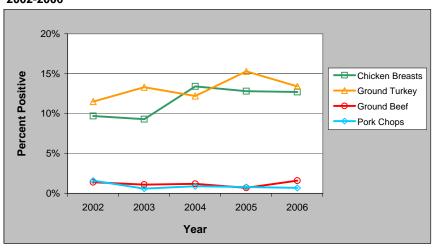


Figure 2. Percent of Retail Meat Samples Positive for $\it Salmonella$, 2002-2006



C. Salmonella (non-Typhi) Serotypes

Table 5. Most Common Serotypes among Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2006

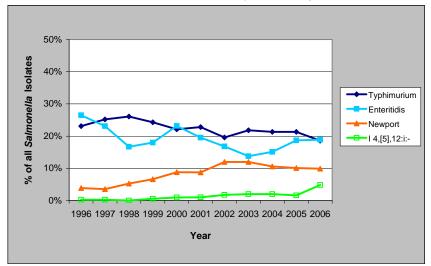
	Humans				Retail Meat	s			Food Anima	als	
				884				Autoral			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans	Enteritidis	412	18.9	Chicken	Kentucky	59	38.8	Chickens	Kentucky	674	48.8
(N=2184)	Typhimurium	407	18.6	Breasts	Heidelberg	30	19.7	(N=1380)	Enteritidis	188	13.6
	Newport	217	9.9	(N=152)	Typhimurium	21	13.8		Heidelberg	164	11.9
	I 4,[5],12:i:-	105	4.8		Enteritidis	17	11.2		Typhimurium	105	7.6
	Heidelberg	102	4.7		I 4,[5],12:i:-	9	5.9		I 4,[5],12:i:-	79	5.7
	Javiana	80	3.7		Schwarzengrund	5	3.3		Montevideo	21	1.5
	Montevideo	62	2.8		Montevideo	2	1.3		Schwarzengrund	18	1.3
	Paratyphi B var. L(+) tartrate+	49	2.2		Ouakam	2	1.3		Infantis	16	1.2
	Oranienburg	48	2.2		Other	7	4.6		Mbandaka	15	1.1
	Muenchen	45	2.1						Berta	10	0.7
	Agona Saintpaul	42 30	1.9 1.4						Senftenberg	10 10	0.7 0.7
	Braenderup	29	1.4						Thompson Other	70	5.1
	Thompson	26	1.2						Other	70	5.1
	Stanley	25	1.1								
	Mississippi	24	1.1	Ground	Heidelberg	35	22.0	Turkeys	Hadar	98	32.2
	Hadar	22	1.0	Turkey	Hadar	25	15.7	(N=304)	Heidelberg	43	14.1
	Infantis	22	1.0	(N=159)	Saintpaul	19	11.9	,	Saintpaul	18	5.9
	Tennessee	21	1.0		Senftenberg	11	6.9		Schwarzengrund	15	4.9
	Berta	19	0.9		Agona	9	5.7		Reading	14	4.6
	All other serotypes	339	15.5		Montevideo	8	5.0		Agona	13	4.3
	Unknown serotype	6	0.3		Reading	8	5.0		Senftenberg	12	3.9
	Partially serotyped	49	2.2		Berta	7	4.4		Anatum	9	3.0
	Rough/nonmotile isolates	3	0.1		IIIa 18:z4,z23:-	6	3.8		Kentucky	8	2.6
					Schwarzengrund	5	3.1		Derby	7	2.3
					I 4,12:d:-	4	2.5		Muenchen	7	2.3
					Brandenburg	4	2.5		Other	60	19.7
					Other	18	11.3				
				Craund	Montevideo	6	31.6	Cattle	Montevideo	63	16.2
				Ground Beef	Anatum	2	10.5	(N=389)	Muenster	42	10.8
				(N=19)	Mbandaka	2	10.5	, ,	Newport	30	7.7
					Blockley	1	5.3		Anatum	27	6.9
					Dublin	1	5.3		Cerro	24	6.2
					Johannesburg	1	5.3		Typhimurium	22	5.7
					Litchfield	1	5.3		Reading	21	5.4
					Muenchen	1	5.3		Dublin	19	4.9
					Muenster	1	5.3		Mbandaka	15	3.9
					Schwarzengrund	1	5.3		Kentucky	14	3.6
					Tennessee	1	5.3		Infantis	13	3.3
					Typhimurium	1	5.3		Other	99	25.4
				Pork	Heidelberg	4	50.0	Swine	Anatum	66	21.7
				Chops	Infantis	2	25.0	(N=304)	Derby	56	18.4
				(N=8)	Typhimurium	2	25.0		Johannesburg	29	9.5
					• •				Typhimurium	25	8.2
									Infantis	16	5.3
									Saintpaul	16	5.3
									Heidelberg	13	4.3
									Agona	12	3.9
								I		4.0	
									Hadar	10	3.3
									Hadar Manhattan	10 8	3.3 2.6

Table 6. Most Common Salmonella (non-Typhi) Serotypes in Humans and their Distributions among Retail Meat

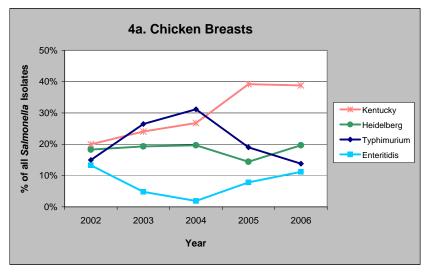
and Food Animal Isolates, by Meat Type and Animal Source, 2006

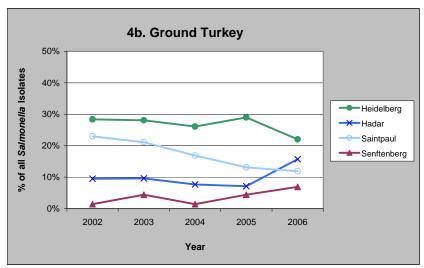
	Humans		Retail	Meats			(N=1380) (N=304) (N=389) (N=304) 13.6% 1.0% 0.5% 0.0% 188 3 2 0 7.6% 1.6% 5.7% 8.2% 105 5 22 25 0.0% 1.3% 7.7% 0.3% 0 4 30 1 5.7% 0.3% 0.8% 0.7% 79 1 3 2 11.9% 14.1% 1.0% 4.3% 164 43 4 13 0.0% 0.0% 0.0% 0.0% 0 0 0 0 1.5% 1.0% 16.2% 0.0%						
	Humans (N=2184)	Chicken Breast (N=152)	Ground Turkey (N=159)	Ground Beef (N=19)	Pork Chops (N=8)				Swine (N=304)				
1. Enteritidis	18.9%	11.2%	0.0%	0.0%	0.0%	13.6%	1.0%	0.5%	0.0%				
1. Entertials	412	17	0	0	0	188	3	2	0				
2. Typhimurium	18.6%	13.8%	0.0%	5.3%	25.0%	7.6%	1.6%	5.7%	8.2%				
2. Typnimunum	407	21	0	1	2	105	5	22	25				
3. Newport	9.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	7.7%	0.3%				
3. Newport	217	0	0	0	0	0	4	30	1				
4. 4,[5],12:i:-	4.8%	5.9%	1.3%	0.0%	0.0%	5.7%	0.3%	0.8%	0.7%				
4. 14,[5],12:1:-	105	9	2	0	0	79	1	3	2				
5. Heidelberg	4.7%	19.7%	22.0%	0.0%	50.0%	11.9%	14.1%	1.0%	4.3%				
5. Heidelberg	102	30	35	0	4	164	43	4	13				
6. Javiana	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
6. Javiana	80	0	0	0	0	0	0	0	0				
7. Montevideo	2.8%	1.3%	5.0%	31.6%	0.0%	1.5%	1.0%	16.2%	0.0%				
7. Montevideo	62	2	8	6	0	21	3	63	0				
8. Paratyphi B var.	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%				
L(+) tartrate+	49	0	0	0	0	0	0	1	0				
0 Oranianhurs	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
9. Oranienburg	48	0	0	0	0	0	0	0	0				
10. Muenchen	2.1%	0.0%	0.6%	5.3%	0.0%	0.0%	2.3%	1.5%	2.3%				
iv. wuenchen	45	0	1	1	0	0	7	6	7				

Figure 3. Most Common *Salmonella* (non-Typhi) Serotypes from Humans in 2006 and their Relative Frequencies, by Year, 1996-2006

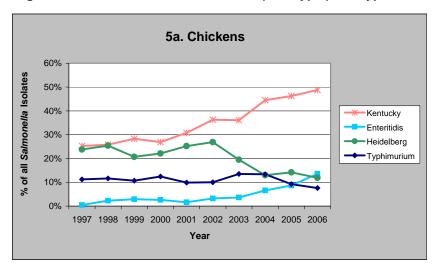


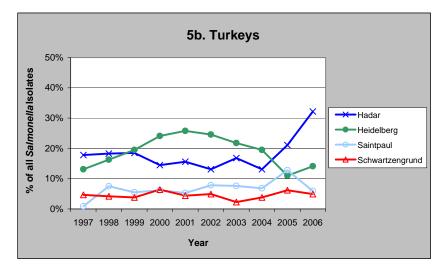
Figures 4a-b. Most Common Salmonella (non-Typhi) Serotypes from Retail Poultry in 2006 and their Relative Frequencies, by Year, 2002-2006

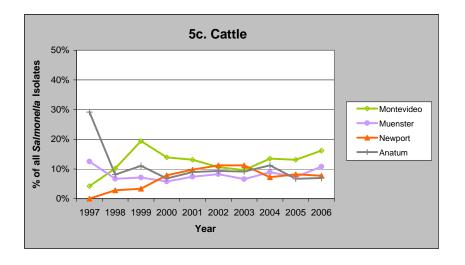


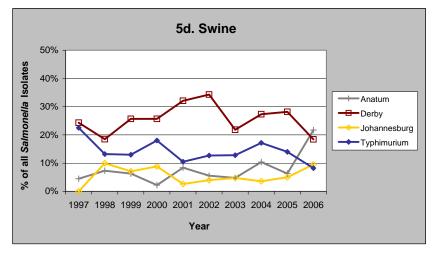


Figures 5a-d. Most Common Salmonella (non-Typhi) Serotypes from Food Animals in 2006 and their Relative Frequencies, by Year, 1997-2006









D. Antimicrobial Susceptibility among all non-TyphiSalmonella

MIC Distributions

Table 7a. Distribution of MICs and Occurrence of Resistance among all Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2006

	Isolate Source										Distrib	ution (%) of M	ICs (µg	g/ml) ⁴						
Antimicrobial	(# of Isolates)	%l ¹	%R²	[95% CI] ³	0.015	0.03	0.06	0.125	0.25		1	2 `	4	8	16	32	64	128	256	512	1024
Aminoglycosides				_																	
Amikacin	Humans (2184)	0.0	0.0	[0.0 - 0.2]						9.9	69.8	18.5	1.7	0.1	<0.1						
	Chicken Breasts (152)	0.0	0.0	[0.0 - 2.4]						1.3	44.1	44.1	10.5								
	Ground Turkey (159)	0.0	0.0	[0.0 - 2.3]									5.7	0.6							
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]								73.7	5.3	5.3							
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]								87.5									
	Chickens (1380)	0.0	0.0	[0.0 - 0.3]						33.4	58.9	6.6	1.0	0.1							
	Turkeys (304)	0.0	0.0	[0.0 - 0.3]							77.0		1.6	0.1							
	• • •																				
Í	Cattle (389)	0.0	0.0	[0.0 - 0.9]						15.9		16.5	2.1								
	Swine (304)	0.0	0.0	[0.0 - 1.2]						23.0	66.8	9.9	0.3								
Gentamicin	Humans (2184)	0.5	2.0	[1.5 - 2.7]					64.6	31.7	1.1	0.2	<0.1	0.5	0.7	1.3					
	Chicken Breasts (152)	1.3	9.2	[5.1 - 15.0]					42.1	46.1	1.3			1.3		9.2					
	Ground Turkey (159)	1.3	28.9	[22.0 - 36.6]					18.9	45.3	4.4	1.3		1.3	6.9	22.0					
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]					15.8	68.4	15.8										
	Pork Chops (8)	12.5	50.0	[15.7 - 84.3]					12.5	25.0				12.5	25.0	25.0					
	Chickens (1380)	0.7	5.7	[4.6 - 7.1]					81.7	11.1	0.5	0.1	0.1	0.7	4.3	1.4					
	Turkeys (304)	3.6	16.4	[12.5 - 21.1]					65.5	11.8	2	0.3	0.3	3.6	11.2	5.3					
	Cattle (389)	0.3	3.9	[2.2 - 6.3]					75.3	19.5	0.8		0.3	0.3	1.5	2.3					
	Swine (304)	1.3	2.0	[0.7 - 4.2]					80.6	14.8	1.0		0.3	1.3	1.3	0.7					
Kanamycin	Humans (2184)	0.2	2.9	[2.2 - 3.7]										96.7	0.2	0.2	<0.1	2.8			
	Chicken Breasts (152)	0.0	9.9	[5.6 - 15.8]										88.8	1.3			9.9			
	Ground Turkey (159)	1.3	15.1	[9.9 - 21.6]										81.1	2.5	1.3	3.1	11.9			
	Ground Beef (19)	0.0	5.3	[0.1 - 26.0]										94.7			•••	5.3			
	Pork Chops (8)	0.0	25.0	[3.2 - 65.1]										75.0				25.0			
															0.4	0.4					
	Chickens (1380)	0.1	3.6	[2.6 - 4.7]										96.0	0.4	0.1	0.1	3.4			
	Turkeys (304)	2.3	10.5	[7.3 - 14.5]										85.5	1.6	2.3	1.0	9.5			
	Cattle (389)	0.0	9.5	[6.8 - 12.9]										90.5		0.0		9.5			
	Swine (304)	0.3	8.6	[5.7 - 12.3]										91.1		0.3	0.7	7.9			
Streptomycin	Humans (2184)	N/A	10.7	[9.4 - 12.0]												89.3	5.3	5.4			
	Chicken Breasts (152)	N/A	36.2	[28.6 - 44.4]												63.8	23.0	13.2			
	Ground Turkey (159)	N/A	40.9	[33.2 - 48.9]												59.1	20.1	20.8			
	Ground Beef (19)	N/A	10.5	[1.3 - 33.1]												89.5	5.3	5.3			
	Pork Chops (8)	N/A	25.0	[3.2 - 65.1]												75.0		25.0			
	Chickens (1380)	N/A	21.2	[19.1 - 23.5]												78.8	16.9	4.3			
	Turkeys (304)	N/A	28.9	[23.9 - 34.4]												71.1	20.7	8.2			
	Cattle (389)	N/A	23.7	[19.5 - 28.2]												76.3	2.6	21.1			
	Swine (304)	N/A	26.3	[21.5 - 31.6]												73.7	10.9	15.5			

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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

⁴The unshaded areas indicate the dilution range of the Sensititre plates used to test 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 7b. Distribution of MICs and Occurrence of Resistance among all Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2006

Table 7b. Distribution o	Isolate Source												%) of M			·					
Antimicrobial	(# of Isolates)	%l ¹	%R ²	[95% CI] ³	0.015	0.03	0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024
Aminopenicillins																					
Ampicillin	Humans (2184)	0.0	10.9	[9.6 - 12.3]							79.6	8.9	0.5				10.9				
	Chicken Breasts (152)	0.0	22.4	[16.0 - 29.8]							74.3	2.6	0.7				22.4				
	Ground Turkey (159)	0.0	25.8	[19.2 - 33.3]							67.9	6.3	0.7				25.8				
	Ground Beef (19)	0.0	10.5	[1.3 - 33.1]								5.3					10.5				
	Pork Chops (8)	0.0	25.0	[3.2 - 65.1]							50.0	0.0	25.0				25.0				
	Chickens (1380)	0.0	14.9	[13.0 - 16.8]							81.3	3.6	0.1	0.1		0.2	14.6				
	Turkeys (304)	0.0	25.3	[20.5 - 30.6]							69.1	4.9	0.7				25.3				
	Cattle (389)	0.0	22.4	[18.3 - 26.8]							72.8	4.4	0.3	0.3			22.4				
	Swine (304)	0.3	11.5	[8.2 - 15.6]							83.2	3.6	0.3	1.0	0.3	1.0	10.5				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (2184)	3.5	3.7	[3.0 - 4.6]							86.5	2.5	0.6	3.2	3.5	1.4	2.3				
	Chicken Breasts (152)	0.7	19.1	[13.2 - 26.2]							75.7	1.3	0.7	2.6	0.7	0.7	18.4				
	Ground Turkey (159)	11.3	5.0	[2.2 - 9.7]							71.7		0.7	9.4	11.3	0.7	5.0				
	Ground Beef (19)	5.3	0.0	[0.0 - 17.6]							84.2	5.3		5.3	5.3		3.0				
	Pork Chops (8)	25.0	0.0	[0.0 - 17.0]							50.0			0.0	25.0						
	, , ,																				
	Chickens (1380)	0.8	12.9	[11.2 - 14.8]							83.5			1.2	0.8	1.0	11.9				
	Turkeys (304)	8.9	5.6	[3.3 - 8.8]							70.6	4.0		10.9	8.9	0.7	5.0				
	Cattle (389)	1.5	18.5	[14.8 - 22.7]							74.6	2.8	4.0	2.6	1.5	1.3	17.2				
	Swine (304)	6.6	2.3	[0.9 - 4.7]							84.9	2.3	1.3	2.6	6.6	0.7	1.6				
Cephalosporins																					
Ceftiofur	Humans (2184)	0.0	3.6	[2.9 - 4.5]				0.2	0.7	49.7	45.0	0.8		<0.1	3.6						
	Chicken Breasts (152)	0.0	19.1	[13.2 - 26.2]						17.8	62.5	0.7		0.7	18.4						
	Ground Turkey (159)	0.0	5.0	[2.2 - 9.7]						4.4	87.4	3.1		0.7	5.0						
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]							89.5	3.1			3.0						
	Pork Chops (8)	0.0	0.0	[0.0 - 17.0]						10.5	62.5	37.5									
	, , ,																				
	Chickens (1380)	0.1	12.8	[11.1 - 14.7]				0.2	2.7	66.7	17.3	0.1	0.1	0.4	12.4						
	Turkeys (304)	0.0	5.3	[3.0 - 8.4]						64.8		0.7			5.3						
	Cattle (389)	0.0	18.8	[15.0 - 23.0]					1.3	45.5	34.2		0.0	0.5	18.3						
	Swine (304)	0.3	2.0	[0.7 - 4.2]					0.3	62.8	33.2	1.3	0.3	0.3	1.6						
Ceftriaxone	Humans (2184)	2.8	0.2	[0.0 - 0.5]					96.3	<0.1			0.1	0.5	1.5	1.4	0.1	0.1			
	Chicken Breasts (152)	17.1	0.7	[0.0 - 3.6]					80.9				0.7	0.7	13.8	3.3	0.7				
	Ground Turkey (159)	3.8	0.6	[0.0 - 3.5]					95.0					0.6	3.1	0.6	0.6				
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]					100.0												
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]					100.0												
	Chickens (1380)	8.4	0.1	[0.0 - 0.5]					87.0	0.1		0.1	0.3	4.0	7.2	1.2	0.1				
	Turkeys (304)	4.6	0.0	[0.0 - 1.2]					94.7					0.7	3.0	1.6					
	Cattle (389)	13.1	1.0	[0.3 - 2.6]					81.0	0.5			0.3	4.1	9.0	4.1	0.8	0.3			
	Swine (304)	1.0	0.0	[0.0 - 1.2]					97.4			1.0		0.7	0.7	0.3					

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 7c. Distribution of MICs and Occurrence of Resistance among all Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2006

Table 7c. Distribution of r	Isolate Source						·							IICs (µ							
Antimicrobial	(# of Isolates)	%l ¹	%R²	[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
Cephamycins																					
Cefoxitin	Humans (2184)	0.3	3.5	[2.8 - 4.4]						0.3	28.5	55.4	11.0	0.9	0.3	1.5	2.0				
	Chicken Breasts (152)	0.7	18.4	[12.6 - 25.5]								58.6	21.1	1.3	0.7	6.6	11.8				
	Ground Turkey (159)	0.0	5.0	[2.2 - 9.7]								54.7	38.4	1.9		3.1	1.9				
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]								52.6	47.4								
	Pork Chops (8)	25.0	0.0	[0.0 - 36.9]								62.5	12.5		25.0						
	Chickens (1380)	0.3	12.8	[11.0 - 14.6]							23.5	49.3	12.6	1.6	0.3	10.6	2.2				
	Turkeys (304)	0.0	5.3	[3.0 - 8.4]							13.2	48.7	31.2	1.6		2.3	3.0				
	Cattle (389)	1.3	17.7	[14.1 - 21.9]							7.5	31.1	39.6	2.8	1.3	7.2	10.5				
	Swine (304)	1.0	2.0	[0.7 - 4.2]							7.6	34.9	49.7	4.9	1.0	1.0	1.0				
Folate Pathway Inhibitors																					
Sulfisoxazole	Humans (2184)	N/A	12.0	[10.7 - 13.5]											14.6	51.6	20.7	1.1	<0.1	12.0	
	Chicken Breasts (152)	N/A	23.0	[16.6 - 30.5]											5.3	16.4	53.9	1.3		23.0	
	Ground Turkey (159)	N/A	32.1	[24.9 - 39.9]											1.9	10.7	51.6	3.1	0.6	32.1	
	Ground Beef (19)	N/A	10.5	[1.3 - 33.1]											5.3	21.1	57.9	5.3		10.5	
	Pork Chops (8)	N/A	75.0	[34.9 - 96.8]												12.5	12.5			75.0	
	Chickens (1380)	N/A	10.7	[9.1 - 12.5]											38.0	45.9	5.4		0.1	10.7	
	Turkeys (304)	N/A	27.3	[22.4 - 32.7]											18.8	46.1	7.6	0.3		27.3	
	Cattle (389)	N/A	24.2	[20.0 - 28.7]											17.0	38.8	20.1			24.2	
	Swine (304)	N/A	26.6	[21.8 - 32.0]											43.1	24.3	5.6	0.3		26.6	
Trimethoprim-Sulfamethoxazole	Humans (2184)	N/A	1.6	[1.2 - 2.3]				88.4	9.5	0.4	0.1			1.6							
	Chicken Breasts (152)	N/A	1.3	[0.2 - 4.7]				94.7	3.3	0.7				1.3							
	Ground Turkey (159)	N/A	0.0	[0.0 - 2.3]				93.1	5.7	1.3											
	Ground Beef (19)	N/A	0.0	[0.0 - 17.6]				94.7	5.3												
	Pork Chops (8)	N/A	50.0	[15.7 - 84.3]				37.5	12.5					50.0							
	Chickens (1380)	N/A	0.1	[0.0 - 0.4]				93.6	6.3		0.1			0.1							
	Turkeys (304)	N/A	1.0	[0.2 - 2.9]				88.8	9.9	0.3			0.3	0.7							
	Cattle (389)	N/A	4.6	[2.8 - 7.2]				85.6	8.2	1.3	0.3		0.3	4.4							
	Swine (304)	N/A	2.0	[0.7 - 4.2]				80.9	13.2	2.6	1.3			2.0							
Phenicols																					
Chloramphenicol	Humans (2184)	0.7	6.4	[5.4 - 7.5]								1.9	61.0	29.9	0.7		6.4				
	Chicken Breasts (152)	0.7	2.6	[0.7 - 6.6]								0.7	32.9	63.2	0.7		2.6				
	Ground Turkey (159)	0.6	0.6	[0.0 - 3.5]									27.7	71.1	0.6		0.6				
	Ground Beef (19)	5.3	5.3	[0.1 - 26.0]									10.5	78.9	5.3		5.3				
	Pork Chops (8)	37.5	0.0	[0.0 - 36.9]										62.5	37.5						
	Chickens (1380)	0.3	1.7	[1.1 - 2.6]								6.6	64.0	27.4	0.3	0.1	1.7				
	Turkeys (304)	0.7	3.9	[2.1 - 6.8]								1.0	53.3	41.1	0.7		3.9				
	Cattle (389)	8.0	19.8	[15.9 - 24.1]								1.3	36.5	41.6	8.0		19.8				
	Swine (304)	2.3	7.9	[5.1 - 11.5]								0.3	31.9	57.6	2.3		7.9				

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 7d. Distribution of MICs and Occurrence of Resistance among all Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2006

	Isolate Source										Distrib	ution (%) of N	IICs (µc	g/ml) ⁴						
Antimicrobial	(# of Isolates)	%l ¹	%R ²	[95% CI] ³	0.015	0.03	0.06	0.125	0.25			2 `	4	8	16	32	64	128	256	512	1024
Quinolones																					
Ciprofloxacin	Humans (2184)	0.0	0.1	[0.0 - 0.3]	94.2	2.5	0.2	1.4	0.7	0.8	<0.1			0.1							
	Chicken Breasts (152)	0.0	0.0	[0.0 - 2.4]	68.4	30.9			0.7												
	Ground Turkey (159)	0.0	0.0	[0.0 - 2.3]	74.8	24.5				0.6											
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]	68.4	31.6															
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]	62.5	12.5	25.0														
	Chickens (1380)	0.0	0.0	[0.0 - 0.3]	95.7	3.5	0.7	0.1													
	Turkeys (304)	0.0	0.0	[0.0 - 1.2]	95.7	3.6		0.7													
	Cattle (389)	0.0	0.0	[0.0 - 0.9]	96.4	2.8	0.3	0.3			0.3										
	Swine (304)	0.0	0.0	[0.0 - 1.2]	95.1	4.3	0.7														
Nalidixic Acid	Humans (2184)	N/A	2.7	[2.1 - 3.5]							0.4	40.7	55.0	0.8	0.3	0.1	2.7				
	Chicken Breasts (152)	N/A	0.7	[0.0 - 3.6]								25.0	71.1	3.3			0.7				
	Ground Turkey (159)	N/A	0.0	[0.0 - 2.3]								10.1	86.2	3.1	0.6						
	Ground Beef (19)	N/A	0.0	[0.0 - 17.6]								10.5									
	Pork Chops (8)	N/A	0.0	[0.0 - 36.9]									75.0	25.0							
	Chickens (1380)	N/A	0.1	[0.0 - 0.5]						0.1	0.8	46.2	49.9	2.8	0.1		0.1				
	Turkeys (304)	N/A	0.7	[0.1 - 2.4]							0.3	19.1	77.0	3.0			0.7				
	Cattle (389)	N/A	0.5	[0.1 - 1.8]								23.9	74.0	1.5			0.5				
	Swine (304)	N/A	0.0	[0.0 - 1.2]							0.3	20.1	75.0	4.3	0.3						
Tetracyclines																					
Tetracycline	Humans (2184)	0.1	13.4	[12.0 - 14.9]									86.5	0.1	1.0	3.9	8.6				
	Chicken Breasts (152)	0.0	46.7	[38.6 - 55.0]									53.3			1.3	45.4				
	Ground Turkey (159)	0.0	56.0	[47.9 - 63.8]									44.0			0.6	55.3				
	Ground Beef (19)	0.0	21.1	[6.1 - 45.6]									78.9			15.8	5.3				
	Pork Chops (8)	0.0	25.0	[3.2 - 65.1]									75.0				25.0				
	Chickens (1380)	1.2	31.8	[29.4 - 34.3]									67.0	1.2	0.4	1.3	30.1				
	Turkeys (304)	0.3	61.8	[56.1 - 67.3]									37.8	0.3	0.3	8.2	53.3				
	Cattle (389)	0.3	30.3	[25.8 - 35.2]									69.4	0.3	0.3	5.7	24.4				
	Swine (304)	0.3	62.8	[57.1 - 68.3]									36.8	0.3	0.7	20.7					

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. 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 8a. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
		Chicken Breasts							60	83	157	153	152
		Ground Turkey Ground Beef							74 9	114 10	142 14	183 8	159 19
		Pork Chops							10	5	11	9	8
		Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
		Turkeys Cattle		107 24	240 284	713 1610	518 1388	550 893	244 1008	262 670	236 607	227 329	304 389
	Autimianahial	Swine		111	793	876	451	418	379	211	308	301	304
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Amikacin (MIC ≥ 64 µg/ml)	Humans		0.0% 0	0.0% 0	0.1% 1	0.0%	0.0%	0.0% 0	0.0%	0.0%	<0.1% 1	0.0%
	(MIC 2 64 μg/IIII)	Chicken Breasts		0	0		0	0	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0% 0	0.0%	0.0% 0	0.0%	0.0%
		Ground Beef							0.0%	0.0%	0.0%	0.0%	0.0%
		Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0% 0	0.0%	0.0%
		Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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%
		Swine		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.8% 63	2.9% 38	2.8% 41	2.1% 32	2.7% 37	1.9% 27	1.3% 27	1.4% 26	1.3% 24	2.1% 44	2.0% 44
	(Chicken Breasts							10.0% 6	6.0% 5	3.8% 6	3.3% 5	9.2% 14
		Ground Turkey							14.9% 11	22.8% 26	20.4% 29	26.8% 49	28.9% 46
		Ground Beef							0.0% 0	0.0%	0.0% 0	25.0% 2	0.0% 0
		Pork Chops							30.0% 3	0.0% 0	0.0% 0	0.0%	50.0% 4
		Chickens		17.8% 38	15.3% 86	10.4% 150	14.9% 175	7.9% 103	5.5% 83	6.3% 73	4.9% 63	4.3% 85	5.7% 79
		Turkeys		20.6% 22	18.3% 44	17.5% 125	16.2% 84	20.9% 115	19.3% 47	21.0% 55	25.4% 60	22.9% 52	16.4% 50
		Cattle		0.0%	1.8% 5	1.6% 25	2.1% 29	2.1% 19	2.6% 26	2.7% 18	1.8% 11	2.4% 8	3.9% 15
		Swine		0.9% 1	0.8% 6	1.1% 10	1.3% 6	1.4% 6	0.8%	0.5% 1	1.3% 4	2.7% 8	2.0% 6
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	5.0% 66	5.1% 67	5.7% 83	4.3% 65	5.6% 77	4.8% 68	3.8% 76	3.4% 64	2.8% 50	3.4% 70	2.9% 63
		Chicken Breasts							6.7% 4	4.8% 4	11.5% 18	4.6% 7	9.9% 15
		Ground Turkey							18.9% 14	27.2% 31	18.3% 26	20.2% 37	15.1% 24
		Ground Beef							0.0% 0	0.0%	0.0% 0	25.0% 2	5.3% 1
		Pork Chops							10.0% 1	0.0%	9.1% 1	0.0% 0	25.0% 2
		Chickens		2.3% 5	3.2% 18	1.2% 17	4.1% 48	2.4% 31	2.0% 30	2.8% 32	2.7% 34	2.5% 49	3.6% 49
		Turkeys		24.3% 26	17.1% 41	21.5% 153	21.4% 111	22.9% 126	24.2% 59	16.0% 42	14.4% 34	19.8% 45	10.5% 32
		Cattle		8.3% 2	9.5% 27	7.1% 115	6.6% 92	6.9% 62	10.1% 102	13.7% 92	8.9% 54	13.1% 43	9.5% 37
		Swine		11.7% 13	7.2% 57	6.7% 59	9.3% 42	6.9% 29	4.2% 16	5.7% 12	3.9% 12	5.0% 15	8.6% 26
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	20.6% 273	21.4% 278	18.6% 272	16.7% 250	16.3% 224	17.0% 241	13.2% 265	15.0% 279	11.8% 212	11.0% 225	10.7% 233
		Chicken Breasts							28.3% 17	26.5% 22	28.0% 44	30.1% 46	36.2% 55
		Ground Turkey							37.8% 28	45.6% 52	34.5% 49	44.3% 81	40.9% 65
		Ground Beef							22.2% 2	40.0% 4	14.3%	25.0%	10.5%
		Pork Chops							70.0% 7	40.0%	27.3%	33.3%	25.0%
		Chickens		24.3% 52	27.8% 156	27.5% 396	28.6% 335	21.0% 275	22.9% 343	19.6% 227	22.2%	23.3% 464	21.2%
		Turkeys		34.6% 37	40.8% 98	43.6% 311	41.9% 217	46.7% 257	37.7% 92	29.4% 77	33.9% 80	40.1% 91	28.9% 88
		Cattle		12.5%	16.2% 46	15.4% 248	21.3% 296	20.3%	25.9% 261	28.7% 192	20.9% 127	24.3% 80	23.7% 92
		Swine		27.9% 31	29.4% 233	29.3% 257	39.2% 177	35.6% 149	40.1% 152	30.8% 65	36.4% 112	36.5% 110	26.3% 80

Table 8b. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	1324	1301	1460	1495	1377	1419	2002	1864	1794	2005	2184
		Chicken Breasts Ground Turkey	1021		. 100	1100	.011		60 74	83 114	157 142	153 183	152 159
		Ground Beef Pork Chops							9 10	10 5	14 11	8 9	19 8
		Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
		Turkeys		107	240	713	518	550	244	262	236	227	304
		Cattle Swine		24 111	284 793	1610 876	1388 451	893 418	1008 379	670 211	607 308	329 301	389 304
	Antimicrobial (Resistance	Isolate											
Antimicrobial Class Aminopenicillins	Breakpoint) Ampicillin	Source	20.7%	18.3%	16.5%	15.5%	15.9%	17.4%	12.9%	13.6%	12.0%	11.3%	10.9%
Антореновно	(MIC ≥ 32 μg/ml)	Humans	274	238	241	232	219	247	259	254	216 30.6%	232 26.8%	238 22.4%
		Chicken Breasts							16.7% 10 16.2%	33.7% 28 28.9%	48	26.8% 26.8%	34 25.8%
		Ground Turkey							12	33	29	49	41
		Ground Beef							22.2% 2	40.0% 4	21.4% 3	25.0% 2	10.5% 2
		Pork Chops							40.0% 4	40.0% 2	9.1% 1	22.2% 2	25.0% 2
		Chickens		11.7% 25	12.8% 72	12.4% 179	13.0% 152	9.4% 123	14.3% 215	13.7% 159	14.5% 185	14.0% 279	14.9% 205
		Turkeys		12.1% 13	10.4% 25	17.7% 126	16.2% 84	19.5% 107	18.0% 44	18.7% 49	22.0% 52	22.9% 52	25.3% 77
		Cattle		12.5% 3	9.2% 26	12.5% 202	18.7% 259	17.9% 160	23.9% 241	28.1% 188	19.3% 117	26.7% 88	22.4% 87
		Swine		16.2% 18	12.9% 102	10.8% 95	18.8% 85	11.7% 49	13.7% 52	12.8% 27	16.2% 50	13.6% 41	11.5% 35
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	1.1% 15	1.0% 13	1.7% 25	2.3% 34	3.9% 54	4.7% 66	5.3% 106	4.6% 86	3.7% 67	3.2% 65	3.7% 81
	(MIC ≥ 32 / 16 µg/ml)	Chicken Breasts							10.0% 6	25.3% 21	24.8% 39	21.6% 33	19.1% 29
		Ground Turkey							12.2% 9	11.4% 13	7.7% 11	8.7% 16	5.0% 8
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	0.0% 0	0.0% 0
		Pork Chops							20.0% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.5% 1	2.0% 11	4.9% 70	7.3% 86	4.5% 59	10.2% 153	9.7% 112	12.4% 159	12.1% 241	12.9% 178
		Turkeys		4.7% 5	0.4% 1	4.3% 31	3.5% 18	6.9% 38	3.7% 9	1.5% 4	4.7% 11	3.5% 8	5.6% 17
		Cattle		8.3% 2	2.5% 7	3.9% 62	9.9% 138	11.8% 105	17.7% 178	21.0% 141	13.5% 82	21.0% 69	18.5% 72
		Swine		0.0% 0	0.4% 3	1.0% 9	1.8% 8	2.6% 11	3.7% 14	3.8% 8	1.9% 6	4.3% 13	2.3% 7
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.2% 2	0.5% 6	0.8% 12	2.0% 30	3.2% 44	4.1% 58	4.3% 87	4.5% 83	3.4% 61	2.9% 60	3.6% 79
		Chicken Breasts							10.0% 6	25.3% 21	24.8% 39	20.9% 32	19.1% 29
		Ground Turkey							8.1% 6	2.6% 3	4.9% 7	7.1% 13	5.0% 8
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	0.0% 0	0.0% 0
		Pork Chops							20.0%	20.0%	0.0%	0.0%	0.0%
		Chickens		0.5% 1	2.0% 11	5.2% 75	7.6% 89	4.1% 54	10.2% 153	9.8% 113	12.4% 159	12.2% 242	12.8% 177
		Turkeys		3.7% 4	0.4%	4.6% 33	3.3% 17	5.1% 28	3.3% 8	1.5% 4	4.7% 11	3.5% 8	5.3% 16
		Cattle		0.0%	2.1%	4.2% 67	9.8% 136	11.4% 102	17.4% 175	21.0% 141	13.3% 81	21.6% 71	18.8% 73
		Swine		0.0%	0.1%	1.9% 17	1.3%	2.2%	3.2% 12	4.3% 9	1.9%	3.7% 11	2.0%
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0%	0.1%	0.0%	0.3%	0.0%	0.0%	0.2%	0.4%	0.6% 10	0.1% 3	0.2% 4
	. 19 /	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.7%
		Ground Turkey							0.0% 0	0.0%	0.0%	2.7% 5	0.6% 1
		Ground Beef							0.0% 0	10.0% 1	7.1% 1	0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0%	0.0%	0.1% 1	0.0% 0	0.3% 5	0.1% 1	0.5% 6	0.3% 5	0.1% 2
		Turkeys		0.0% 0	0.0%	0.8% 6	0.4% 2	0.2% 1	0.0% 0	0.4% 1	0.4% 1	0.9% 2	0.0%
		Cattle		0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.1%	1.3%	2.1% 7	1.0%
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

Table 8c. Antimicrobial Resistance among all Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
		Chicken Breasts							60	83	157	153	152
		Ground Turkey Ground Beef							74 9	114 10	142 14	183 8	159 19
		Pork Chops							10	5	11	9	8
		Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
		Turkeys Cattle		107 24	240 284	713 1610	518 1388	550 893	244 1008	262 670	236 607	227 329	304 389
		Swine		111	793	876	451	418	379	211	308	301	304
	Antimicrobial	Isolate											
Antimicrobial Class	(Resistance Breakpoint)	Source	Į.										
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					3.2%	3.4%	4.3%	4.2%	3.5% 62	3.0% 62	3.5% 77
	(MIC ≥ 32 μg/III)	Chicken Breasts					44	48	86 10.0% 6	79 25.3% 21	24.8%	20.9%	18.4% 28
		Ground Turkey							8.1% 6	2.6%	4.9% 7	7.1% 13	5.0%
		Ground Beef							22.2%	40.0%	14.3%	0.0%	0.0%
		Pork Chops							20.0%	20.0%	0.0%	0.0%	0.0%
		Chickens					7.2%	4.1%	8.7%	8.2%	12.4%	12.0%	12.8%
		Turkeys					85 3.3%	53 4.5%	130 2.5%	95 1.1%	159 5.1%	238 3.5%	176 5.3%
		Cattle					9.1%	25 11.1%	6 15.9%	17.8%	12 13.2%	19.8% 65	16 17.7%
		Swine					126 1.3% 6	99 2.2% 9	160 2.9% 11	4.3% 9	80 1.9% 6	65 3.7% 11	69 2.0% 6
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹	Humans	20.3% 269	22.8% 297	19.4% 283	18.0% 269	17.1% 235	17.7% 251	11 12.8% 258	15.0% 280	13.2% 237	12.5% 256	12.0% 263
	(MIC ≥ 512 μg/ml)	Chicken Breasts	203	231	203	203	200	201	16.7% 10	14.5% 12	28.7% 45	17.0% 26	23.0%
		Ground Turkey							20.3% 15	33.3% 38	28.2% 40	34.4% 63	32.1% 51
		Ground Beef							22.2%	40.0%	14.3%	25.0%	10.5%
		Pork Chops							70.0% 7	40.0%	18.2%	33.3%	75.0% 6
		Chickens		24.8% 53	23.7% 133	15.9% 229	18.4% 216	11.8% 154	8.9% 133	10.3% 119	11.9% 152	8.5% 169	10.7% 148
		Turkeys		37.4% 40	32.1% 77	36.0% 257	25.1% 130	38.0% 209	30.3% 74	28.2% 74	36.4% 86	37.0% 84	27.3% 83
		Cattle		20.8% 5	15.5% 44	15.0% 242	19.9% 276	19.7% 176	22.3% 225	25.1% 168	22.7% 138	27.4% 90	24.2% 94
		Swine		34.2% 38	29.0% 230	30.7% 269	35.7% 161	34.9% 146	34.6% 131	25.1% 53	37.0% 114	32.9% 99	26.6% 81
	Trimethoprim- Sulfamethoxazole	Humans	3.9% 51	1.8% 24	2.3% 34	2.0% 30	2.1% 29	2.0% 28	1.4% 28	1.9% 36	1.8% 32	1.7% 34	1.6% 36
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 2
		Ground Turkey							1.4% 1	0.0%	0.0%	0.5% 1	0.0%
		Ground Beef							0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0
		Pork Chops							20.0%	0.0% 0	0.0% 0	11.1% 1	50.0% 4
		Chickens		0.5% 1	1.2% 7	1.1% 16	0.4% 5	0.5% 6	0.8% 12	0.3% 4	0.2% 3	0.2% 4	0.1% 1
		Turkeys		3.7% 4	2.5% 6	4.2% 30	1.5% 8	2.5% 14	2.5% 6	2.3% 6	0.8% 2	1.8% 4	1.0% 3
		Cattle		4.2% 1	2.5% 7	2.4% 39	2.2% 30	2.6% 23	2.5% 25	3.3% 22	1.5% 9	4.9% 16	4.6% 18
		Swine		1.8% 2	0.3% 2	1.1% 10	0.9% 4	0.0% 0	1.6% 6	2.4% 5	1.6% 5	2.3% 7	2.0% 6
Phenicols	Chloramphenicol (MIC ≥ 32 μg/ml)	Humans	10.6% 140	10.1% 131	9.9% 145	9.2% 137	10.1% 139	11.6% 164	8.6% 172	10.0% 187	7.6% 136	7.7% 159	6.4% 139
		Chicken Breasts							0.0%	2.4%	1.9%	0.7%	2.6%
		Ground Turkey							1.4%	0.9%	2.8%	0.5%	0.6%
		Ground Beef							22.2%	40.0%	14.3%	12.5%	5.3%
		Pork Chops		2.207	2.007	4.007	4.004	2.504	40.0%	40.0%	18.2%	22.2%	0.0%
		Chickens		2.3%	2.9%	1.8% 26	4.6% 54	2.5%	2.4% 36	2.1%	1.3% 16	1.8% 36	1.7% 24
		Turkeys		3.7%	0.8%	4.1% 29	4.1% 21	3.8% 21	5.3%	4.2% 11	4.7% 11	4.8%	3.9%
		Cattle		4.2% 1	5.6% 16	8.5% 137	15.1% 209	16.5% 147	20.6% 208	25.1% 168	17.6% 107	21.9% 72	19.8% 77
				11.7%	8.4%	8.0%	12.4%	7.7%	10.0%	8.5%	12.7%	10.6%	7.9%

¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 8d. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

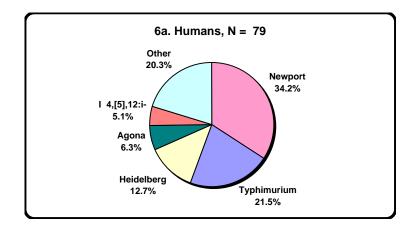
Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
		Chicken Breasts Ground Turkey Ground Beef							60 74 9	83 114 10	157 142 14	153 183 8	152 159 19
		Pork Chops Chickens		214	561	1438	1173	1307	10 1500	5 1158	11 1280	9 1989	8 1380
		Turkeys Cattle Swine		107 24 111	240 284 793	713 1610 876	518 1388 451	550 893 418	244 1008 379	262 670 211	236 607 308	227 329 301	304 389 304
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source			7.00	0.0	101	110	0.0	2	- 000	301	001
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	0.0% 0	0.0% 0	0.1% 1	0.1% 1	0.4% 5	0.2% 3	<0.1% 1	0.2% 3	0.2% 4	<0.1% 1	0.1% 2
		Chicken Breasts							0.0% 0	0.0%	0.0%	0.0% 0	0.0%
		Ground Turkey							0.0% 0	0.0%	0.0%	0.0% 0	0.0%
		Ground Beef							0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%
		Pork Chops							0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%
		Chickens		0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.1% 1	0.0%	0.0% 0	0.0%
		Turkeys		0.0% 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		0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%
		Swine		0.0% 0	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)	Humans	0.4% 5	0.9% 12	1.4% 20	0.9% 14	2.5% 34	2.6% 37	1.8% 36	2.3% 42	2.6% 47	2.4% 50	2.7% 60
		Chicken Breasts							0.0% 0	1.2% 1	0.0%	0.7% 1	0.7% 1
		Ground Turkey							8.1% 6	4.4% 5	0.0%	1.1% 2	0.0%
		Ground Beef							0.0%	0.0% 0	0.0%	0.0% 0	0.0%
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
		Chickens		0.0% 0	0.2% 1	0.2% 3	0.5% 6	0.0% 0	0.8% 12	0.4% 5	0.5% 6	0.3% 6	0.1%
		Turkeys		4.7% 5	2.1% 5	5.3% 38	5.4% 28	5.1% 28	5.3% 13	3.8% 10	2.1% 5	2.2% 5	0.7% 2
		Cattle		0.0%	0.4% 1	0.1% 1	0.4% 6	0.4% 4	0.4% 4	0.4% 3	2.0% 12	1.5% 5	0.5% 2
		Swine		0.0%	0.0%	0.0% 0	0.2% 1	0.0%	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.0%
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans	24.2% 320	21.7% 282	20.2% 295	19.3% 289	18.6% 256	19.7% 280	14.9% 299	16.3% 303	13.5% 242	13.7% 282	13.4% 293
		Chicken Breasts							33.3% 20	27.7% 23	46.5% 73	43.8% 67	46.7% 71
		Ground Turkey							55.4% 41	39.5% 45	56.3% 80	39.9% 73	56.0% 89
		Ground Beef							22.2%	40.0% 4	14.3% 2	12.5% 1	21.1% 4
		Pork Chops							70.0% 7	80.0% 4	54.5% 6	55.6% 5	25.0% 2
		Chickens		20.6% 44	20.5% 115	25.0% 359	26.3% 308	21.9% 286	24.9% 374	26.2% 303	27.4% 351	28.3% 563	31.8% 439
	<u> </u>				45.004	E0.00/	EC 20/	E 4 00/	54.5%	E0.00/	40.007	E 4 00/	61.8%
		Turkeys		52.3% 56	45.8% 110	52.9% 377	56.2% 291	54.9% 302	133	58.8% 154	48.3% 114	54.6% 124	188
		Turkeys Cattle											

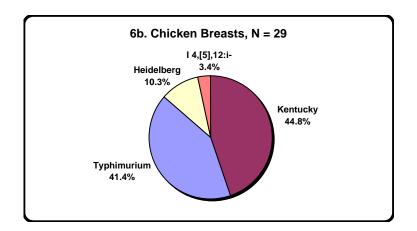
Ceftiofur Resistance

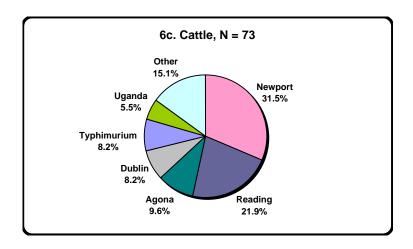
Table 9. Ceftiofur-Resistant *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2006

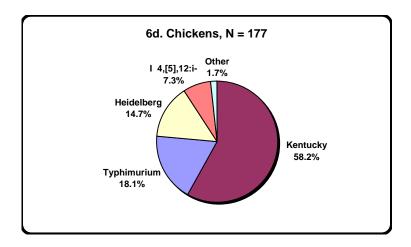
	Humans				Retail Me	ats			Food Anima	als	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=79)	Newport Typhimurium Heidelberg Agona I 4,[5],12:i:- Enteritidis IV 44:z4,z23:- Berta Concord	27 17 10 5 4 2 1	34.2 21.5 12.7 6.3 5.1 2.5 1.3 1.3	Chicken Breasts (N=29)	Kentucky Typhimurium Heidelberg I 4,[5],12:i:-	13 12 3 1	44.8 41.4 10.3 3.4	Chickens (N=177)	Kentucky Typhimurium Heidelberg I 4,[5],12:i:- Brandenburg Infantis Untypable	103 32 26 13 1 1	58.2 18.1 14.7 7.3 0.6 0.6 0.6
	Kentucky Lindenburg Paratyphi B var. L(+) tartrate+ Mbandaka Saintpaul Schwarzengrund Thompson Uganda Partial serotype (Groups B, C1, C2)	1 1 1 1 1 1 1 1 3	1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 3.8	Ground Turkey (N=8)	Heidelberg Berta Bredeney	6 1 1	75.0 12.5 12.5	Turkeys (N=16)	Agona Heidelberg Rough O:e,h:1,2 Cerro Hadar Newport Saintpaul Schwarzengrund Senftenberg	5 4 1 1 1 1 1	31.3 25.0 6.3 6.3 6.3 6.3 6.3 6.3 6.3
				Ground Beef (N=0)				Cattle (N=73)	Newport Reading Agona Dublin Typhimurium Uganda Infantis Bardo Kentucky Anatum Enteritidis Montevideo Saintpaul	23 16 7 6 6 4 3 2 2 1 1 1	31.5 21.9 9.6 8.2 8.2 5.5 4.1 2.7 2.7 1.4 1.4
				Pork Chops (N=0)				Swine (N=6)	Agona Johannesburg Heidelberg Infantis	2 2 1 1	33.3 33.3 16.7 16.7

Figures 6a-d. Ceftiofur-Resistant Salmonella (non-Typhi) Isolates, by Source and Serotype, 2006¹









¹ Pie charts are not provided for other sources due to the small number of ceftiofur-resistant isolates. Table 9 shows a complete listing of ceftiofur-resistant isolates by source and serotype

Figure 7. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftiofur, by Year, 1996-2006

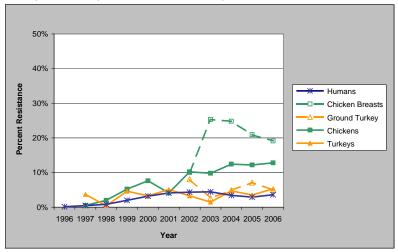
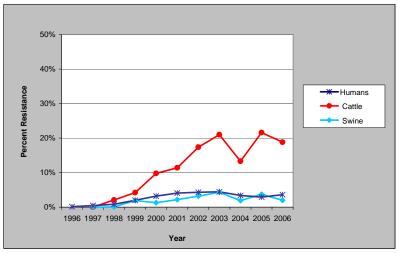


Figure 8. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Cattle, and Swine Resistant to Ceftiofur, by Year, 1996-2006¹



¹ Data for ground beef and pork chops are not included due to the small number of *Salmonella* isolates from these sources. Table 8 contains resistance data for *Salmonella* isolates from each source, by year

Table 10. Number of Salmonella (non-Typhi) Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

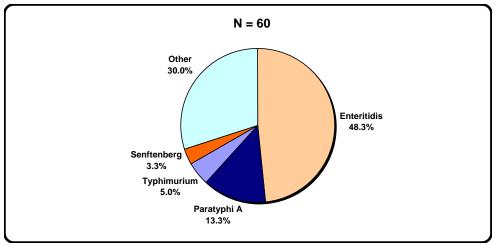
Tubic 10. Humber	or cannor	iona (non	· , p,	iatoo ioot	ou nomin	airiario, itt	otan moute	, and i oo	a / tillillaio	, by ioui,	1000 2000
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
Chicken Breasts							60	83	157	153	152
Ground Turkey							74	114	142	183	159
Ground Beef							9	10	14	8	19
Pork Chops							10	5	11	9	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
Turkeys		107	240	713	518	550	244	262	236	227	304
Cattle		24	284	1610	1388	893	1008	670	607	329	389
Swine		111	793	876	451	418	379	211	308	301	304

Nalidixic Acid Resistance

Table 11. Naldixic Acid-Resistant *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2006

	Humans				Retail Me	eats			Food Anima	ls	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=60)	Enteritidis Paratyphi A Typhimurium Senftenberg I 4,5,12:b:- I 4,[5],12:i:- Agona Albany Bardo Braenderup Cubana Hadar	29 8 3 2 1 1 1 1 1 1	48.3 13.3 5.0 3.3 1.7 1.7 1.7 1.7 1.7	Chicken Breasts (N=1)	Heidelberg	1	100.0	Chickens (N=2)	Kentucky Schwarzengrund	1 1	50.0 50.0
	Kentucky Kiambu Muenchen Newport Sandiego Schwarzengrund	1 1 1 1 1	1.7 1.7 1.7 1.7 1.7	Ground Turkey (N=0)				Turkeys (N=2)	Agona Saintpaul	1	50.0 50.0
	Stanley Tennessee Uganda Virchow	1 1 1 1	1.7 1.7 1.7 1.7	Ground Beef (N=0)				Cattle (N=2)	Dublin Reading	1 1	50.0 50.0
				Pork Chops (N=0)				Swine (N=0)			

Figure 9. Nalidixic Acid-Resistant *Salmonella* (non-Typhi) Isolates from Humans, by Serotype, 2006¹



¹ Pie charts are not provided for other sources due to the small number of nalidixic acid-resistant isolates. Table 11 above show a complete listing of nalidixic acid-resistant isolates by source and serotype

Figure 10. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Retail Poultry, and Poultry Resistant to Nalidixic Acid, by Year, 1996-2006

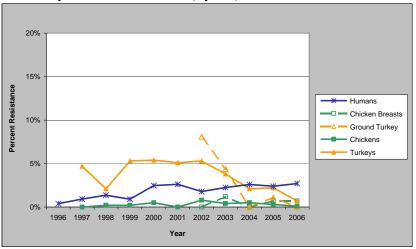
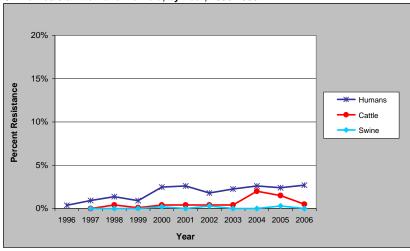


Figure 11. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Cattle, and Swine Resistant to Nalidixic Acid, by Year, 1996-2006 ¹



¹ Data for ground beef and pork chops are not included due to the small number of *Salmonella* isolates from these sources. Table 8 contains resistance data for *Salmonella* isolates from each source, by year

Table 12. Number of Salmonella (non-Typhi) Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

			<i>j</i>								
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
Chicken Breasts							60	83	157	153	152
Ground Turkey							74	114	142	183	159
Ground Beef							9	10	14	8	19
Pork Chops							10	5	11	9	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
Turkeys		107	240	713	518	550	244	262	236	227	304
Cattle		24	284	1610	1388	893	1008	670	607	329	389
Swine		111	793	876	451	418	379	211	308	301	304

Multidrug Resistance

Table 13a. Resistance Patterns among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2002	1864	1794	2005	2184
		1021		. 100	1 100						153	
	Chicken Breasts Ground Turkey							60 74	83 114	157 142	183	152 159
	Ground Beef							9	10	142	8	19
	Pork Chops							10	5	11	9	8
	· ·											
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
	Turkeys		107	240	713	518	550	244	262	236	227	304
	Cattle		24	284	1610	1388	893	1008	670	607	329	389
	Swine		111	793	876	451	418	379	211	308	301	304
Resistance Pattern	Isolate Source											
	Humans	66.2%	68.4%	72.9%	74.2%	74.4%	72.3%	79.0%	77.7%	79.6%	80.6%	80.2%
1. No Resistance Detected	Tamano	876	890	1064	1109	1024	1026	1586	1449	1428	1654	1752
	Chicken Breasts							51.7%	47.0% 39	40.1%	46.4%	38.8%
								31 37.8%	34.2%	63 28.9%	71 30.1%	59 17.6%
	Ground Turkey							28	39	41	55	28
								77.8%	60.0%	78.6%	75.0%	73.7%
	Ground Beef							7	6	11	6	14
	D. J. Ol							20.0%	20.0%	45.5%	44.4%	25.0%
	Pork Chops							2	1	5	4	2
	Chickens		52.8%	58.6%	58.8%	57.1%	66.7%	62.0%	61.1%	62.7%	61.2%	57.3%
	CHICKEHS		113	329	846	670	872	930	708	803	1217	791
	Turkeys		32.7%	41.3%	32.5%	33.4%	31.6%	29.9%	24.0%	33.5%	27.8%	28.6%
	Tunioyo		35	99	232	173	174	73	63	79	63	85
	Cattle		66.7%	73.2%	74.5%	70.1%	70.0%	64.3%	61.0%	65.6%	63.2%	67.6%
			16	208	1199	973	625	648	409	398	208	263
	Swine		44.1% 49	49.2% 390	48.9% 428	43.2%	43.5% 182	40.1% 152	53.6%	37.3%	44.5% 134	34.5%
		8.8%	9.5%	8.9%	8.4%	195 8.9%	10.0%	7.8%	113 9.3%	115 7.1%	6.9%	105 5.5%
2. At Least ACSSuT ¹ Resistant	Humans											
2. At Least ACSSUT Resistant		116	124	130	125	122	142	156 0.0%	173 2.4%	128 1.9%	141 0.7%	121 2.6%
	Chicken Breasts							0.0%	2.478	3	1	4
								1.4%	0.9%	2.8%	0.5%	0.6%
	Ground Turkey							1	1	4	1	1
								22.2%	40.0%	14.3%	12.5%	5.3%
	Ground Beef							2	4	2	1	1
	Dork Chang							40.0%	40.0%	9.1%	22.2%	0.0%
	Pork Chops							4	2	1	2	0
	Chickens		1.4%	2.7%	1.7%	4.3%	2.4%	1.9%	1.5%	0.9%	1.6%	1.6%
	Chickons		3	15	24	50	32	29	17	12	31	22
	Turkeys		3.7%	0.8%	3.8%	3.3%	3.6%	4.5%	2.3%	4.7%	4.0%	3.9%
			4	2	27	17	20	11	6	11	9	12
	Cattle		4.2%	4.2%	7.6%	13.1%	14.6%	17.1%	18.1%	16.3%	20.4%	18.3%
			1 4 59/	12	123	182	130	172 7.7%	121	99	67	71 5 20/
	Swine		4.5% 5	7.8% 62	7.1% 62	8.6% 39	7.2% 30	7.7% 29	7.6% 16	12.0% 37	9.6% 29	5.3% 16
		0.8%	0.4%	0.9%	0.9%	1.0%	0.5%	1.0%	1.2%	0.6%	0.9%	0.7%
3. At Least ACT/S ² Resistant	Humans	10	5	13	14	1.0%	7	21	23	10	18	15
S. At Least ACI/S Resistant		10	3	13	14	14		0.0%	0.0%	0.0%	0.0%	0.0%
	Chicken Breasts							0.0%	0.0 %	0.078	0.0 %	0.0 %
	Ground Turkey							1.4%	0.0%	0.0%	0.0%	0.0%
	· ·							0.0%	0.0%	7.1%	0.0%	0.0%
	Ground Beef							0	0	1	0	0
	Pork Chops							20.0% 2	0.0% 0	0.0%	11.1% 1	0.0%
	Chickens		0.0%	0.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%
			0	1 0.49/	2	0	1 0.70/	0	0	1 0.40/	2	0
	Turkeys		0.0%	0.4%	0.4%	0.8%	0.7%	0.8%	0.0%	0.4%	0.0%	0.3%
			0.0%	1 2.1%	3 2.2%	1.7%	4 2.4%	2.4%	0 2.7%	1.2%	0 4.3%	1 10/
	Cattle		0.0%	6	35	23	2.4%	2.4%	18	7	4.3% 14	4.1% 16
			0.0%	0.5%	0.5%	0.0%	1.0%	0.5%	0.9%	0.6%	1.7%	0.3%
	Swine		0.0%	4	4	0.0%	4	2	2	2	5	1
			. J	-		J					J	

 $^{^{1} \ \}mathsf{ACSSuT} = \mathsf{ampicillin}, \ \mathsf{chloramphenicol}, \ \mathsf{streptomycin}, \ \mathsf{sulfamethoxazole/sulfisoxazole}, \ \mathsf{and} \ \mathsf{tetracycline}$

 $^{^2\,\}mbox{ACT/S} = \mbox{ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole}$

Table 13b. Resistance Patterns among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006 Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
	Chicken Breasts							60	83	157	153	152
	Ground Turkey							74	114	142	183	159
	Ground Beef							9	10	142	8	19
	Pork Chops							10	5	11	9	8
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380
	Turkeys		107	240	713	518	550	244	262	236	227	304
	Cattle		24	284	1610	1388	893	1008	670	607	329	389
	Swine		111	793	876	451	418	379	211	308	301	304
	Isolate											
Resistance Pattern	Source											
	Humans	0.0%	0.3%	0.3%	1.5%	2.6%	2.5%	3.3%	3.2%	2.3%	2.0%	2.0%
4. At Least ACSSuTAuCf 1	Tiumans	0	4	5	23	36	36	67	60	42	41	43
Resistant	Chicken Breasts							0.0%	0.0%	1.9%	0.0%	2.6%
	Cilionolii Brodolo							0	0	3	0	4
	Ground Turkey							1.4%	0.9%	2.1%	0.5%	0.0%
								1	1	3	1	0
	Ground Beef							22.2%	40.0%	14.3%	0.0%	0.0%
								2	4	2	0	0
	Pork Chops							20.0%	20.0%	0.0%	0.0%	0.0%
			0.0%	0.5%	0.3%	2.7%	1.1%	0.9%	1.0%	0.4%	0.9%	0 1.1%
	Chickens		0.0%	3	5	32	1.1%	13	1.0%	5	18	1.1%
			3.7%	0.4%	3.4%	1.9%	2.9%	1.6%	0.8%	2.1%	1.8%	2.3%
	Turkeys		4	1	24	10	16	4	2	5	4	7
			0.0%	2.1%	3.7%	8.9%	11.0%	14.6%	15.1%	11.9%	17.6%	16.2%
	Cattle		0	6	59	124	98	147	101	72	58	63
			0.0%	0.1%	0.6%	1.3%	2.2%	1.8%	1.9%	1.0%	2.7%	1.0%
	Swine		0	1	5	6	9	7	4	3	8	3
		0.0%	0.2%	0.0%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%
5. At Least Ceftiofur and	Humans	0	2	0	1	1	2	4	2	2	2	3
Nalidixic Acid Resistant	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
	Chicken bleasis							0	0	0	0	0
	Ground Turkey							0.0%	0.9%	0.0%	0.0%	0.0%
	Glound Turkey							0	1	0	0	0
	Ground Beef							0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Boor							0	0	0	0	0
	Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
								0	0	0	0	0
	Chickens		0.0%	0.0%	0.1%	0.1%	0.0%	0.6%	0.1%	0.2%	0.1%	0.0%
			0	0	1	1 1.2%	0	9	1 0.40/	3	1	0
	Turkeys		1.9% 2	0.0% 0	2.7% 19	1.2% 6	1.5% 8	1.2% 3	0.4% 1	0.8%	0.9% 2	0.3% 1
	<u> </u>		0.0%	0.0%	0.1%	0.1%	0.3%	0.2%	0.4%	1.0%	0.9%	0.3%
	Cattle		0.0%	0.0%	0.1%	0.1%	3	0.2%	3	1.0%	0.9%	1
			0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%
	Swine		0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070

¹ ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

Table 14. *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals that are at least ACSSuT¹ Resistant, by Serotype, 2006

	Humans				Retail Mea	ats			Food Anim	als	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=121)	Typhimurium Newport Agona Paratyphi B var. L(+) tartrate+ I 4,[5],12:i:-	80 26 4 3	66.1 21.5 3.3 2.5 1.7	Chicken Breasts (N=4)	Kentucky	4	100.0	Chickens (N=22)	Kentucky Typhimurium Heidelberg	12 7 3	54.5 31.8 13.6
	Mbandaka Saintpaul Stanley Tennessee Uganda Partial Serotype (Group C2)	1 1 1 1 1	0.8 0.8 0.8 0.8 0.8	Ground Turkey (N=1)	Senftenberg	1	100.0	Turkeys (N=12)	Agona Typhimurium Illa 18:z4,z23:- Heidelberg Hadar Senftenberg	3 3 2 2 1 1	25.0 25.0 16.7 16.7 8.3 8.3
				Ground Beef (N=1)	Typhimurium	1	100.0	Cattle (N=71)	Newport Reading Typhimurium Agona Dublin Uganda Bardo Infantis Anatum Enteritidis Kentucky	19 16 11 7 7 4 2 2 1 1	26.8 22.5 15.5 9.9 9.9 5.6 2.8 2.8 1.4 1.4
				Pork Chops (N=0)				Swine (N=16)	Typhimurium Agona Infantis Ohio	11 3 1	68.8 18.8 6.3 6.3

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

Table 15. Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals that are at least ACT/S¹ Resistant, by Serotype, 2006

	Humans				Retail M	eats				Food Anir	nals	
Source	Serotype	n	%	Meat Type	Serotype		n	%	Animal Source	Serotype	n	%
Humans (N=15)	Newport Typhimurium Agona Kedougou Mbandaka Stanley Tennessee Partial Serotype (Group C2)	5 3 2 1 1 1 1	33.3 20.0 13.3 6.7 6.7 6.7 6.7	Chicken Breasts (N=0) Ground Turkey (N=0)					Chickens (N=0) Turkeys (N=1)	Agona	1	100.0
				Ground Beef (N=0)					Cattle (N=16)	Agona Newport Uganda Dublin Infantis Reading Typhimurium	6 3 3 1 1 1 1	37.5 18.8 18.8 6.3 6.3 6.3 6.3
				Pork Chops (N=0)					Swine (N=1)	Typhimurium	1	100.0

 $^{^{1}}$ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 16. Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals that are at least ACSSuTAuCf¹ Resistant, by Serotype, 2006

	Humans				Retail Me	ats				Food Anir	nals	
				Meat					Animal			
ource	Serotype	n %	,	Туре	Serotype	ı	n	%	Source	Serotype	n	%
umans	Newport	23 5	3.5	Chicken	Kentucky		4	100.0	Chickens	Kentucky	12	80.0
	Typhimurium		7.9	Breasts	rtoritativy		•	100.0	(N=15)	Heidelberg	3	20.0
-	Agona		.3	(N=4)					, -,	r rordonoorg	ŭ	20.0
	Mbandaka		.3	` ,								
	Saintpaul		.3									
	Uganda		.3									
	Partial Serotype (Group C2)		.3									
				Ground					Turkeys	Agona	3	42.9
				Turkey					(N=7)	Heidelberg	2	28.6
				(N=0)						Hadar	1	14.3
										Senftenberg	1	14.3
									2	Newsort	40	00.0
				Ground Beef					Cattle (N=63)	Newport	19	30.2
				(N=0)					(14=03)	Reading	16 7	25.4
				(14-0)						Agona Dublin	<i>7</i> 5	11.1 7.9
										Typhimurium	5	7.9 7.9
										Uganda	4	6.3
										Bardo	2	3.2
										Infantis	2	3.2
										Anatum	1	1.6
										Enteritidis	1	1.6
										Kentucky	1	1.6
				Pork					Swine	Agona	2	66.7
				Chops					(N=3)	Infantis	1	33.3
				(N=0)								
				(N=0)								

¹ ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

Table 17. Salmonella (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals that are at least Ceftiofur and Nalidixic Acid Resistant, by Serotype, 2006

Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=3)	Agona Kentucky Uganda	1 1 1	33.3 33.3 33.3	Chicken Breasts (N=0)				Chickens (N=0)			
				Ground Turkey (N=0)				Turkeys (N=1)	Agona	1	100.0
				Ground Beef (N=0)				Cattle (N=1)	Reading	1	100.0
				Pork Chops (N=0)				Swine (N=0)			

E. Antimicrobial Susceptibility among Salmonella Enteritidis

Table 18a. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	d	Humans	351	301	244	269	319	277	337	257	271	384	412
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							4 5 1 0	3 1 1 0	3 0 0	12 0 0 0	17 0 0 0
		Chickens Turkeys Cattle		1 0 1	13 0 1	41 1 8	31 1 4	21 0 4	48 0 6	42 0 3	84 0 2	173 0 2	188 3 2
		Swine		0	0	2	1	1	1	1	1	0	0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Amikacin (MIC ≥ 64 µg/ml)	Humans		0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0% 0	0.0%	0.0%
	(= 5	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0% 0	0.0%			
		Ground Beef							0.0% 0	0.0%			
		Pork Chops											
		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
		Turkeys				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% 0
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0		
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.8% 17	0.3% 1	0.4% 1	0.0%	0.3% 1	0.0% 0	0.3% 1	0.4% 1	0.4% 1	0.8%	0.2% 1
		Chicken Breasts							0.0%	0.0%	0.0% 0	0.0%	0.0% 0
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens		0.0% 0	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	1.2% 1	0.0%	0.0% 0
		Turkeys				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	0.0% 0
		Swine				0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0		
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	0.0% 0	0.7% 2	0.4% 1	0.4% 1	0.3% 1	0.7% 2	0.3% 1	0.0%	0.7% 2	0.3% 1	0.2% 1
		Chicken Breasts							0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens		0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0	2.1% 1	0.0%	0.0% 0	0.0% 0	0.0% 0
		Turkeys				0.0%	0.0% 0						0.0% 0
		Cattle		0.0%	0.0%	12.5% 1	0.0% 0	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	50.0% 1
		Swine				0.0%	0.0%	100.0%	0.0%	0.0%	0.0%		
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	2.0% 7	4.3% 13	1.6% 4	2.2% 6	0.0%	1.4%	1.8%	1.2%	2.2% 6	1.0% 4	1.2% 5
		Chicken Breasts							0.0%	0.0%	0.0% 0	0.0%	0.0%
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens		0.0%	0.0% 0	0.0%	0.0% 0	0.0% 0	2.1% 1	0.0% 0	1.2% 1	0.6% 1	0.0% 0
		Turkeys				0.0%	0.0% 0						0.0% 0
		Cattle		0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	50.0% 1
		Swine				0.0%	0.0%	100.0%	0.0%	0.0%	0.0% 0		

Table 18b. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans Chicken Breasts Ground Turkey Ground Beef Pork Chops	351	301	244	269	319	277	337 4 5 1	257 3 1 1 0	271 3 0 0 0	384 12 0 0	412 17 0 0 0
		Chickens Turkeys Cattle Swine		1 0 1 0	13 0 1 0	41 1 8 2	31 1 4 1	21 0 4 1	48 0 6 1	42 0 3 1	84 0 2 1	173 0 2 0	188 3 2 0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	20.5% 72	11.3% 34	6.1% 15	10.8% 29	7.5% 24	8.7% 24	7.1% 24	2.3%	4.1% 11	2.9% 11	4.4% 18
	(Chicken Breasts	.=			=-	= :	_ :	0.0%	66.7%	33.3%	0.0%	17.6%
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops							-				
		Chickens		100.0% 1	30.8% 4	12.2% 5	9.7% 3	0.0%	4.2% 2	0.0%	1.2% 1	1.2% 2	1.6% 3
		Turkeys		·		0.0%	0.0%		_			_	0.0%
		Cattle		0.0%	100.0% 1	12.5% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%
		Swine				0.0%	0.0%	100.0%	0.0%	0.0%	0.0%		
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	0.6% 2	0.0%	0.0%	0.4%	0.0%	1.4%	0.6%	0.0%	0.0%	0.8%	0.5% 2
	(MIC ≥ 32 / 16 μg/ml)	Chicken Breasts	_						0.0%	33.3%	33.3% 1	0.0%	0.0%
		Ground Turkey							0.0%	0.0%			
	 - -	Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens		0.0%	0.0%	2.4% 1	3.2% 1	0.0%	4.2% 2	0.0%	1.2% 1	0.6% 1	0.0%
		Turkeys			J	0.0%	0.0%	J	_			•	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%
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	J	
Cephalosporins	Ceftiofur (MIC ≥ 8 μg/ml)	Humans	0.0%	0.3% 1	0.0%	0.4% 1	0.0%	2.2% 6	0.0%	0.0%	0.0%	0.5% 2	0.5% 2
	(Chicken Breasts							0.0%	33.3%	33.3% 1	0.0%	0.0%
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops							J				
		Chickens		0.0%	0.0%	4.9% 2	3.2% 1	0.0%	4.2% 2	0.0%	1.2% 1	1.2% 2	0.0%
		Turkeys		-		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	50.0%
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Ceftriaxone (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%	0.0% 0
	19/	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	0.0%			
	<u></u>	Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%
		Turkeys				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%
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		

Table 18c. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006			4000	400=	4622	4000	0000	0001	0000	0000	0001	000=	0522
Year Number of Isolates Tested		Humans	1996 351	1997 301	1998 244	1999 269	2000 319	2001 277	2002 337	2003 257	2004 271	2005 384	2006 412
		Chicken Breasts Ground Turkey Ground Beef Pork Chops		66.		200	0.0		4 5 1 0	3 1 1 0	3 0 0	12 0 0 0	17 0 0 0
		Chickens Turkeys Cattle Swine		1 0 1 0	13 0 1 0	41 1 8 2	31 1 4 1	21 0 4 1	48 0 6 1	42 0 3 1	84 0 2 1	173 0 2 0	188 3 2 0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 μg/ml)	Humans					0.0%	0.4% 1	0.0%	0.0%	0.0%	1.0% 4	0.5% 2
	(Wile = 62 µg/iii)	Chicken Breasts					J		0.0%	33.3% 1	33.3% 1	0.0%	0.0%
		Ground Turkey							0.0%	0.0%			Ť
		Ground Beef							0.0%	0.0%			
		Pork Chops							U	0			
		Chickens					0.0%	0.0%	2.1%	0.0%	1.2%	0.6%	0.0%
		Turkeys					0.0%	0	'	0	'	'	0.0%
		Cattle					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%
		Swine					0.0%	0.0%	0.0%	0.0%	0.0%	0	,
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹	Humans	8.5%	9.0%	2.0%	3.0%	0.9%	2.2%	1.8%	1.2%	1.8%	1.6%	1.5%
	(MIC ≥ 512 µg/ml)	Chicken Breasts	30	27	5	8	3	6	0.0%	0.0%	5 33.3%	0.0%	0.0%
		Ground Turkey							0.0%	0.0%	1	0	0
		Ground Beef							0.0%	0.0%			
		Pork Chops							0	0			
		Chickens		0.0%	0.0%	4.9%	3.2%	0.0%	4.2%	2.4%	1.2%	0.0%	0.0%
		Turkeys		0	0	0.0%	0.0%	0	2	1	1	0	0.0%
		Cattle		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%
		Swine		0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	1
	Trimethoprim- Sulfamethoxazole	Humans	6.6%	1.3%	0.8%	0.7%	0.0%	0.7%	0.6%	0.8%	0.0%	0.5%	0.5%
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts	23	4	2	2	0	2	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	0.0%	0	0	0
		Ground Beef							0.0%	0.0%			
		Pork Chops							0	0			
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0	0	0.0%	0.0%	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%
		Swine		0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0
Phenicols	Chloramphenicol	Humans	0.0%	0.7%	0.0%	0.4%	0.0%	0.0%	0.6%	0.4%	0.4%	0.5%	0.0%
	(MIC ≥ 32 μg/ml)	Chicken Breasts	0	2	0	1	0	0	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	0.0%	0	0	0
		Ground Beef							0.0%	0.0%			
		Pork Chops							0	0			
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%
		Turkeys		0	0	0.0%	0.0%	0	0	0	0	1	0.0%
		Cattle		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%
		Swine		0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	1
1	L	and was replaced				0	0	0	0	0	0		

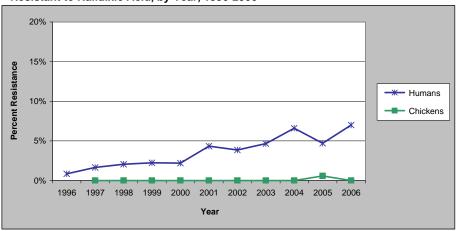
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 18d. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	351	301	244	269	319	277	337	257	271	384	412
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							4 5 1 0	3 1 1 0	3 0 0 0	12 0 0 0	17 0 0 0
		Chickens Turkeys Cattle Swine		1 0 1 0	13 0 1 0	41 1 8 2	31 1 4 1	21 0 4 1	48 0 6 1	42 0 3 1	84 0 2 1	173 0 2 0	188 3 2 0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (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	0.0% 0	0.0%
	(,	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0% 0	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops											
		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%
		Turkeys				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%	0.0% 0	0.0% 0
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.9% 3	1.7% 5	2.0% 5	2.2% 6	2.2% 7	4.3% 12	3.9% 13	4.7% 12	6.6% 18	4.7% 18	7.0% 29
	, , ,	Chicken Breasts							0.0%	0.0% 0	0.0%	0.0% 0	0.0%
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens		0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0	0.0%	0.0% 0	0.0%	0.6% 1	0.0%
		Turkeys				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%
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans	16.8% 59	9.6% 29	6.6% 16	8.2% 22	1.9% 6	1.8%	4.5% 15	1.6%	3.3%	2.3% 9	1.7% 7
		Chicken Breasts							0.0%	0.0%	33.3% 1	0.0% 0	11.8% 2
		Ground Turkey							0.0%	0.0% 0			
		Ground Beef							0.0%	0.0% 0			
		Pork Chops											
		Chickens		0.0%	0.0% 0	7.3% 3	0.0%	0.0%	2.1% 1	2.4% 1	2.4% 2	0.6% 1	1.6% 3
		Turkeys				0.0%	0.0%						0.0%
		Cattle		0.0%	100.0% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	50.0% 1
		Swine				0.0%	0.0%	100.0% 1	0.0%	0.0%	0.0%		

Nalidixic Acid Resistance

Figure 12. Percent of *Salmonella* Enteritidis Isolates from Humans and Chickens Resistant to Nalidixic Acid, by Year, 1996-2006¹



¹ Data for other sources are not included due to the small number of *Salmonella* Enteritidis isolates from these sources. Table 18 contains resistance data for *Salmonella* Enteritidis isolates from each source, by year

Table 19. Number of *Salmonella* Enteritidis Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	351	301	244	269	319	277	337	257	271	384	412
Chicken Breasts							4	3	3	12	17
Ground Turkey							5	1	0	0	0
Ground Beef							1	1	0	0	0
Pork Chops							0	0	0	0	0
Chickens		1	13	41	31	21	48	42	84	173	188
Turkeys		0	0	1	1	0	0	0	0	0	3
Cattle		1	1	8	4	4	6	3	2	2	2
Swine		0	0	2	1	1	1	1	1	0	0

Table 20a. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	351	301	244	269	319	277	337	257	271	384	412
	Chicken Breasts Ground Turkey Ground Beef Pork Chops							4 5 1 0	3 1 1 0	3 0 0 0	12 0 0 0	17 0 0 0
	Chickens Turkeys Cattle Swine		1 0 1 0	13 0 1 0	41 1 8 2	31 1 4 1	21 0 4 1	48 0 6 1	42 0 3 1	84 0 2 1	173 0 2 0	188 3 2 0
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans	73.5% 258	77.4% 233	87.7% 214	83.6% 225	89.0% 284	86.6% 240	87.2% 294	91.8% 236	87.1% 236	91.9% 353	88.6% 365
	Chicken Breasts							100.0% 4	33.3% 1	66.7% 2	100.0% 12	82.4% 14
	Ground Turkey							100.0%	100.0%			
	Ground Beef							100.0% 1	100.0% 1			
	Pork Chops											
	Chickens		0.0% 0	69.2% 9	82.9% 34	90.3% 28	100.0% 21	95.8% 46	97.6% 41	97.6% 82	97.1% 168	97.9% 184
	Turkeys				100.0% 1	100.0% 1						100.0% 3
	Cattle		100.0% 1	0.0%	87.5% 7	100.0% 4	100.0% 4	100.0% 6	100.0% 3	100.0% 2	100.0% 2	50.0% 1
	Swine		0.0% 0	0.0%	100.0% 2	100.0% 1	0.0%	100.0% 1	100.0% 1	100.0% 1		
2. At Least ACSSuT ¹ Resistant	Humans	0.0%	0.3%	0.0%	0.4% 1	0.0%	0.0%	0.3%	0.4%	0.4%	0.5% 2	0.0%
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0
	Ground Turkey							0.0% 0	0.0% 0			
	Ground Beef							0.0% 0	0.0% 0			
	Pork Chops											
	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
	Turkeys				0.0% 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	0.0% 0	0.0% 0
	Swine		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. At Least ACT/S ² Resistant	Humans	0.0%	0.3% 1	0.0%	0.4% 1	0.0%	0.0%	0.0%	0.4% 1	0.0%	0.0%	0.0%
	Chicken Breasts							0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%
	Ground Turkey							0.0% 0	0.0% 0			
	Ground Beef							0.0%	0.0%			
	Pork Chops											
	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
	Turkeys				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	0.0% 0	0.0% 0
	Swine		0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%		

 $^{^{1}\;} ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline$

 $^{^2}$ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 20b. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	351	301	244	269	319	277	337	257	271	384	412
	Chicken Breasts							4	3	3	12	17
	Ground Turkey							5	1	0	0	0
	Ground Beef							1	1	0	0	0
	Pork Chops							0	0	0	0	0
	Chickens		1	13	41	31	21	48	42	84	173	188
	Turkeys		0	0	1	1	0	0	0	0	0	3
	Cattle		1	1	8	4	4	6	3	2	2	2
	Swine		0	0	2	1	1	1	1	1	0	0
Resistance Pattern	Isolate Source											
	Humans	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%
4. At Least ACSSuTAuCf ¹ Resistant		0	0	0	1	0	0	0.0%	0.0%	0.0%	1 0.0%	0.0%
Resistant	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
								0.0%	0.0%			
	Ground Turkey							0	0			
	Ground Beef							0.0%	0.0%			
	Ground Beer							0	0			
	Pork Chops											
	Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Offickeria		0	0	0	0	0	0	0	0	0	0
	Turkeys				0.0%	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		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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		0	0	0	0	0	0	0	0		
	Ulumana	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%
5. At Least Ceftiofur and	Humans	0	1	0	0	0	0	0	0	0	1	0
Nalidixic Acid Resistant	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
								0	0	0	0	0
	Ground Turkey							0.0% 0	0.0%			
								0.0%	0.0%			
	Ground Beef							0.0 %	0.078			
	Pork Chops											
	OLIVE.		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens		0	0	0	0	0	0	0	0	0	0
	Turkeys				0.0% 0	0.0%						0.0%
	Caula		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cattle		0	0	0	0	0	0	0	0	0	0
	Swine		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	344110		0	0	0	0	0	0	0	0		

 $^{^{\}rm 1}$ ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

F. Antimicrobial Susceptibility among Salmonella Typhimurium

Table 21a. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	ed	Humans	306	328	381	363	304	324	393	406	382	437	407
		Chicken Breasts							9	22	49	29	21
		Ground Turkey Ground Beef							2 2	2	2 0	0	0
		Pork Chops							2	1	2	2	2
		Chickens Turkeys		24 11	66 6	154 37	145 18	130 15	150 9	156 6	171 14	183 7	105 5
		Cattle		2	33	189	187	87	98	78	48	34	22
	Antimicrobial	Swine		25	105	114	81	44	48	27	53	42	25
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Amikacin (MIC ≥ 64 µg/ml)	Humans		0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%
		Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0%	
		Ground Beef							0.0% 0	0.0%			0.0%
		Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens		0.0%	0.0% 0	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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%
		Swine		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gentamicin	Humans	4.2%	4.6%	3.7%	2.2%	2.6%	1.5%	2.3% 9	2.0%	2.1% 8	1.8%	2.7%
	(MIC ≥ 16 μg/ml)	Chicken Breasts	13	15	14	8	8	5	0.0%	0.0%	2.0%	0.0%	0.0%
		Ground Turkey							0 0.0% 0	0 0.0% 0	0.0%	0.0%	0
		Ground Beef							0.0%	0.0%	0	0	0.0%
		Pork Chops							0.0%	0.0%	0.0%	0.0%	50.0%
		Chickens		20.8%	18.2% 12	16.9% 26	15.2% 22	3.1%	12.7% 19	5.1% 8	4.1% 7	4.4%	6.7% 7
		Turkeys		45.5% 5	50.0%	29.7% 11	33.3% 6	53.3%	44.4% 4	83.3% 5	64.3% 9	14.3%	20.0%
		Cattle		0.0%	3.0%	2.6%	1.6%	0.0%	2.0%	1.3%	0.0%	0.0%	0.0%
		Swine		0.0%	0.0%	1.8%	0.0%	2.3%	2.1%	0.0%	3.8%	7.1%	8.0%
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	14.4% 44	15.5% 51	15.7% 60	12.9% 47	13.2% 40	8.3% 27	7.6% 30	7.1% 29	5.8% 22	5.7% 25	5.2% 21
	(=	Chicken Breasts		-				=:	0.0%	18.2%	34.7% 17	24.1%	47.6% 10
		Ground Turkey							0.0%	50.0% 1	50.0% 1	0.0%	
		Ground Beef							0.0% 0	0.0%			0.0%
		Pork Chops							0.0% 0	0.0%	0.0%	0.0%	100.0%
		Chickens		8.3% 2	4.5% 3	3.9% 6	3.4% 5	3.1% 4	5.3% 8	7.7% 12	9.9% 17	7.7% 14	18.1% 19
		Turkeys		81.8% 9	66.7% 4	59.5% 22	44.4% 8	73.3% 11	55.6% 5	50.0% 3	21.4% 3	0.0%	0.0%
		Cattle		0.0%	54.5% 18	36.5% 69	27.3% 51	24.1% 21	26.5% 26	16.7% 13	14.6% 7	38.2% 13	13.6% 3
		Swine		16.0% 4	18.1% 19	21.1% 24	14.8% 12	13.6% 6	2.1% 1	0.0% 0	9.4% 5	7.1% 3	16.0% 4
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	51.6% 158	55.2% 181	47.8% 182	43.3% 157	39.5% 120	40.1% 130	31.8% 125	35.2% 143	31.7% 121	27.9% 122	29.5% 120
		Chicken Breasts							0.0% 0	18.2% 4	14.3% 7	3.4% 1	9.5% 2
		Ground Turkey							0.0%	50.0% 1	50.0% 1	0.0% 0	
		Ground Beef							0.0% 0	0.0% 0			100.0% 1
		Pork Chops							50.0% 1	100.0% 1	100.0% 2	100.0% 2	100.0% 2
		Chickens		41.7% 10	45.5% 30	40.9% 63	35.9% 52	16.9% 22	30.0% 45	16.7% 26	8.2% 14	13.7% 25	17.1% 18
		Turkeys		81.8% 9	83.3% 5	81.1% 30	72.2% 13	93.3% 14	77.8% 7	100.0% 6	64.3% 9	57.1% 4	60.0% 3
		Cattle		100.0%	57.6% 19	63.0% 119	63.1% 118	46.0% 40	66.3% 65	52.6% 41	56.3% 27	55.9% 19	54.5% 12
		Swine		44.0% 11	82.9% 87	80.7% 92	77.8% 63	70.5% 31	77.1% 37	59.3% 16	77.4% 41	69.0% 29	72.0% 18

Table 21b. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tester	d	Humans	306	328	381	363	304	324	393	406	382	437	407
		Chicken Breasts							9	22	49	29	21
		Ground Turkey Ground Beef							2 2	2	2	0	0
		Pork Chops							2	1	2	2	2
		Chickens Turkeys		24 11	66 6	154 37	145 18	130 15	150 9	156 6	171 14	183 7	105 5
		Cattle		2	33	189	187	87	98	78	48	34	22
	Antimicrobial	Swine		25	105	114	81	44	48	27	53	42	25
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source											
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	50.0% 153	50.3% 165	45.7% 174	41.3% 150	42.1% 128	42.6% 138	33.6% 132	36.0% 146	31.9% 122	28.8% 126	28.3% 115
	, , ,	Chicken Breasts							33.3% 3	72.7% 16	53.1% 26	55.2% 16	57.1% 12
		Ground Turkey							0.0% 0	100.0% 2	50.0% 1	100.0% 1	
		Ground Beef							0.0% 0	0.0% 0			100.0% 1
		Pork Chops							50.0% 1	100.0% 1	50.0% 1	100.0% 2	100.0% 2
		Chickens		33.3% 8	30.3% 20	43.5% 67	42.1% 61	26.2% 34	45.3% 68	32.1% 50	46.8% 80	26.8% 49	42.9% 45
		Turkeys		72.7% 8	50.0% 3	64.9% 24	66.7% 12	80.0% 12	55.6% 5	66.7% 4	28.6% 4	57.1% 4	80.0% 4
		Cattle		100.0% 2	57.6% 19	66.1% 125	63.1% 118	57.5% 50	71.4% 70	59.0% 46	60.4% 29	73.5% 25	63.6% 14
		Swine		72.0% 18	75.2% 79	64.0% 73	82.7% 67	63.6% 28	62.5% 30	51.9% 14	71.7% 38	66.7% 28	76.0% 19
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	2.6% 8	3.4% 11	4.5% 17	2.8% 10	6.3% 19	6.2% 20	7.6% 30	5.4% 22	4.7% 18	3.2% 14	4.4% 18
	(MIC ≥ 32 / 16 μg/ml)	Chicken Breasts							33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12
		Ground Turkey							0.0% 0	100.0%	0.0% 0	100.0% 1	
	Pi	Ground Beef							0.0% 0	0.0%			0.0%
		Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens		0.0%	9.1% 6	29.2% 45	25.5% 37	14.6% 19	28.7% 43	25.6% 40	43.3% 74	19.7% 36	30.5% 32
		Turkeys		63.6% 7	0.0% 0	51.4% 19	38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0
		Cattle		50.0% 1	6.1% 2	6.9% 13	12.8% 24	13.8% 12	17.3% 17	20.5% 16	25.0% 12	35.3% 12	27.3% 6
		Swine		0.0%	1.9% 2	1.8% 2	2.5% 2	4.5% 2	8.3% 4	0.0% 0	0.0% 0	9.5% 4	0.0% 0
Cephalosporins	Ceftiofur (MIC ≥ 8 μg/ml)	Humans	0.0% 0	1.5% 5	1.8% 7	1.9% 7	3.6% 11	3.1% 10	4.3% 17	4.9% 20	4.5% 17	2.5% 11	4.2% 17
		Chicken Breasts							33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12
		Ground Turkey							0.0% 0	100.0% 2	0.0%	100.0% 1	
		Ground Beef							0.0% 0	0.0% 0			0.0% 0
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	9.1% 6	29.9% 46	26.2% 38	14.60% 19	28.0% 42	25.6% 40	43.3% 74	19.7% 36	30.5% 32
		Turkeys		63.6%	0.0%	48.6% 18	38.9% 7	53.3%	22.2%	16.7%	14.3%	0.0%	0.0%
		Cattle		0.0%	3.0%	6.9%	11.8% 22	11.5% 10	15.3% 15	20.5%	25.0% 12	35.3% 12	27.3% 6
	O-friends	Swine	2.22/	0.0%	0.0%	1.8%	0.0%	0.0%	4.2%	0.0%	1.9%	4.8%	0.0%
	Ceftriaxone (MIC ≥ 64 μg/ml)	Humans	0.0%	0.3% 1	0.0% 0	0.3% 1	0.0% 0	0.0%	0.3%	0.2%	0.8%	0.0%	0.2%
		Chicken Breasts							0.0%	0.0%	0.0%	0.0%	4.8% 1
		Ground Turkey							0.0%	0.0%	0.0%	0.0%	0.0%
	<u> </u>	Ground Beef							0.0%	0.0%	0.097	0.007	0.0%
		Pork Chops		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0 1.8%	0.0% 0 0.0%	0.0%
		Chickens		0.0%	0.0%	0.0% 0 8.1%	0.0% 0 11.1%	0.0% 0 6.7%	1.3%	0.0% 0 16.7%	1.8% 3 0.0%	0.0%	0.0%
		Turkeys		0	0.0%	3	2	6.7% 1 0.0%	0.0%	16.7% 1 0.0%	0.0%	0.0%	0.0%
		Cattle		0.0%	0	0.5%	0.0%	0	0.0%	0	2.1% 1 0.0%	0.0%	0.0%
		Swine		0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%

Table 21c. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

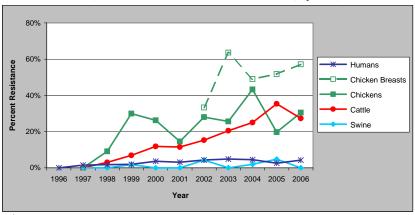
Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	1	Humans	306	328	381	363	304	324	393	406	382	437	407
		Chicken Breasts Ground Turkey							9 2	22 2	49 2	29 1	21 0
		Ground Beef Pork Chops							2 2	1	0 2	0 2	1 2
		Chickens		24	66	154	145	130	150	156	171	183	105
		Turkeys		11	6	37	18	15	9	6	14	7	5
		Cattle Swine		2 25	33 105	189 114	187 81	87 44	98 48	78 27	48 53	34 42	22 25
	Antimicrobial (Resistance	Isolate											
Antimicrobial Class	Breakpoint)	Source											
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					3.6% 11	3.1% 10	4.3% 17	4.4% 18	4.7% 18	2.5% 11	3.9% 16
		Chicken Breasts							33.3% 3	63.6% 14	49.0% 24	51.7% 15	52.4% 11
		Ground Turkey							0.0%	100.0% 2	0.0%	100.0% 1	
		Ground Beef							0.0% 0	0.0%			0.0%
		Pork Chops							0.0% 0	0.0%	0.0%	0.0%	0.0% 0
		Chickens					24.8% 36	14.6% 19	26.7% 40	23.7%	43.3% 74	19.7% 36	29.5% 31
		Turkeys					38.9% 7	53.3%	22.2%	16.7%	14.3%	0.0%	0.0%
		Cattle					9.1%	11.5%	11.2%	16.7%	25.0%	35.3%	27.3%
		Swine					17 12.1%	0.0%	4.2%	3.7%	0.0%	4.8%	0.0%
Folate Pathway Inhibitors	Sulfamethoxazole/	Humans	53.3%	56.7%	50.1%	45.7%	1 45.4%	0 43.2%	2 32.1%	1 38.4%	0 35.9%	31.8%	0 33.4%
	Sulfisoxazole¹ (MIC ≥ 512 µg/ml)	Chicken Breasts	163	186	191	166	138	140	126 44.4%	156 31.8%	137 73.5%	139 69.0%	136 90.5%
		Ground Turkey							0.0%	7 50.0%	36 100.0%	20 0.0%	19
		Ground Beef							0.0%	0.0%	2	0	100.0%
		Pork Chops							0 50.0%	0 100.0%	100.0%	100.0%	1 100.0%
				41.7%	37.9%	32.5%	34.5%	18.5%	1 31.3%	1 28.2%	2 47.4%	2 37.2%	2 65.7%
		Chickens		10 81.8%	25 83.3%	50 75.7%	50 66.7%	24 86.7%	47 77.8%	44 100.0%	81 78.6%	68 57.1%	69 80.0%
		Turkeys		9	5 60.6%	28 64.6%	12 64.2%	13 54.0%	7 58.2%	6 44.9%	11 60.4%	4 73.5%	4 59.1%
		Cattle		2 80.0%	20	122 78.9%	120 86.4%	47 75.0%	57 68.8%	35 63.0%	29 81.1%	25 69.0%	13
	Tring ath an ring	Swine	4.00/	20	88	90	70	33	33	17	43	29	24
	Trimethoprim- Sulfamethoxazole	Humans	4.6% 14	3.0% 10	4.5% 17	2.8% 10	3.6% 11	2.5% 8	2.3% 9	3.4% 14	2.6% 10	2.7% 12	2.2% 9
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0%	0.0% 0	0.0%	
		Ground Beef							0.0%	0.0% 0			0.0%
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0
		Chickens		0.0%	1.5% 1	1.3%	0.0%	0.8%	13.0%	0.6%	0.0%	0.0%	0.0%
		Turkeys		0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle		0.0%	6.1%	9.0%	2.1%	2.3%	4.1% 4	2.6%	4.2%	5.9%	4.5%
		Swine		4.0%	0.0%	0.0%	0.0%	0.0%	2.1%	3.7%	1.9% 1	9.5% 4	4.0%
Phenicols	Chloramphenicol	Humans	39.9%	36.0%	34.1%	28.9%	30.9%	31.8%	23.2%	27.8%	24.1%	24.3%	22.1%
	(MIC ≥ 32 μg/ml)	Chicken Breasts	122	118	130	105	94	103	91 0.0%	9.1%	92 4.1%	106 3.4%	90
		Ground Turkey							0.0%	50.0%	50.0%	0.0%	0
		Ground Beef							0.0%	0.0%	1	0	100.0%
		Pork Chops							50.0%	100.0%	100.0%	100.0%	0.0%
		Chickens		20.8%	19.7%	10.4%	14.5%	11.5%	1 16.0%	5.1%	1.8%	8.2%	7.6%
		Turkeys		5 63.6%	13 0.0%	16 54.1%	21 55.6%	15 73.3%	24 66.7%	8 50.0%	3 28.6%	15 57.1%	8 60.0%
		Cattle		7 100.0%	0 27.3%	20 37.0%	10 42.8%	11 37.9%	6 49.0%	3 42.3%	4 54.2%	4 47.1%	3 50.0%
				2 52.0%	9 57.1%	70 49.1%	80 53.1%	33 47.7%	48 56.3%	33 48.1%	26 60.4%	16 54.8%	11 64.0%
		Swine		13	60	56	43	21	27	13	32	23	16

¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 21d. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	ed	Humans	306	328	381	363	304	324	393	406	382	437	407
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							9 2 2 2	22 2 1 1	49 2 0 2	29 1 0 2	21 0 1 2
		Chickens Turkeys Cattle Swine		24 11 2 25	66 6 33 105	154 37 189 114	145 18 187 81	130 15 87 44	150 9 98 48	156 6 78 27	171 14 48 53	183 7 34 42	105 5 22 25
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1
	(e = 1 pg/)	Chicken Breasts			Ü				0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Beef							0.0%	0.0% 0			0.0%
		Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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%
		Swine		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)	Humans	0.3%	0.9%	0.5%	0.0%	1.3%	0.6%	1.3%	1.2%	0.5%	0.9%	0.7%
	(o = o= pg/)	Chicken Breasts	•	J	_	J	•	_	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	50.0%	0.0%	0.0%	
		Ground Beef							0.0%	0.0%			0.0%
		Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens		0.0%	0.0%	6.0% 1	7.0% 1	0.0%	2.7% 4	0.0%	0.0% 0	1.1% 2	0.0% 0
		Turkeys		45.5% 5	0.0%	51.4% 19	33.3% 6	60.0% 9	55.6% 5	33.3% 2	14.3% 2	0.0%	0.0% 0
		Cattle		0.0% 0	0.0%	0.5% 1	0.0% 0	0.0%	1.0% 1	0.0%	6.3% 3	0.0%	0.0%
		Swine		0.0% 0	0.0%	0.0% 0	1.2% 1	0.0%	2.1% 1	0.0%	0.0%	0.0%	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	49.3% 151	52.4% 172	46.5% 177	41.9% 152	43.4% 132	43.5% 141	31.8% 125	37.9% 154	30.1% 115	30.2% 132	31.7% 129
		Chicken Breasts							44.4% 4	31.8% 7	71.4% 35	69.0% 20	90.5% 19
		Ground Turkey							0.0%	50.0% 1	100.0% 2	0.0%	
		Ground Beef							0.0%	0.0%			100.0% 1
		Pork Chops							100.0%	100.0%	100.0% 2	100.0% 2	100.0% 2
		Chickens		33.3% 8	31.8% 21	32.5% 50	32.4% 47	16.2% 21	28.0% 42	33.3% 52	44.4% 76	34.4% 63	61.0% 64
		Turkeys		90.9% 10	83.3% 5	78.4% 29	83.3% 15	93.3% 14	77.8% 7	100.0% 6	78.6% 11	57.1% 4	100.0% 5
		Cattle		100.0%	63.6% 21	58.7% 111	61.5% 115	44.8% 39	64.3% 63	53.8% 42	60.4% 29	67.6% 23	54.5% 12
		Swine		84.0% 21	89.5% 94	84.2% 96	91.1% 73	79.5% 35	89.6% 43	74.1% 20	90.6% 48	83.3% 35	96.0% 24
		1		'	7	50	, ,	JJ	Ÿ	-∪			

Figure 13. Percent of *Salmonella* Typhimurium Isolates from Humans, Retail Chicken Breasts, and Food Animals Resistant to Ceftiofur, by Year, 1996-2006 ¹



¹ Data for ground turkey, ground beef, pork chops, and turkeys are not included due to the small number of *Salmonella* Typhimurium isolates from these sources. Table 21 contains resistance data for *Salmonella* Typhimurium isolates from each source, by year

Table 22. Number of *Salmonella* Typhimurium Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	306	328	381	363	304	324	393	406	382	437	407
Chicken Breasts							9	22	49	29	21
Ground Turkey							2	2	2	1	0
Ground Beef							2	1	0	0	1
Pork Chops							2	1	2	2	2
Chickens		24	66	154	145	130	150	156	171	183	105
Turkeys		11	6	37	18	15	9	6	14	7	5
Cattle		2	33	189	187	87	98	78	48	34	22
Swine		25	105	114	81	44	48	27	53	42	25

Table 23a. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	306	328	381	363	304	324	393	406	382	437	407
	Chicken Breasts							9	22	49	29	21
	Ground Turkey							2	2	2	1	0
	Ground Beef Pork Chops							2 2	1	0 2	0 2	1 2
	· ·						400					
	Chickens Turkeys		24 11	66 6	154 37	145 18	130 15	150 9	156 6	171 14	183 7	105 5
	Cattle		2	33	189	187	87	98	78	48	34	22
	Swine		25	105	114	81	44	48	27	53	42	25
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans	37.9% 116	39.0% 128	46.5% 177	50.4% 183	49.3% 150	49.1% 159	60.3% 237	54.9% 223	60.7% 232	65.2% 285	62.4% 254
	Chicken Breasts							22.2% 2	22.7% 5	14.3% 7	24.1% 7	0.0% 0
	Ground Turkey							100.0% 2	0.0% 0	0.0% 0	0.0% 0	
	Ground Beef							100.0%	100.0%			0.0%
	Pork Chops		07.70	22.424	22.22/	22.42/	24.224	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens		37.5% 9	39.4% 26	29.2% 45	32.4% 47	64.6% 84	37.3% 56	45.5% 71	40.9% 70	54.1% 99	30.5% 32
	Turkeys		0.0% 0	16.7% 1	10.8% 4	5.6% 1	6.7% 1	0.0% 0	0.0% 0	14.3% 2	42.9% 3	0.0%
	Cattle		0.0% 0	36.4% 12	29.1% 55	26.7% 50	34.5% 30	19.4% 19	39.7% 31	35.4% 17	26.5% 9	31.8% 7
	Swine		12.0% 3	7.6% 8	7.9% 9	2.5% 2	13.6% 6	8.3% 4	18.5% 5	3.8% 2	16.7% 7	0.0% 0
2. At Least ACSSuT 1 Resistant	Humans	33.7% 103	35.1% 115	32.5% 124	27.8% 101	28.0% 85	29.6% 96	21.4%	26.1% 106	23.3% 89	22.2% 97	19.7% 80
<u></u>	Chicken Breasts	100	110	12.	101	00		0.0%	9.1%	4.1%	3.4%	0.0%
	Ground Turkey							0.0%	50.0%	50.0%	0.0%	U
	Ground Beef							0.0%	0.0%	·		100.0%
	Pork Chops							50.0% 1	100.0% 1	50.0% 1	100.0% 2	0.0% 0
	Chickens		12.5% 3	16.7% 11	9.7% 15	13.1% 19	11.5% 15	12.7% 19	3.2% 5	1.8% 3	7.1% 13	6.7% 7
	Turkeys		27.3% 3	0.0% 0	51.4% 19	50.0% 9	66.7% 10	44.4% 4	50.0% 3	28.6% 4	57.1% 4	60.0% 3
	Cattle		50.0% 1	21.2% 7	32.8% 62	37.4% 70	31.0% 27	31.6% 31	28.2% 22	54.2% 26	41.2% 14	50.0% 11
	Swine		20.0% 5	54.3% 57	46.5% 53	39.5% 32	45.5% 20	47.9% 23	44.4% 12	60.4% 32	50.0% 21	44.0% 11
3. At Least ACT/S ² Resistant	Humans	2.0% 6	0.6% 2	2.6% 10	2.2% 8	1.6% 5	0.9% 3	2.0% 8	3.2% 13	1.6% 6	2.1% 9	0.7% 3
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							0.0%	0.0%	0.0%	0.0%	
	Ground Beef							0.0% 0	0.0%			0.0% 0
	Pork Chops							0.0% 0	0.0% 0	0.0% 0	50.0% 1	0.0% 0
	Chickens		0.0% 0	0.0% 0	0.6% 1	0.7% 1	0.0% 0	2.7% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys		18.2% 2	0.0% 0	48.6% 18	33.3% 6	53.3% 8	22.2% 2	16.7% 1	0.0% 0	0.0% 0	0.0% 0
	Cattle		0.0% 0	0.0% 0	0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	4.2% 2	2.9% 1	4.5% 1
	Swine		0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%	2.1% 1	0.0% 0	1.9% 1	7.1% 3	4.0% 1

 $^{^{1}\} ACSSuT = ampicillin,\ chloramphenicol,\ streptomycin,\ sulfamethoxazole/sulfisoxazole,\ and\ tetracycline$

 $^{^2\,\}mbox{ACT/S} = \mbox{ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole}$

Table 23b. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	306	328	381	363	304	324	393	406	382	437	407
	Chicken Breasts							9	22	49	29	21
	Ground Turkey							2	2	2	1	0
	Ground Beef							2	1	0	0	1
	Pork Chops							2	1	2	2	2
			0.4	00	454	4.45	400					
	Chickens Turkeys		24 11	66 6	154 37	145 18	130 15	150 9	156 6	171 14	183 7	105 5
	Cattle		2	33	189	187	87	98	78	48	34	22
	Swine		25	105	114	81	44	48	27	53	42	25
	Isolate Source		20	103	114	01	77	40	21	33	72	20
Resistance Pattern	Isolate Source	0.00/	4.00/	4.00/	0.00/	2.00/	4.00/	4.00/	0.00/	0.00/	4.00/	0.00/
4. At Least ACSSuTAuCf 1	Humans	0.0% 0	1.2% 4	1.0%	0.6% 2	2.0% 6	1.2% 4	1.8% 7	2.2% 9	2.6%	1.8% 8	2.9% 12
Resistant		U	4	4		0	4	0.0%	0.0%	10 4.1%	0.0%	0.0%
Resistant	Chicken Breasts							0.0%	0.0%	2	0.0%	0.0%
								0.0%	50.0%	0.0%	0.0%	Ü
	Ground Turkey							0	1	0	0	
	O 1 D (0.0%	0.0%			0.0%
	Ground Beef							0	0			0
	Pork Chops							0.0%	0.0%	0.0%	0.0%	0.0%
	Fork Chops							0	0	0	0	0
	Chickens		0.0%	0.0%	0.6%	0.7%	0.0%	2.0%	0.6%	0.0%	1.1%	0.0%
			0	0	1	1	0	3	1	0	2	0
	Turkeys		27.3%	0.0%	45.9%	33.3%	53.3%	11.1%	16.7%	14.3%	0.0%	0.0%
			3	0	17	6	8	1 1 00/	10.00/	2	0	0
	Cattle		0.0% 0	3.0% 1	6.3% 12	11.8% 22	10.3% 9	11.2% 11	12.8% 10	20.8% 10	26.5% 9	22.7% 5
	-		0.0%	0.0%	1.8%	0.0%	0.0%	4.2%	0.0%	0.0%	2.4%	0.0%
	Swine		0.0 %	0.0%	2	0.0%	0.0%	2	0.0%	0.0%	1	0.0%
		0.0%	0.3%	0.0%	0.0%	0.3%	0.3%	0.5%	0.0%	0.0%	0.0%	0.0%
5. At Least Ceftiofur and	Humans	0.070	1	0.070	0.070	1	1	2	0.070	0.070	0.070	0.070
Nalidixic Acid Resistant			·			·	·	0.0%	0.0%	0.0%	0.0%	0.0%
	Chicken Breasts							0	0	0	0	0
	Ground Turkey							0.0%	50.0%	0.0%	0.0%	
	Ground Turkey							0	1	0	0	
	Ground Beef							0.0%	0.0%			0.0%
	Ground Boor							0	0			0
	Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
			0.0%	0.0%	0.6%	0.7%	0.0%	2.7%	0.0%	0.0%	0.5%	0.0%
	Chickens		0	0	1	1	0	4	0	0	1	0
	Turkeys		18.2%	0.0%	48.6%	33.3%	53.3%	22.2%	16.7%	14.3%	0.0%	0.0%
			2	0	18	6	8	2	1	2	0	0
	Cattle		0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%
			0.0%	0.0%	0.0%	0.0%	0.0%	0 2.1%	0.0%	0.0%	0.0%	0.0%
	Swine		0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%

¹ ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

G. Antimicrobial Susceptibility among Salmonella Newport

Table 24a. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	ed	Humans	51	46	77	99	121	124	241	223	191	207	217
		Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Turkeys Cattle		0 0	1 1 8	7 4	5 6 109	8 16 87	0 3 3 2 6 10 113	0 2 1 1 7 19 75	0 2 2 0 0 7 44	0 3 0 0 6 5	0 0 0 0 0 4 30
		Swine		0	1	54 5	2	7	0	3	0	1	1
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Amikacin (MIC ≥ 64)	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%
	(6 = 6 1)	Chicken Breasts					J						J
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Beef							0.0%	0.0%	0.0%		
		Pork Chops							0.0% 0	0.0% 0			
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0		0.0% 0	
		Turkeys			0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 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
		Swine			0.0% 0	0.0%	0.0%	0.0%		0.0% 0		0.0% 0	0.0% 0
	Gentamicin (MIC ≥ 16)	Humans	5.9% 3	4.3% 2	0.0%	0.0%	2.5%	3.2% 4	3.3% 8	3.1% 7	0.5% 1	1.0% 2	0.9% 2
	` ′	Chicken Breasts											
		Ground Turkey							0.0%	50.0% 1	0.0%	0.0%	
	-	Ground Beef							0.0%	0.0% 0	0.0%		
		Pork Chops							0.0%	0.0%			
		Chickens			100.0% 1	0.0%	20.0% 1	0.0%	0.0%	0.0%		16.7% 1	
		Turkeys			0.0%	0.0%	16.7% 1	6.3% 1	0.0%	52.6% 10	14.3% 1	80.0% 4	50.0% 2
		Cattle			0.0%	1.9%	11.0% 12	6.9%	7.1% 8	1.3%	0.0%	0.0%	3.3%
		Swine			0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%
	Kanamycin (MIC ≥ 64)	Humans	2.0%	0.0%	1.3% 1	1.0%	5.0% 6	7.3% 9	10.0% 24	4.5% 10	2.6% 5	1.9% 4	2.3% 5
	` ′	Chicken Breasts											
		Ground Turkey							0.0%	0.0% 0	0.0%	0.0%	
		Ground Beef							0.0%	0.0% 0	0.0%		
		Pork Chops							0.0%	0.0%			
		Chickens			0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0% 0		33.3% 2	
		Turkeys			0.0%	0.0%	0.0%	0.0%	10.0% 1	21.1% 4	14.3% 1	80.0% 4	50.0% 2
		Cattle			0.0%	0.0%	9.2% 10	6.9%	15.9% 18	17.3% 13	25.0% 11	14.8%	13.3% 4
		Swine			0.0%	0.0%	0.0%	57.1% 4	1.0	0.0%		0.0%	0.0%
	Streptomycin (MIC ≥ 64)	Humans	7.8% 4	4.3% 2	2.6%	19.2% 19	24.0% 29	31.5% 39	25.3% 61	24.2% 54	15.7% 30	14.0% 29	13.8%
	(, ,	Chicken Breasts											
		Ground Turkey							33.3% 1	50.0% 1	0.0%	0.0%	
		Ground Beef							66.7%	100.0%	100.0%		
	-	Pork Chops							100.0%	100.0%			
		Chickens			100.0% 1	0.0%	20.0% 1	37.5% 3	0.0%	85.7% 6		50.0% 3	
		Turkeys			0.0%	0.0%	16.7% 1	12.5%	0.0%	31.6% 6	14.3% 1	80.0% 4	0.0%
		Cattle			12.5% 1	37.0% 20	79.8% 87	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25
		Swine			0.0%	0.0%	50.0%	85.7% 6		100.0%		0.0%	0.0%

Table 24b. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year Number of Isolates Tested													
raniber of isolates rested		Humans	1996 51	1997 46	1998 77	1999 99	2000 121	2001 124	2002 241	2003 223	2004 191	2005 207	2006 217
		Chicken Breasts Ground Turkey Ground Beef Pork Chops	31						0 3 3 2	0 2 1 1	0 2 2 0	0 3 0 0	0 0 0 0
		Chickens Turkeys Cattle Swine		0 0 0 0	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1
	Antimicrobial (Resistance Breakpoint)	Isolate Source		0	'	5		- /	0	3	U	'	
	Ampicillin	Humans	5.9%	6.5%	2.6%	18.2%	23.1%	29.8%	24.9%	22.9%	15.7%	14.0%	15.2%
	(MIC ≥ 32 μg/ml)	Chicken Breasts	3	3	2	18	28	37	60	51	30	29	33
		Ground Turkey							33.3% 1	0.0% 0	0.0%	0.0%	
		Ground Beef							66.7% 2	100.0% 1	100.0%		
		Pork Chops							100.0% 2	100.0% 1			
		Chickens			100.0% 1	0.0%	0.0%	37.5% 3	16.7% 1	85.7% 6		50.0% 3	
		Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0%	15.8% 3	28.6% 2	20.0% 1	75.0% 3
		Cattle			12.5% 1	37.0% 20	77.1% 84	70.1% 61	78.8% 89	82.7% 62	81.8% 36	85.2% 23	80.0% 24
		Swine			0.0% 0	0.0%	0.0%	85.7% 6		100.0%		0.0% 0	0.0%
Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	2.0% 1	0.0% 0	2.6%	18.2% 18	22.3% 27	26.6% 33	22.8% 55	21.5% 48	15.2% 29	12.6% 26	12.4% 27
	(MIC ≥ 32 / 16 µg/ml)	Chicken Breasts											
		Ground Turkey							33.3% 1	0.0% 0	0.0% 0	0.0% 0	
		Ground Beef							66.7% 2	100.0% 1	100.0%		
		Pork Chops							100.0%	100.0% 1			
		Chickens			0.0% 0	0.0%	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3	
		Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0%	10.5% 2	14.3% 1	0.0%	25.0% 1
		Cattle			12.5% 1	37.0% 20	76.1% 83	69.0% 60	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23
		Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0
The state of the s	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	0.0% 0	1.3% 1	18.2% 18	22.3% 27	27.4% 34	22.8% 55	22.0% 49	15.2% 29	12.6% 26	12.4% 27
		Chicken Breasts											
		Ground Turkey							33.3% 1	0.0% 0	0.0% 0	0.0%	
		Ground Beef							66.7% 2	100.0% 1	100.0% 2		
		Pork Chops							100.0% 2	100.0% 1			
		Chickens			0.0%	0.0%	0.0% 0	37.5% 3	0.0%	85.7% 6		50.0%	
		Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0%	10.5% 2	14.3% 1	0.0%	25.0% 1
		Cattle			12.5% 1	37.0% 20	76.1% 83	69.0% 60	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23
		Swine			0.0% 0	0.0%	0.0%	85.7% 6		100.0%		0.0%	0.0%
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.0% 0	0.0%	3.0%	0.0%	0.0%	0.8% 2	1.8% 4	2.6% 5	1.4% 3	0.5% 1
		Chicken Breasts											
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Beef							0.0% 0	0.0% 0	50.0% 1		
		Pork Chops							0.0% 0	0.0% 0			
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0		0.0%	
		Turkeys			0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%
		Cattle			0.0% 0	0.0% 0	0.9% 1	1.1% 1	0.9% 1	1.3% 1	11.4% 5	14.8% 4	3.3% 1
		Swine			0.0% 0	0.0% 0	0.0% 0	0.0%		0.0% 0		0.0%	0.0% 0

Table 24c. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year. 1996-2006

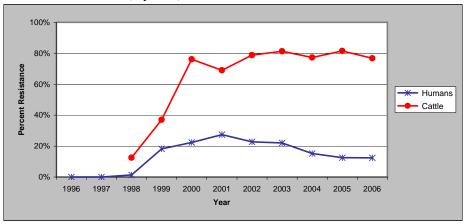
Year, 1996-2006			4000	4007	4000	4000	2000	2024	2022	2022	2024	2025	2022
Year Number of Isolates Tested		Humans	1996 51	1997 46	1998 77	1999 99	2000 121	2001 124	2002 241	2003 223	2004 191	2005 207	2006 217
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							0 3 3 2	0 2 1	0 2 2 0	0 3 0 0	0 0 0 0
		Chickens Turkeys Cattle Swine		0 0 0 0	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin	Humans					22.3%	25.8%	22.4%	21.5%	15.2%	12.6%	12.9%
	(MIC ≥ 32 μg/ml)	Chicken Breasts					27	32	54	48	29	26	28
		Ground Turkey							33.3% 1	0.0%	0.0%	0.0%	
		Ground Beef							66.7%	100.0%	100.0%	U	
		Pork Chops							100.0% 2	100.0% 1			
		Chickens					0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3	
		Turkeys					0.0% 0	12.5% 2	0.0% 0	10.5% 2	14.3% 1	0.0% 0	25.0% 1
		Cattle					73.4% 80	66.7% 58	77.9% 88	74.7% 56	77.3% 34	81.5% 22	70.0% 21
		Swine					0.0%	85.7% 6		100.0%		0.0% 0	0.0%
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹	Humans	11.8% 6	4.3% 2	3.9% 3	22.2% 22	23.1% 28	32.3% 40	25.7% 62	24.7% 55	16.8% 32	15.5% 32	15.2% 33
	(MIC ≥ 512 μg/ml)	Chicken Breasts											
		Ground Turkey							33.3% 1	50.0% 1	0.0% 0	0.0% 0	
		Ground Beef							66.7% 2	100.0%	100.0% 2		
		Pork Chops							100.0% 2	100.0%			
		Chickens			100.0% 1	0.0% 0	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3	
		Turkeys			0.0%	0.0%	16.7%	12.5%	0.0%	52.6% 10	14.3%	80.0%	75.0%
		Cattle			12.5% 1	35.2% 19	73.4% 80	72.4% 63	74.3% 84	73.3% 55	77.3% 34	85.2% 23	83.3% 25
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0%		0.0% 0	0.0% 0
	Trimethoprim- Sulfamethoxazole	Humans	3.9% 2	4.3% 2	1.3% 1	2.0%	4.1% 5	1.6% 2	4.1% 10	0.9% 2	2.1% 4	1.9% 4	3.2% 7
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts											
		Ground Turkey							33.3%	0.0%	0.0%	0.0%	
		Ground Beef							0.0% 0	0.0% 0	50.0% 1		
		Pork Chops			0.624	0.624	0.627	0.007	100.0%	0.0%		40 ===	
		Chickens			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.007	16.7%	0.634
		Turkeys			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle			0.0%	1.9%	14.7% 16	12.6% 11	7.1% 8	0.0%	11.4% 5	25.9% 7	16.7%
Displants	Oblemento	Swine	F 00/	4.00/	0.0%	0.0%	0.0%	0.0%	05.00/	33.3%	45.00/	0.0%	0.0%
Phenicols	Chloramphenicol (MIC ≥ 32 μg/ml)	Humans	5.9%	4.3% 2	2.6%	18.2% 18	23.1% 28	28.2% 35	25.3% 61	22.4% 50	15.2% 29	13.5% 28	12.4% 27
		Chicken Breasts							33.3%	0.0%	0.0%	0.0%	
		Ground Turkey							1 66.7%	0 100.0%	0 100.0%	0.078	
		Ground Beef							2 100.0%	1 100.0%	2		
		Pork Chops			0.0%	0.0%	0.0%	37.5%	2 0.0%	1 85.7%		50.0%	
		Chickens			0.0%	0.0%	0.0%	3 12.5%	0.0%	6 21.1%	14.3%	3 0.0%	0.0%
		Turkeys			0 12.5%	0 37.0%	0 78.9%	2 73.6%	0 77.9%	4 78.7%	1 77.3%	0 81.5%	0 66.7%
		Cattle			1 0.0%	20 0.0%	86 50.0%	64 85.7%	88	59 100.0%	34	22 0.0%	20 0.0%
¹ Sulfamethoxazole was te	etad from 1006 2002		by sulfice	vazolo :-	0	0	1	6		3		0	0

¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 24d. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	51	46	77	99	121	124	241	223	191	207	217
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							0 3 3 2	0 2 1 1	0 2 2 0	0 3 0 0	0 0 0 0
		Chickens Turkeys Cattle Swine		0 0 0 0	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (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%	0.0%
	(е = . рд)	Chicken Breasts	Ü	Ů	Ü	J							
		Ground Turkey							0.0% 0	0.0%	0.0% 0	0.0%	
		Ground Beef							0.0%	0.0%	0.0% 0		
		Pork Chops							0.0% 0	0.0% 0			
		Chickens			0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%		0.0% 0	
		Turkeys			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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%
		Swine			0.0%	0.0%	0.0%	0.0%	J	0.0%		0.0%	0.0%
	Nalidixic Acid (MIC ≥ 32 μg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.8%	0.4%	0.5% 1	0.0%	0.5%
		Chicken Breasts											
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Ground Beef							0.0% 0	0.0% 0	0.0% 0		
		Pork Chops							0.0% 0	0.0% 0			
		Chickens			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	
		Turkeys			0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
		Cattle			0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0%
		Swine			0.0% 0	0.0%	0.0% 0	0.0% 0		0.0% 0		0.0% 0	0.0%
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	7.8% 4	4.3% 2	2.6% 2	19.2% 19	23.1% 28	30.6% 38	25.7% 62	24.2% 54	16.8% 32	14.5% 30	14.3% 31
		Chicken Breasts											
		Ground Turkey							33.3% 1	0.0% 0	0.0% 0	0.0%	
		Ground Beef							66.7% 2	100.0% 1	100.0% 2		
		Pork Chops							100.0% 2	100.0% 1			
		Chickens			100.0% 1	0.0%	0.0%	37.5% 3	0.0% 0	85.7% 6		50.0% 3	
		Turkeys			0.0% 0	0.0%	0.0%	12.5% 2	40.0% 4	36.8% 7	28.6% 2	60.0% 3	25.0% 1
		Cattle			12.5% 1	38.9% 21	80.7% 88	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25
		Swine			100.0% 1	20.0%	50.0% 1	85.7% 6		100.0%		0.0% 0	0.0%

Figure 14. Percent of *Salmonella* Newport Isolates from Humans and Cattle Resistant to Ceftiofur, by Year, 1996-2006¹



¹ Data for other sources are not included due to the small number of *Salmonella* Newport isolates. Table 24 contains resistance data for *Salmonella* Newport isolates from each source, by year

Table 25. Number of *Salmonella* Newport Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	51	46	77	99	121	124	241	223	191	207	217
Chicken Breasts							0	0	0	0	0
Ground Turkey							3	2	2	3	0
Ground Beef							3	1	2	0	0
Pork Chops							2	1	0	0	0
Chickens		0	1	7	5	8	6	7	0	6	0
Turkeys		0	1	4	6	16	10	19	7	5	4
Cattle		0	8	54	109	87	113	75	44	27	30
Swine		0	1	5	2	7	0	3	0	1	1

Table 26a. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

1996-2006 Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207	217
	Chicken Breasts Ground Turkey Ground Beef Pork Chops							0 3 3 2	0 2 1	0 2 2 0	0 3 0	0 0 0 0
	Chickens Turkeys Cattle Swine		0 0 0 0	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans Chicken Breasts	86.3% 44	93.5% 43	94.8% 73	75.8% 75	75.2% 91	65.3% 81	72.2% 174	73.5% 164	82.2% 157	84.1% 174	82.9% 180
	Ground Turkey							66.7%	50.0%	100.0%	100.0%	
	Ground Beef							2 33.3%	1 0.0%	2 0.0%	3	
	Pork Chops							0.0%	0.0%	0		
	Chickens		0.0%	0.0%	100.0%	80.0%	62.5% 5	0 83.3% 5	0 14.3% 1		50.0%	
	Turkeys		0.0%	100.0%	100.0%	83.3%	87.5% 14	60.0%	21.1%	57.1% 4	20.0%	25.0% 1
	Cattle		0.0% 0	87.5% 7	61.1% 33	19.3% 21	25.3% 22	19.5% 22	14.7% 11	15.9% 7	14.8% 4	16.7% 5
	Swine		0.0% 0	0.0% 0	80.0% 4	50.0% 1	14.3% 1		0.0% 0		100.0% 1	100.0% 1
2. At Least ACSSuT ¹ Resistant	Humans	5.9% 3	4.3%	1.3%	18.2% 18	23.1% 28	25.8% 32	23.7% 57	22.0% 49	14.7% 28	12.6% 26	12.0% 26
	Chicken Breasts							00.004	0.00/	2.20/	2.22/	
	Ground Turkey							33.3% 1 66.7%	0.0% 0 100.0%	0.0% 0 100.0%	0.0%	
	Ground Beef							2 100.0%	1 100.0%	2		
	Pork Chops		0.0%	0.0%	0.0%	0.0%	37.5%	2 0.0%	1 71.4%		50.0%	
	Chickens		0	0	0	0	3 12.5%	0.0%	5.3%	14.3%	3	0.0%
	Turkeys		0.0%	0 12.5%	0 35.2%	0 70.6%	2 67.8%	0 70.8%	1 66.7%	1 75.0%	0 81.5%	0 63.3%
	Swine		0 0.0% 0	0.0% 0	0.0% 0	77 0.0% 0	59 85.7% 6	80	50 100.0% 3	33	0.0% 0	0.0% 0
3. At Least ACT/S ² Resistant	Humans	3.9%	4.3%	1.3%	2.0%	4.1% 5	0.8%	3.7%	0.9%	1.0%	1.9%	2.3%
	Chicken Breasts											
	Ground Turkey							33.3% 1	0.0% 0	0.0% 0	0.0% 0	
	Ground Beef							0.0%	0.0%	50.0% 1		
	Pork Chops		0.00/	0.00/	0.09/	0.09/	0.00/	100.0%	0.0%		40.70/	
	Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.20/	16.7%	0.0%
	Turkeys		0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 1.9%	0.0% 0 13.8%	0.0% 0 11.5%	0.0% 0 7.1%	0.0% 0 0.0%	14.3% 1 2.3%	0.0% 0 25.9%	0.0%
	Cattle		0.0%	0.0%	1.9%	15.8%	11.5% 10 0.0%	7.1%	0.0%	1	25.9% 7 0.0%	3 0.0%
	Swine		0.0 %	0.0%	0.078	0.0%	0.0%		1		0.078	0.078

 $^{^{1}\} ACSSuT = ampicillin,\ chloramphenicol,\ streptomycin,\ sulfamethoxazole/sulfisoxazole,\ and\ tetracycline$

 $^{^2\,\}mbox{ACT/S}$ = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 26b. Resistance Patterns among Salmonella Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207	217
	Chicken Breasts							0	0 2	0 2	0	0
	Ground Turkey Ground Beef							3	1	2	3 0	0
	Pork Chops							2	1	0	0	0
	Chickens		0	1	7	5	8	6	7	0	6	0
	Turkeys		0	1	4	6	16	10	19	7	5	4
	Cattle		0	8	54	109	87	113	75	44	27	30
	Swine		0	1	5	2	7	0	3	0	1	1
Resistance Pattern	Isolate Source											
4.4414.4000T4041	Humans	0.0%	0.0%	1.3%	18.2%	22.3%	25.0%	22.8%	21.1%	14.7%	12.6%	10.6%
4. At Least ACSSuTAuCf 1 Resistant	<u> </u>	0	0	1	18	27	31	55	47	28	26	23
Resistant	Chicken Breasts											
	Ground Turkey							33.3%	0.0%	0.0%	0.0%	
	Ground Funcy							1	0	0	0	
	Ground Beef							66.7%	100.0%	100.0%		
								2	1	2		
	Pork Chops							100.0% 2	100.0% 1			
			0.0%	0.0%	0.0%	0.0%	37.5%	0.0%	71.4%		50.0%	
	Chickens		0.070	0.070	0.070	0.070	3	0.070	5		3	
			0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	5.3%	14.3%	0.0%	0.0%
	Turkeys		0	0	0	0	2	0	1	1	0	0
	Cattle		0.0%	12.5%	35.2%	69.7%	66.7%	70.8%	66.7%	72.7%	81.5%	63.3%
	Cattle		0	1	19	76	58	80	50	32	22	19
	Swine		0.0%	0.0%	0.0%	0.0%	85.7%		100.0%		0.0%	0.0%
	O.I.i.i.o		0	0	0	0	6		3		0	0
	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.5%	0.0%	0.0%
5. At Least Ceftiofur and		0	0	0	0	0	0	1	0	1	0	0
Nalidixic Acid Resistant	Chicken Breasts											
	One and Transfers							0.0%	0.0%	0.0%	0.0%	
	Ground Turkey							0	0	0	0	
	Ground Beef							0.0%	0.0%	0.0%		
	Ground Beer							0	0	0		
	Pork Chops							0.0%	0.0%			
			0.00/	0.004	0.00/	0.00/	0.004	0	0		2.00/	
	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%
	Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%
	Cattle		0.070	0.070	0.070	0.070	0.070	0.070	1.570	0.078	0.078	0.070
			0.0%	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%
	Swine		0	0	0	0	0		0		0	0

¹ ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

H. Antimicrobial Susceptibility among Salmonella I 4,[5],12:i:-

Table 27a. Antimicrobial Resistance among all *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	1996 3	1997 3	1998	1999 8	13	14	35	37	36	33	105
		Chicken Breasts							5	2	4	9	9
		Ground Turkey Ground Beef							2 0	0	0	0	2 0
		Pork Chops							0	0	0	0	0
		Chickens Turkeys		N/A ¹ N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	44 1	102 2	79 1
		Cattle Swine		N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	4 0	2 1	3 2
	Antimicrobial			IN/A	IN/A	IN/A	IN/A	IN/A	IN/A	IN/A	0	'	
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Amikacin (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%
	(Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	J			0.0%
		Ground Beef							0				Ů
		Pork Chops											
		Chickens									0.0%	0.0%	0.0%
		Turkeys									0.0%	0.0%	0.0%
		Cattle									0.0%	0.0%	0.0%
		Swine									0	0.0%	0.0%
	Gentamicin	Humans	0.0%	0.0%		0.0%	0.0%	7.1%	0.0%	5.4%	5.6%	0.0%	0 4.8%
	(MIC ≥ 16 μg/ml)	Chicken Breasts	0	0		0	0	1	0.0%	0.0%	0.0%	0 11.1%	5 22.2%
		Ground Turkey							0.0%	0	0	1	2 50.0%
		Ground Beef							0				1
		Pork Chops									11.4%	9.8%	11.4%
		Chickens									5 100.0%	10 0.0%	9 100.0%
		Turkeys									1 0.0%	0	1 0.0%
		Cattle									0	0	0
	Kanani sin	Swine	0.00/	0.00/		0.00/	0.00/	7.40/	0.00/	0.00/	0.00/	0	0
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	0.0% 0	0.0%		0.0%	0.0%	7.1% 1	0.0%	0.0%	0.0%	0.0%	0.0%
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
		Ground Turkey							0.0%				0.0% 0
		Ground Beef											
		Pork Chops											
		Chickens									4.5% 2	0.0% 0	0.0% 0
		Turkeys									0.0% 0	0.0% 0	0.0%
		Cattle									0.0%	0.0%	0.0%
		Swine									Ů	0.0%	0.0%
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	0.0%	66.7% 2		0.0%	7.7% 1	14.3% 2	2.9% 1	8.1% 3	5.6% 2	3.0%	3.8%
	(ιο = ο γ μg/11ιι)	Chicken Breasts							0.0%	0.0%	0.0%	11.1%	22.2%
		Ground Turkey							0.0%	U	U		50.0%
		Ground Beef							U				_
		Pork Chops											
		Chickens									15.9%	9.8%	6.3%
		Turkeys									7 100.0%	10 50.0%	100.0%
		Cattle									1 25.0%	0.0%	0.0%
		Swine									1	0 100.0%	0.0%
¹ N/A = data not available.												1	0

Table 27b. Antimicrobial Resistance among all *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year. 1996-2006

by Year, 1996-2006												
Year Number of Isolates Tested	Humans	1996	1997	1998	1999	2000	2001	2002 35	2003 37	2004 36	2005 33	2006 105
Number of isolates resteu	Chicken Breasts Ground Turkey Ground Beef Pork Chops	J	3	Ü	Ü	13	17	5 2 0	2 0 0	4 0 0 0	9 0 0	9 2 0 0
	Chickens Turkeys Cattle Swine		N/A ¹ N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	44 1 4 0	102 2 2 1	79 1 3 2
Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins Ampicillin	Humans	0.0%	0.0%		0.0%	7.7%	7.1%	8.6%	8.1%	5.6%	6.1%	6.7%
(MIC ≥ 32 μg/ml)	Chicken Breasts	0	0		0	1	1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	7 11.1% 1
	Ground Turkey							0.0%				0.0%
	Ground Beef											
	Pork Chops											
	Chickens									6.8% 3	8.8% 9	17.7% 14
	Turkeys									0.0%	50.0% 1	0.0% 0
	Cattle									0.0%	0.0%	0.0% 0
	Swine										100.0% 1	50.0% 1
Amoxicillin- Inhibitor Combinations Clavulanic Acid	Humans	0.0%	0.0% 0		0.0%	0.0%	0.0%	2.9% 1	5.4% 2	2.8% 1	3.0% 1	3.8% 4
(MIC ≥ 32 / 16 μg/ml	Chicken Breasts							0.0% 0	0.0%	0.0% 0	0.0%	11.1% 1
	Ground Turkey							0.0% 0				0.0%
	Ground Beef											
	Pork Chops											
	Chickens									4.5% 2	5.9% 6	16.5% 13
	Turkeys									0.0% 0	50.0% 1	0.0%
	Cattle									0.0% 0	0.0%	0.0%
	Swine										0.0%	0.0%
Cephalosporins Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0%	0.0% 0		0.0%	0.0%	7.1% 1	2.9% 1	5.4% 2	2.8% 1	3.0% 1	3.8% 4
	Chicken Breasts							0.0%	0.0%	0.0% 0	0.0%	11.1% 1
	Ground Turkey							0.0%				0.0%
	Ground Beef											
	Pork Chops											
	Chickens									4.5% 2	5.9% 6	16.5% 13
	Turkeys									0.0% 0	50.0% 1	0.0%
	Cattle									0.0% 0	0.0%	0.0%
	Swine										0.0%	0.0%
Ceftriaxone (MIC ≥ 64 μg/ml)	Humans	0.0%	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	2.8% 1	0.0% 0	0.0%
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0				0.0% 0
	Ground Beef											
	Pork Chops											
	Chickens									0.0% 0	0.0%	0.0%
	Turkeys									0.0% 0	50.0% 1	0.0%
	Cattle									0.0% 0	0.0% 0	0.0% 0
	Swine										0.0%	0.0%

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

Table 27c. Antimicrobial Resistance among all *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

by Year, 1996-2006 Year			1006	1007	1000	1000	2000	2004	2002	2002	2004	2005	2006
Year Number of Isolates Tested		Humans	1996	1997	1998	1999 8	2000	2001 14	2002 35	2003 37	2004 36	2005 33	2006 105
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							5 2 0	2 0 0	4 0 0 0	9 0 0	9 2 0 0
		Chickens Turkeys Cattle Swine		N/A ¹ N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	44 1 4 0	102 2 2 1	79 1 3 2
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 μg/ml)	Humans						0.0%	2.9%	5.4%	2.8%	3.0%	3.8%
	(MIC ≥ 32 µg/III)	Chicken Breasts						0	0.0%	0.0%	0.0%	0.0%	11.1%
		Ground Turkey							0 0.0% 0	0	0	0	0.0% 0
		Ground Beef							U				0
		Pork Chops											
		Chickens									4.5% 2	5.9% 6	16.5% 13
		Turkeys									0.0%	50.0%	0.0%
		Cattle									0.0%	0.0%	0.0%
		Swine									U	0.0%	0.0%
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ²	Humans	0.0%	100.0%		12.5%	0.0%	14.3% 2	2.9%	5.4% 2	11.1%	0.0%	8.6%
	(MIC ≥ 512 μg/ml)	Chicken Breasts	0	3			J		0.0%	0.0%	0.0%	11.1%	22.2%
		Ground Turkey							0.0%	ŭ	J		50.0%
		Ground Beef							U				'
		Pork Chops											
		Chickens									13.6% 6	9.8% 10	13.9% 11
		Turkeys									100.0%	50.0%	100.0%
		Cattle									0.0%	0.0%	0.0%
		Swine									J	100.0%	50.0%
	Trimethoprim- Sulfamethoxazole	Humans	0.0%	0.0%		0.0%	0.0%	7.1% 1	2.9%	0.0%	2.8%	0.0% 0	0.0%
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts							0.0%	0.0%	0.0%	0.0% 0	0.0%
		Ground Turkey							0.0%				0.0%
		Ground Beef											
		Pork Chops											
		Chickens									4.5% 2	0.0% 0	0.0%
		Turkeys									0.0%	0.0% 0	0.0% 0
		Cattle									0.0%	0.0% 0	0.0%
		Swine										0.0% 0	0.0%
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0%	0.0%		0.0%	0.0%	7.1% 1	2.9% 1	0.0%	2.8% 1	0.0% 0	1.9% 2
		Chicken Breasts							0.0%	0.0% 0	0.0%	0.0% 0	0.0%
		Ground Turkey							0.0%				0.0%
		Ground Beef											
		Pork Chops											
		Chickens									0.0%	0.0%	0.0%
		Turkeys									0.0%	0.0%	0.0%
		Cattle									0.0%	0.0%	0.0%
		Swine										0.0%	50.0%
N/A = data not available.	Antigonia formulas f	or monophosic So	lmonollo	wore not	determin	ad for foo	d animal	inalataa n	rior to 20	0.4			<u> </u>

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

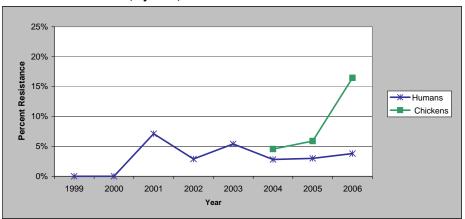
 $^{^{\}rm 2}$ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 27d. Antimicrobial Resistance among all *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	3	3	0	8	13	14	35	37	36	33	105
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							5 2 0 0	2 0 0 0	4 0 0 0	9 0 0 0	9 2 0 0
		Chickens Turkeys Cattle Swine		N/A ¹ N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	44 1 4 0	102 2 2 1	79 1 3 2
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (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%	0.0% 0	0.0% 0
	, ,	Chicken Breasts							0.0%	0.0%	0.0%	0.0% 0	0.0%
		Ground Turkey							0.0%	Ü	J		0.0%
		Ground Beef											-
		Pork Chops											
		Chickens									0.0%	0.0%	0.0%
		Turkeys									0.0%	0.0%	0.0%
		Cattle									0.0%	0.0%	0.0%
		Swine										0.0%	0.0%
	Nalidixic Acid (MIC ≥ 32 μg/ml)	Humans	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	2.7% 1	2.8%	0.0%	1.0%
	, ,	Chicken Breasts							0.0%	0.0% 0	0.0%	0.0% 0	0.0%
		Ground Turkey							0.0%				0.0%
		Ground Beef											
		Pork Chops											
		Chickens									2.3% 1	0.0% 0	0.0%
		Turkeys									0.0%	0.0% 0	0.0%
		Cattle									0.0%	0.0% 0	0.0%
		Swine										0.0% 0	0.0%
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	0.0% 0	0.0%		0.0% 0	7.7% 1	7.1% 1	5.7% 2	0.0%	11.1% 4	3.0% 1	8.6% 9
		Chicken Breasts							0.0%	0.0% 0	0.0%	11.1% 1	11.1% 1
		Ground Turkey							0.0%				0.0%
		Ground Beef											
		Pork Chops											
		Chickens									11.4% 5	4.9% 5	3.8% 3
		Turkeys									0.0% 0	50.0% 1	0.0% 0
		Cattle									0.0% 0	0.0% 0	0.0%
		Swine										100.0% 1	50.0% 1

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

Figure 15. Percent of *Salmonella* I 4,[5],12:i:- Isolates from Humans and Chickens Resistant to Ceftiofur, by Year, 1999-2006¹



¹ Data for other sources and data for humans for 1996-1998 are not included due to the small number of *Salmonella* I 4,[5],12:i:- isolates. Data for food animals are not available for this serotype prior to 2004. Table 27 contains all resistance data available for *Salmonella* I 4,[5],12:i:- isolates

Table 28. Number of Salmonella I 4,[5],12:i:- Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	3	3	0	8	13	14	35	37	36	33	105
Chicken Breasts							5	2	4	9	9
Ground Turkey							2	0	0	0	2
Ground Beef							0	0	0	0	0
Pork Chops							0	0	0	0	0
Chickens		N/A ¹	N/A	N/A	N/A	N/A	N/A	N/A	44	102	79
Turkeys		N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	2	1
Cattle		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	2	3
Swine		N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2

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

Table 29a. Resistance Patterns among all Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Chickens Breats Ground Turkey Cream Deed Cream De	Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Concent Turkey Congress Con	Number of Isolates Tested	Humans	3	3	0	8	13	14	35	37	36	33	105
Cround Seef Pink Chaps Pi													
Chickens No.													
Turkeys		Pork Chops							0	0	0	0	0
Calife													
No Resistance Pattern													
No Resistance Detected No.				N/A	N/A	N/A		N/A	N/A		0	1	
No Resistance Detected Humans 3 0 7 12 11 102 20 22 22 50 50	Resistance Pattern												
Control Turkey	1. No Resistance Detected	Humans							32	29	29	29	
Ground Buerl		Chicken Breasts							5				5
Pork Chops Por		Ground Turkey											50.0% 1
Chickens		Ground Beef											
Chickens		Pork Chops											
Turkeys		Chickens									34	78	54
Swine		Turkeys									0	1	0
2. At Least ACSsur ² Resistant Humans		Cattle											100.0% 3
Humans		Swine											50.0% 1
Chicken Breasts	2. At Least ACSSuT ² Resistant	Humans											
Ground Beef		Chicken Breasts											
Pork Chops		Ground Turkey											
Chickens Chickens Chickens Chickens Chickens Cattle Cattle Chickens Cattle Chickens Count Turkeys Chickens Chicken		Ground Beef											
Chickens		Pork Chops											
Cattle		Chickens											
Swine		Turkeys											
Swite		Cattle											
Humans		Swine											
Chicken Breasts 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3. At Least ACT/S ³ Resistant	Humans											
Ground Turkey		Chicken Breasts											
Pork Chops Chickens Turkeys Cattle Cattle		Ground Turkey											
Chickens 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0		Ground Beef											
Turkeys 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Pork Chops											
Cattle 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Chickens											
		Turkeys											
		Cattle									0.0% 0	0.0% 0	0.0% 0
Swine 0.0% 0.0% 0 0		Swine											

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

² ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

 $^{^{\}rm 3}$ ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 29b. Resistance Patterns among all Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans Chicken Breasts Ground Turkey Ground Beef Pork Chops	3	3	0	8	13	14	35 5 2 0	37 2 0 0	36 4 0 0	33 9 0 0	105 9 2 0
	Chickens Turkeys Cattle Swine		N/A ¹ N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	44 1 4 0	102 2 2 1	79 1 3 2
Resistance Pattern	Isolate Source											
4. At Least ACSSuTAuCf ²	Humans	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Resistant	Chicken Breasts							0.0% 0	0.0%	0.0%	0.0%	0.0% 0
	Ground Turkey							0.0% 0				0.0% 0
	Ground Beef											
	Pork Chops											
	Chickens									0.0% 0	0.0% 0	0.0% 0
	Turkeys									0.0% 0	0.0% 0	0.0% 0
	Cattle									0.0% 0	0.0% 0	0.0% 0
	Swine										0.0% 0	0.0% 0
5. At Least Ceftiofur and	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
Nalidixic Acid Resistant	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0				0.0% 0
	Ground Beef											
	Pork Chops											
	Chickens									2.3% 1	0.0% 0	0.0% 0
	Turkeys									0.0% 0	0.0%	0.0% 0
	Cattle									0.0% 0	0.0% 0	0.0% 0
	Swine										0.0%	0.0%

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

² ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

I. Antimicrobial Susceptibility among Salmonella Heidelberg

Table 30a. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	d	Humans	74	75	101	88	79	102	105	96	93	125	102
		Chicken Breasts							11	16	31	22	30
		Ground Turkey Ground Beef							21 0	32 0	37 0	53 0	35 0
		Pork Chops							3	0	3	0	4
		Chickens Turkeys		51 14	143 39	297 139	259 125	329 142	403 60	226 57	167 46	283 25	164 43
		Cattle		1	11	28	6	10	8	9	1	6	4
	Antimicrobial	Swine		7	37	33	22	16	11	11	4	8	13
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source											
Aminoglycosides	Amikacin (MIC ≥ 64)	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%
		Ground Beef											
		Pork Chops							0.0% 0		0.0% 0		0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0						
		Turkeys		0.0% 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		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine		0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0
	Gentamicin (MIC ≥ 16)	Humans	23.0% 17	17.3% 13	16.8% 17	14.8% 13	8.9% 7	7.8% 8	3.8% 4	5.2% 5	4.3% 4	6.4% 8	4.9% 5
		Chicken Breasts							45.5% 5	18.8% 3	9.7% 3	13.6% 3	20.0% 6
		Ground Turkey							28.6% 6	12.5% 4	35.1% 13	37.7% 20	31.4% 11
		Ground Beef											
		Pork Chops							100.0% 3		0.0% 0		75.0% 3
		Chickens		41.2% 21	26.6% 38	18.5% 55	32.0% 83	12.5% 41	8.9% 36	7.5% 17	10.2% 17	9.2% 26	9.8% 16
		Turkeys		0.0% 0	17.9% 7	16.5% 23	12.0% 15	13.4% 19	18.3% 11	12.3% 7	17.4% 8	36.0% 9	32.6% 14
		Cattle		0.0% 0	27.3% 3	39.3% 11	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
		Swine		0.0% 0	0.0% 0	0.0%	9.1% 2	0.0%	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Kanamycin (MIC ≥ 64)	Humans	14.9% 11	8.0% 6	12.9% 13	9.1% 8	15.2% 12	19.6% 20	10.5% 11	8.3% 8	8.6% 8	12.8% 16	8.8% 9
		Chicken Breasts							36.4% 4	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							42.9% 9	34.4% 11	27.0% 10	30.2% 16	34.3% 12
		Ground Beef											
		Pork Chops							0.0% 0		33.3% 1		0.0% 0
		Chickens		0.0% 0	0.7% 1	1.3% 4	12.0% 31	4.3% 14	3.7% 15	5.3% 12	6.0% 10	6.7% 19	7.3% 12
		Turkeys		7.1% 1	5.1% 2	17.3% 24	43.2% 54	31.0% 44	30.0% 18	21.1% 12	19.6% 9	44.0% 11	27.9% 12
		Cattle		0.0%	63.6%	42.9% 12	16.7%	10.0%	37.5%	55.6% 5	100.0%	50.0%	0.0%
	O:	Swine	40.50/	85.7% 6	64.9%	60.6% 20	77.3% 17	75.0% 12	54.5%	100.0%	75.0% 3	75.0% 6	84.6% 11
	Streptomycin (MIC ≥ 64)	Humans	40.5% 30	24.0% 18	30.7% 31	23.9% 21	22.8% 18	25.5% 26	17.1% 18	12.5% 12	15.1% 14	13.6% 17	11.8%
		Chicken Breasts							63.6%	12.5%	22.6% 7	18.2% 4	23.3%
		Ground Turkey							61.9% 13	37.5% 12	43.2% 16	47.2% 25	45.7% 16
		Ground Beef							100.00/		22.00/		0.00/
		Pork Chops		2F 22'	20.007	22.00/	20.70/	20.407	100.0%	47.70/	33.3%	15 504	0.0%
		Chickens		35.3% 18	32.9% 47	23.9%	36.7% 95	20.4% 67	18.6% 75	17.7% 40	18.0% 30	15.5% 44	10.4%
		Turkeys		14.3%	30.8% 12	30.2% 42	52.8% 66	40.1% 57	35.0% 21	28.1% 16	21.7% 10	44.0% 11	34.9% 15
		Cattle		0.0%	72.7%	57.1% 16	16.7%	20.0%	37.5% 3	55.6% 5	100.0%	50.0%	0.0%
		Swine		57.1% 4	81.1% 30	63.6% 21	86.4% 19	75.0% 12	45.5% 5	100.0% 11	75.0% 3	87.5% 7	69.2% 9

Table 30b. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	<u> </u>	Humans	74	75	101	88	79	102	105	96	93	125	102
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							11 21 0 3	16 32 0 0	31 37 0 3	22 53 0 0	30 35 0 4
		Chickens Turkeys Cattle Swine		51 14 1 7	143 39 11 37	297 139 28 33	259 125 6 22	329 142 10 16	403 60 8 11	226 57 9 11	167 46 1 4	283 25 6 8	164 43 4 13
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins	(Resistance	Humans	14.9% 11	13.3% 10	16.8% 17	6.8% 6	10.1% 8	9.8% 10	12.4% 13	10.4% 10	25.8% 24	20.0% 25	18.6% 19
	(ινιίο = 32 μg/1111)	Chicken Breasts		10	17	0	J	10	18.2%	18.8%	25.8% 8	27.3% 6	16.7% 5
		Ground Turkey							19.0% 4	9.4% 3	13.5% 5	18.9% 10	31.4% 11
		Ground Beef								J	J		
		Pork Chops							0.0%		0.0% 0		0.0%
		Chickens		21.6% 11	25.2% 36	16.2% 48	24.7% 64	16.7% 55	14.9% 60	19.0% 43	16.2% 27	25.1% 71	16.5% 27
		Turkeys		7.1% 1	12.8% 5	8.6% 12	4.0% 5	9.2% 13	13.3%	3.5%	17.4% 8	24.0% 6	37.2% 16
		Cattle		0.0% 0	27.3%	50.0% 14	0.0%	0.0%	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0%
		Swine		0.0%	5.4% 2	0.0% 0	9.1% 2	0.0%	18.2% 2	9.1% 1	0.0% 0	12.5% 1	7.7% 1
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	2.7% 2	1.3% 1	1.0% 1	1.1% 1	3.8%	2.9%	9.5% 10	5.2% 5	10.8% 10	8.8% 11	9.8% 10
	(MIC ≥ 32 / 16 µg/ml)	Chicken Breasts							0.0%	6.3% 1	9.7% 3	13.6% 3	10.0%
		Ground Turkey							19.0% 4	9.4%	5.4% 2	9.4% 5	17.1% 6
		Ground Beef											
		Pork Chops							0.0%		0.0%		0.0%
		Chickens		2.0% 1	1.4% 2	1.3% 4	13.5% 35	7.0% 23	8.7% 35	9.3% 21	10.2% 17	21.9% 62	15.9% 26
		Turkeys		0.0% 0	2.6%	0.7% 1	2.4% 3	5.6% 8	5.0% 3	0.0%	6.5% 3	0.0%	9.3% 4
		Cattle		0.0%	27.3% 3	42.9% 12	0.0%	0.0%	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0%
		Swine		0.0%	0.0%	0.0%	4.5% 1	0.0%	9.1% 1	9.1% 1	0.0% 0	0.0%	7.7% 1
Cephalosporins	Ceftiofur (MIC ≥ 8 μg/ml)	Humans	1.4% 1	0.0%	0.0%	0.0%	3.8%	2.9%	7.6% 8	5.2%	9.7% 9	8.8% 11	9.8% 10
		Chicken Breasts							0.0%	6.3% 1	9.7% 3	9.1% 2	10.0%
		Ground Turkey							19.0% 4	0.0%	5.4% 2	9.4% 5	17.1% 6
		Ground Beef											
		Pork Chops							0.0%		0.0%		0.0%
		Chickens		2.0% 1	1.4% 2	1.7% 5	13.9% 36	5.8% 19	8.9% 36	9.3% 21	10.2% 17	21.9% 62	15.9% 26
		Turkeys		0.0% 0	2.6% 1	0.7% 1	3.2% 4	5.6% 8	5.0% 3	0.0% 0	6.5% 3	0.0% 0	9.3% 4
		Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	0.0% 0	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0%
		Swine		0.0% 0	0.0%	0.0%	4.5% 1	0.0%	9.1% 1	9.1% 1	0.0% 0	0.0%	7.7% 1
	Ceftriaxone (MIC ≥ 64 μg/ml)	Humans	0.0%	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%
		Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
	Gi Gi Po	Ground Turkey							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef											
		Pork Chops							0.0%		0.0%		0.0%
		Chickens		0.0%	0.0%	0.0%	0.4% 1	0.0%	0.2%	0.0%	0.6%	1.4% 4	0.0%
		Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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%
		Swine		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 30c. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

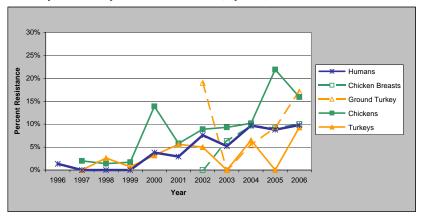
Year, 1996-2006 Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested		Humans	74	75	101	88	79	102	105	96	93	125	102
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							11 21 0 3	16 32 0 0	31 37 0 3	22 53 0 0	30 35 0 4
		Chickens Turkeys Cattle Swine		51 14 1 7	143 39 11 37	297 139 28 33	259 125 6 22	329 142 10 16	403 60 8 11	226 57 9 11	167 46 1 4	283 25 6 8	164 43 4 13
	Antimicrobial (Resistance	Isolate		,	01	00	LL	10			4		10
Antimicrobial Class Cephamycins	Breakpoint) Cefoxitin	Source					2.5%	2.9%	8.6%	5.2%	8.6%	8.8%	8.8%
	(MIC ≥ 32 µg/ml)	Humans Chicken Breasts					2	3	9	5 6.3%	8 9.7%	11 9.1%	9
		Ground Turkey							0 19.0%	1 0.0%	3 5.4%	2 9.4%	3 17.1%
		Ground Beef							4	0	2	5	6
		Pork Chops							0.0%		0.0%		0.0%
		Chickens					13.5%	5.2%	7.4%	7.1%	0 10.2%	21.6%	15.2%
		Turkeys					35 2.4%	17 4.9%	30 1.7%	16 0.0%	17 6.5%	61 0.0%	25 9.3%
		Cattle					0.0%	7 0.0%	1 37.5%	0 44.4%	3 100.0%	0 66.7%	0.0%
		Swine					0 4.5%	0.0%	9.1%	9.1%	0.0%	0.0%	7.7%
Folate Pathway Inhibitors	Sulfamethoxazole/	Humans	17.6%	21.3%	21.8%	18.2%	11.4%	8.8%	6.7%	7.3%	7.5%	8.0%	4.9%
	Sulfisoxazole¹ (MIC ≥ 512 µg/ml)	Chicken Breasts	13	16	22	16	9	9	7 45.5%	7 12.5%	7 12.9%	13.6%	26.7%
		Ground Turkey							33.3%	15.6%	37.8%	35.8%	37.1%
		Ground Beef							7	5	14	19	13
	-	Pork Chops							100.0%		0.0%		100.0%
		Chickens		45.1% 23	33.6% 48	26.6% 79	33.2% 86	16.4% 54	9.7% 39	11.1% 25	12.6% 21	10.6%	7.9% 13
		Turkeys		50.0%	35.9% 14	33.8% 47	15.2% 19	27.5%	30.0% 18	19.3% 11	26.1% 12	52.0% 13	30.2%
		Cattle		0.0%	36.4% 4	57.1% 16	0.0%	10.0%	12.5% 1	44.4% 4	100.0%	50.0%	0.0%
		Swine		0.0%	21.6%	21.2%	13.6%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%
	Trimethoprim- Sulfamethoxazole	Humans	0.0%	0.0%	2.0%	1.1% 1	1.3%	2.0%	1.0%	2.1%	0.0%	0.8%	0.0%
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts			_			_	0.0%	0.0%	0.0%	0.0%	6.7% 2
		Ground Turkey							0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef											
		Pork Chops							0.0% 0		0.0% 0		100.0%
		Chickens		0.0% 0	0.7% 1	0.7% 2	0.4% 1	0.3% 1	0.7% 3	0.9% 2	0.0%	0.4%	0.0%
		Turkeys		7.1% 1	5.1% 2	4.3% 6	0.8% 1	3.5% 5	3.3% 2	3.5% 2	0.0%	0.0%	0.0%
		Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	10.0% 1	0.0% 0	55.6% 5	100.0% 1	50.0% 3	0.0% 0
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	1.4% 1	0.0% 0	1.0% 1	1.1% 1	1.3% 1	1.0% 1	1.0% 1	0.0% 0	1.1% 1	0.8% 1	0.0%
		Chicken Breasts							0.0% 0	0.0% 0	3.2% 1	0.0%	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0	5.4% 2	0.0%	0.0% 0
		Ground Beef											
		Pork Chops							0.0%		0.0%		0.0%
		Chickens		0.0%	0.7%	1.3%	11.6% 30	3.3%	1.7%	3.1% 7	4.2% 7	3.2% 9	2.4%
		Turkeys		0.0%	2.6%	0.7%	1.6%	2.8%	1.7%	0.0%	0.0%	0.0%	4.7%
		Cattle		0.0%	27.3%	42.9% 12	0.0%	10.0%	25.0%	44.4%	100.0%	50.0%	0.0%
		Swine		0.0% 0	0.0%	3.0% 1	4.5% 1	0.0%	9.1% 1	0.0% 0	0.0%	0.0%	0.0%

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

Table 30d. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	ed	Humans	74	75	101	88	79	102	105	96	93	125	102
		Chicken Breasts Ground Turkey Ground Beef Pork Chops							11 21 0 3	16 32 0 0	31 37 0 3	22 53 0 0	30 35 0 4
		Chickens Turkeys Cattle Swine		51 14 1 7	143 39 11 37	297 139 28 33	259 125 6 22	329 142 10 16	403 60 8 11	226 57 9 11	167 46 1 4	283 25 6 8	164 43 4 13
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Quinolones	Ciprofloxacin (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	0.0% 0	0.0%
	(WIO = 4 µg/III)	Chicken Breasts		J		J	J	Ü	0.0% 0	0.0% 0	0.0%	0.0%	0.0%
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%
		Ground Beef											
		Pork Chops							0.0% 0		0.0%		0.0%
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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%
		Swine		0 0.0% 0	0 0.0% 0	0 0.0% 0	0 0.0% 0	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)	Humans	0.0%	0.0%	1.0%	1.1%	1.3%	0.0%	0.0%	1.0%	0.0%	0.8%	0.0%
	Nalidixic Acid (MIC ≥ 32 μg/ml)	Chicken Breasts	ű	J	•		•	J	0.0%	0.0%	0.0%	0.0%	3.3%
		Ground Turkey							4.8% 1	0.0% 0	0.0%	1.9% 1	0.0%
		Ground Beef											
		Pork Chops							0.0% 0		0.0%		0.0% 0
		Chickens		0.0% 0	0.0% 0	0.3% 1	0.0%	0.0% 0	0.7% 3	0.0% 0	0.0% 0	0.0%	0.0% 0
		Turkeys		0.0%	0.0%	0.7% 1	0.8% 1	0.0% 0	1.7% 1	0.0% 0	0.0% 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%
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans	20.3% 15	12.0% 9	19.8% 20	18.2% 16	21.5% 17	24.5% 25	19.0% 20	16.7% 16	19.4% 18	18.4% 23	13.7% 14
	, , ,	Chicken Breasts							45.5% 5	0.0%	6.5% 2	4.5% 1	3.3% 1
		Ground Turkey							57.1% 12	43.8% 14	70.3% 26	56.6% 30	68.6% 24
		Ground Beef											
		Pork Chops							66.7% 2		100.0% 3		0.0% 0
		Chickens		2.0% 1	7.7% 11	7.7% 23	20.1% 52	14.9% 49	11.7% 47	16.4% 37	15.0% 25	14.5% 41	12.2% 20
		Turkeys		14.3% 2	23.1% 9	38.1% 53	64.0% 80	54.2% 77	70.0% 42	84.2% 48	73.9% 34	64.0% 16	62.8% 27
		Cattle		0.0% 0	63.6% 7	60.7% 17	33.3% 2	40.0% 4	62.5% 5	55.6% 5	100.0% 1	66.7% 4	0.0%
		Swine		85.7% 6	73.0% 27	72.7% 24	81.8% 18	93.8% 15	72.7% 8	100.0% 11	75.0% 3	87.5% 7	92.3% 12
		ı		U	21	24	10	IJ	U	_ ' '	J		

Figure 16. Percent of *Salmonella* Heidelberg Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftiofur, by Year, 1996-2006 ¹



¹ Data for ground beef, pork chops, cattle, and swine are not included due to the small number of *Salmonella* Heidelberg isolates from these sources. Table 30 contains resistance data for *Salmonella* Heidelberg isolates from each source, by year

Table 31. Number of Salmonella Heidelberg Isolates Tested from Humans, Food Animals, and Retail Meats, by Year, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	74	75	101	88	79	102	105	96	93	125	102
Chicken Breasts							11	16	31	22	30
Ground Turkey							21	32	37	53	35
Ground Beef							0	0	0	0	0
Pork Chops							3	0	3	0	4
Chickens		51	143	297	259	329	403	226	167	283	164
Turkeys		14	39	139	125	142	60	57	46	25	43
Cattle		1	11	28	6	10	8	9	1	6	4
Swine	_	7	37	33	22	16	11	11	4	8	13

Table 32a. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	74	75	1998	88	79	102	105	96	93	125	102
Total of Isolates Tested	Chicken Breasts Ground Turkey Ground Beef Pork Chops	, 4	, 5	101	30	, 5	102	11 21 0 3	16 32 0	31 37 0 3	22 53 0	30 35 0 4
	Chickens Turkeys Cattle Swine		51 14 1 7	143 39 11 37	297 139 28 33	259 125 6 22	329 142 10 16	403 60 8 11	226 57 9 11	167 46 1 4	283 25 6 8	164 43 4 13
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans	54.1% 40	66.7% 50	56.4% 57	68.2% 60	63.3% 50	64.7% 66	67.6% 71	68.8% 66	55.9% 52	62.4% 78	67.6% 69
	Chicken Breasts							27.3% 3	62.5% 10	58.1% 18	54.5% 12	50.0% 15
	Ground Turkey							33.3% 7	50.0% 16	16.2% 6	20.8% 11	8.6% 3
	Ground Beef											
	Pork Chops							0.0% 0		0.0% 0		0.0% 0
	Chickens		35.3% 18	50.3% 72	61.6% 183	48.3% 125	63.5% 209	66.5% 268	62.8% 142	68.3% 114	59.4% 168	67.1% 110
	Turkeys		50.0% 7	46.2% 18	43.2% 60	28.8% 36	31.0% 44	15.0% 9	8.8% 5	15.2% 7	16.0% 4	23.3% 10
	Cattle		100.0% 1	27.3% 3	25.0% 7	66.7% 4	60.0% 6	12.5% 1	44.4% 4	0.0%	0.0% 0	100.0% 4
	Swine		14.3% 1	18.9% 7	27.3% 9	13.6% 3	6.3% 1	27.3% 3	0.0%	0.0%	12.5% 1	7.7% 1
2. At Least ACSSuT ¹ Resistant	Humans	1.4% 1	0.0% 0	0.0% 0	0.0% 0	1.3% 1	1.0% 1	1.0% 1	0.0% 0	1.1% 1	0.0% 0	0.0% 0
	Chicken Breasts							0.0% 0	0.0% 0	3.2% 1	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	0.0% 0	5.4% 2	0.0% 0	0.0% 0
	Ground Beef											
	Pork Chops							0.0% 0		0.0% 0		0.0% 0
	Chickens		0.0% 0	0.7% 1	1.3% 4	11.2% 29	3.0% 10	1.5% 6	2.2% 5	2.4% 4	2.8% 8	1.8% 3
	Turkeys		0.0% 0	2.6% 1	0.7% 1	1.6% 2	2.8% 4	1.7% 1	0.0% 0	0.0%	0.0% 0	4.7% 2
	Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	0.0%	12.5% 1	33.3% 3	100.0% 1	50.0% 3	0.0%
	Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%
3. At Least ACT/S ² Resistant	Humans	0.0% 0	0.0%	0.0% 0	0.0%	0.0% 0	0.0%	1.0% 1	0.0%	0.0%	0.0%	0.0%
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef											
	Pork Chops							0.0% 0		0.0% 0		0.0% 0
	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
	Turkeys		0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.4% 2	1.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	0.0% 0	0.0% 0	44.4% 4	100.0% 1	50.0% 3	0.0% 0
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0

 $^{^{1} \} ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline$

 $^{^2\,\}mbox{ACT/S}$ = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 32b. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125	102
	Chicken Breasts							11	16	31	22	30
	Ground Turkey							21	32	37	53	35
	Ground Beef							0	0	0	0	0
	Pork Chops							3	0	3	0	4
	Chickens		51	143	297	259	329	403	226	167	283	164
	Turkeys		14	39	139	125	142	60	57	46	25	43
	Cattle		1	11	28	6	10	8	9	1	6	4
	Swine		7	37	33	22	16	11	11	4	8	13
Resistance Pattern	Isolate Source											
Nesistance i atteni		0.0%	0.0%	0.0%	0.0%	1.3%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%
4. At Least ACSSuTAuCf 1	Humans	0	0	0	0	1	1	1	0	0	0	0.070
Resistant	OLI L. B							0.0%	0.0%	3.2%	0.0%	0.0%
	Chicken Breasts							0	0	1	0	0
	Ground Turkey							0.0%	0.0%	5.4%	0.0%	0.0%
	Glound Turkey							0	0	2	0	0
	Ground Beef											
	Pork Chops							0.0%		0.0%		0.0%
	1 on onops							0		0		0
	Chickens		0.0%	0.7%	0.7%	11.2%	2.7%	1.5%	2.2%	2.4%	2.8%	1.8%
			0.0%	1 2.6%	2 0.7%	29 0.8%	9 2.8%	6 1.7%	5 0.0%	0.0%	0.0%	3 4.7%
	Turkeys		0.0%	2.6%	1	1	4	1.7%	0.0%	0.0%	0.0%	2
			0.0%	27.3%	42.9%	0.0%	0.0%	12.5%	33.3%	100.0%	50.0%	0.0%
	Cattle		0	3	12	0	0	1	3	1	3	0.070
	Curin a		0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Swine		0	0	0	1	0	0	0	0	0	0
	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5. At Least Ceftiofur and	Tiumans	0	0	0	0	0	0	0	0	0	0	0
Nalidixic Acid Resistant	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%
								0	0	0	0	0
	Ground Turkey							0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Beef							U	U	U	U	
								0.00/		0.00/		0.00/
	Pork Chops							0.0% 0		0.0%		0.0%
	Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	3	0	0	0	0
	Turkeys		0.0% 0	0.0%	0.0%	0.0%	0.0%	1.7% 1	0.0%	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%
	Cattle		0	0	0	0	0	0	0	0	0	0
	Swine		0.0%	0.0%	0.0%	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 ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

IV. Campylobacter Data

A. Campylobacter jejuni and Campylobacter coli Isolates Tested

Table 33. Number of Campylobacter jejuni Isolates Tested, by Source and Year, 1997-2006

					Ye	ear				
Source	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	209	297	293	306	365	329	303	320	791	709
Chicken Breasts						198	325	510	403	426
Ground Turkey						2	4	7	10	12
Ground Beef						0	1	0	0	0
Pork Chops						2	0	0	1	1
Chickens					64 ¹	526	374	508	567	228

¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

Table 34. Number of Campylobacter coli Isolates Tested, by Source and Year, 1997-2006

	Year									
Source	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	6	8	20	12	17	25	22	26	98	97
Chicken Breasts						90	142	196	151	145
Ground Turkey						2	1	5	9	10
Ground Beef						0	0	0	0	0
Pork Chops						3	4	3	0	2
Chickens					52 ¹	288	247	186	380	123

¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

B. Isolation of Campylobacter from Retail Meats

Table 35. Number and Percent of Retail Meat Samples Positive for Campylobacter, 2006

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	1193	1185	1195	1192
Number Positive for Campylobacter	572	24	0	3
Percent Positive for Campylobacter	47.9%	2.0%	0.0%	0.3%

Figure 17. Percent of Retail Meat Samples Positive for Campylobacter, 2006

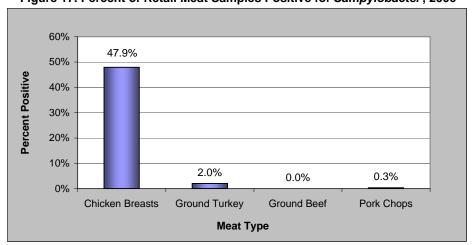
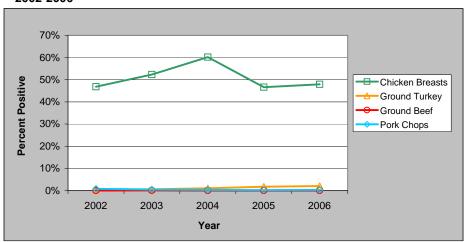


Figure 18. Percent of Retail Meat Samples Positive for *Campylobacter*, 2002-2006

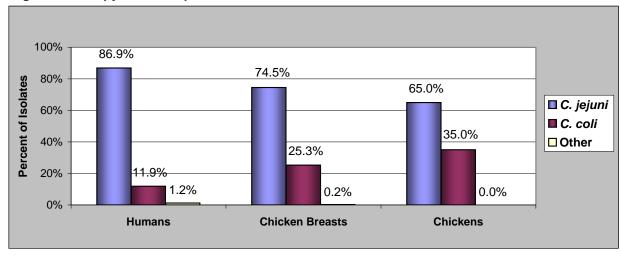


C. Campylobacter Species

Table 36. Campylobacter Species Isolated from Humans, Retail Meats, and Chickens, 2006

	Humans		Retail	Meats		Food Animals
Campylobacter	Humans (n=816)	Chicken Breasts (n=572)	Ground Turkey (n=24)	Ground Beef (n=0)	Pork Chops (n=3)	Chickens (n=351)
Species						
C. jejuni	86.9%	74.5%	50.0%	0.0%	33.3%	65.0%
,·,	709	426	12	0	1	228
C. coli	11.9%	25.3%	41.7%	0.0%	66.7%	35.0%
C. COII	97	145	10	0	2	123
Other	1.2%	0.2%	8.3%	0.0%	0.0%	0.0%
Other	10	1	2	0	0	0

Figure 19. Campylobacter Species Isolated from Humans, Chicken Breasts, and Chickens, 2006



D. Antimicrobial Susceptibility among Campylobacter jejuni

MIC Distributions

Table 37a. Distribution of MICs and Occurrence of Resistance among Campylobacter jejuni Isolates from Humans, Retail Meats, and Chickens, 2006

	Isolate Source									D	istributio	n (%) of MI	Cs (µg/m) ⁵					
Antimicrobial	(# of Isolates)1	%l ²	%R ³	[95% CI] 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 (709)	0.0	0.0	[0.0 - 0.5]				8.5	37.5	49.6	4.1	0.3							
	Chicken Breasts (426)	0.0	0.0	[0.0 - 0.9]				0.2	12.9	82.9	3.8	0.2							
	Ground Turkey (12)	0.0	0.0	[0.0 - 26.5]					16.7	83.3									
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]						100.0									
	Chickens (228)	0.0	0.0	[0.0 - 1.6]				7.0	54.4	38.2	0.4								
Ketolides																			
Telithromycin	Humans (709)	0.1	8.0	[0.3 - 1.8]			0.3	1.7	12.4	31.5	32.6	19.0	1.6	0.1	0.8				
	Chicken Breasts (426)	0.2	0.7	[0.1 - 2.0]				0.9	11.5	50.0	31.7	4.9		0.2	0.7				
	Ground Turkey (12)	0.0	0.0	[0.0 - 26.5]					8.3	50.0	25.0	16.7							
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]						100.0									
	Chickens (228)	0.4	0.0	[0.0 - 1.6]				2.6	21.9	51.8	18.9	3.9	0.4	0.4					
Lincosamides																			
Clindamycin	Humans (709)	0.0	1.0	[0.4 - 2.0]		4.4	24.4	43.6	20.0	5.2	8.0	0.6		0.1	0.4	0.4			
	Chicken Breasts (426)	0.0	0.7	[0.1 - 2.0]		1.6	14.1	46.9	32.4	4.2				0.7					
	Ground Turkey (12)	0.0	0.0	[0.0 - 26.5]				58.3	41.7										
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]					100.0										
	Chickens (228)	0.4	0.0	[0.0 - 1.6]		1.8	38.2	44.3	13.2	2.2			0.4						
Macrolides																			
Azithromycin	Humans (709)	0.0	8.0	[0.3 - 1.8]	4.1	28.1	37.7	22.8	6.1	0.3	0.1							0.8	
	Chicken Breasts (426)	0.0	0.9	[0.3 - 2.4]		54.5	39.4	5.2										0.9	
	Ground Turkey (12)	0.0	0.0	[0.0 - 26.5]		58.3	41.7												
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]		100.0													
	Chickens (228)	0.0	0.4	[0.0 - 2.4]	22.4	52.2	21.5	2.6			0.4	0.4						0.4	
Erythromycin	Humans (709)	0.0	0.8	[0.3 - 1.8]			1.0	8.2	30.9	34.3	20.6	3.5	0.7					0.8	
	Chicken Breasts (426)	0.0	0.9	[0.0 - 0.9]				8.0	39.4	39.0	12.7							0.9	
	Ground Turkey (12)	0.0	0.0	[0.0 - 26.5]					50.0	33.3	16.7								
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]						100.0									
	Chickens (228)	0.0	0.4	[0.0 - 2.4]				15.4	47.4	28.1	6.6	1.8	0.4					0.4	

¹ There were no *C. jejuni* isolates from ground beef

²Percent of isolates with intermediate susceptibility

³ Percent resistant; for florfenicol, percent non-susceptible

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 area 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 37b. Distribution of MICs and Occurrence of Resistance among Campylobacter jejuni Isolates from Humans, Retail Meats, and Chickens, 2006

	Isolate Source										Distribution	n (%) of M	ICs (µg/ml) ⁵					
Antimicrobial	(# of Isolates)1	%l ²	%R ³	[95% CI] ⁴	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Phenicols																			
Florfenicol ⁶	Humans (709)	N/A	0.0	[0.0 - 0.5]					2.3	20.2	61.6	13.7	2.3						
	Chicken Breasts (426)	N/A	0.0	[0.0 - 0.9]				0.2		8.2	77.9	13.6							
	Ground Turkey (12)	N/A	0.0	[0.0 - 26.5]						8.3	91.7								
	Pork Chops (1)	N/A	0.0	[0.0 - 97.5]							100.0								
	Chickens (228)	N/A	0.0	[0.0 - 1.6]					1.8	45.2	48.2	4.8							
Quinolones																			
Ciprofloxacin	Humans (709)	0.1	19.5	[16.6 - 22.6]	0.3	5.9	39.5	28.2	5.8	0.7		0.1	1.8	8.3	5.8	2.1	1.1	0.3	
	Chicken Breasts (426)	0.0	16.7	[13.3 - 20.6]		0.7	29.8	44.8	8.0				0.2	7.0	7.5	1.9			
	Ground Turkey (12)	0.0	50.0	[21.1 - 78.9]			16.7	33.3						25.0	16.7	8.3			
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]			100.0												
	Chickens (228)	0.4	8.8	[5.4 - 13.2]		5.3	54.8	28.5	1.8		0.4	0.4		7.0	1.8				
Nalidixic acid	Humans (709)	0.4	19.0	[16.2 - 22.1]									62.3	15.8	2.4	0.4	2.3	16.8	
	Chicken Breasts (426)	0.0	16.7	[13.3 - 20.6]									71.4	12.0			0.5	16.2	
	Ground Turkey (12)	0.0	50.0	[21.1 - 78.9]									41.7	8.3				50.0	
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]									100.0						
	Chickens (228)	0.0	8.8	[5.4 - 13.2]									82.0	8.3	0.9		4.8	3.9	
Tetracyclines																			
Tetracycline	Humans (709)	0.6	47.4	[43.7 - 51.1]			6.6	24.3	15.2	3.2	2.0	0.6	0.1	0.6	1.6	3.7	13.8	28.3	
	Chicken Breasts (426)	0.0	47.2	[42.4 - 52.0]			1.4	23.2	13.8	10.3	2.8	0.7	0.5		1.2	3.3	17.4	25.4	
	Ground Turkey (12)	0.0	75.0	[42.8 - 94.5]				16.7		8.3						8.3	16.7	50.0	
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]					100.0										
	Chickens (228)	1.8	56.1	[49.4 - 62.7]			4.8	23.7	7.9	3.9	1.3	0.4		1.8	3.5	10.1	25.0	17.5	

¹ There were no *C. jejuni* isolates from ground beef

²Percent of isolates with intermediate susceptibility

³ Percent resistant; for florfenicol, percent non-susceptible

⁴95% 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 area 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 38a. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2006

Year Number of Isolates Te	sted	Humans Chicken Breasts	1997 209	1998 297	1999 293	2000 306	2001 365	2002 329	2003 303	2004 320	2005 791	2006 709
		Ground Turkey Ground Beef Pork Chops						198 2 0 2	325 4 1 0	510 7 0	403 10 0 1	426 12 0 1
		Chickens					64 ¹	526	374	508	567	228
	Antimicrobial (Resistance											
Antimicrobial Class	Breakpoint) ²	Isolate Source										
Aminoglycosides	Gentamicin (MIC ≥ 8 µg/ml)	Humans		0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.5%	0.0%
		Chicken Breasts						0.0% 0 0.0%	0.3% 1 0.0%	0.0%	0.0% 0 0.0%	0.0% 0 0.0%
		Ground Turkey						0.0%	0	0.0%	0.0%	0.0%
		Ground Beef						2 22/	0.0%		2.22/	2.22
		Pork Chops						0.0%			0.0%	0.0%
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0%	0.0%
Ketolides	Telithromycin (MIC ≥ 16 μg/ml)	Humans									0.6% 5	0.8% 6
		Chicken Breasts								0.4% 2	0.5% 2	0.7% 3
		Ground Turkey								0.0% 0	0.0% 0	0.0%
		Ground Beef										
		Pork Chops									0.0% 0	0.0%
		Chickens									0.4% 2	0.0%
Lincosamides	Clindamycin (MIC ≥ 8 µg/ml)	Humans	1.0% 2	1.0% 3	0.7% 2	0.7% 2	1.9% 7	1.8% 6	0.0% 0	2.2% 7	1.1% 9	1.0% 7
		Chicken Breasts								0.4% 2	0.5% 2	0.7% 3
		Ground Turkey								0.0% 0	0.0% 0	0.0%
		Ground Beef										
		Pork Chops									0.0% 0	0.0%
		Chickens					0.0% 0	0.4% 2	0.8% 3	0.2% 1	0.4% 2	0.0% 0
Macrolides	Azithromycin (MIC ≥ 8 μg/ml)	Humans		0.3% 1	1.7% 5	1.6% 5	1.9% 7	1.8% 6	0.3% 1	0.6% 2	1.8% 14	0.8% 6
		Chicken Breasts								0.8% 4	0.5% 2	0.9% 4
		Ground Turkey								0.0% 0	0.0% 0	0.0% 0
		Ground Beef										
		Pork Chops									0.0%	0.0%
		Chickens					3.1% 2	0.6%	1.3% 5	1.6% 8	1.4%	0.4%
	Erythromycin (MIC ≥ 32 µg/ml)	Humans	1.4%	0.7% 2	1.4% 4	1.0%	1.9% 7	1.2%	0.3%	0.3%	1.6% 13	0.8%
	(e reg)	Chicken Breasts						0.0%	0.0%	0.8%	0.5%	0.9%
		Ground Turkey						0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef						J	0.0%	Ť		
		Pork Chops						0.0%			0.0%	0.0%
		Chickens					3.1%	0.6%	1.6%	1.2%	1.1%	0.4%

¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

² 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

Table 38b. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2006

1997-2006 Year			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Te	ested	Humans	209	297	293	306	365	329	303	320	791	709
		Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens					64 ¹	198 2 0 2 526	325 4 1 0	510 7 0 0 508	403 10 0 1 567	426 12 0 1
	Antimicrobial (Resistance											
Antimicrobial Class Phenicols	Breakpoint) ² Chloramphenicol	Isolate Source	3.8%	1.0%	0.7%	0.0%	0.3%	0.3%	0.0%	1.6%		
FIIemcois	(MIC ≥ 32 μg/ml)	Humans Chickens	8	3	2	0.078	0.0%	1 0.0%	0.0%	5 0.0%		
	Florfenicol (MIC ≥ 8) ³	Humans					0	0	0	0	0.5%	0.0%
	(6 2 6)	Chicken Breasts								0.0%	0.0% 0	0.0%
		Ground Turkey								0.0% 0	0.0% 0	0.0% 0
		Ground Beef									0.0%	0.0%
		Pork Chops									0.0%	0.0%
Quinolones	Ciprofloxacin	Chickens	12.4%	13.8%	17.7%	14.7%	18.4%	20.7%	17.2%	18.1%	0 21.5%	0 19.5%
	(MIC ≥ 4 μg/ml)	Chicken Breasts	26	41	52	45	67	68 15.2%	52 14.5%	58 15.1%	170 15.1%	138 16.7%
		Ground Turkey						30 50.0%	47 0.0%	77 28.6%	61 10.0%	71 50.0%
		Ground Beef						1	0 0.0% 0	2	1	6
		Pork Chops						0.0%	0		100.0%	0.0%
		Chickens					20.3% 13	18.6% 98	14.7% 55	21.3% 108	15.0% 85	8.8% 20
	Nalidixic acid (MIC ≥ 64 µg/ml)	Humans	13.4% 28	15.5% 46	20.1% 59	16.0% 49	18.9% 69	21.3% 70	17.8% 54	18.4% 59	21.9% 173	19.0% 135
		Chicken Breasts								15.1% 77	14.9% 60	16.7% 71
		Ground Turkey								28.6% 2	10.0% 1	50.0% 6
		Ground Beef									100.00/	0.00/
		Pork Chops					20.3%	22.1%	15.5%	21.7%	100.0% 1 15.3%	0.0% 0 8.8%
		Chickens					13	116	58	110	87	20
Tetracyclines	Doxycycline (MIC ≥ 8 μg/ml)	Chicken Breasts						38.4% 76	40.6% 132			
	(о = о ру)	Ground Turkey						100.0%	75.0% 3			
		Ground Beef							0.0% 0			
		Pork Chops						0.0% 0				
	Tetracycline (MIC ≥ 16 μg/ml)	Humans	47.8% 100	46.1% 137	45.4% 133	39.2% 120	40.3% 147	41.3% 136	38.3% 116	46.9% 150	41.8% 331	47.4% 336
		Chicken Breasts								50.2% 256	46.4% 187	47.2% 201
		Ground Turkey								42.9% 3	70.0% 7	75.0% 9
		Ground Beef									0.0%	0.0%
		Pork Chops					35.9%	45.1%	47.6%	42.3%	0 44.1%	0.0%
		Chickens					23	237	178	215	250	128

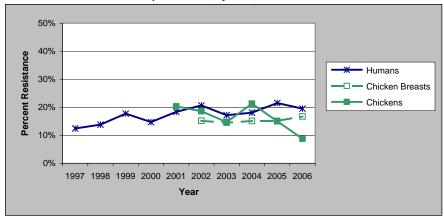
¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

² 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

 $^{^3}$ For florfenicol, only a susceptible breakpoint (\leq 4 μ g/ml) has been established. In this report, isolates with an MIC \geq 8 μ g/ml are categorized as resistant

Ciprofloxacin Resistance

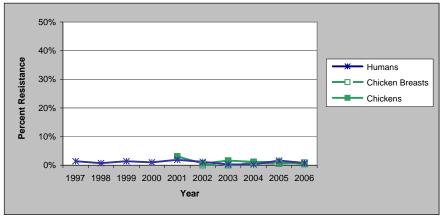
Figure 20. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2006¹



¹ Data for ground turkey, ground beef, and pork chops are not included due to the small number of *C. jejuni* isolates from these sources. Table 38 contains resistance data for *C. jejuni* isolates from each source, by year

Erythromycin Resistance

Figure 21. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Erythromycin, by Year, 1997-2006¹



¹ Data for ground turkey, ground beef, and pork chops are not included due to the small number of *C. jejuni* isolates from these sources. Table 38 contains resistance data for *C. jejuni* isolates from each source, by year

Table 39. Number of *Campylobacter jejuni* Isolates Tested from Humans, Retail Meats, and Chickens by Year, 1997-2006

Offickeria by Te	ui, 1001									
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	209	297	293	306	365	329	303	320	791	709
Chicken Breasts						198	325	510	403	426
Ground Turkey						2	4	7	10	12
Ground Beef						0	1	0	0	0
Pork Chops						2	0	0	1	1
Chickens					64 ¹	526	374	508	567	228

¹ These isolates were recovered from July through December 2001, when the new ARS isolation method was used

E. Antimicrobial Susceptibility among Campylobacter coli

MIC Distributions

Table 40a. Distribution of MICs and Occurrence of Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, 2006

	Isolate Source									0	istributio	n (%) of M	ICs (µg/ml) ⁵					
Antimicrobial	(# of Isolates)1	%l ²	%R ³	[95% CI] 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 (97)	0.0	1.0	[0.0 - 5.6]				2.1	6.2	63.9	25.8	1.0					1.0		
	Chicken Breasts (145)	0.0	0.0	[0.0 - 2.5]					2.8	93.1	4.1								
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]					20.0	70.0	10.0								
	Pork Chops (2)	0.0	0.0	[0.0 - 84.2]						100.0									
	Chickens (123)	0.0	0.0	[0.0 - 3.0]					30.9	66.7	2.4								
Ketolides																			
Telithromycin	Humans (97)	2.1	7.2	[3.0 - 14.3]				1.0	14.4	21.6	14.4	20.6	18.6	2.1	7.2				
	Chicken Breasts (145)	0.7	4.8	[2.0 - 9.7]				1.4	13.1	2.1	11.7	47.6	18.6	0.7	4.8				
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]					10.0	10.0	20.0	30.0	30.0						
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]								50.0			50.0				
	Chickens (123)	5.7	6.5	[2.8 - 12.4]				2.4	30.9	5.7	13.0	32.5	3.3	5.7	6.5				
Lincosamides																			
Clindamycin	Humans (97)	1.0	9.3	[4.3 - 16.9]		1.0	3.1	15.5	36.1	22.7	7.2	4.1	1.0	1.0	3.1	5.2			
	Chicken Breasts (145)	0.7	4.8	[2.0 - 9.7]		0.7	0.7	22.8	44.1	15.9	5.5	4.8	0.7	4.8					
	Ground Turkey (10)	10.0	0.0	[0.0 - 30.8]				10.0	30.0	50.0			10.0						
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]					50.0							50.0			
	Chickens (123)	5.7	1.6	[0.2 - 5.8]			6.5	39.8	36.6	4.1	0.8	4.9	5.7	1.6					
Macrolides																			
Azithromycin	Humans (97)	0.0	8.2	[3.6 - 15.6]		8.2	11.3	41.2	24.7	5.2	1.0							8.2	
	Chicken Breasts (145)	0.0	5.5	[2.4 - 10.6]		11.7	37.9	37.9	5.5	0.7	0.7							5.5	
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]		10.0	60.0	10.0	20.0										
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]			50.0											50.0	
	Chickens (123)	0.0	8.9	[4.5 - 15.4]	0.8	23.6	50.4	13.8	1.6		0.8							8.9	
Erythromycin	Humans (97)	0.0	8.2	[3.6 - 15.6]				1.0	6.2	29.9	29.9	13.4	11.3		1		1.0	7.2	
	Chicken Breasts (145)	0.0	5.5	[2.4 - 10.6]				2.1	13.1	10.3	49.0	17.9	2.1					5.5	
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]				10.0		20.0	60.0		10.0						
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]						50.0								50.0	
	Chickens (123)	0.0	8.9	[4.5 - 15.4]				6.5	30.9	10.6	30.9	8.9		3.3				8.9	

¹ There were no *C. coli* isolates from ground beef and pork chops

² Percent of isolates with intermediate susceptibility

³ Percent resistant; for florfenicol, percent non-susceptible

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 area 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.

⁶ For florfenicol, only a susceptible breakpoint (≤ 4 μg/ml) has been established. In this report, isolates with an MIC ≥ 8 μg/ml are categorized as resistant

Table 40b. Distribution of MICs and Occurrence of Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, 2006

	Isolate Source										Distribution	n (%) of MI	ICs (µg/ml) ⁵					
Antimicrobial	(# of Isolates) ¹	%l ²	%R³	[95% CI] ⁴	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Phenicols																			
Florfenicol 6	Humans (97)	N/A	0.0	[0.0 - 3.7]						7.2	54.6	33.0	5.2						
	Chicken Breasts (145)	N/A	0.0	[0.0 - 2.5]						1.4	61.4	33.8	3.4						
	Ground Turkey (10)	N/A	0.0	[0.0 - 30.8]							40.0	60.0							
	Pork Chops (2)	N/A	0.0	[0.0 - 84.2]							100.0								
	Chickens (123)	N/A	0.0	[0.0 - 3.0]						5.7	90.2	4.1							
Quinolones																			
Ciprofloxacin	Humans (97)	0.0	21.6	[13.9 - 31.2]		1.0	15.5	35.1	22.7	4.1			3.1	9.3	7.2	1.0	1.0		
	Chicken Breasts (145)	0.0	22.1	[15.6 - 29.7]			6.2	36.6	31.7	3.4				2.8	13.8	5.5			
	Ground Turkey (10)	0.0	30.0	[6.7 - 65.2]				20.0	30.0	20.0					10.0	20.0			
	Pork Chops (2)	0.0	0.0	[0.0 - 84.2]				100.0											
	Chickens (123)	0.0	15.4	[9.6 - 23.1]		2.4	29.3	43.9	8.9					4.9	10.6				
Nalidixic acid	Humans (97)	0.0	23.7	[15.7 - 33.4]									32.0	36.1	8.2		5.2	18.6	
	Chicken Breasts (145)	0.0	20.7	[14.4 - 28.2]									51.0	24.8	3.4		4.8	15.9	
	Ground Turkey (10)	0.0	30.0	[6.7 - 65.2]									40.0	30.0				30.0	
	Pork Chops (2)	0.0	0.0	[0.0 - 84.2]									50.0	50.0					
	Chickens (123)	0.0	15.4	[9.6 - 23.1]									69.1	15.4			11.4	4.1	
Tetracyclines																			
Tetracycline	Humans (97)	0.0	39.2	[29.4 - 49.6]			2.1	9.3	29.9	12.4	5.2	2.1					2.1	37.1	
	Chicken Breasts (145)	0.0	46.9	[38.6 - 55.4]				2.8	19.3	18.6	6.9	5.5					3.4	43.4	
	Ground Turkey (10)	0.0	80.0	[44.4 - 97.5]						20.0							10.0	70.0	
	Pork Chops (2)	50.0	0.0	[0.0 - 84.2]								50.0		50.0					
	Chickens (123)	0.0	53.7	[44.4 - 62.7]				13.0	28.5	3.3	0.8		0.8		0.8	3.3	7.3	42.3	

¹ There were no *C. coli* isolates from ground beef and pork chops

² Percent of isolates with intermediate susceptibility

³ Percent resistant; for florfenicol, percent non-susceptible

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 area 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.

⁶ For florfenicol, only a susceptible breakpoint (≤ 4 μg/ml) has been established. In this report, isolates with an MIC ≥ 8 μg/ml are categorized as resistant

Resistance by Year

Table 41a. Antimicrobial Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2006

Year		e among Camp	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of Isolates Te	ested	Humans	6	8	20	12	17	25	22	26	98	97
		Chicken Breasts Ground Turkey Ground Beef Pork Chops						90 2 0 3	142 1 0 4	196 5 0 3	151 9 0 0	145 10 0 2
		Chickens					52 ¹	288	247	186	380	123
	Antimicrobial (Resistance											
Antimicrobial Class	Breakpoint) ²	Isolate Source										
Aminoglycosides	Gentamicin (MIC ≥ 8 μg/ml)	Humans		0.0%	0.0%	8.3% 1	0.0%	0.0%	4.5% 1	0.0%	2.0%	1.0%
		Chicken Breasts						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
		Ground Turkey						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef										
		Pork Chops						0.0%	0.0%	0.0%		0.0%
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0
Ketolides	Telithromycin (MIC ≥ 16 μg/ml)	Humans									4.1% 4	7.2% 7
		Chicken Breasts								8.2% 16	7.9% 12	4.8% 7
		Ground Turkey								0.0% 0	22.2% 2	0.0%
		Ground Beef										
		Pork Chops								0.0% 0		50.0% 1
		Chickens									5.5% 21	6.5% 8
Lincosamides	Clindamycin (MIC ≥ 8 µg/ml)	Humans	16.7% 1	12.5% 1	10.0% 2	8.3% 1	5.9% 1	4.0% 1	9.1% 2	0.0% 0	4.1% 4	9.3% 9
		Chicken Breasts								7.1% 14	8.6% 13	4.8% 7
		Ground Turkey								0.0% 0	0.0% 0	0.0% 0
		Ground Beef										
		Pork Chops								33.3% 1		50.0%
		Chickens					1.9% 1	4.9% 14	4.5% 11	1.1% 2	2.4% 9	1.6% 2
Macrolides	Azithromycin (MIC ≥ 8 μg/ml)	Humans		12.5% 1	10.0% 2	8.3% 1	5.9% 1	4.0% 1	9.1% 2	0.0% 0	3.1% 3	8.2% 8
		Chicken Breasts								9.2% 18	9.9% 15	5.5% 8
		Ground Turkey								0.0% 0	22.2% 2	0.0% 0
		Ground Beef										
		Pork Chops								33.3% 1		50.0% 1
		Chickens					11.5% 6	19.4% 56	20.2% 50	9.1% 17	8.4% 32	8.9% 11
	Erythromycin (MIC ≥ 32 μg/ml)	Humans	0.0%	12.5% 1	10.0% 2	8.3% 1	5.9% 1	4.0%	9.1% 2	0.0%	3.1%	8.2% 8
		Chicken Breasts						7.8% 7	7.0%	9.2% 18	9.9% 15	5.5%
		Ground Turkey						0.0% 0	0.0% 0	0.0% 0	22.2%	0.0%
		Ground Beef										
		Pork Chops						33.3%	75.0%	33.3%	F 11.	50.0%
		Chickens					9.6% 5	18.8% 54	20.2% 50	9.1% 17	8.4% 32	8.9% 11

 $[\]overline{\ }^{1}$ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

² 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

Table 41b. Antimicrobial Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2006

	TODIAI INCOISIAIN	e among Camp										
Year Number of Isolates Te	ested	Humans	1997 6	1998 8	1999 20	2000 12	2001 17	2002 25	2003 22	2004 26	2005 98	2006 97
		Chicken Breasts						90	142	196	151	145
		Ground Turkey						2	1	5	9	10
		Ground Beef Pork Chops						0 3	0 4	0	0	0 2
		Chickens					52 ¹	288	247	186	380	123
	Antimicrobial											
	(Resistance											
Antimicrobial Class Phenicols	Breakpoint) ² Chloramphenicol	Isolate Source	50.0%	37.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Themeole	(MIC ≥ 32 μg/ml)	Humans	3	3	0.070	0.070	0	0	0	0		
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Florfenicol (MIC > 4) ³	Humans									1.0% 1	0.0%
		Chicken Breasts								0.0% 0	0.0% 0	0.0% 0
		Ground Turkey								0.0% 0	0.0%	0.0%
		Ground Beef										
		Pork Chops								0.0% 0		0.0% 0
		Chickens									0.0%	0.0% 0
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	33.3% 2	0.0% 0	30.0% 6	25.0% 3	47.1% 8	12.0% 3	22.7% 5	30.8% 8	23.5% 23	21.6% 21
	(IVIIO 2 4 µg/IIII)	Chicken Breasts		0	0	3	8	10.0%	13.4%	16.3%	29.1%	22.1%
		Ground Turkey						9 50.0%	19 100.0%	32 0.0%	44 55.6%	32 30.0%
		Ground Beef						1	1	0	5	3
		Pork Chops						0.0%	0.0%	0.0%		0.0%
		Chickens					19.2%	16.0%	20.2%	26.9%	22.1%	15.4%
	Nalidixic acid	Humans	50.0%	50.0% 4	30.0%	25.0% 3	10 47.1%	46 12.0%	50 22.7%	50 34.6%	26.5%	19 23.7%
	(MIC ≥ 64 μg/ml)	Chicken Breasts	3	4	6	3	8	3	5	9 16.3% 32	26 29.1% 44	23 20.7% 30
		Ground Turkey								0.0%	55.6% 5	30.0%
		Ground Beef										-
		Pork Chops								0.0% 0		0.0%
		Chickens					19.2% 10	17.7% 51	21.5% 53	27.4% 51	22.1% 84	15.4% 19
Tetracyclines	Doxycycline (MIC ≥ 8 μg/ml)	Chicken Breasts						44.4% 40	50.7% 72			
		Ground Turkey						50.0% 1	100.0% 1			
		Ground Beef										
		Pork Chops						33.3% 1	75.0% 3			
	Tetracycline (MIC ≥ 16 µg/ml)	Humans	66.7% 4	50.0% 4	30.0% 6	25.0% 3	58.8% 10	40.0%	45.5% 10	38.5% 10	30.6% 30	39.2% 38
	, , , ,	Chicken Breasts								46.4% 91	42.4% 64	46.9% 68
		Ground Turkey								0.0%	88.9% 8	80.0%
		Ground Beef										
		Pork Chops								66.7% 2		0.0%
		Chickens					57.7% 30	49.0% 141	51.0% 126	48.4% 90	42.1% 160	53.7% 66

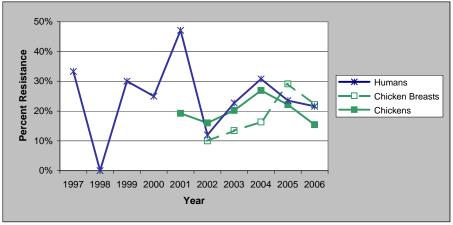
¹These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

² 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

 $^{^3}$ For florfenicol, only a susceptible breakpoint (\leq 4 μ g/ml) has been established. In this report, isolates with an MIC \geq 8 μ g/ml are categorized as resistant

Ciprofloxacin Resistance

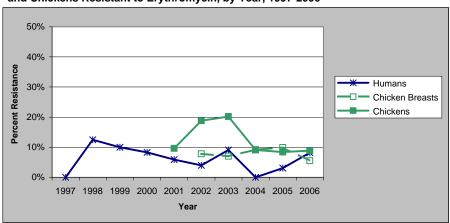
Figure 22. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2006 ¹



¹ Data for ground turkey and pork chops are not included due to the small number of *C. coli* isolates from these sources. There were no *C. coli* isolates from ground beef. Table 41 contains resistance data for *C. coli* isolates from each source, by year

Erythromycin Resistance

Figure 23. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Erythromycin, by Year, 1997-2006 ¹



¹ Data for ground turkey and pork chops are not included due to the small number of *C. coli* isolates from these sources. There were no *C. coli* isolates from ground beef. Table 41 contains resistance data for *C. coli* isolates from each source, by year

Table 42. Number of *Campylobacter coli* Isolates Tested from Humans, Retail Meats, and Chickens, by Year, 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	6	8	20	12	17	25	22	26	98	97
Chicken Breasts						90	142	196	151	145
Ground Turkey						2	1	5	9	10
Ground Beef						0	0	0	0	0
Pork Chops						3	4	3	0	2
Chickens					52 ¹	288	247	186	380	123

¹ These isolates were recovered from July through December 2001, when the new ARS isolation method was used

V. Escherichia coli Data

A. Escherichia coli Isolates Tested

Table 43. Number of *E. coli* Isolates Tested, by Source and Year, 2000-2006

				Year			
Source	2000	2001	2002	2003	2004	2005	2006
Chicken Breasts			282	396	400	393	418
Ground Turkey			304	333	376	396	388
Ground Beef			295	311	338	316	295
Pork Chops			184	218	232	205	182
Chickens	285	1989	2100	1365	1697	2232	1357

B. Isolation of *E. coli* from Retail Meats

Table 44. Number and Percent of Retail Meat Samples Positive for E. coli, 2006

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	475	466	471	472
Number Positive for <i>E. coli</i>	418	388	295	182
Percent Positive for <i>E. coli</i>	88.0%	83.3%	62.6%	38.6%

Figure 24. Percent of Retail Meat Samples Positive for E. coli, 2006

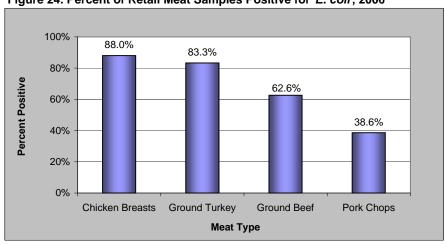
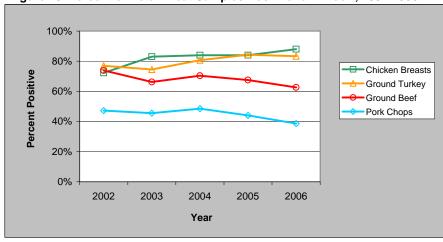


Figure 25. Percent of Retail Meat Samples Positive for E. coli, 2002-2006



C. Antimicrobial Susceptibility among E. coli

MIC Distributions

Table 45a. Distribution of MICs and Occurrence of Resistance among E. coli Isolates from Retail Meats and Chickens, 2006

	Isolate Source									D	istribu	ition (º	%) of N	IICs (μ	g/ml) ⁴						
Antimicrobial	(# of Isolates)	%l ¹	%R²	[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
Aminoglycosides																					
Amikacin	Chicken Breasts (418)	0.0	0.0	[0.0 - 0.9]							3.3	60.3	34.4	1.9			l				
	Ground Turkey (388)	0.0	0.0	[0.0 - 0.9]							4.6	60.3	31.2	3.9							
	Ground Beef (295)	0.0	0.0	[0.0 - 1.2]						0.3	1.7		31.9	5.4	0.3						
	Pork Chops (182)	0.0	0.0	[0.0 - 2.0]							4.4	47.8		7.7	0.5						
										2.5											
	Chickens (1357)	0.0	0.0	[0.0 - 0.3]						3.5	40.0	47.0	7.8	1.7			J				
Gentamicin	Chicken Breasts (418)	1.9	37.3	[32.7 - 42.2]					2.4	36.1	18.7	2.4	1.2	1.9	12.2	25.1					
	Ground Turkey (388)	3.6	29.6	[25.1 - 34.5]					0.8	42.3	20.4	2.3	1.0	3.6	11.9	17.8					
	Ground Beef (295)	1.7	4.1	[2.1 - 7.0]					1.0	64.1	23.1	6.1		1.7	2.0	2.0					
	Pork Chops (182)	1.6	1.1	[0.1 - 3.9]					2.7	47.8	41.2	4.4	1.1	1.6	0.5	0.5					
	Chickens (1357)	5.5	33.1	[30.6 - 35.7]					15.0	36.8	7.3	1.0	1.3	5.5	16.1	17.0					
	· · · · · · · · · · · · · · · · · · ·																I				
Kanamycin	Chicken Breasts (418)		11.5	[8.6 - 14.9]										77.5	10.0	1.0	0.5	11.0			
	Ground Turkey (388)	1.0	14.7	[11.3 - 18.6]										78.4	5.9	1.0	8.0	13.9			
	Ground Beef (295)	0.3	4.7	[2.6 - 7.8]										92.2	2.7	0.3	0.7	4.1			
	Pork Chops (182)	0.0	6.0	[3.1 - 10.6]										91.2	2.7			6.0			
	Chickens (1357)	1.1	9.1	[7.6 - 10.7]										82.2	7.7	1.1	0.6	8.5			
Streptomycin	Chicken Breasts (418)	N/A	48.1	[43.2 - 53.0]												51.9	18.7	29.4			
	Ground Turkey (388)	N/A	43.8	[38.8 - 48.9]												56.2	19.8	24.0			
	Ground Beef (295)	N/A	14.2	[10.5 - 18.8]												85.8	6.1	8.1			
	Pork Chops (182)		13.7	[9.1 - 19.6]												86.3	7.7	6.0			
	Chickens (1357)	N/A	49.5	[46.8 - 52.2]												50.5	23.5	26.0			
Aminopenicillins																	1				
Ampicillin	Chicken Breasts (418)	0.5	20.1	[16.4 - 24.3]							8.1	39.7	30.1	1.4	0.5	1	20.1				
·	Ground Turkey (388)	0.0	42.0	[37.0 - 47.1]							4.1	35.6	18.3			0.3	41.8				
	Ground Beef (295)	0.7	9.2	[6.1 - 13.0]							5.1	46.4		1.0	0.7		9.2				
	Pork Chops (182)	1.6	15.9	[10.9 - 22.1]							3.8		30.2	0.5	1.6	1.6	14.3				
	Chickens (1357)	0.3	25.6	[23.3 - 28.0]							10.8	44.0	18.5	0.8	0.3	0.3	25.3				
	(,			[====												1 0.0					
β-Lactam/β-Lactamase																					
Inhibitor Combinations	0			ro o . 4.4.53								20.5	50.6	40.6	!						
Amoxicillin-Clavulanic Acid	Chicken Breasts (418)	0.7	11.5	[8.6 - 14.9]							1.4		50.0	13.2	0.7	8.1	3.3				
	Ground Turkey (388)	6.2	6.7	[4.4 - 9.7]							2.3		41.0	31.4	6.2	6.2	0.5				
	Ground Beef (295)	1.4	2.4	[1.0 - 4.8]							1.4	19.0	64.1	11.9	1.4	2.0	0.3				
	Pork Chops (182)	3.3	2.2	[0.6 - 5.5]								23.1	59.3	12.1	3.3	2.2					
	Chickens (1357)	1.0	16.0	[14.1 - 18.1]							2.6	27.1	39.6	13.6	1.0	9.8	6.2				

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 45b. Distribution of MICs and Occurrence of Resistance among E. coli Isolates from Retail Meats and Chickens, 2006

	Isolate Source									D	istribu	tion (%	%) of M	IICs (µg	/ml) ⁴						
Antimicrobial	(# of Isolates)	%l ¹	%R²	[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
Cephalosporins																					
Ceftiofur	Chicken Breasts (418)	0.2	8.6	[6.1 - 11.7]				1.2	25.6	60.3	1.9	2.2	0.2	5.5	3.1						
	Ground Turkey (388)	0.0	3.1	[1.6 - 5.3]				1.0	26.8	62.9	5.7	0.5		8.0	2.3						
	Ground Beef (295)	0.3	1.0	[0.2 - 2.9]				0.7	31.9	64.1	2.0		0.3	0.7	0.3						
	Pork Chops (182)	0.5	0.0	[0.0 - 2.0]				0.5	41.2	53.8	3.8		0.5								
	Chickens (1357)	4.2	10.2	[8.7 - 12.0]				8.1	58.9	16.9	1.1	0.5	4.2	8.3	2.0						
Ceftriaxone	Chicken Breasts (418)	4.0	0.7	[0.1 - 2.1]					88.5	0.7	1.4	0.2		4.3	3.8	0.2	0.7				
	Ground Turkey (388)	2.3	0.3	[0.0 - 1.4]					93.6	1.8	1.3	0.3		0.5	1.5	0.8	0.3				
	Ground Beef (295)	1.0	0.0	[0.0 - 1.2]					97.6	0.3	0.3		0.3	0.3	0.7	0.3					
	Pork Chops (182)	0.0	0.0	[0.0 - 2.0]					97.8	0.5	1.1			0.5							
	Chickens (1357)	4.5	0.1	[0.0 - 0.4]					84.1	0.7	0.4	0.1	2.4	7.7	3.8	0.7	0.1				
Cephamycins																					
Cefoxitin	Chicken Breasts (418)	2.4	44.2	[8.4 - 14.7]							0.2	8.6	57.2	20.2	2.4	11 20	7.4				
Celoxitiii	Ground Turkey (388)	2.4	11.2 6.2	[4.0 - 9.1]							0.2	12.1		18.8	2.4	3.8 2.6	7.4 3.6				
	Ground Beef (295)		2.0								0.3	12.1		16.6		0.3	1.7				
	Pork Chops (182)	1.7 2.7	1.6	[0.7 - 4.4] [0.3 - 4.7]							0.3		68.7	14.3	1.7 2.7	1.6	1.7				
	. , , ,																				
	Chickens (1357)	1.7	15.0	[13.2 - 17.0]						0.1	1.3	22.9	48.0	11.0	1.7	7.8	7.2				
Folate Pathway Inhibitors																					
Sulfisoxazole	Chicken Breasts (418)	N/A	46.9	[42.0 - 51.8]											33.0	18.2	1.9			46.9	
	Ground Turkey (388)	N/A	48.5	[43.4 - 53.6]											25.3	23.2	2.8		0.3	48.5	
	Ground Beef (295)	N/A	12.5	[9.0 - 16.9]											58.6	27.1	0.7	0.3	0.7	12.5	
	Pork Chops (182)	N/A	20.3	[14.7 - 26.9]											48.4	28.6	1.1	0.5	1.1	20.3	
	Chickens (1357)	N/A	48.6	[45.9 - 51.3]											46.6	2.7	0.1	0.3	1.6	48.6	
Tring of the service Outle service the service of	Chicken Breasts (418)	N/A	8.9	[6.3 - 12.0]				58.1	18.9	9.8	3.3	1.0	1.0	7.9							
Trimethoprim-Sulfamethoxazole	Ground Turkey (388)	N/A	8.0	[5.5 - 11.1]				61.1	17.8	7.2	4.4	1.5	0.5	7.5							
	Ground Beef (295)	N/A	1.4	[0.4 - 3.4]				84.0	10.8	2.4	1.4		0.3	1.0							
	Pork Chops (182)	N/A	2.2	[0.6 - 5.5]				73.1	15.4	8.2	1.1			2.2							
	Chickens (1357)	N/A	8.4	[7.0 - 10.0]				67.0	15.7	5.5	2.7	0.7	0.1	8.3							
Phenicols																					
Chloramphenicol	Chicken Breasts (418)	1.0	2.6	[1.3 - 4.7]								1.0	39.5	56.0	1.0	0.2	2.4				
	Ground Turkey (388)	1.3	2.3	[1.1 - 4.4]								1.0	42.3	53.1	1.3		2.3				
	Ground Beef (295)	0.7	1.4	[0.4 - 3.4]								1.0	32.5	64.4	0.7	0.3	1.0				
	Pork Chops (182)	1.1	6.6	[3.5 - 11.2]								0.5	33.0	58.8	1.1	2.7	3.8				
	Chickens (1357)	0.7	1.9	[1.3 - 2.8]								7.7	00.0	29.6	0.7		1.9				

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 45c. Distribution of MICs and Occurrence of Resistance among E. coli Isolates from Retail Meats and Chickens, 2006

	Isolate Source									D	istribu	ıtion (S	%) of M	IICs (µo	g/ml) ⁴						
Antimicrobial	(# of Isolates)	%l 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
Quinolones																					
Ciprofloxacin	Chicken Breasts (418)	0.0	0.0	[0.0 - 0.9]	93.3	1.7	0.2	1.2	2.9	0.7											
	Ground Turkey (388)	0.0	0.5	[0.1 - 1.8]	91.8	2.6	0.3	2.1	2.3	0.5				0.5							
	Ground Beef (295)	0.0	0.0	[0.0 - 1.2]	98.0	1.4		0.3	0.3												
	Pork Chops (182)	0.0	0.0	[0.0 - 2.0]	97.8	1.6			0.5												
	Chickens (1357)	0.0	0.0	[0.0 - 0.3]	94.1	0.4	0.2	2.8	2.1	0.3	0.1										
Nalidixic Acid	Chicken Breasts (418)	N/A	5.0	[3.1 - 7.6]						0.5	6.9	72.5	14.8		0.2	I	5.0				
	Ground Turkey (388)	N/A	5.2	[3.2 - 7.8]						0.3	3.4	74.0	16.8	0.3	0.3	0.3	4.9				
	Ground Beef (295)	N/A	0.7	[0.1 - 2.4]							4.7	74.6	20.0				0.7				
	Pork Chops (182)	N/A	0.5	[0.0 - 3.0]							9.9	75.8	12.6	1.1			0.5				
	Chickens (1357)	N/A	5.4	[4.2 - 6.7]						0.1	16.8	68.7	8.9	0.1		0.5	4.9				
Tetracyclines																					
Tetracycline	Chicken Breasts (418)	2.2	50.7	[45.8 - 55.6]									47.4	2.2	1.2	4.8	44.5				
	Ground Turkey (388)	0.3	76.5	[72.0 - 80.7]									23.2	0.3	0.3	1.8	74.5				
	Ground Beef (295)	7.5	25.4	[20.6 - 30.8]									67.1	7.5	2.0	4.1	19.3				
	Pork Chops (182)	0.5	52.7	[45.2 - 60.2]									46.7	0.5	1.6	4.9	46.2				
	Chickens (1357)	1.3	49.0	[46.3 - 51.7]									49.7	1.3	2.1	16.9	30.0				

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

 $^{^3}$ 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 2006 isolates. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest concentrations on the Sensititre plate. 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 *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2006

Year			2000	2001	2002	2003	2004	2005	2006
Number of Isolates Teste	ed .	Chicken Breasts	1000	2001	282	396	400	393	418
	.4	Ground Turkey			304	333	376	396	388
		Ground Beef			295	311		316	295
							338		
		Pork Chops			184	218	232	205	182
		Chickens	285	1989	2100	1365	1697	2232	1357
	Antimicrobial								
	(Resistance	Isolate							
Antimicrobial Class	Breakpoint)	Source							
		Jource					0.00/	0.00/	0.00/
Aminoglycosides	Amikacin	Chicken Breasts			0.0%	0.0%	0.0%	0.0%	0.0%
	(MIC ≥ 64 μg/ml)				0	0	0	0	0
		Ground Turkey			0.0%	0.0%	0.0%	0.0%	0.0%
					0	0	0	0	0
		Ground Beef			0.0%	0.0%	0.0%	0.0%	0.0%
					0	0	0	0	0
		Pork Chops			0.0%	0.0%	0.0%	0.0%	0.0%
					0	0	0	0	0
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Omendia	0	0	0	0	0	0	0
	Gentamicin	Chicken Breasts			23.0%	29.3%	30.0%	37.7%	37.3%
	(MIC ≥ 16 μg/ml)	SHOREH DIGGGG			65	116	120	148	156
		Ground Turkey			27.0%	29.7%	29.3%	27.5%	29.6%
		Orouna ruikey			82	99	110	109	115
		Ground Beef			0.3%	1.0%	0.6%	0.0%	4.1%
		Giodila Deel			1	3	2	0	12
		Pork Chops			1.1%	1.4%	1.3%	0.0%	1.1%
		FUIK CHUPS			2	3	3	0	2
		Chickens	40.0%	33.4%	38.0%	38.8%	39.1%	36.7%	33.1%
		Chickens	114	664	799	530	663	819	449
	Kanamycin	Chielean Dragate			6.0%	6.8%	6.8%	7.1%	11.5%
	(MIC ≥ 64 μg/ml)	Chicken Breasts			17	27	27	28	48
		One or d Tordon			13.2%	16.8%	16.0%	11.4%	14.7%
		Ground Turkey			40	56	60	45	57
		One and De of			2.4%	2.9%	2.4%	0.6%	4.7%
		Ground Beef			7	9	8	2	14
		Darl Ohana			5.4%	8.7%	8.2%	7.3%	6.0%
		Pork Chops			10	19	19	15	11
		Ohistona	16.1%	14.5%	11.6%	10.3%	11.5%	10.3%	9.1%
		Chickens	46	288	243	140	196	231	123
	Streptomycin				49.3%	56.1%	56.8%	50.6%	48.1%
	(MIC ≥ 64 µg/ml)	Chicken Breasts			139	222	227	199	201
	(57.6%	54.7%	49.2%	43.4%	43.8%
		Ground Turkey			175	182	185	172	170
					9.5%	9.0%	11.8%	5.4%	14.2%
		Ground Beef			28	28	40	17	42
					22.3%	19.7%	21.1%	13.2%	13.7%
		Pork Chops			41	43	49	27	25
			77.5%	65.8%	65.1%	64.2%	64.1%	58.0%	49.5%
		Chickens	221	1308	1368	877	1088	1295	672
Aminopenicillins	Ampicillin			.500	21.6%	25.3%	17.0%	24.7%	20.1%
iopoinomina	(MIC ≥ 32 μg/ml)	Chicken Breasts			61	100	68	97	84
	(o = oz µg/iiii)				31.3%	35.7%	33.2%	38.1%	42.0%
		Ground Turkey			95	119	125	151	163
					0.40/	5.1%	5.3%	0.50/	0.00/
		Ground Beef			18	16	18	3.5%	9.2%
					13.6%	13.3%	15.1%	16.1%	15.9%
		Pork Chops			25	29	35	33	29
			20.0%	10 50/			17.6%	22.0%	25.6%
		Chickens		19.5%	19.0%	18.6%	298	492	347
β-Lactam/β-Lactamase	Amoxicillin-		57	388	399	254	10.0%	12.2%	11.5%
	Clavulanic Acid	Chicken Breasts			12.1%	13.6%	40		11.5% 48
Inhibitor Combinations					34	54		48	
	(MIC ≥ 32 / 16 μg/ml)	Ground Turkey			5.6%	3.0%	5.3%	3.8%	6.7%
					17	10	20	15	26
		Ground Beef			2.0%	2.3%	3.8%	1.3%	2.4%
					6	7	13	4	7
		Pork Chops			5.4%	5.0%	5.6%	2.9%	2.2%
					10	11	13	6	4
		Chickens	8.1%	10.0%	10.9%	11.1%	8.8%	10.6%	16.0%
			23	199	229	151	149	236	217

Table 46b. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2006

Cephalosporins Celisiance Tesaled Checken Breasts Chicken Breasts Celisiance Bell Celisia	Year	iai Resistance amo	ing L. con isolate	2000	2001	2002	2003	2004	2005	2006
Comman C			Chicken Breasts	2000	2001					
Command Bear Park Chape P	itumber of isolates rested									
Pork Chope										
Antimicrobial (Resistance Resistance R										
Antimicrobial (Resistance Breakpoint) Itelaste Route Source Route Ro			· ·							
### Antimicrobial Class Resistance Resis		Antimicrobial	Chickens	285	1989	2100	1365	1697	2232	1357
Cephalosporins			Isolate							
Cephalosporins Official Parallel (MIC ≥ 8 μg/ml)	Antimicrobial Class									
Ground Turkey		Ceftiofur	Chickon Broasts			7.1%	7.6%	5.8%	8.7%	8.6%
Ground Beef		(MIC ≥ 8 μg/ml)	Cilicken bleasis							
Ground Beef 0 0 0 0 0 3			Ground Turkey							
Pork Chops			Ground Beef					0.9%		1.0%
Pork Chops			Cidana Beei							
Ceftriaxone			Pork Chops							
Cefriaxone (MIC ≥ 64 µg/ml)			Chickens	6.3%	4.4%	5.5%				
MIC ≥ 64 μg/ml)		O-th-i	Onlocono	18	88					
Ground Turkey			Chicken Breasts							
Ground Beef 0.0%		(= = = : Mg()	Ground Turkov							
Foliate Pathway Inhibitors Sulfamethoxazole (MIC ≥ 512 μg/ml) Foliate Pathway Inhibitors Sulfamethoxazole (MIC ≥ 4 / 76 μg/ml) Foliate Pathway Inhibitors Chickens 57.9% 58.2% 48.0% 51.7% 48.4% 48.0% 51.7% 48.9% 6.9%			Ground Turkey							
Pork Chops			Ground Beef							
Cephamycins Cephamycins Cefoxitin (MIC ≥ 32 μg/ml) Chicken Breasts Cefoxitin (MIC ≥ 32 μg/ml) Chicken Breasts Chicken Breasts Coround Turkey Chicken Breasts Chicken Breasts Chicken Breasts Chicken Breasts Chickens Chicken			Park Chang							
Celphamycins			Pork Chops							
Cephamycins Cefoxiin (MIC ≥ 32 μg/ml) Chicken Breasts 311 0% 33 33 33 44 44 47 47 47 47 47 13 33 33 44 44 47 47 17 13 32 44 45 67 10 4 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 44 17 13 32 42 17 12 12 12 12 12 12 12 12 12 12 12 12 12			Chickens							
MIC ≥ 32 μg/ml) Ground Turkey 3.3% 1.2% 4.5% 3.3% 6.2%	Cephamycins	Cefoxitin	Chicken Process	0						
Ground Beef 10		(MIC ≥ 32 μg/ml)	Chicken bleasts							
Ground Beef			Ground Turkey							
Pork Chops			Ground Boof							
Foliate Pathway Inhibitors Sulfamethoxazole/ Sulfisoxazole/ Sulfisoxazole/ (MIC ≥ 512 μg/ml) Chickens 7.4% 8.7% 8.5% 8.3% 8.2% 9.9% 15.0% 15.0% 178 113 139 221 204 173 178 113 139 221 204 173 178 113 139 221 204 173 178 113 139 221 204 173 178 113 139 221 204 173 178 113 139 221 204 173 178 113 139 221 204 178 113 139 221 204 178 113 139 221 204 178			Glouriu Beer							
Chickens 7.4% 8.7% 8.5% 8.3% 8.2% 9.9% 15.0% 204			Pork Chops							
Folate Pathway Inhibitors Sulfamethoxazole/ Sulfisoxazole (MIC ≥ 512 μg/ml) Chicken Breasts 21 173 178 113 139 221 204 46.9% 46.9% 46.9% 48.1% 46.9% 48.5% 46.9% 46.9% 48.5% 46.9%			Chickens	7.4%	8.7%			8.2%	9.9%	15.0%
Sulfisoxazole¹ (MIC ≥ 512 μg/ml)	Falata Bathuran kahihitana	Culformath avarials/	Onlocono	21	173					
MIC ≥ 512 μg/ml) Ground Turkey 48.0% 51.7% 48.4% 48.0% 48.5% 188 190 188 188 190 188 188 190 188 190 188 188 190 188 188 190 188 188 190 188 188 190 188 188 190 188 188 190 188 190 188 188 190 188 188 190 188 188 190 189 190	Folate Pathway Inhibitors		Chicken Breasts							
Ground Beef 9.8% 10.3% 13.0% 7.0% 12.5% 29 32 44 22 37			Cround Turkov							
Pork Chops			Glound Turkey							
Pork Chops 12.5% 15.1% 19.4% 14.1% 20.3% 33 45 29 37			Ground Beef							
Chickens 57.9% 58.2% 46.1% 43.9% 53.2% 51.9% 48.6%			Dorle Chana							
Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 μg/ml) Chicken Breasts Chickens 1157 969 599 903 1159 660 7.1% 4.3% 7.4% 8.9% 8.9% 10 28 17 29 37 22 14 20 31 23 14 20 31 24 1 2 2 2 4 25 1 2 1 2 2 2 4 26 6 9 3 4 4 27 1 10.5% 10.7% 10.4% 8.4% 10.5% 10.7% 10.4% 10.5% 1			Pork Chops							
Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 μg/ml)			Chickens							
Sultamethoxazole (MIC ≥ 4 / 76 μg/ml) Ground Turkey 10 28 17 29 37		Trimethoprim-	Chieken Breeste	103	1137					
Caround Turkey 12 23 14 20 31			Chicken bleasts							
Ground Beef 0.7% 0.3% 0.6% 1.4%		(MIC ≥ 4 / 76 μg/ml)	Ground Turkey							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Cround Poof							
Pork Chops Chickens 17.2% 12.6% 49 10.4% 10.5% 10.7% 10.4% 181 232 114 144 181 232 114 144 181 232 114 144 181 232 114 144 181 232 114 144 181 232 114 144 181 232 114 181 232 18 181 232 18 181 232 18 181 232 18 181 232 18 181 232 18 28 28 38 38 38 38 48 48 48 48 48 48 48 48 48 48 48 48 48			Oloulla Deel							
Phenicols Chickens 17.2% 49 251 218 10.4% 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 114 181 232 181 181 232 181 181 232 181 181 232 181 181 232 181 181 232 181 181 232 181 181 232 181 181 233 181 9 181 233 181 9 181 233 181 9 181 233 181 9 181 233 181 9 181 233 181 9 181 233 181 233 234 244 254 26668 2668 2668 2668 2668 2668 2668 26			Pork Chops							
Phenicols Chloramphenicol (MIC ≥ 32 μg/ml) Chicken Breasts Chicken Br			Chickens			10.4%	10.5%	10.7%	10.4%	8.4%
(MIC ≥ 32 μg/ml) Ground Turkey Ground Beef 1.0% 2.3% 2.36 4.0% 2.3% 16 9 1.0% 2.3% 3.6% 1.6% 1.4% 2.5 4 Pork Chops 1.6% 3 9 10 7 12 5 4 Chickens 4.6% 2.4% 1.8% 1.3% 1.0% 1.0% 1.0% 1.9%	Phonicals	Chloramphonicol		49	251					
Ground Turkey 0.3% 3.6% 0.8% 4.0% 2.3% 16 9 Ground Beef 1.0% 2.3% 3.6% 1.6% 1.4% 1.4% 3 7 12 5 4 Pork Chops 1.6% 4.1% 4.3% 3.4% 6.6% 3 9 10 7 12 Chickens 4.6% 2.4% 1.8% 1.3% 1.0% 1.0% 1.9%	FIIGHICUIS		Chicken Breasts							
Ground Beef 1.0% 2.3% 3.6% 1.6% 1.4% 3 7 12 5 4 Pork Chops 1.6% 4.1% 4.3% 3.4% 6.6% 3 9 10 7 12 Chickens 4.6% 2.4% 1.8% 1.3% 1.0% 1.0% 1.9%			Ground Turkey			0.3%	3.6%	0.8%	4.0%	2.3%
Ground Beer 3 7 12 5 4 Pork Chops 1.6% 4.1% 4.3% 3.4% 6.6% 3 9 10 7 12 Chickens 4.6% 2.4% 1.8% 1.3% 1.0% 1.0% 1.9%			Clound runey							
Pork Chops			Ground Beef							
Chickens 4.6% 2.4% 1.8% 1.3% 1.0% 1.0% 1.9%			Pork Chops					4.3%		
T Chickens			т отк опора	4.00/	0.40/					
1 12 1 //7 1 20 1 10 1 1/ 1 22 1 26			Chickens	4.6% 13	2.4% 47	1.8% 38	1.3% 18	1.0% 17	1.0% 22	1.9% 26

¹ Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

Table 46c. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2006

Year			2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tes	sted	Chicken Breasts Ground Turkey			282 304	396 333	400 376	393 396	418 388
		Ground Beef			295	311	338	316	295
		Pork Chops			184	218	232	205	182
		·							
		Chickens	285	1989	2100	1365	1697	2232	1357
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source							
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Chicken Breasts			0.0%	0.0%	0.0% 0	0.0% 0	0.0%
	(MIC ≥ 4 μg/III)				0.0%	0.3%	0.8%	0.0%	0.5%
		Ground Turkey			0.0%	1	3	0.0%	0.5%
					0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef			0.070	0.070	0.070	0.070	0.070
		D 1 01			0.0%	0.0%	0.0%	0.5%	0.0%
		Pork Chops			0	0	0	1	0
		Chickens	0.0%	0.2%	0.0%	0.1%	0.2%	0.4%	0.0%
		Chickens	0	3	1	1	3	8	0
	Nalidixic Acid	Chicken Breasts			2.8%	4.0%	7.0%	6.6%	5.0% 21
	(MIC ≥ 32 μg/ml)				8 4.3%	16 11.7%	28 10.6%	26 10.4%	5.2%
		Ground Turkey			13	39	40	41	20
					0.0%	1.0%	1.5%	1.3%	0.7%
		Ground Beef			0.070	3	5	4	2
					0.5%	0.5%	0.0%	1.5%	0.5%
		Pork Chops			1	1	0	3	1
		Chickens	10.2%	8.4%	6.8%	6.2%	6.8%	7.5%	5.4%
T . P	T ()		29	168	142	84	115	168	73
Tetracyclines	Tetracycline	Chicken Breasts			46.1%	42.9%	48.0% 192	46.6% 183	50.7% 212
	(MIC ≥ 16 μg/ml)				130 77.0%	170 77.8%	74.2%	78.0%	76.5%
		Ground Turkey			234	259	279	309	297
					30.8%	25.1%	22.8%	16.5%	25.4%
		Ground Beef			91	78	77	52	75
					52.7%	46.3%	56.0%	45.9%	52.7%
		Pork Chops			97	101	130	94	96
		Objeteere	68.4%	61.6%	58.6%	52.2%	50.3%	48.9%	49.0%
		Chickens	195	1226	1231	713	853	1092	665

Multidrug Resistance

Table 47. Resistance Patterns among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2006

Year		2000	2001	2002	2003	2004	2005	2006
Number of Isolates Tested	Chicken Presets	2000	2001					
Number of isolates rested	Chicken Breasts Ground Turkey			282 304	396 333	400 376	393 396	418 388
	,							
	Ground Beef			295	311	338	316	295
	Pork Chops			184	218	232	205	182
	Chickens	285	1989	2100	1365	1697	2232	1357
Resistance Pattern	Isolate Source							
	Chicken Breasts			27.0%	20.5%	20.8%	20.6%	23.4%
1. No Resistance Detected				76	81	83	81	98
	Ground Turkey			16.8% 51	14.7% 49	19.1% 72	16.2% 64	16.0% 62
				63.1%	66.9%	73.1%	81.3%	71.5%
	Ground Beef			186	208	247	257	211
	Pork Chops			41.3%	44.5%	37.9%	48.8%	42.9%
	1 ork Chops			76	97	88	100	78
	Chickens	10.2%	12.9%	15.9%	16.0%	17.0%	17.7%	18.6%
	Official	29	257	333	219	288	395	253
,	Chicken Breasts			0.4%	0.0%	1.3%	0.3%	1.4%
2. At Least ACSSuT ¹ Resistant				1	0	5	1	6
	Ground Turkey			0.0%	2.7%	0.5%	1.8%	0.8%
				0	9	2	7	3
	Ground Beef			0.3%	1.0%	1.5%	0.6%	0.3%
				0.5%	3 1.4%	5 1.3%	1.0%	1.1%
	Pork Chops			1	3	3	1.0%	2
		3.5%	2.0%	1.3%	1.0%	0.8%	0.6%	1.3%
	Chickens	10	40	27	14	14	14	18
		.0	10	0.0%	0.0%	0.3%	0.0%	0.0%
3. At Least ACT/S ² Resistant	Chicken Breasts			0	0	1	0	0
	0 17 1			0.0%	0.9%	0.0%	0.8%	0.3%
	Ground Turkey			0	3	0	3	1
	Ground Beef			0.0%	0.0%	0.0%	0.3%	0.3%
	Glound Beel			0	0	0	1	1
	Pork Chops			0.5%	0.0%	0.4%	0.5%	0.0%
	T OIK OHOPO			1	0	1	1	0
	Chickens	1.4%	0.6%	0.3%	0.2%	0.3%	0.3%	0.2%
		4	11	7	3	5	7	3
	Chicken Breasts			0.4%	0.0%	1.0%	0.3%	1.0%
4. At Least ACSSuTAuCf 3				1	0	4	1	4
Resistant	Ground Turkey			0.0%	0.3%	0.0%	0.3%	0.0%
				0.0%	0.0%	0.9%	1 0.3%	0.0%
	Ground Beef			0.0%	0.0%	3	0.3%	0.0%
				0.0%	0.5%	0.4%	0.0%	0.0%
	Pork Chops			0	1	1	0	0
	Chielena	2.8%	1.1%	0.8%	0.8%	0.6%	0.5%	1.0%
	Chickens	8	22	17	11	10	11	13
	Chicken Breasts			0.4%	0.5%	0.8%	0.3%	0.2%
5. At Least Ceftiofur and	CHICKEH DIEASIS			1	2	3	1	1
Nalidixic Acid Resistant	Ground Turkey			0.3%	0.3%	0.3%	0.0%	0.0%
	Ciodila raincy			1	1	1	0	0
	Ground Beef			0.0%	0.0%	0.0%	0.0%	0.3%
				0	0	0	0	1
	Pork Chops			0.5%	0.0%	0.0%	0.0%	0.0%
	· ·	4 407	0.007	1 0.40/	0	0	0	0
	Chickens	1.4%	0.3%	0.4%	0.9%	0.4%	0.7%	0.4%
		4	5	9	12	7	16	5

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

² ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

³ ACSSuTAuCf = ACSSuT, amoxicillin-clavulanic acid, and ceftiofur

Appendix

Table A1. Concentration Ranges Used for Susceptibility Testing of *Salmonella* and *E. coli*, 2006

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
Aminoglycosides	Amikacin	0.5 - 64
	Gentamicin	0.25 - 16
	Kanamycin	8 - 64
	Streptomycin	32 - 64
Aminopenicillins	Ampicillin	1 - 32
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	1 / 0.5 - 32 / 16
Cephalosporins	Ceftiofur	0.12 - 8
	Ceftriaxone	0.25 - 64
Cephamycins	Cefoxitin	0.5 - 32
Folate Pathway Inhibitors	Sulfisoxazole	16 - 256
	Trimethoprim–Sulfamethoxazole	0.12 / 2.4 - 4 / 76
Phenicols	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, 2006

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
Phenicols	Florfenicol	0.03 - 64
Quinolones	Ciprofloxacin	0.015 - 64
	Nalidixic acid	4 - 64
Tetracyclines	Tetracycline	0.06 - 64