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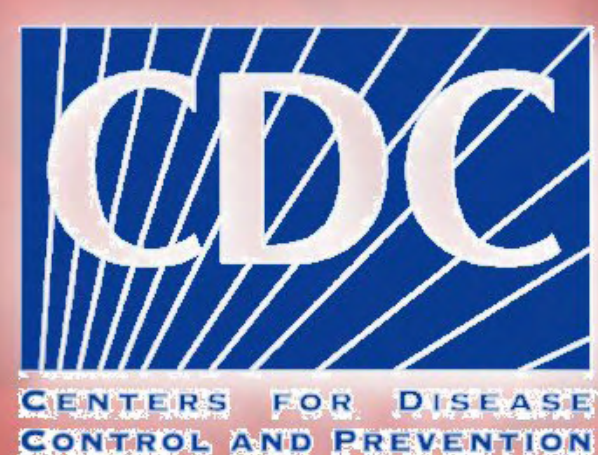
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2006

Executive Report



Contents

	Page Number
I. Introduction	1
A. Executive Report.....	1
B. NARMS Program	1
C. NARMS Components	2
D. Links to Additional Information.....	2
II. Methods	4
A. Sampling Methodology	4
B. Antimicrobial Susceptibility Testing Methods.....	5
C. Breakpoints.....	6
D. Reporting Methods	9
III. <i>Salmonella</i> (non-Typhi) Data.....	11
A. <i>Salmonella</i> (non-Typhi) Isolates Tested	11
B. Isolation of <i>Salmonella</i> (non-Typhi) from Retail Meats	12
C. <i>Salmonella</i> (non-Typhi) Serotypes	13
D. Antimicrobial Susceptibility among all non-Typhi <i>Salmonella</i>	17
E. Antimicrobial Susceptibility among <i>Salmonella</i> Enteritidis.....	34
F. Antimicrobial Susceptibility among <i>Salmonella</i> Typhimurium	41
G. Antimicrobial Susceptibility among <i>Salmonella</i> Newport.....	48
H. Antimicrobial Susceptibility among <i>Salmonella</i> I 4,[5],12:i:-	55
I. Antimicrobial Susceptibility among <i>Salmonella</i> Heidelberg.....	62
IV. <i>Campylobacter</i> Data	69
A. <i>Campylobacter jejuni</i> and <i>Campylobacter coli</i> Isolates Tested	69
B. Isolation of <i>Campylobacter</i> from Retail Meats	70
C. <i>Campylobacter</i> Species.....	71
D. Antimicrobial Susceptibility among <i>Campylobacter jejuni</i>	72
E. Antimicrobial Susceptibility among <i>Campylobacter coli</i>	77
V. <i>Escherichia coli</i> Data	82
A. <i>E. coli</i> Isolates Tested.....	82
B. Isolation of <i>E. coli</i> from Retail Meats.....	83
C. Antimicrobial Susceptibility among <i>E. coli</i>	84
Appendix.....	91

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 Iowa. 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/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.¹ 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,

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.

¹ **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. coli*¹

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		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
Cephameycins	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 *Campylobacter*¹

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		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 (≤ 4 µg/ml) has been established. In this report, isolates with an MIC ≥ 8 µg/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).^{1,2} 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 (≥ 8 $\mu\text{g/ml}$) to ceftiofur are usually indicative of the presence of an AmpC beta-lactamase gene (bla_{CMY}), which also confers decreased susceptibility ($\text{MIC} \geq 2$ $\mu\text{g/ml}$) to ceftriaxone. Similarly, resistance to the quinolone nalidixic acid ($\text{MIC} \geq 32$ $\mu\text{g/ml}$) correlates with mutations causing decreased susceptibility to ciprofloxacin ($\text{MIC} \geq 0.125$ $\mu\text{g/ml}$). 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.

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

Source	Year										
	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 <i>Salmonella</i>	152	159	19	8
Percent Positive for <i>Salmonella</i>	12.7%	13.4%	1.6%	0.7%

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

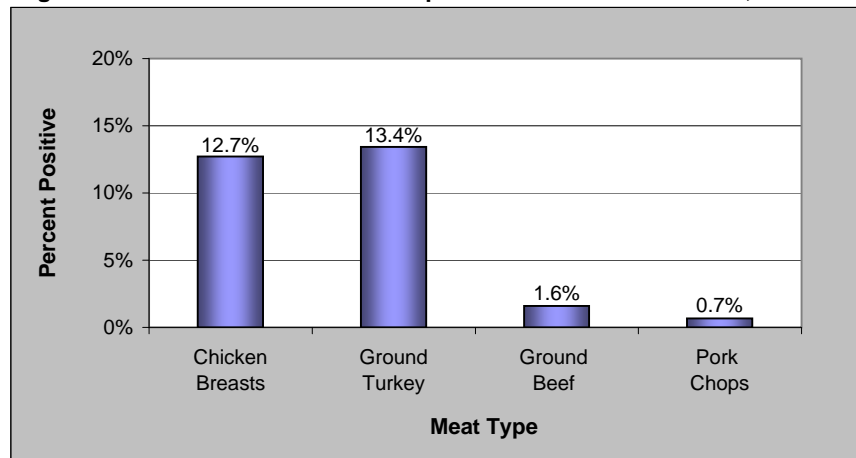
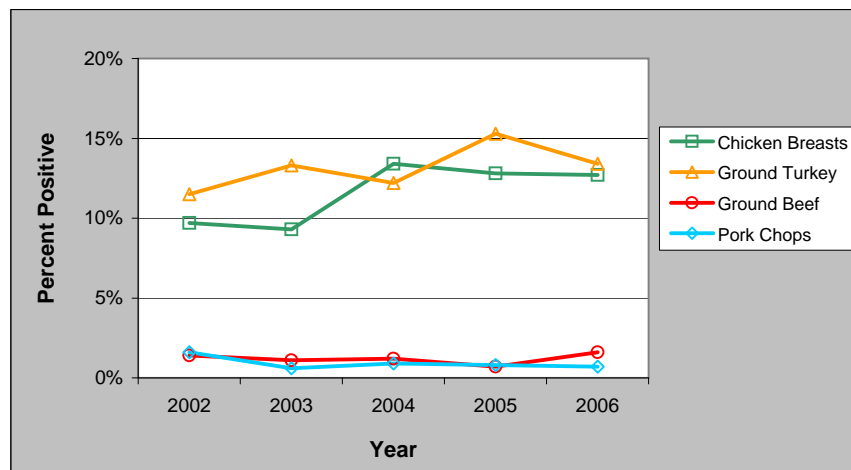


Figure 2. Percent of Retail Meat Samples Positive for *Salmonella*, 2002-2006



C. *Salmonella* (non-Typhi) Serotypes

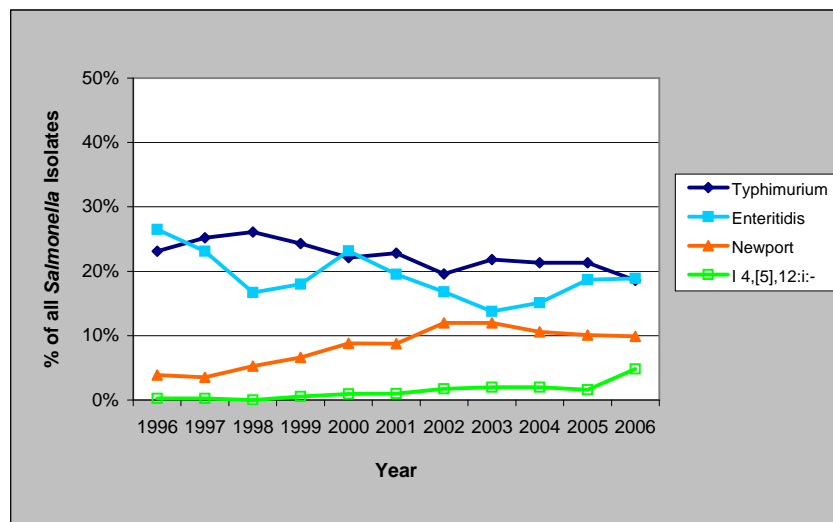
Table 5. Most Common Serotypes among *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2006

Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=2184)	Enteritidis	412	18.9	Chicken Breasts (N=152)	Kentucky	59	38.8	Chickens (N=1380)	Kentucky	674	48.8
	Typhimurium	407	18.6		Heidelberg	30	19.7		Enteritidis	188	13.6
	Newport	217	9.9		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	42	1.9						Senftenberg	10	0.7
	Saintpaul	30	1.4						Thompson	10	0.7
	Braenderup	29	1.3						Other	70	5.1
	Thompson	26	1.2								
	Stanley	25	1.1								
	Mississippi	24	1.1	Ground Turkey (N=159)	Heidelberg	35	22.0	Turkeys (N=304)	Hadar	98	32.2
	Hadar	22	1.0		Hadar	25	15.7		Heidelberg	43	14.1
	Infantis	22	1.0		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		Illia 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				
			Ground Beef (N=19)	Montevideo	6	31.6	Cattle (N=389)	Montevideo	63	16.2	
				Anatum	2	10.5		Muenster	42	10.8	
				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 Chops (N=8)	Heidelberg	4	50.0	Swine (N=304)	Anatum	66	21.7	
				Infantis	2	25.0		Derby	56	18.4	
				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	
								Hadar	10	3.3	
								Manhattan	8	2.6	
						Muenchen	7	2.3			
						Other	46	15.1			

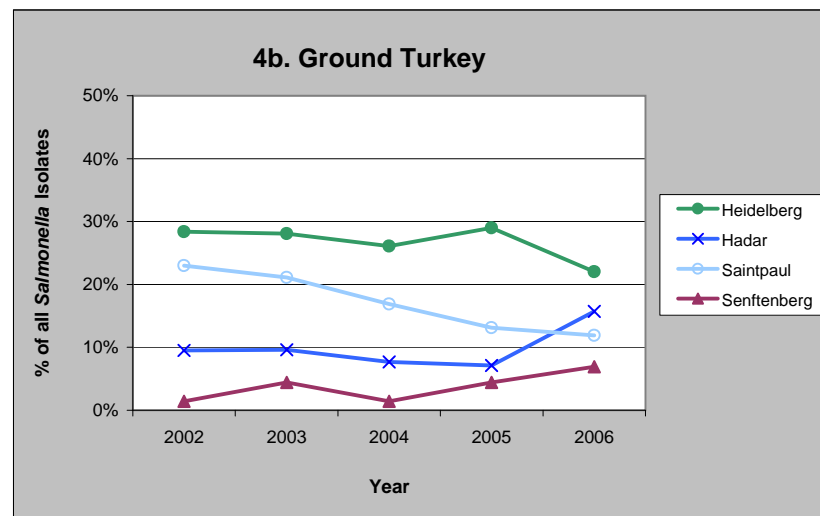
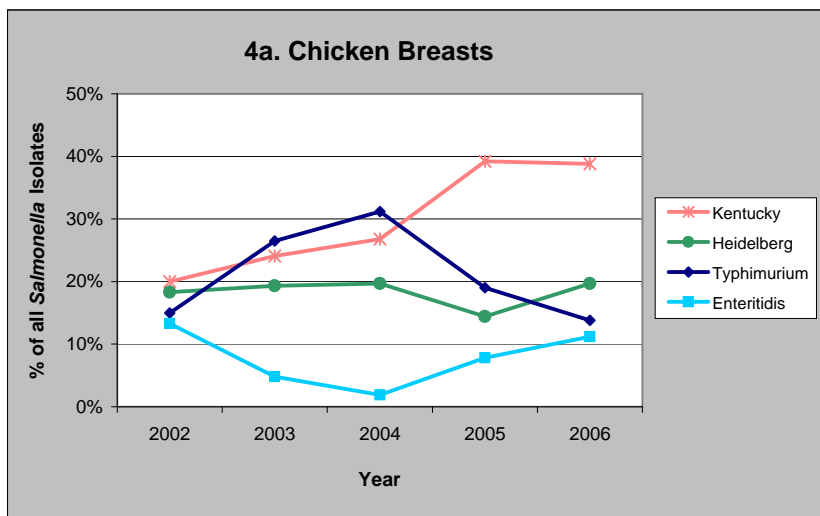
Table 6. Most Common *Salmonella* (non-Typhi) Serotypes in Humans and their Distributions among Retail Meat and Food Animal Isolates, by Meat Type and Animal Source, 2006

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

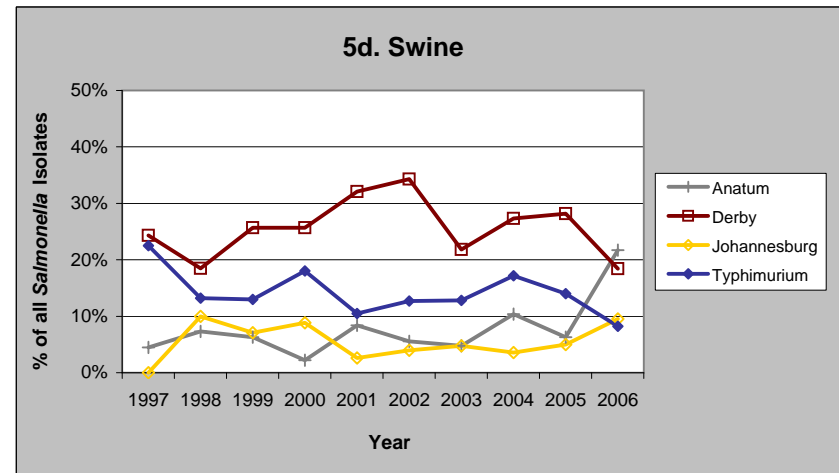
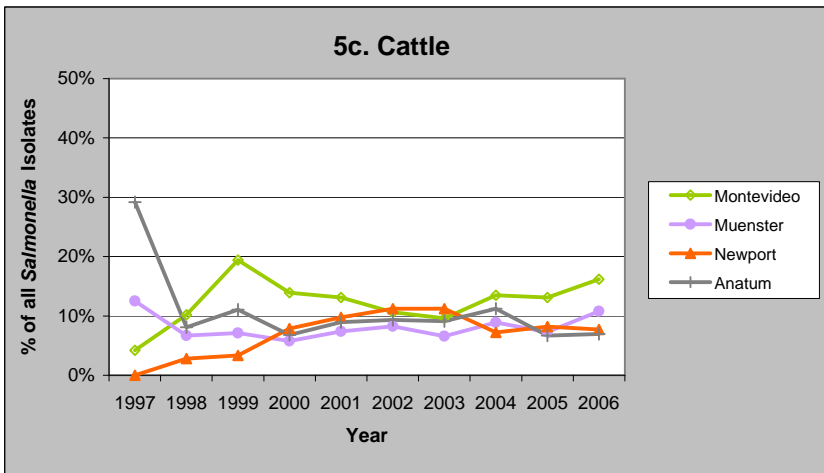
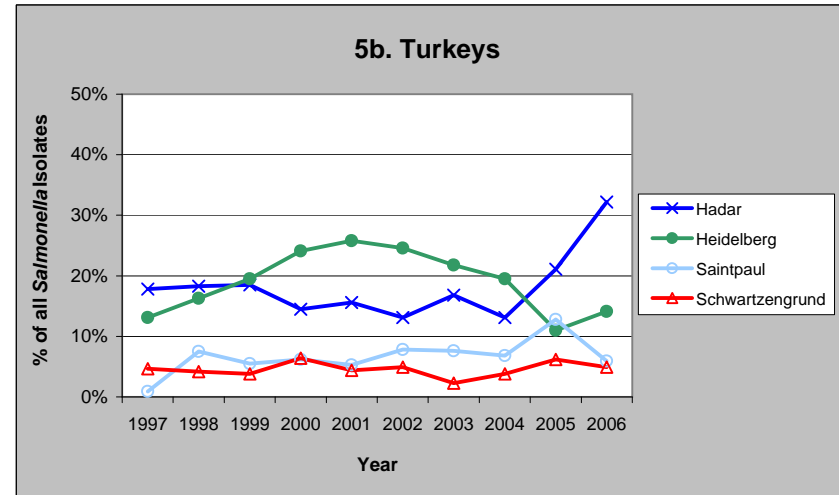
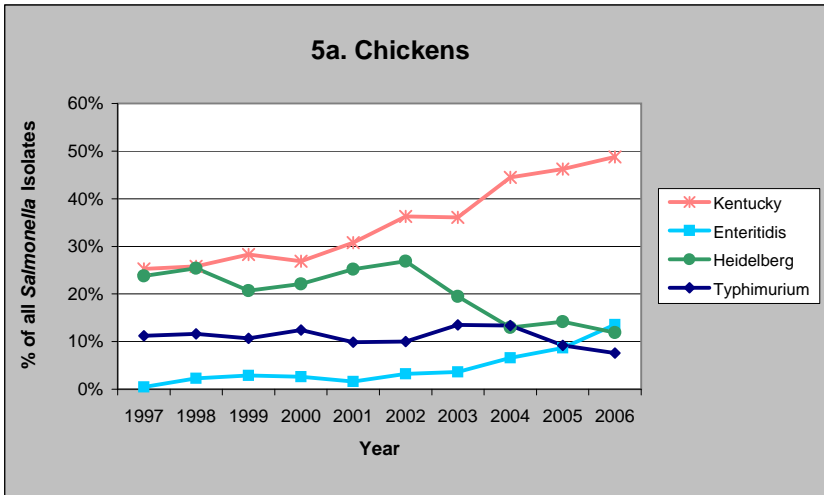
Figure 3. Most Common *Salmonella* (non-Typhi) Serotypes from Humans in 2006 and their Relative Frequencies, by Year, 1996-2006



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-Typhi *Salmonella*

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

Antimicrobial	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides 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]							34.6	59.1	5.7	0.6							
	Ground Beef (19)	0.0	0.0	[0.0 - 17.6]							15.8	73.7	5.3	5.3							
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]							12.5	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 - 1.2]						11.2	77.0	10.2	1.6								
	Cattle (389)	0.0	0.0	[0.0 - 0.9]						15.9	65.6	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			
	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				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

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

Antimicrobial	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴																																																																																																																																																																																		
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024																																																																																																																																																																		
Cephamycins																																																																																																																																																																																							
Cefoxitin	Humans (2184)	0.3	3.5	[2.8 - 4.4]	<table border="1"> <tr> <td>0.3</td> <td>28.5</td> <td>55.4</td> <td>11.0</td> <td>0.9</td> <td>0.3</td> <td>1.5</td> <td>2.0</td> <td colspan="10"></td> </tr> <tr> <td colspan="5"></td> <td>58.6</td> <td>21.1</td> <td>1.3</td> <td>0.7</td> <td>6.6</td> <td>11.8</td> <td colspan="7"></td> </tr> <tr> <td colspan="5"></td> <td>54.7</td> <td>38.4</td> <td>1.9</td> <td colspan="3"></td> <td>3.1</td> <td>1.9</td> <td colspan="6"></td> </tr> <tr> <td colspan="5"></td> <td>52.6</td> <td>47.4</td> <td colspan="3"></td> <td colspan="2"></td> <td colspan="6"></td> </tr> <tr> <td colspan="5"></td> <td>62.5</td> <td>12.5</td> <td colspan="3"></td> <td>25.0</td> <td colspan="7"></td> </tr> <tr> <td colspan="5"></td> <td>23.5</td> <td>49.3</td> <td>12.6</td> <td>1.6</td> <td>0.3</td> <td>10.6</td> <td>2.2</td> <td colspan="6"></td> </tr> <tr> <td colspan="5"></td> <td>13.2</td> <td>48.7</td> <td>31.2</td> <td>1.6</td> <td colspan="3"></td> <td>2.3</td> <td>3.0</td> <td colspan="5"></td> </tr> <tr> <td colspan="5"></td> <td>7.5</td> <td>31.1</td> <td>39.6</td> <td>2.8</td> <td>1.3</td> <td>7.2</td> <td>10.5</td> <td colspan="6"></td> </tr> <tr> <td colspan="5"></td> <td>7.6</td> <td>34.9</td> <td>49.7</td> <td>4.9</td> <td>1.0</td> <td>1.0</td> <td>1.0</td> <td colspan="7"></td> </tr> </table>														0.3	28.5	55.4	11.0	0.9	0.3	1.5	2.0																58.6	21.1	1.3	0.7	6.6	11.8													54.7	38.4	1.9				3.1	1.9												52.6	47.4																	62.5	12.5				25.0													23.5	49.3	12.6	1.6	0.3	10.6	2.2												13.2	48.7	31.2	1.6				2.3	3.0											7.5	31.1	39.6	2.8	1.3	7.2	10.5												7.6	34.9	49.7	4.9	1.0	1.0	1.0							
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Folate Pathway Inhibitors Sulfisoxazole	Humans (2184)	N/A	12.0	[10.7 - 13.5]	<table border="1"> <tr> <td colspan="5"></td> <td>14.6</td> <td>51.6</td> <td>20.7</td> <td>1.1</td> <td><0.1</td> <td>12.0</td> <td colspan="7"></td> </tr> <tr> <td colspan="5"></td> <td>5.3</td> <td>16.4</td> <td>53.9</td> <td>1.3</td> <td colspan="3"></td> <td>23.0</td> <td colspan="5"></td> </tr> <tr> <td colspan="5"></td> <td>1.9</td> <td>10.7</td> <td>51.6</td> <td>3.1</td> <td>0.6</td> <td>32.1</td> <td colspan="5"></td> </tr> <tr> <td colspan="5"></td> <td>5.3</td> <td>21.1</td> <td>57.9</td> <td>5.3</td> <td colspan="3"></td> <td>10.5</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td colspan="5"></td> <td>12.5</td> <td>12.5</td> <td colspan="7"></td> </tr> <tr> <td colspan="5"></td> <td>38.0</td> <td>45.9</td> <td>5.4</td> <td colspan="3"></td> <td>0.1</td> <td>10.7</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td>18.8</td> <td>46.1</td> <td>7.6</td> <td>0.3</td> <td colspan="3"></td> <td>27.3</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td>17.0</td> <td>38.8</td> <td>20.1</td> <td colspan="3"></td> <td>24.2</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td>43.1</td> <td>24.3</td> <td>5.6</td> <td>0.3</td> <td colspan="3"></td> <td>26.6</td> <td colspan="4"></td> </tr> </table>																			14.6	51.6	20.7	1.1	<0.1	12.0													5.3	16.4	53.9	1.3				23.0											1.9	10.7	51.6	3.1	0.6	32.1											5.3	21.1	57.9	5.3				10.5															12.5	12.5													38.0	45.9	5.4				0.1	10.7										18.8	46.1	7.6	0.3				27.3										17.0	38.8	20.1				24.2										43.1	24.3	5.6	0.3				26.6														
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Trimethoprim-Sulfamethoxazole	Humans (2184)	N/A	1.6	[1.2 - 2.3]	<table border="1"> <tr> <td>88.4</td> <td>9.5</td> <td>0.4</td> <td>0.1</td> <td colspan="3"></td> <td>1.6</td> <td colspan="7"></td> </tr> <tr> <td>94.7</td> <td>3.3</td> <td>0.7</td> <td colspan="3"></td> <td>1.3</td> <td colspan="7"></td> </tr> <tr> <td>93.1</td> <td>5.7</td> <td>1.3</td> <td colspan="3"></td> <td colspan="7"></td> </tr> <tr> <td>94.7</td> <td>5.3</td> <td colspan="3"></td> <td colspan="7"></td> </tr> <tr> <td>37.5</td> <td>12.5</td> <td colspan="3"></td> <td>50.0</td> <td colspan="7"></td> </tr> <tr> <td>93.6</td> <td>6.3</td> <td colspan="2"></td> <td>0.1</td> <td colspan="3"></td> <td>0.1</td> <td colspan="5"></td> </tr> <tr> <td>88.8</td> <td>9.9</td> <td>0.3</td> <td colspan="3"></td> <td>0.3</td> <td>0.7</td> <td colspan="5"></td> </tr> <tr> <td>85.6</td> <td>8.2</td> <td>1.3</td> <td>0.3</td> <td colspan="3"></td> <td>0.3</td> <td>4.4</td> <td colspan="5"></td> </tr> <tr> <td>80.9</td> <td>13.2</td> <td>2.6</td> <td>1.3</td> <td colspan="3"></td> <td>2.0</td> <td colspan="7"></td> </tr> </table>														88.4	9.5	0.4	0.1				1.6								94.7	3.3	0.7				1.3								93.1	5.7	1.3											94.7	5.3											37.5	12.5				50.0								93.6	6.3			0.1				0.1						88.8	9.9	0.3				0.3	0.7						85.6	8.2	1.3	0.3				0.3	4.4						80.9	13.2	2.6	1.3				2.0																																																	
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Phenicol Chloramphenicol	Humans (2184)	0.7	6.4	[5.4 - 7.5]	<table border="1"> <tr> <td>1.9</td> <td>61.0</td> <td>29.9</td> <td>0.7</td> <td colspan="3"></td> <td>6.4</td> <td colspan="6"></td> </tr> <tr> <td>0.7</td> <td>32.9</td> <td>63.2</td> <td>0.7</td> <td colspan="3"></td> <td>2.6</td> <td colspan="5"></td> </tr> <tr> <td colspan="5"></td> <td>27.7</td> <td>71.1</td> <td>0.6</td> <td colspan="3"></td> <td>0.6</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td>10.5</td> <td>78.9</td> <td>5.3</td> <td colspan="3"></td> <td>5.3</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td colspan="5"></td> <td>62.5</td> <td>37.5</td> <td colspan="7"></td> </tr> <tr> <td colspan="5"></td> <td>6.6</td> <td>64.0</td> <td>27.4</td> <td>0.3</td> <td>0.1</td> <td>1.7</td> <td colspan="5"></td> </tr> <tr> <td colspan="5"></td> <td>1.0</td> <td>53.3</td> <td>41.1</td> <td>0.7</td> <td colspan="3"></td> <td>3.9</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td>1.3</td> <td>36.5</td> <td>41.6</td> <td>0.8</td> <td colspan="3"></td> <td>19.8</td> <td colspan="4"></td> </tr> <tr> <td colspan="5"></td> <td>0.3</td> <td>31.9</td> <td>57.6</td> <td>2.3</td> <td colspan="3"></td> <td>7.9</td> <td colspan="4"></td> </tr> </table>														1.9	61.0	29.9	0.7				6.4							0.7	32.9	63.2	0.7				2.6											27.7	71.1	0.6				0.6										10.5	78.9	5.3				5.3															62.5	37.5													6.6	64.0	27.4	0.3	0.1	1.7											1.0	53.3	41.1	0.7				3.9										1.3	36.5	41.6	0.8				19.8										0.3	31.9	57.6	2.3				7.9																								
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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

Antimicrobial	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴												
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64
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																	
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	89.5				
	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	41.4	

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

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	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			
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Amikacin (MIC ≥ 64 µg/ml)	Humans		0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1%	0.0%	
		Chicken Breasts		0	0	1	0	0	0	0	0	0	1	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%
		Pork Chops							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%	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%	0.0%	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%
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.8%	2.9%	2.8%	2.1%	2.7%	1.9%	1.3%	1.4%	1.3%	2.1%	2.0%	
		Chicken Breasts	63	38	41	32	37	27	27	26	24	44	44	
		Ground Turkey							10.0%	6.0%	3.8%	3.3%	9.2%	
		Ground Beef							6	5	6	5	14	
		Pork Chops							14.9%	22.8%	20.4%	26.8%	28.9%	
		Chickens		17.8%	15.3%	10.4%	14.9%	7.9%	5.5%	6.3%	4.9%	4.3%	5.7%	
		Turkeys		20.6%	18.3%	17.5%	16.2%	20.9%	19.3%	21.0%	25.4%	22.9%	16.4%	
		Cattle		0.0%	1.8%	1.6%	2.1%	2.1%	2.6%	2.7%	1.8%	2.4%	3.9%	
		Swine		0.9%	0.8%	1.1%	1.3%	1.4%	0.8%	0.5%	1.3%	2.7%	2.0%	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	5.0%	5.1%	5.7%	4.3%	5.6%	4.8%	3.8%	3.4%	2.8%	3.4%	2.9%	
		Chicken Breasts	66	67	83	65	77	68	76	64	50	70	63	
		Ground Turkey							6.7%	4.8%	11.5%	4.6%	9.9%	
		Ground Beef							4	4	18	7	15	
		Pork Chops							18.9%	27.2%	18.3%	20.2%	15.1%	
		Chickens		2.3%	3.2%	1.2%	4.1%	2.4%	2.0%	2.8%	2.7%	2.5%	3.6%	
		Turkeys		24.3%	17.1%	21.5%	21.4%	22.9%	24.2%	16.0%	14.4%	19.8%	10.5%	
		Cattle		8.3%	9.5%	7.1%	6.6%	6.9%	10.1%	13.7%	8.9%	13.1%	9.5%	
		Swine		11.7%	7.2%	6.7%	9.3%	6.9%	4.2%	5.7%	3.9%	5.0%	8.6%	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	20.6%	21.4%	18.6%	16.7%	16.3%	17.0%	13.2%	15.0%	11.8%	11.0%	10.7%	
		Chicken Breasts	273	278	272	250	224	241	265	279	212	225	233	
		Ground Turkey							28.3%	26.5%	28.0%	30.1%	36.2%	
		Ground Beef							17	22	44	46	55	
		Pork Chops							37.8%	45.6%	34.5%	44.3%	40.9%	
		Chickens		24.3%	27.8%	27.5%	28.6%	21.0%	22.9%	19.6%	22.2%	23.3%	21.2%	
		Turkeys		34.6%	40.8%	43.6%	41.9%	46.7%	37.7%	29.4%	33.9%	40.1%	28.9%	
		Cattle		12.5%	16.2%	15.4%	21.3%	20.3%	25.9%	28.7%	20.9%	24.3%	23.7%	
		Swine		27.9%	29.4%	29.3%	39.2%	35.6%	40.1%	30.8%	36.4%	36.5%	26.3%	

Table 8b. 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							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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	20.7% 274	18.3% 238	16.5% 241	15.5% 232	15.9% 219	17.4% 247	12.9% 259	13.6% 254	12.0% 216	11.3% 232	10.9% 238
		Chicken Breasts							16.7% 10	33.7% 28	30.6% 48	26.8% 41	22.4% 34
		Ground Turkey							16.2% 12	28.9% 33	20.4% 29	26.8% 49	25.8% 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 (MIC ≥ 32 / 16 µg/ml)	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
		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% 14	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% 2	20.0% 1	0.0% 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% 1	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% 0	2.1% 6	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	0.1% 1	1.9% 17	1.3% 6	2.2% 9	3.2% 12	4.3% 9	1.9% 6	3.7% 11	2.0% 6
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.1% 1	0.0% 0	0.3% 5	0.0% 0	0.0% 0	0.2% 4	0.4% 8	0.6% 10	0.1% 3	0.2% 4
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 1
		Ground Turkey							0.0% 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% 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	0.8% 6	0.4% 2	0.2% 1	0.0% 0	0.4% 1	0.4% 1	0.9% 2	0.0% 0
		Cattle		0.0% 0	0.0% 0	0.1% 1	0.1% 1	0.1% 1	0.2% 2	0.1% 1	1.3% 8	2.1% 7	1.0% 4
		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

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	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					3.2% 44	3.4% 48	4.3% 86	4.2% 79	3.5% 62	3.0% 62	3.5% 77
		Chicken Breasts							10.0% 6	25.3% 21	24.8% 39	20.9% 32	18.4% 28
		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% 2	20.0% 1	0.0% 0	0.0% 0	0.0% 0
		Chickens					7.2% 85	4.1% 53	8.7% 130	8.2% 95	12.4% 159	12.0% 238	12.8% 176
		Turkeys					3.3% 17	4.5% 25	2.5% 6	1.1% 3	5.1% 12	3.5% 8	5.3% 16
		Cattle					9.1% 126	11.1% 99	15.9% 160	17.8% 119	13.2% 80	19.8% 65	17.7% 69
		Swine					1.3% 6	2.2% 9	2.9% 11	4.3% 9	1.9% 6	3.7% 11	2.0% 6
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Humans	20.3% 269	22.8% 297	19.4% 283	18.0% 269	17.1% 235	17.7% 251	12.8% 258	15.0% 280	13.2% 237	12.5% 256	12.0% 263
		Chicken Breasts							16.7% 10	14.5% 12	28.7% 45	17.0% 26	23.0% 35
		Ground Turkey							20.3% 15	33.3% 38	28.2% 40	34.4% 63	32.1% 51
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	25.0% 2	10.5% 2
		Pork Chops							70.0% 7	40.0% 2	18.2% 2	33.3% 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 (MIC ≥ 4 / 76 µg/ml)	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
		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% 0	0.5% 1	0.0% 0
		Ground Beef							0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0
		Pork Chops							20.0% 2	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% 0	2.4% 2	1.9% 3	0.7% 1	2.6% 4
		Ground Turkey							1.4% 1	0.9% 1	2.8% 4	0.5% 1	0.6% 1
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1
		Pork Chops							40.0% 4	40.0% 2	18.2% 2	22.2% 2	0.0% 0
		Chickens		2.3% 5	2.9% 16	1.8% 26	4.6% 54	2.5% 33	2.4% 36	2.1% 24	1.3% 16	1.8% 36	1.7% 24
		Turkeys		3.7% 4	0.8% 2	4.1% 29	4.1% 21	3.8% 21	5.3% 13	4.2% 11	4.7% 11	4.8% 11	3.9% 12
		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
		Swine		11.7% 13	8.4% 67	8.0% 70	12.4% 56	7.7% 32	10.0% 38	8.5% 18	12.7% 39	10.6% 32	7.9% 24

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

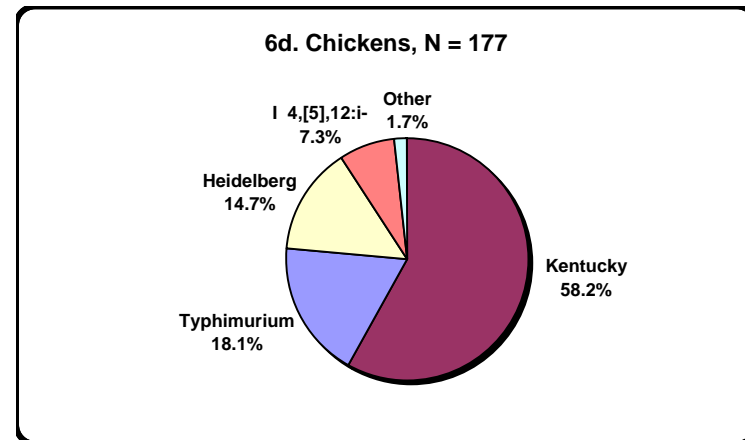
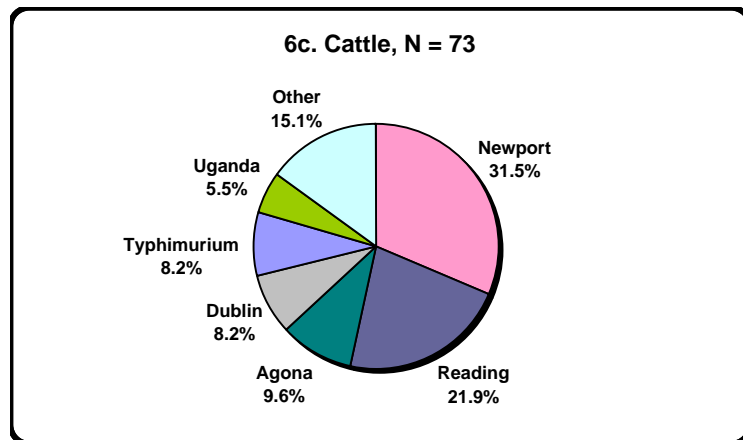
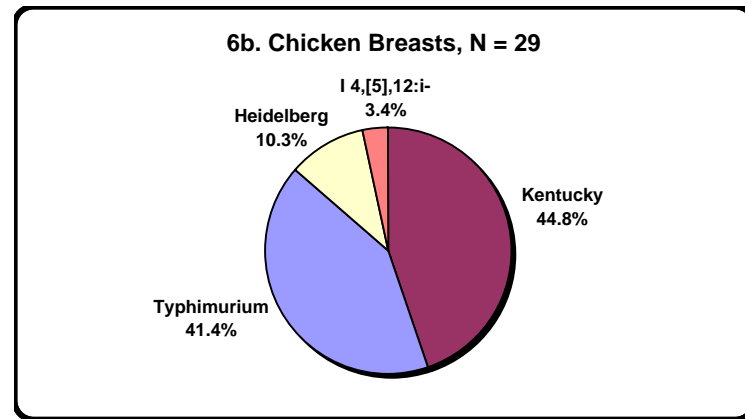
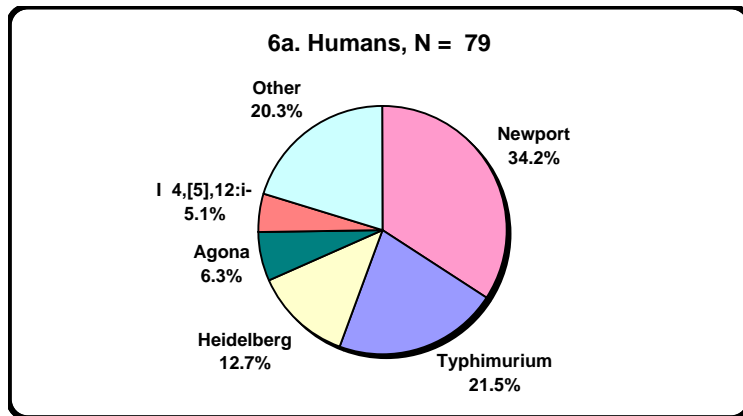
Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184	
	Chicken Breasts							60	83	157	153	152	
	Ground Turkey							74	114	142	183	159	
	Ground Beef							9	10	14	8	19	
	Pork Chops							10	5	11	9	8	
	Chickens		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		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
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	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% 0	0.0% 0	0.1% 1	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
		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% 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	0.7% 1	0.7% 1
		Ground Turkey							8.1% 6	4.4% 5	0.0% 0	1.1% 2	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	0.2% 1	0.2% 3	0.5% 6	0.0% 0	0.8% 12	0.4% 5	0.5% 6	0.3% 6	0.1% 2
		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	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% 0	0.2% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.0% 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% 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
		Turkeys		52.3% 56	45.8% 110	52.9% 377	56.2% 291	54.9% 302	54.5% 133	58.8% 154	48.3% 114	54.6% 124	61.8% 188
		Cattle		25.0% 6	24.3% 69	20.9% 336	25.8% 358	26.3% 235	32.0% 323	36.9% 247	31.8% 193	34.0% 112	30.3% 118
		Swine		52.3% 58	47.5% 377	48.4% 424	54.3% 245	53.1% 222	57.8% 219	43.1% 91	58.8% 181	54.8% 165	62.8% 191

Ceftiofur Resistance

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

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

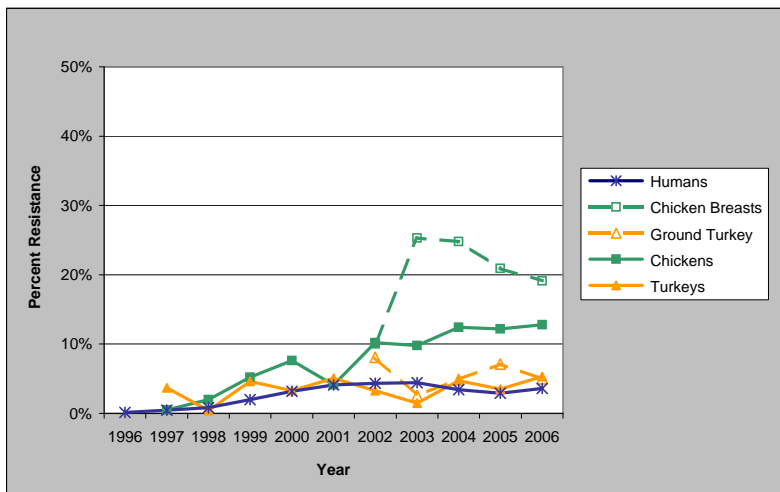
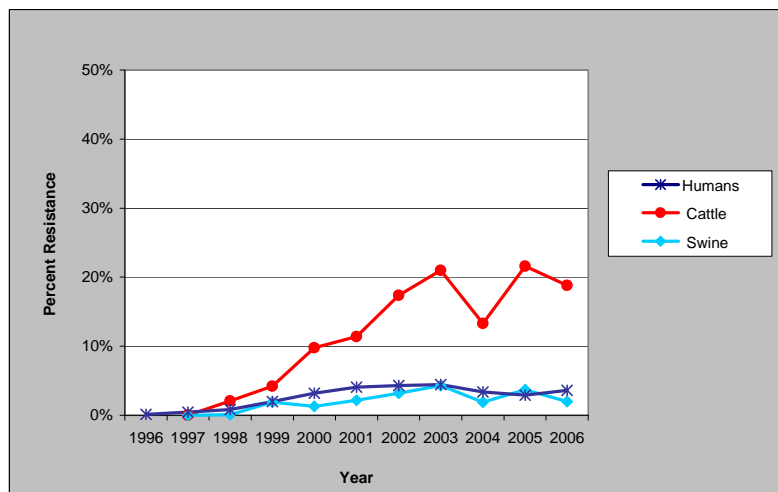


Figure 8. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Cattle, and Swine Resistant to Ceftiofur, by Year, 1996-2006¹



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

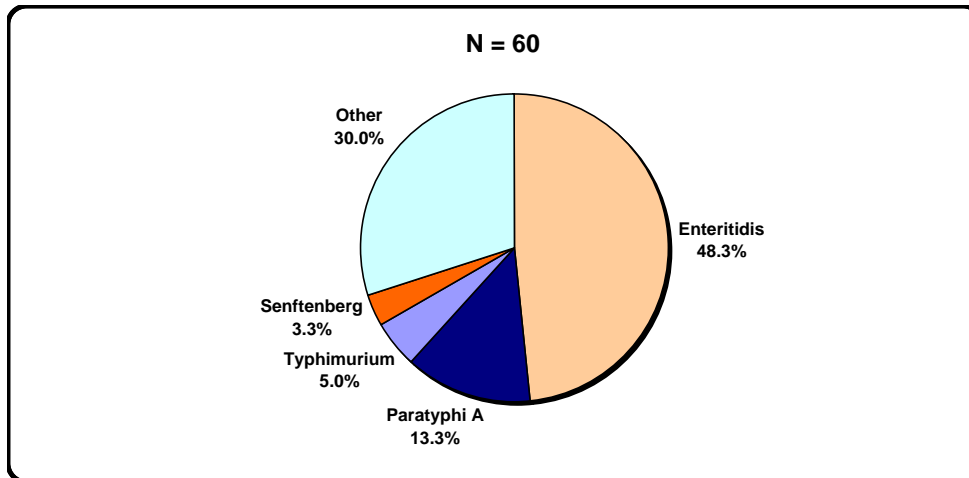
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1794	2052	2184
Chicken Breasts							60	83	157	153	152
Ground Turkey							74	114	142	183	159
Ground Beef							9	10	14	8	19
Pork Chops							10	5	11	9	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	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. Nalidixic Acid-Resistant *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2006

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

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 shows 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

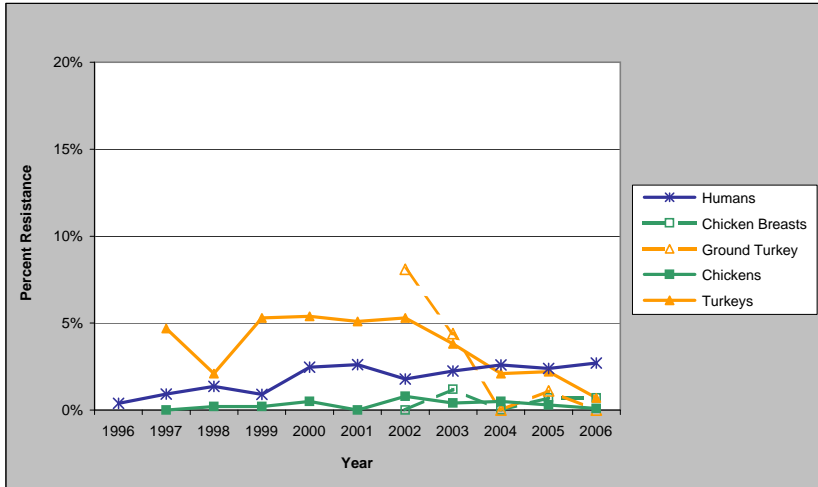
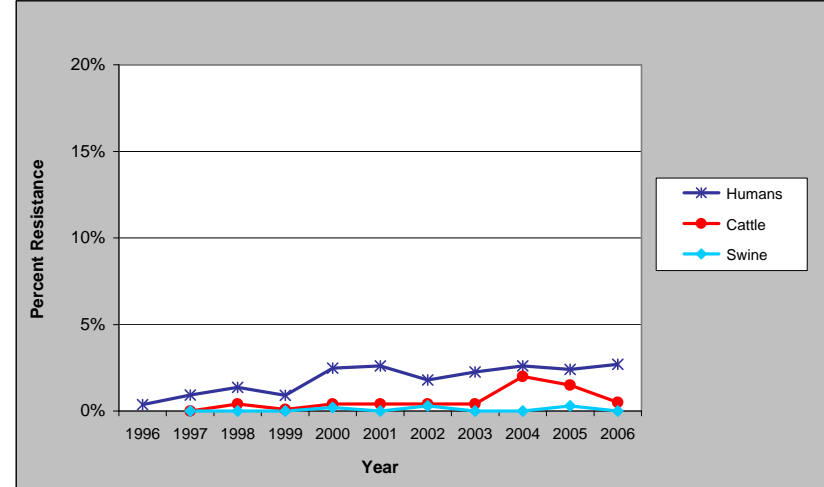


Figure 11. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Cattle, and Swine Resistant to Nalidixic Acid, by Year, 1996-2006¹



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 12. Number of *Salmonella* (non-Typhi) 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	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		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	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
	Swine		24	284	1610	1388	893	1008	670	607	329	389
		111	793	876	451	418	379	211	308	301	304	
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans	66.2% 876	68.4% 890	72.9% 1064	74.2% 1109	74.4% 1024	72.3% 1026	79.0% 1586	77.7% 1449	79.6% 1428	80.6% 1654	80.2% 1752
	Chicken Breasts							51.7% 31	47.0% 39	40.1% 63	46.4% 71	38.8% 59
	Ground Turkey							37.8% 28	34.2% 39	28.9% 41	30.1% 55	17.6% 28
	Ground Beef							77.8% 7	60.0% 6	78.6% 11	75.0% 6	73.7% 14
	Pork Chops							20.0% 2	20.0% 1	45.5% 5	44.4% 4	25.0% 2
	Chickens		52.8% 113	58.6% 329	58.8% 846	57.1% 670	66.7% 872	62.0% 930	61.1% 708	62.7% 803	61.2% 1217	57.3% 791
	Turkeys		32.7% 35	41.3% 99	32.5% 232	33.4% 173	31.6% 174	29.9% 73	24.0% 63	33.5% 79	27.8% 63	28.6% 85
	Cattle		66.7% 16	73.2% 208	74.5% 1199	70.1% 973	70.0% 625	64.3% 648	61.0% 409	65.6% 398	63.2% 208	67.6% 263
	Swine		44.1% 49	49.2% 390	48.9% 428	43.2% 195	43.5% 182	40.1% 152	53.6% 113	37.3% 115	44.5% 134	34.5% 105
	2. At Least ACSSuT¹ Resistant	Humans	8.8% 116	9.5% 124	8.9% 130	8.4% 125	8.9% 122	10.0% 142	7.8% 156	9.3% 173	7.1% 128	6.9% 141
Chicken Breasts								0.0% 0	2.4% 2	1.9% 3	0.7% 1	2.6% 4
Ground Turkey								1.4% 1	0.9% 1	2.8% 4	0.5% 1	0.6% 1
Ground Beef								22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1
Pork Chops								40.0% 4	40.0% 2	9.1% 1	22.2% 2	0.0% 0
Chickens			1.4% 3	2.7% 15	1.7% 24	4.3% 50	2.4% 32	1.9% 29	1.5% 17	0.9% 12	1.6% 31	1.6% 22
Turkeys			3.7% 4	0.8% 2	3.8% 27	3.3% 17	3.6% 20	4.5% 11	2.3% 6	4.7% 11	4.0% 9	3.9% 12
Cattle			4.2% 1	4.2% 12	7.6% 123	13.1% 182	14.6% 130	17.1% 172	18.1% 121	16.3% 99	20.4% 67	18.3% 71
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
3. At Least ACT/S² Resistant		Humans	0.8% 10	0.4% 5	0.9% 13	0.9% 14	1.0% 14	0.5% 7	1.0% 21	1.2% 23	0.6% 10	0.9% 18
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							1.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef							0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0
	Pork Chops							20.0% 2	0.0% 0	0.0% 0	11.1% 1	0.0% 0
	Chickens		0.0% 0	0.2% 1	0.1% 2	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.1% 1	0.1% 2	0.0% 0
	Turkeys		0.0% 0	0.4% 1	0.4% 3	0.8% 4	0.7% 4	0.8% 2	0.0% 0	0.4% 1	0.0% 0	0.3% 1
	Cattle		0.0% 0	2.1% 6	2.2% 35	1.7% 23	2.4% 21	2.4% 24	2.7% 18	1.2% 7	4.3% 14	4.1% 16
	Swine		0.0% 0	0.5% 4	0.5% 4	0.0% 0	1.0% 4	0.5% 2	0.9% 2	0.6% 2	1.7% 5	0.3% 1

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

² ACT/S = 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	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	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
Resistance Pattern	Isolate Source											
4. At Least ACSSuTAuCf¹ Resistant	Humans	0.0% 0	0.3% 4	0.3% 5	1.5% 23	2.6% 36	2.5% 36	3.3% 67	3.2% 60	2.3% 42	2.0% 41	2.0% 43
	Chicken Breasts							0.0% 0	0.0% 0	1.9% 3	0.0% 0	2.6% 4
	Ground Turkey							1.4% 1	0.9% 1	2.1% 3	0.5% 1	0.0% 0
	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		0.0% 0	0.5% 3	0.3% 5	2.7% 32	1.1% 14	0.9% 13	1.0% 12	0.4% 5	0.9% 18	1.1% 15
	Turkeys		3.7% 4	0.4% 1	3.4% 24	1.9% 10	2.9% 16	1.6% 4	0.8% 2	2.1% 5	1.8% 4	2.3% 7
	Cattle		0.0% 0	2.1% 6	3.7% 59	8.9% 124	11.0% 98	14.6% 147	15.1% 101	11.9% 72	17.6% 58	16.2% 63
	Swine		0.0% 0	0.1% 1	0.6% 5	1.3% 6	2.2% 9	1.8% 7	1.9% 4	1.0% 3	2.7% 8	1.0% 3
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.2% 2	0.0% 0	0.1% 1	0.1% 1	0.1% 2	0.2% 4	0.1% 2	0.1% 2	0.1% 2	0.1% 3
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	0.9% 1	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	0.1% 1	0.1% 1	0.0% 0	0.6% 9	0.1% 1	0.2% 3	0.1% 1	0.0% 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% 2	0.9% 2	0.3% 1
	Cattle		0.0% 0	0.0% 0	0.1% 1	0.1% 1	0.3% 3	0.2% 2	0.4% 3	1.0% 6	0.9% 3	0.3% 1
	Swine		0.0% 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

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 Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=121)	Typhimurium	80	66.1	Chicken Breasts (N=4)	Kentucky	4	100.0	Chickens (N=22)	Kentucky	12	54.5
	Newport	26	21.5						Typhimurium	7	31.8
	Agona	4	3.3						Heidelberg	3	13.6
	Paratyphi B var. L(+) tartrate+	3	2.5					Turkeys (N=12)	Agona	3	25.0
	I 4,[5],12:i:-	2	1.7	Typhimurium	3	25.0					
	Mbandaka	1	0.8	Illa 18:z4,z23:-	2	16.7					
	Saintpaul	1	0.8	Heidelberg	2	16.7					
	Stanley	1	0.8	Hadar	1	8.3					
	Tennessee	1	0.8	Senftenberg	1	8.3					
	Uganda	1	0.8	Ground Beef (N=1)	Typhimurium	1	100.0	Cattle (N=71)	Newport	19	26.8
Partial Serotype (Group C2)	1	0.8	Reading						16	22.5	
			Typhimurium						11	15.5	
			Agona	7	9.9						
			Dublin	7	9.9						
			Uganda	4	5.6						
			Bardo	2	2.8						
			Infantis	2	2.8						
			Anatum	1	1.4						
			Enteritidis	1	1.4						
			Kentucky	1	1.4						
			Pork Chops (N=0)				Swine (N=16)	Typhimurium	11	68.8	
								Agona	3	18.8	
								Infantis	1	6.3	
								Ohio	1	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 Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=15)	Newport	5	33.3	Chicken Breasts (N=0)				Chickens (N=0)			
	Typhimurium	3	20.0								
	Agona	2	13.3								
	Kedougou	1	6.7								
	Mbandaka	1	6.7	Ground Turkey (N=0)				Turkeys (N=1)	Agona	1	100.0
	Stanley	1	6.7								
	Tennessee	1	6.7								
	Partial Serotype (Group C2)	1	6.7								
			Ground Beef (N=0)				Cattle (N=16)	Agona	6	37.5	
								Newport	3	18.8	
								Uganda	3	18.8	
								Dublin	1	6.3	
								Infantis	1	6.3	
								Reading	1	6.3	
			Typhimurium	1	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 Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=43)	Newport	23	53.5	Chicken Breasts (N=4)	Kentucky	4	100.0	Chickens (N=15)	Kentucky	12	80.0
	Typhimurium	12	27.9		Heidelberg	3	20.0				
	Agona	4	9.3		Ground Turkey (N=0)	Turkeys (N=7)	Agona	3	42.9		
	Mbandaka	1	2.3				Heidelberg	2	28.6		
	Saintpaul	1	2.3	Hadar			1	14.3			
	Uganda	1	2.3	Ground Beef (N=0)	Cattle (N=63)	Senftenberg	1	14.3			
	Partial Serotype (Group C2)	1	2.3			Newport	19	30.2			
			Reading			16	25.4				
			Agona			7	11.1				
			Dublin			5	7.9				
			Typhimurium			5	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 Chops (N=0)	Swine (N=3)	Agona	2	66.7				
					Infantis	1	33.3				

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	1	33.3	Chicken Breasts (N=0)	Chickens (N=0)	Ground Turkey (N=0)	Turkeys (N=1)	Agona	Cattle (N=1)	Reading	1	100.0
	Kentucky	1	33.3									
	Uganda	1	33.3									
			Ground Beef (N=0)	Cattle (N=1)	Swine (N=0)							
						Pork Chops (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	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	0	2	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% 0	0.0% 0	
		Chicken Breasts							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	
		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	
		Swine				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% 17	0.3% 1	0.4% 1	0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.4% 1	0.4% 1	0.8% 3	0.2% 1
		Chicken Breasts							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	1.2% 1	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	
		Swine				0.0% 0	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	0.7% 2	0.3% 1	0.2% 1
		Chicken Breasts							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	2.1% 1	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	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	0.0% 0	100.0% 1	0.0% 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% 0	1.4% 4	1.8% 6	1.2% 3	2.2% 6	1.0% 4	1.2% 5
		Chicken Breasts							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	2.1% 1	0.0% 0	1.2% 1	0.6% 1	0.0% 0
		Turkeys				0.0% 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	0.0% 0	100.0% 1	0.0% 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	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	
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% 6	4.1% 11	2.9% 11	4.4% 18
		Chicken Breasts							0.0% 0	66.7% 2	33.3% 1	0.0% 0	17.6% 3
		Ground Turkey							0.0% 0	0.0% 0			
		Ground Beef							0.0% 0	0.0% 0			
		Pork Chops											
		Chickens		100.0% 1	30.8% 4	12.2% 5	9.7% 3	0.0% 0	4.2% 2	0.0% 0	1.2% 1	1.2% 2	1.6% 3
		Turkeys				0.0% 0	0.0% 0						0.0% 0
		Cattle		0.0% 0	100.0% 1	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	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0		
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.6% 2	0.0% 0	0.0% 0	0.4% 1	0.0% 0	1.4% 4	0.6% 2	0.0% 0	0.0% 0	0.8% 3	0.5% 2
		Chicken Breasts							0.0% 0	33.3% 1	33.3% 1	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	2.4% 1	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	0.6% 1	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% 0
		Swine				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	0.3% 1	0.0% 0	0.4% 1	0.0% 0	2.2% 6	0.0% 0	0.0% 0	0.0% 0	0.5% 2	0.5% 2
		Chicken Breasts							0.0% 0	33.3% 1	33.3% 1	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	4.9% 2	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	1.2% 2	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	50.0% 1
		Swine				0.0% 0	0.0% 0	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% 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			
		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	2.1% 1	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% 0
		Swine				0.0% 0	0.0% 0	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	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					0.0%	0.4%	0.0%	0.0%	0.0%	1.0%	0.5%
		Chicken Breasts					0	1	0	0	0	4	2
		Ground Turkey							0.0%	0.0%			
		Ground Beef							0.0%	0.0%			
		Pork Chops											
		Chickens					0.0%	0.0%	2.1%	0.0%	1.2%	0.6%	0.0%
		Turkeys					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%		1
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Humans	8.5%	9.0%	2.0%	3.0%	0.9%	2.2%	1.8%	1.2%	1.8%	1.6%	1.5%
		Chicken Breasts	30	27	5	8	3	6	6	3	5	6	6
		Ground Turkey							0.0%	0.0%	33.3%	0.0%	0.0%
		Ground Beef							0	0	1	0	0
		Pork Chops											
		Chickens		0.0%	0.0%	4.9%	3.2%	0.0%	4.2%	2.4%	1.2%	0.0%	0.0%
		Turkeys		0	0	2	1	0	2	1	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	1
	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	6.6%	1.3%	0.8%	0.7%	0.0%	0.7%	0.6%	0.8%	0.0%	0.5%	0.5%
		Chicken Breasts	23	4	2	2	0	2	2	2	0	2	2
		Ground Turkey							0.0%	0.0%	0.0%	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%
		Turkeys		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
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0%	0.7%	0.0%	0.4%	0.0%	0.0%	0.6%	0.4%	0.4%	0.5%	0.0%
		Chicken Breasts	0	2	0	1	0	0	2	1	1	2	0
		Ground Turkey							0.0%	0.0%	0.0%	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%	0.6%	0.0%
		Turkeys		0	0	0	0	0	0	0	0	1	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	1

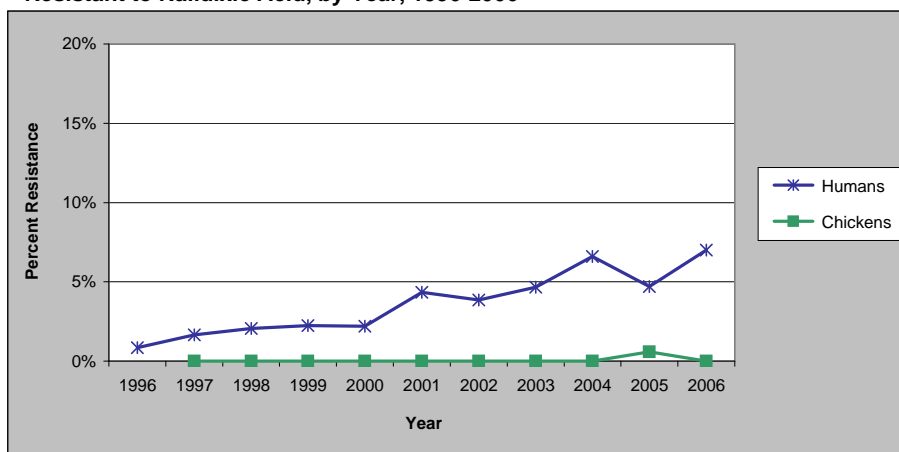
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

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							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	
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	0.0% 0	
		Chicken Breasts							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	
		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	
		Swine				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	0.9% 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	0.0% 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	0.6% 1	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	
		Swine				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	16.8% 59	9.6% 29	6.6% 16	8.2% 22	1.9% 6	1.8% 5	4.5% 15	1.6% 4	3.3% 9	2.3% 9	1.7% 7
		Chicken Breasts							0.0% 0	0.0% 0	33.3% 1	0.0% 0	11.8% 2
		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	7.3% 3	0.0% 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						0.0% 0
		Cattle		0.0% 0	100.0% 1	0.0% 0	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	0.0% 0	100.0% 1	0.0% 0	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

Multidrug Resistance

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							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	2	1	1	1	1	0	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% 5	100.0% 1			
	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% 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% 0	100.0% 2	100.0% 1	0.0% 0	100.0% 1	100.0% 1	100.0% 1		
2. At Least ACSSuT¹ Resistant	Humans	0.0% 0	0.3% 1	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.3% 1	0.4% 1	0.4% 1	0.5% 2	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							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% 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/S² Resistant	Humans	0.0% 0	0.3% 1	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.4% 1	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			
	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% 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		

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											
4. At Least ACSSuTAuCf¹ Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	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							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% 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		
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	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							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% 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		

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

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	
	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	
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%	
		Chicken Breasts		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%
		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
		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%
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.2%	4.6%	3.7%	2.2%	2.6%	1.5%	2.3%	2.0%	2.1%	1.8%	2.7%
		Chicken Breasts	13	15	14	8	8	5	9	8	8	8	11
		Ground Turkey							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%	0.0%	50.0%
		Chickens		20.8%	18.2%	16.9%	15.2%	3.1%	12.7%	5.1%	4.1%	4.4%	6.7%
		Turkeys		5	12	26	22	4	19	8	7	8	7
		Cattle		45.5%	50.0%	29.7%	33.3%	53.3%	44.4%	83.3%	64.3%	14.3%	20.0%
		Swine		5	3	11	6	8	4	5	9	1	1
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	14.4%	15.5%	15.7%	12.9%	13.2%	8.3%	7.6%	7.1%	5.8%	5.7%	5.2%
		Chicken Breasts	44	51	60	47	40	27	30	29	22	25	21
		Ground Turkey							0.0%	18.2%	34.7%	24.1%	47.6%
		Ground Beef							0	4	17	7	10
		Pork Chops							0.0%	50.0%	50.0%	0.0%	
		Chickens		8.3%	4.5%	3.9%	3.4%	3.1%	5.3%	7.7%	9.9%	7.7%	18.1%
		Turkeys		2	3	6	5	4	8	12	17	14	19
		Cattle		81.8%	66.7%	59.5%	44.4%	73.3%	55.6%	50.0%	21.4%	0.0%	0.0%
		Swine		9	4	22	8	11	5	3	3	0	0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	51.6%	55.2%	47.8%	43.3%	39.5%	40.1%	31.8%	35.2%	31.7%	27.9%	29.5%
		Chicken Breasts	158	181	182	157	120	130	125	143	121	122	120
		Ground Turkey							0.0%	18.2%	14.3%	3.4%	9.5%
		Ground Beef							0	4	7	1	2
		Pork Chops							0.0%	50.0%	50.0%	0.0%	
		Chickens		41.7%	45.5%	40.9%	35.9%	16.9%	30.0%	16.7%	8.2%	13.7%	17.1%
		Turkeys		10	30	63	52	22	45	26	14	25	18
		Cattle		81.8%	83.3%	81.1%	72.2%	93.3%	77.8%	100.0%	64.3%	57.1%	60.0%
		Swine		9	5	30	13	14	7	6	9	4	3
		100.0%	57.6%	63.0%	63.1%	46.0%	66.3%	52.6%	56.3%	55.9%	54.5%		
		2	19	119	118	40	65	41	27	19	12		
		44.0%	82.9%	80.7%	77.8%	70.5%	77.1%	59.3%	77.4%	69.0%	72.0%		
		4	19	24	12	6	1	0	5	3	4		
		51.6%	55.2%	47.8%	43.3%	39.5%	40.1%	31.8%	35.2%	31.7%	27.9%	29.5%	
		158	181	182	157	120	130	125	143	121	122	120	
								0.0%	18.2%	14.3%	3.4%	9.5%	
								0	4	7	1	2	
								0.0%	50.0%	50.0%	0.0%		
								0.0%	0	0		100.0%	
								50.0%	100.0%	100.0%	100.0%	100.0%	
								1	1	2	2	2	
								45	26	14	25	18	
								7	6	9	4	3	
								65	41	27	19	12	
								37	16	41	29	18	

Table 21b. 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	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
Antimicrobial Class	Antimicrobial (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 (MIC ≥ 32 / 16 µg/ml)	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
		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% 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	29.2% 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% 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% 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% 7	0.0% 0	48.6% 18	38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0
		Cattle		0.0% 0	3.0% 1	6.9% 13	11.8% 22	11.5% 10	15.3% 15	20.5% 16	25.0% 12	35.3% 12	27.3% 6
		Swine		0.0% 0	0.0% 0	1.8% 2	0.0% 0	0.0% 0	4.2% 2	0.0% 0	1.9% 1	4.8% 2	0.0% 0
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.2% 1	0.8% 3	0.0% 0	0.2% 1
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	4.8% 1
		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	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	1.3% 2	0.0% 0	1.8% 3	0.0% 0	0.0% 0
		Turkeys		0.0% 0	0.0% 0	8.1% 3	11.1% 2	6.7% 1	0.0% 0	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	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% 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	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate 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% 0	100.0% 2	0.0% 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					24.8% 36	14.6% 19	26.7% 40	23.7% 37	43.3% 74	19.7% 36	29.5% 31
		Turkeys					38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0
		Cattle					9.1% 17	11.5% 10	11.2% 11	16.7% 13	25.0% 12	35.3% 12	27.3% 6
		Swine					12.1% 1	0.0% 0	4.2% 2	3.7% 1	0.0% 0	4.8% 2	0.0% 0
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Humans	53.3% 163	56.7% 186	50.1% 191	45.7% 166	45.4% 138	43.2% 140	32.1% 126	38.4% 156	35.9% 137	31.8% 139	33.4% 136
		Chicken Breasts							44.4% 4	31.8% 7	73.5% 36	69.0% 20	90.5% 19
		Ground Turkey							0.0% 0	50.0% 1	100.0% 2	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	37.9% 25	32.5% 50	34.5% 50	18.5% 24	31.3% 47	28.2% 44	47.4% 81	37.2% 68	65.7% 69
		Turkeys		81.8% 9	83.3% 5	75.7% 28	66.7% 12	86.7% 13	77.8% 7	100.0% 6	78.6% 11	57.1% 4	80.0% 4
		Cattle		100.0% 2	60.6% 20	64.6% 122	64.2% 120	54.0% 47	58.2% 57	44.9% 35	60.4% 29	73.5% 25	59.1% 13
		Swine		80.0% 20	83.8% 88	78.9% 90	86.4% 70	75.0% 33	68.8% 33	63.0% 17	81.1% 43	69.0% 29	96.0% 24
	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	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
		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	
		Ground Beef							0.0% 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	1.5% 1	1.3% 2	0.0% 0	0.8% 1	13.0% 2	0.6% 1	0.0% 0	0.0% 0	0.0% 0
		Turkeys		0.0% 0	0.0% 0	0.0% 0	11.1% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle		0.0% 0	6.1% 2	9.0% 17	2.1% 4	2.3% 2	4.1% 4	2.6% 2	4.2% 2	5.9% 2	4.5% 1
Swine		4.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.1% 1	3.7% 1	1.9% 1	9.5% 4	4.0% 1		
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	39.9% 122	36.0% 118	34.1% 130	28.9% 105	30.9% 94	31.8% 103	23.2% 91	27.8% 113	24.1% 92	24.3% 106	22.1% 90
		Chicken Breasts							0.0% 0	9.1% 2	4.1% 2	3.4% 1	0.0% 0
		Ground Turkey							0.0% 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	0.0% 0
		Chickens		20.8% 5	19.7% 13	10.4% 16	14.5% 21	11.5% 15	16.0% 24	5.1% 8	1.8% 3	8.2% 15	7.6% 8
		Turkeys		63.6% 7	0.0% 0	54.1% 20	55.6% 10	73.3% 11	66.7% 6	50.0% 3	28.6% 4	57.1% 4	60.0% 3
		Cattle		100.0% 2	27.3% 9	37.0% 70	42.8% 80	37.9% 33	49.0% 48	42.3% 33	54.2% 26	47.1% 16	50.0% 11
		Swine		52.0% 13	57.1% 60	49.1% 56	53.1% 43	47.7% 21	56.3% 27	48.1% 13	60.4% 32	54.8% 23	64.0% 16

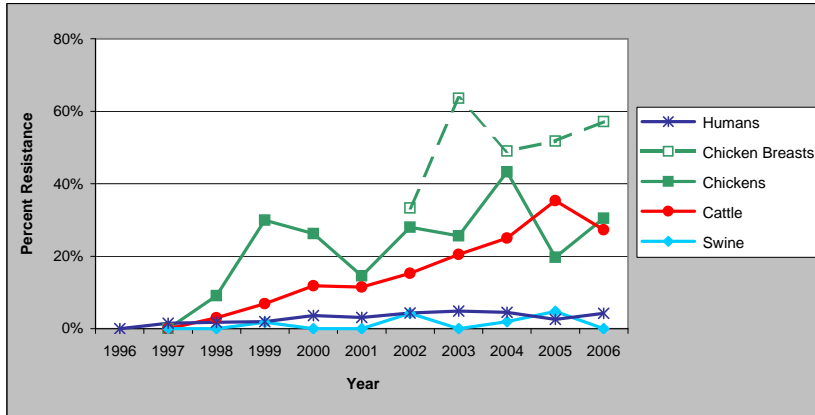
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

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 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
	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
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	0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.2% 1
		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	
		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	0.0% 0	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
		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% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.3% 1	0.9% 3	0.5% 2	0.0% 0	1.3% 4	0.6% 2	1.3% 5	1.2% 5	0.5% 2	0.9% 4	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	50.0% 1	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	0.0% 0	0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	6.0% 1	7.0% 1	0.0% 0	2.7% 4	0.0% 0	0.0% 0	1.1% 2	0.0% 0
		Turkeys		45.5% 5	0.0% 0	51.4% 19	33.3% 6	60.0% 9	55.6% 5	33.3% 2	14.3% 2	0.0% 0	0.0% 0
		Cattle		0.0% 0	0.0% 0	0.5% 1	0.0% 0	0.0% 0	1.0% 1	0.0% 0	6.3% 3	0.0% 0	0.0% 0
		Swine		0.0% 0	0.0% 0	0.0% 0	1.2% 1	0.0% 0	2.1% 1	0.0% 0	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% 0	50.0% 1	100.0% 2	0.0% 0	
		Ground Beef							0.0% 0	0.0% 0			100.0% 1
		Pork Chops							100.0% 2	100.0% 1	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% 2	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

Ceftiofur Resistance

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

Multidrug Resistance

Table 23a. 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
	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	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% 2	100.0% 1			0.0% 0
	Pork Chops							0.0% 0	0.0% 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% 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 ACSSuT¹ Resistant	Humans	33.7% 103	35.1% 115	32.5% 124	27.8% 101	28.0% 85	29.6% 96	21.4% 84	26.1% 106	23.3% 89	22.2% 97	19.7% 80
	Chicken Breasts							0.0% 0	9.1% 2	4.1% 2	3.4% 1	0.0% 0
	Ground Turkey							0.0% 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	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/S² 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% 0	0.0% 0	
	Ground Beef							0.0% 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	0.0% 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 ACT/S = 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
	Chickens		24	66	154	145	130	150	156	171	183	105
	Turkeys		11	6	37	18	15	9	6	14	7	5
	Swine		2	33	189	187	87	98	78	48	34	22
		25	105	114	81	44	48	27	53	42	25	
Resistance Pattern	Isolate Source											
4. At Least ACSSuTAuCf¹ Resistant	Humans	0.0% 0	1.2% 4	1.0% 4	0.6% 2	2.0% 6	1.2% 4	1.8% 7	2.2% 9	2.6% 10	1.8% 8	2.9% 12
	Chicken Breasts							0.0% 0	0.0% 0	4.1% 2	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	50.0% 1	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	0.0% 0	0.0% 0	0.0% 0
	Chickens		0.0% 0	0.0% 0	0.6% 1	0.7% 1	0.0% 0	2.0% 3	0.6% 1	0.0% 0	1.1% 2	0.0% 0
	Turkeys		27.3% 3	0.0% 0	45.9% 17	33.3% 6	53.3% 8	11.1% 1	16.7% 1	14.3% 2	0.0% 0	0.0% 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
	Swine		0.0% 0	0.0% 0	1.8% 2	0.0% 0	0.0% 0	4.2% 2	0.0% 0	0.0% 0	2.4% 1	0.0% 0
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.3% 1	0.5% 2	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	50.0% 1	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	0.0% 0	0.0% 0	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	0.5% 1	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	14.3% 2	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	0.0% 0	0.0% 0
	Swine		0.0% 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% 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	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	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	
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	0.0% 0	
		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% 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	
		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	
		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	0.0% 0	2.5% 3	3.2% 4	3.3% 8	3.1% 7	0.5% 1	1.0% 2	0.9% 2
		Chicken Breasts											
		Ground Turkey							0.0% 0	50.0% 1	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			100.0% 1	0.0% 0	20.0% 1	0.0% 0	0.0% 0	0.0% 0		16.7% 1	
		Turkeys			0.0% 0	0.0% 0	16.7% 1	6.3% 1	0.0% 0	52.6% 10	14.3% 1	80.0% 4	50.0% 2
		Cattle			0.0% 0	1.9% 1	11.0% 12	6.9% 6	7.1% 8	1.3% 1	0.0% 0	0.0% 0	3.3% 1
		Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0	
	Kanamycin (MIC ≥ 64)	Humans	2.0% 1	0.0% 0	1.3% 1	1.0% 1	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	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% 0	0.0% 0		33.3% 2	
		Turkeys			0.0% 0	0.0% 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	0.0% 0	9.2% 10	6.9% 6	15.9% 18	17.3% 13	25.0% 11	14.8% 4	13.3% 4
		Swine			0.0% 0	0.0% 0	0.0% 0	57.1% 4		0.0% 0		0.0% 0	
	Streptomycin (MIC ≥ 64)	Humans	7.8% 4	4.3% 2	2.6% 2	19.2% 19	24.0% 29	31.5% 39	25.3% 61	24.2% 54	15.7% 30	14.0% 29	13.8% 30
		Chicken Breasts											
		Ground Turkey							33.3% 1	50.0% 1	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	20.0% 1	37.5% 3	0.0% 0	85.7% 6		50.0% 3	
		Turkeys			0.0% 0	0.0% 0	16.7% 1	12.5% 2	0.0% 0	31.6% 6	14.3% 1	80.0% 4	0.0% 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	0.0% 0	50.0% 1	85.7% 6		100.0% 3		0.0% 0	

Table 24b. 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							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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	5.9% 3	6.5% 3	2.6% 2	18.2% 18	23.1% 28	29.8% 37	24.9% 60	22.9% 51	15.7% 30	14.0% 29	15.2% 33
		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% 2		
		Pork Chops							100.0% 2	100.0% 1			
		Chickens			100.0% 1	0.0% 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% 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	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	2.0% 1	0.0% 0	2.6% 2	18.2% 18	22.3% 27	26.6% 33	22.8% 55	21.5% 48	15.2% 29	12.6% 26	12.4% 27
		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% 2		
		Pork Chops							100.0% 2	100.0% 1			
		Chickens			0.0% 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% 0	10.5% 2	14.3% 1	0.0% 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
Cephalosporins	Cefotiofur (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% 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	0.0% 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% 0	10.5% 2	14.3% 1	0.0% 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
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	3.0% 3	0.0% 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		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
		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		0.0% 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	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	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					22.3% 27	25.8% 32	22.4% 54	21.5% 48	15.2% 29	12.6% 26	12.9% 28
		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% 2		
		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% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	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
		Chicken Breasts											
		Ground Turkey							33.3% 1	50.0% 1	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	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3	
		Turkeys			0.0% 0	0.0% 0	16.7% 1	12.5% 2	0.0% 0	52.6% 10	14.3% 1	80.0% 4	75.0% 3
		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% 3		0.0% 0	0.0% 0
	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	3.9% 2	4.3% 2	1.3% 1	2.0% 2	4.1% 5	1.6% 2	4.1% 10	0.9% 2	2.1% 4	1.9% 4	3.2% 7
		Chicken Breasts											
		Ground Turkey							33.3% 1	0.0% 0	0.0% 0	0.0% 0	
		Ground Beef							0.0% 0	0.0% 0	50.0% 1		
		Pork Chops							100.0% 2	0.0% 0			
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		16.7% 1	
		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
		Cattle			0.0% 0	1.9% 1	14.7% 16	12.6% 11	7.1% 8	0.0% 0	11.4% 5	25.9% 7	16.7% 5
Swine				0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1		0.0% 0	0.0% 0	
Phenicolis	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	5.9% 3	4.3% 2	2.6% 2	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											
		Ground Turkey							33.3% 1	0.0% 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	0.0% 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% 0	21.1% 4	14.3% 1	0.0% 0	0.0% 0
		Cattle			12.5% 1	37.0% 20	78.9% 86	73.6% 64	77.9% 88	78.7% 59	77.3% 34	81.5% 22	66.7% 20
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0

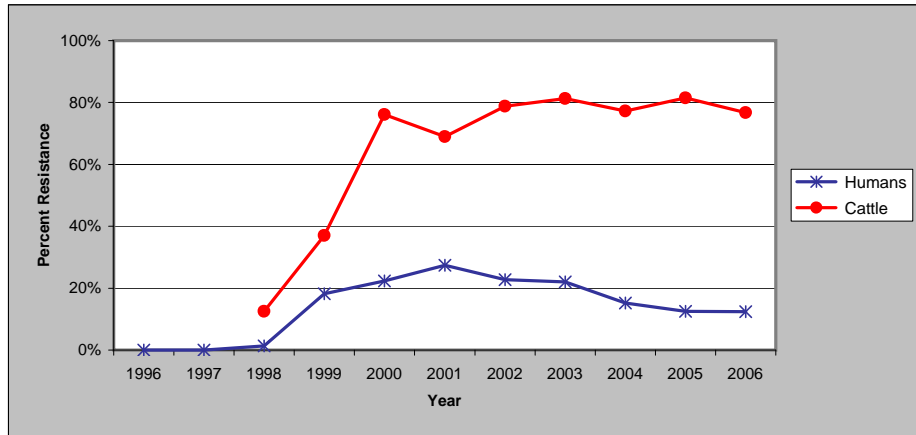
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

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							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	
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	0.0% 0	
		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% 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	
		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	
		Swine			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	0.0% 0	0.0% 0	0.0% 0	0.8% 1	0.0% 0	0.8% 2	0.4% 1	0.5% 1	0.0% 0	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	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% 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	
		Cattle			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0% 0
		Swine			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	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% 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	0.0% 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	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% 1	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0

Ceftiofur Resistance

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

Multidrug Resistance

Table 26a. 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	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
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans	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
	Chicken Breasts											
	Ground Turkey							66.7% 2	50.0% 1	100.0% 2	100.0% 3	
	Ground Beef							33.3% 1	0.0% 0	0.0% 0		
	Pork Chops							0.0% 0	0.0% 0			
	Chickens		0.0% 0	0.0% 0	100.0% 7	80.0% 4	62.5% 5	83.3% 5	14.3% 1		50.0% 3	
	Turkeys		0.0% 0	100.0% 1	100.0% 4	83.3% 5	87.5% 14	60.0% 6	21.1% 4	57.1% 4	20.0% 1	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 ACSSuT¹ Resistant	Humans	5.9% 3	4.3% 2	1.3% 1	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											
	Ground Turkey							33.3% 1	0.0% 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	0.0% 0	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3	
	Turkeys		0.0% 0	0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	5.3% 1	14.3% 1	0.0% 0	0.0% 0
	Cattle		0.0% 0	12.5% 1	35.2% 19	70.6% 77	67.8% 59	70.8% 80	66.7% 50	75.0% 33	81.5% 22	63.3% 19
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0
3. At Least ACT/S² Resistant	Humans	3.9% 2	4.3% 2	1.3% 1	2.0% 2	4.1% 5	0.8% 1	3.7% 9	0.9% 2	1.0% 2	1.9% 4	2.3% 5
	Chicken Breasts											
	Ground Turkey							33.3% 1	0.0% 0	0.0% 0	0.0% 0	
	Ground Beef							0.0% 0	0.0% 0	50.0% 1		
	Pork Chops							100.0% 2	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		16.7% 1	
	Turkeys		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 1	0.0% 0	0.0% 0
	Cattle		0.0% 0	0.0% 0	1.9% 1	13.8% 15	11.5% 10	7.1% 8	0.0% 0	2.3% 1	25.9% 7	10.0% 3
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1		0.0% 0	0.0% 0

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

² 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	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
Resistance Pattern	Isolate Source											
4. At Least ACSSuTAuCf¹ Resistant	Humans	0.0% 0	0.0% 0	1.3% 1	18.2% 18	22.3% 27	25.0% 31	22.8% 55	21.1% 47	14.7% 28	12.6% 26	10.6% 23
	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% 2		
	Pork Chops							100.0% 2	100.0% 1			
	Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	37.5% 3	0.0% 0	71.4% 5		50.0% 3	
	Turkeys		0.0% 0	0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	5.3% 1	14.3% 1	0.0% 0	0.0% 0
	Cattle		0.0% 0	12.5% 1	35.2% 19	69.7% 76	66.7% 58	70.8% 80	66.7% 50	72.7% 32	81.5% 22	63.3% 19
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.0% 0	0.5% 1	0.0% 0	0.0% 0
	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% 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
	Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 1	0.0% 0	0.0% 0	0.0% 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

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

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							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	
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% 0	
		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
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	7.1% 1	0.0% 0	5.4% 2	5.6% 2	0.0% 0	4.8% 5
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2
		Ground Turkey							0.0% 0				50.0% 1
		Ground Beef											
		Pork Chops											
		Chickens									11.4% 5	9.8% 10	11.4% 9
		Turkeys									100.0% 1	0.0% 0	100.0% 1
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										0.0% 0	0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	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									4.5% 2	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
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	66.7% 2		0.0% 0	7.7% 1	14.3% 2	2.9% 1	8.1% 3	5.6% 2	3.0% 1	3.8% 4
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2
		Ground Turkey							0.0% 0				50.0% 1
		Ground Beef											
		Pork Chops											
		Chickens									15.9% 7	9.8% 10	6.3% 5
		Turkeys									100.0% 1	50.0% 1	100.0% 1
		Cattle									25.0% 1	0.0% 0	0.0% 0
		Swine										100.0% 1	0.0% 0

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

Table 27b. 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							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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	7.7% 1	7.1% 1	8.6% 3	8.1% 3	5.6% 2	6.1% 2	6.7% 7
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	11.1% 1
		Ground Turkey							0.0% 0				0.0% 0
		Ground Beef											
		Pork Chops											
		Chickens									6.8% 3	8.8% 9	17.7% 14
		Turkeys									0.0% 0	50.0% 1	0.0% 0
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										100.0% 1	50.0% 1
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	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	0.0% 0	11.1% 1
		Ground Turkey							0.0% 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% 0
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										0.0% 0	0.0% 0
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	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	0.0% 0	11.1% 1
		Ground Turkey							0.0% 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% 0
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										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	2.8% 1	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
		Ground Beef											
		Pork Chops											
		Chickens									0.0% 0	0.0% 0	0.0% 0
		Turkeys									0.0% 0	50.0% 1	0.0% 0
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										0.0% 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

Table 27c. 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							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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans						0.0% 0	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	0.0% 0	11.1% 1	
		Ground Turkey						0.0% 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% 0
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										0.0% 0	0.0% 0
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ² (MIC ≥ 512 µg/ml)	Humans	0.0% 0	100.0% 3		12.5% 1	0.0% 0	14.3% 2	2.9% 1	5.4% 2	11.1% 4	0.0% 0	8.6% 9
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	11.1% 1	22.2% 2
		Ground Turkey							0.0% 0				50.0% 1
		Ground Beef											
		Pork Chops											
		Chickens									13.6% 6	9.8% 10	13.9% 11
		Turkeys									100.0% 1	50.0% 1	100.0% 1
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										100.0% 1	50.0% 1
	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	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
		Ground Beef											
		Pork Chops											
		Chickens									4.5% 2	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		
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	1.9% 2
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	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	50.0% 1

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

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

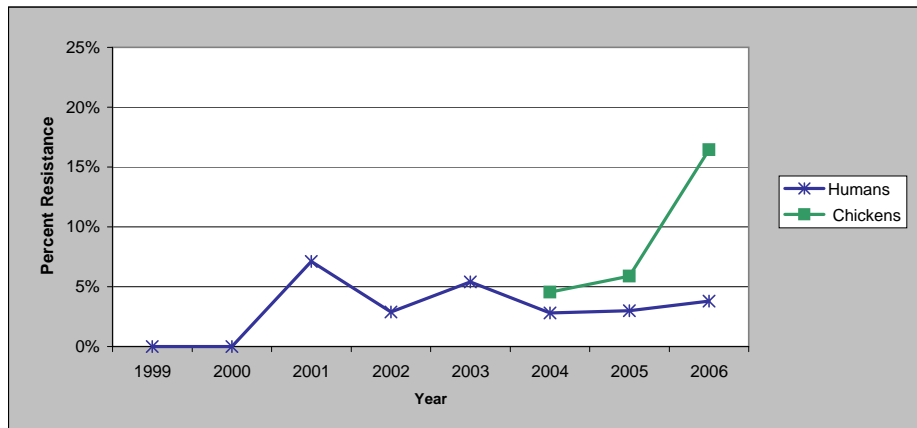
Table 27d. Antimicrobial Resistance among all *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2006

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							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	
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	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	0.0% 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
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.7% 1	2.8% 1	0.0% 0	1.0% 1
		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% 0
		Cattle									0.0% 0	0.0% 0	0.0% 0
		Swine										0.0% 0	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	0.0% 0	0.0% 0		0.0% 0	7.7% 1	7.1% 1	5.7% 2	0.0% 0	11.1% 4	3.0% 1	8.6% 9
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	11.1% 1	11.1% 1
		Ground Turkey							0.0% 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% 0
		Swine										100.0% 1	50.0% 1

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

Ceftiofur Resistance

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

Multidrug Resistance

Table 29a. 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	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
Resistance Pattern	Isolate Source											
1. No Resistance Detected	Humans	100.0% 3	0.0% 0		87.5% 7	92.3% 12	78.6% 11	91.4% 32	78.4% 29	80.6% 29	87.9% 29	85.7% 90
	Chicken Breasts							100.0% 5	100.0% 2	100.0% 4	88.9% 8	55.6% 5
	Ground Turkey							100.0% 2				50.0% 1
	Ground Beef											
	Pork Chops											
	Chickens									77.3% 34	76.5% 78	68.4% 54
	Turkeys									0.0% 0	50.0% 1	0.0% 0
	Cattle									75.0% 3	100.0% 2	100.0% 3
	Swine										0.0% 0	50.0% 1
2. At Least ACSSuT² Resistant	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	1.9% 2
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	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
3. At Least ACT/S³ Resistant	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	7.1% 1	2.9% 1	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
	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

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

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	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
Resistance Pattern	Isolate Source											
4. At Least ACSSuTAuCf² Resistant	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	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	0.0% 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 Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	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% 0
	Cattle									0.0% 0	0.0% 0	0.0% 0
	Swine										0.0% 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	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	
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	0.0% 0	
		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											
		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	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
		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
	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% 0
		Swine		0.0% 0	0.0% 0	0.0% 0	9.1% 2	0.0% 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% 0	63.6% 7	42.9% 12	16.7% 1	10.0% 1	37.5% 3	55.6% 5	100.0% 1	50.0% 3	0.0% 0
		Swine		85.7% 6	64.9% 24	60.6% 20	77.3% 17	75.0% 12	54.5% 6	100.0% 11	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% 12
		Chicken Breasts							63.6% 7	12.5% 2	22.6% 7	18.2% 4	23.3% 7
		Ground Turkey							61.9% 13	37.5% 12	43.2% 16	47.2% 25	45.7% 16
		Ground Beef											
		Pork Chops							100.0% 3		33.3% 1		0.0% 0
		Chickens		35.3% 18	32.9% 47	23.9% 71	36.7% 95	20.4% 67	18.6% 75	17.7% 40	18.0% 30	15.5% 44	10.4% 17
		Turkeys		14.3% 2	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% 0	72.7% 8	57.1% 16	16.7% 1	20.0% 2	37.5% 3	55.6% 5	100.0% 1	50.0% 3	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	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	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
		Chicken Breasts							18.2% 2	18.8% 3	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											
		Pork Chops							0.0% 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% 8	3.5% 2	17.4% 8	24.0% 6	37.2% 16
		Cattle		0.0% 0	27.3% 3	50.0% 14	0.0% 0	0.0% 0	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0% 0
		Swine		0.0% 0	5.4% 2	0.0% 0	9.1% 2	0.0% 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 (MIC ≥ 32 / 16 µg/ml)	Humans	2.7% 2	1.3% 1	1.0% 1	1.1% 1	3.8% 3	2.9% 3	9.5% 10	5.2% 5	10.8% 10	8.8% 11	9.8% 10
		Chicken Breasts							0.0% 0	6.3% 1	9.7% 3	13.6% 3	10.0% 3
		Ground Turkey							19.0% 4	9.4% 3	5.4% 2	9.4% 5	17.1% 6
		Ground Beef											
		Pork Chops							0.0% 0		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% 1	0.7% 1	2.4% 3	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	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0% 0
		Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	1.4% 1	0.0% 0	0.0% 0	0.0% 0	3.8% 3	2.9% 3	7.6% 8	5.2% 5	9.7% 9	8.8% 11	9.8% 10
		Chicken Breasts							0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3
		Ground Turkey							19.0% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6
		Ground Beef											
		Pork Chops							0.0% 0		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% 0
		Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 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% 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	0.4% 1	0.0% 0	0.2% 1	0.0% 0	0.6% 1	1.4% 4	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
		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% 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	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					2.5% 2	2.9% 3	8.6% 9	5.2% 5	8.6% 8	8.8% 11	8.8% 9
		Chicken Breasts							0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3
		Ground Turkey							19.0% 4	0.0% 0	5.4% 2	9.4% 5	17.1% 6
		Ground Beef											
		Pork Chops							0.0% 0		0.0% 0		0.0% 0
		Chickens					13.5% 35	5.2% 17	7.4% 30	7.1% 16	10.2% 17	21.6% 61	15.2% 25
		Turkeys					2.4% 3	4.9% 7	1.7% 1	0.0% 0	6.5% 3	0.0% 0	9.3% 4
		Cattle					0.0% 0	0.0% 0	37.5% 3	44.4% 4	100.0% 1	66.7% 4	0.0% 0
		Swine					4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Humans	17.6% 13	21.3% 16	21.8% 22	18.2% 16	11.4% 9	8.8% 9	6.7% 7	7.3% 7	7.5% 7	8.0% 10	4.9% 5
		Chicken Breasts							45.5% 5	12.5% 2	12.9% 4	13.6% 3	26.7% 8
		Ground Turkey							33.3% 7	15.6% 5	37.8% 14	35.8% 19	37.1% 13
		Ground Beef											
		Pork Chops							100.0% 3		0.0% 0		100.0% 4
		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% 30	7.9% 13	
		Turkeys	50.0% 7	35.9% 14	33.8% 47	15.2% 19	27.5% 39	30.0% 18	19.3% 11	26.1% 12	52.0% 13	30.2% 13	
		Cattle	0.0% 0	36.4% 4	57.1% 16	0.0% 0	10.0% 1	12.5% 1	44.4% 4	100.0% 1	50.0% 3	0.0% 0	
		Swine	0.0% 0	21.6% 8	21.2% 7	13.6% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	12.5% 1	0.0% 0	
	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	0.0% 0	0.0% 0	2.0% 2	1.1% 1	1.3% 1	2.0% 2	1.0% 1	2.1% 2	0.0% 0	0.8% 1	0.0% 0
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	6.7% 2
		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		100.0% 4
		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	0.4% 1	0.0% 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	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			
Phenicol	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% 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	11.6% 30	3.3% 11	1.7% 7	3.1% 7	4.2% 7	3.2% 9	2.4% 4	
		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% 0	4.7% 2	
		Cattle	0.0% 0	27.3% 3	42.9% 12	0.0% 0	10.0% 1	25.0% 2	44.4% 4	100.0% 1	50.0% 3	0.0% 0	
		Swine	0.0% 0	0.0% 0	3.0% 1	4.5% 1	0.0% 0	9.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	

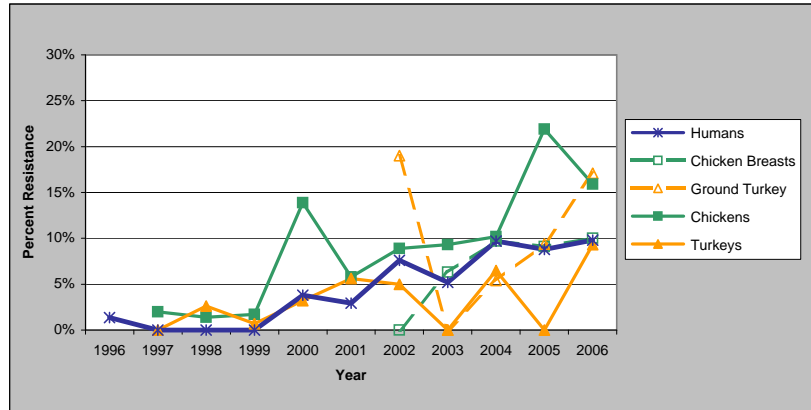
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

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 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	
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	0.0% 0	
		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											
		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	
		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	
		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	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.0% 0	1.0% 1	1.1% 1	1.3% 1	0.0% 0	0.0% 0	1.0% 1	0.0% 0	0.8% 1	0.0% 0
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1
		Ground Turkey							4.8% 1	0.0% 0	0.0% 0	1.9% 1	0.0% 0
		Ground Beef											
		Pork Chops							0.0% 0		0.0% 0		0.0% 0
		Chickens		0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.7% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys		0.0% 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% 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% 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
Chicken Breasts									45.5% 5	0.0% 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% 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

Ceftiofur Resistance

Figure 16. Percent of *Salmonella* Heidelberg Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftiofur, by Year, 1996-2006¹



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

Multidrug Resistance

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	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											
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% 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	0.0% 0	12.5% 1	7.7% 1
2. At Least ACSSuT¹ 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% 0	4.7% 2
	Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	0.0% 0	12.5% 1	33.3% 3	100.0% 1	50.0% 3	0.0% 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	0.0% 0	0.0% 0
3. At Least ACT/S² Resistant	Humans	0.0% 0	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% 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 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											
4. At Least ACSSuTAuCf¹ Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.3% 1	1.0% 1	1.0% 1	0.0% 0	0.0% 0	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	0.7% 2	11.2% 29	2.7% 9	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	0.8% 1	2.8% 4	1.7% 1	0.0% 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% 0	12.5% 1	33.3% 3	100.0% 1	50.0% 3	0.0% 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	0.0% 0	0.0% 0
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	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	0.7% 3	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	1.7% 1	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
	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

Source	Year									
	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

Source	Year									
	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 <i>Campylobacter</i>	572	24	0	3
Percent Positive for <i>Campylobacter</i>	47.9%	2.0%	0.0%	0.3%

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

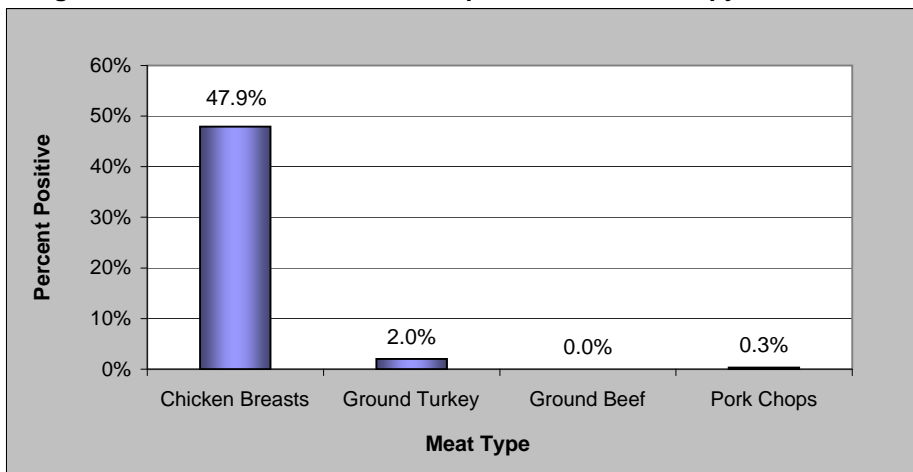
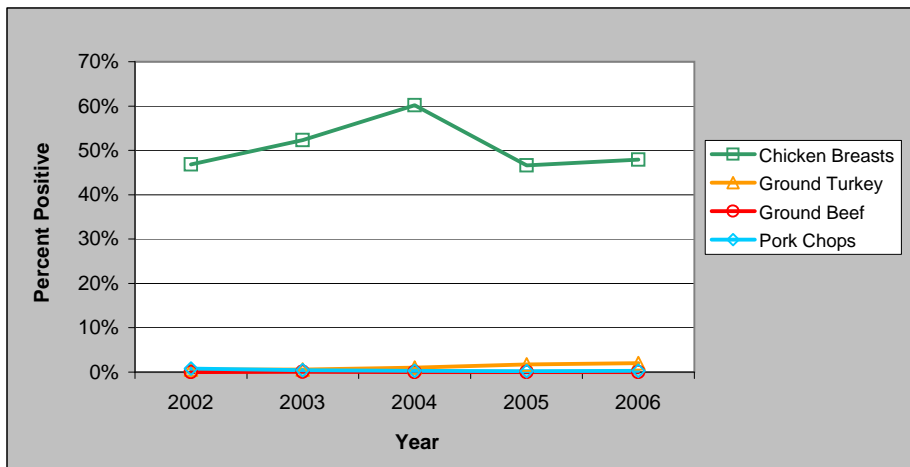


Figure 18. Percent of Retail Meat Samples Positive for *Campylobacter*, 2002-2006

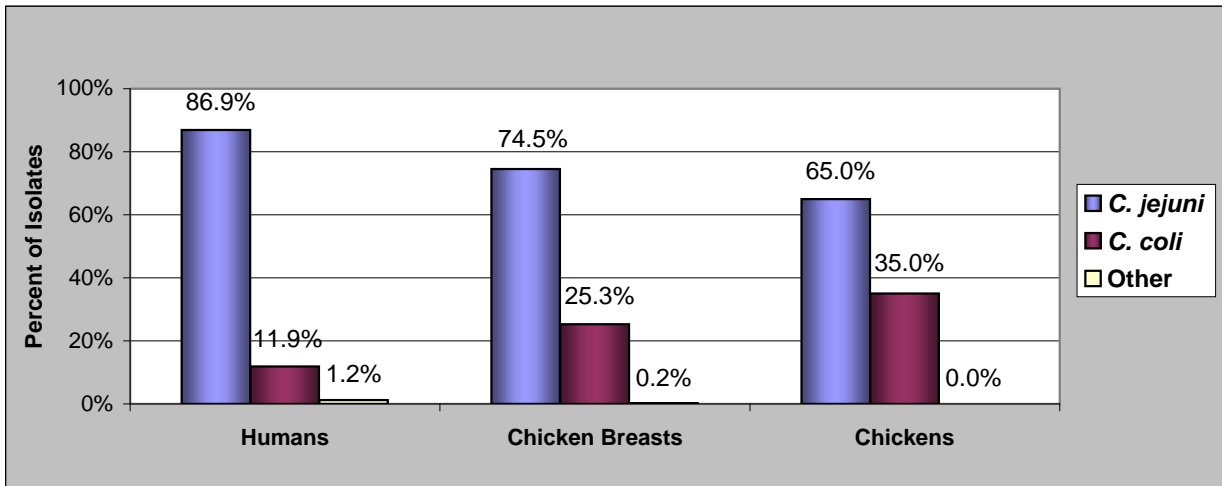


C. Campylobacter Species

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

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

Antimicrobial	Isolate Source (# of Isolates) ¹	%I ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵														
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
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	0.8	[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	0.8	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	0.8	[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

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

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

Antimicrobial	Isolate Source (# of Isolates) ¹	%I ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵												
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64
Phenicol																	
Florfenicol ⁶	Humans (709)	N/A	0.0	[0.0 - 0.5]													
	Chicken Breasts (426)	N/A	0.0	[0.0 - 0.9]													
	Ground Turkey (12)	N/A	0.0	[0.0 - 26.5]													
	Pork Chops (1)	N/A	0.0	[0.0 - 97.5]													
	Chickens (228)	N/A	0.0	[0.0 - 1.6]													
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]													
	Chicken Breasts (426)	0.0	16.7	[13.3 - 20.6]													
	Ground Turkey (12)	0.0	50.0	[21.1 - 78.9]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (228)	0.0	8.8	[5.4 - 13.2]													
Tetracyclines																	
Tetracycline	Humans (709)	0.6	47.4	[43.7 - 51.1]													
	Chicken Breasts (426)	0.0	47.2	[42.4 - 52.0]													
	Ground Turkey (12)	0.0	75.0	[42.8 - 94.5]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (228)	1.8	56.1	[49.4 - 62.7]													

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

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

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Number of Isolates Tested	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)²	Isolate Source										
Aminoglycosides	Gentamicin (MIC ≥ 8 µg/ml)	Humans		0.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.5% 4	0.0% 0
		Chicken Breasts						0.0% 0	0.3% 1	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							0.0% 0			
		Pork Chops						0.0% 0			0.0% 0	0.0% 0
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 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% 0	
		Ground Beef										
		Pork Chops								0.0% 0	0.0% 0	
		Chickens								0.4% 2	0.0% 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% 0
		Ground Beef										
		Pork Chops									0.0% 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	0.0% 0
		Chickens					3.1% 2	0.6% 3	1.3% 5	1.6% 8	1.4% 8	0.4% 1
	Erythromycin (MIC ≥ 32 µg/ml)	Humans	1.4% 3	0.7% 2	1.4% 4	1.0% 3	1.9% 7	1.2% 4	0.3% 1	0.3% 1	1.6% 13	0.8% 6
		Chicken Breasts						0.0% 0	0.0% 0	0.8% 4	0.5% 2	0.9% 4
		Ground Turkey						0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef							0.0% 0			
		Pork Chops						0.0% 0			0.0% 0	0.0% 0
		Chickens					3.1% 2	0.6% 3	1.6% 6	1.2% 6	1.1% 6	0.4% 1

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

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Number of Isolates Tested	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)²	Isolate Source										
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	3.8% 8	1.0% 3	0.7% 2	0.0% 0	0.3% 1	0.3% 1	0.0% 0	1.6% 5		
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.0% 0		
	Florfenicol (MIC ≥ 8) ³	Humans									0.5% 4	0.0% 0
		Chicken Breasts								0.0% 0	0.0% 0	0.0% 0
		Ground Turkey								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		
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	12.4% 26	13.8% 41	17.7% 52	14.7% 45	18.4% 67	20.7% 68	17.2% 52	18.1% 58	21.5% 170	19.5% 138
		Chicken Breasts						15.2% 30	14.5% 47	15.1% 77	15.1% 61	16.7% 71
		Ground Turkey						50.0% 1	0.0% 0	28.6% 2	10.0% 1	50.0% 6
		Ground Beef							0.0% 0			
		Pork Chops						0.0% 0			100.0% 1	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										
		Pork Chops									100.0% 1	0.0% 0
		Chickens					20.3% 13	22.1% 116	15.5% 58	21.7% 110	15.3% 87	8.8% 20
Tetracyclines	Doxycycline (MIC ≥ 8 µg/ml)	Chicken Breasts						38.4% 76	40.6% 132			
		Ground Turkey						100.0% 2	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										
		Pork Chops									0.0% 0	0.0% 0
		Chickens					35.9% 23	45.1% 237	47.6% 178	42.3% 215	44.1% 250	56.1% 128

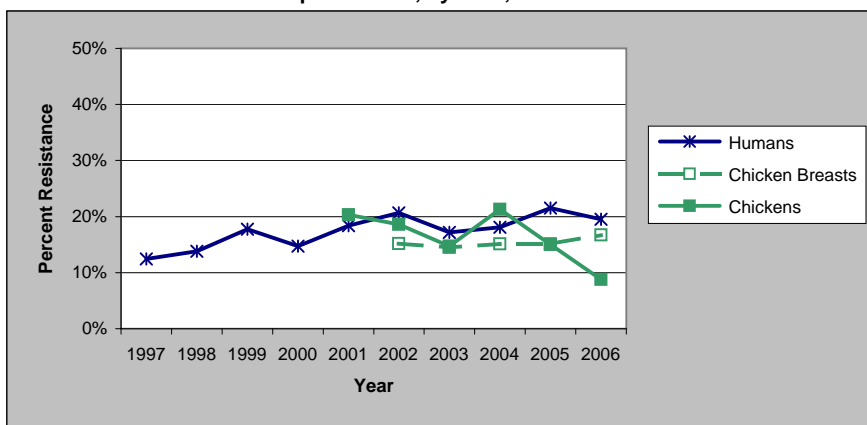
¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

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 (≤ 4 µg/ml) has been established. In this report, isolates with an MIC ≥ 8 µg/ml are categorized as resistant

Ciprofloxacin Resistance

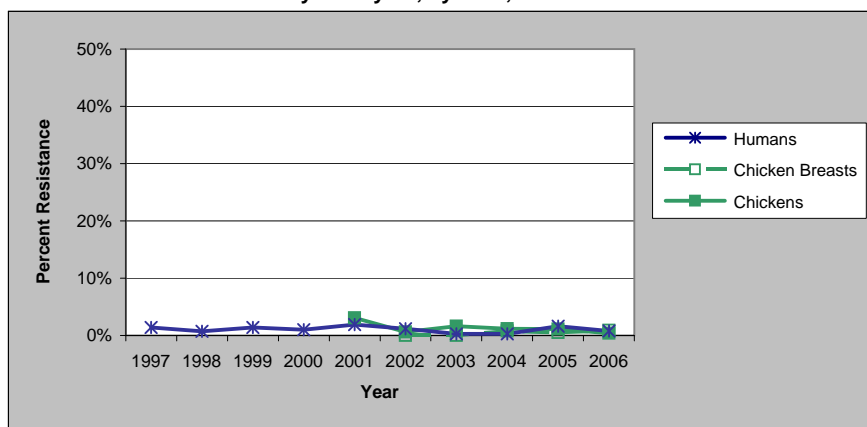
Figure 20. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2006¹



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

	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

Antimicrobial	Isolate Source (# of Isolates) ¹	%I ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵																													
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256															
Aminoglycosides																																		
Gentamicin	Humans (97)	0.0	1.0	[0.0 - 5.6]													1.0																	
	Chicken Breasts (145)	0.0	0.0	[0.0 - 2.5]													2.1	6.2	63.9	25.8	1.0													
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]																														
	Pork Chops (2)	0.0	0.0	[0.0 - 84.2]																														
	Chickens (123)	0.0	0.0	[0.0 - 3.0]																														
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]																														
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]																														
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]																														
	Chickens (123)	5.7	6.5	[2.8 - 12.4]																														
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]																														
	Ground Turkey (10)	10.0	0.0	[0.0 - 30.8]																														
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]																														
	Chickens (123)	5.7	1.6	[0.2 - 5.8]																														
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]																														
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]																														
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]																														
	Chickens (123)	0.0	8.9	[4.5 - 15.4]																														
Erythromycin	Humans (97)	0.0	8.2	[3.6 - 15.6]													1.0	6.2	29.9	29.9	13.4	11.3					1.0	7.2						
	Chicken Breasts (145)	0.0	5.5	[2.4 - 10.6]																														
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]																														
	Pork Chops (2)	0.0	50.0	[1.3 - 98.7]																														
	Chickens (123)	0.0	8.9	[4.5 - 15.4]																														

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

Antimicrobial	Isolate Source (# of Isolates) ¹	%I ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵															
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	
Phenicol																				
Florfenicol ⁶	Humans (97)	N/A	0.0	[0.0 - 3.7]																
	Chicken Breasts (145)	N/A	0.0	[0.0 - 2.5]																
	Ground Turkey (10)	N/A	0.0	[0.0 - 30.8]																
	Pork Chops (2)	N/A	0.0	[0.0 - 84.2]																
	Chickens (123)	N/A	0.0	[0.0 - 3.0]																
Quinolones																				
Ciprofloxacin	Humans (97)	0.0	21.6	[13.9 - 31.2]																
	Chicken Breasts (145)	0.0	22.1	[15.6 - 29.7]																
	Ground Turkey (10)	0.0	30.0	[6.7 - 65.2]																
	Pork Chops (2)	0.0	0.0	[0.0 - 84.2]																
	Chickens (123)	0.0	15.4	[9.6 - 23.1]																
Nalidixic acid																				
Nalidixic acid	Humans (97)	0.0	23.7	[15.7 - 33.4]																
	Chicken Breasts (145)	0.0	20.7	[14.4 - 28.2]																
	Ground Turkey (10)	0.0	30.0	[6.7 - 65.2]																
	Pork Chops (2)	0.0	0.0	[0.0 - 84.2]																
	Chickens (123)	0.0	15.4	[9.6 - 23.1]																
Tetracyclines																				
Tetracycline	Humans (97)	0.0	39.2	[29.4 - 49.6]																
	Chicken Breasts (145)	0.0	46.9	[38.6 - 55.4]																
	Ground Turkey (10)	0.0	80.0	[44.4 - 97.5]																
	Pork Chops (2)	50.0	0.0	[0.0 - 84.2]																
	Chickens (123)	0.0	53.7	[44.4 - 62.7]																

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		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Number of Isolates Tested	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)²	Isolate Source										
Aminoglycosides	Gentamicin (MIC ≥ 8 µg/ml)	Humans		0.0% 0	0.0% 0	8.3% 1	0.0% 0	0.0% 0	4.5% 1	0.0% 0	2.0% 2	1.0% 1
		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		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% 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% 1
		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% 0	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						7.8% 7	7.0% 10	9.2% 18	9.9% 15	5.5% 8
		Ground Turkey						0.0% 0	0.0% 0	0.0% 0	22.2% 2	0.0% 0
		Ground Beef										
		Pork Chops						33.3% 1	75.0% 3	33.3% 1		50.0% 1
		Chickens					9.6% 5	18.8% 54	20.2% 50	9.1% 17	8.4% 32	8.9% 11

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

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Number of Isolates Tested	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) ²	Isolate Source										
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	50.0% 3	37.5% 3	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	0.0% 0		
	Florfenicol (MIC > 4) ³	Humans									1.0% 1	0.0% 0
		Chicken Breasts								0.0% 0	0.0% 0	0.0% 0
		Ground Turkey								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		
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
		Chicken Breasts						10.0% 9	13.4% 19	16.3% 32	29.1% 44	22.1% 32
		Ground Turkey						50.0% 1	100.0% 1	0.0% 0	55.6% 5	30.0% 3
		Ground Beef										
		Pork Chops						0.0% 0	0.0% 0	0.0% 0		0.0% 0
		Chickens					19.2% 10	16.0% 46	20.2% 50	26.9% 50	22.1% 84	15.4% 19
	Nalidixic acid (MIC ≥ 64 µg/ml)	Humans	50.0% 3	50.0% 4	30.0% 6	25.0% 3	47.1% 8	12.0% 3	22.7% 5	34.6% 9	26.5% 26	23.7% 23
		Chicken Breasts								16.3% 32	29.1% 44	20.7% 30
		Ground Turkey								0.0% 0	55.6% 5	30.0% 3
		Ground Beef										
		Pork Chops								0.0% 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% 10	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% 0	88.9% 8	80.0% 8
		Ground Beef										
		Pork Chops								66.7% 2		0.0% 0
		Chickens					57.7% 30	49.0% 141	51.0% 126	48.4% 90	42.1% 160	53.7% 66

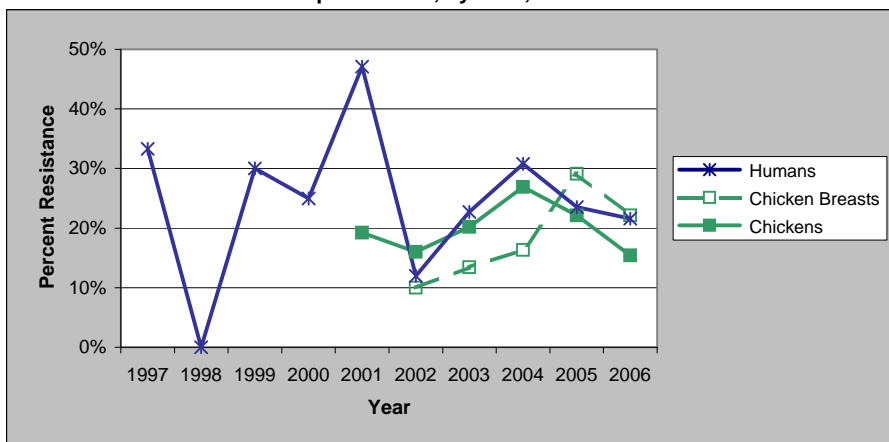
¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

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 (≤ 4 µg/ml) has been established. In this report, isolates with an MIC ≥ 8 µg/ml are categorized as resistant

Ciprofloxacin Resistance

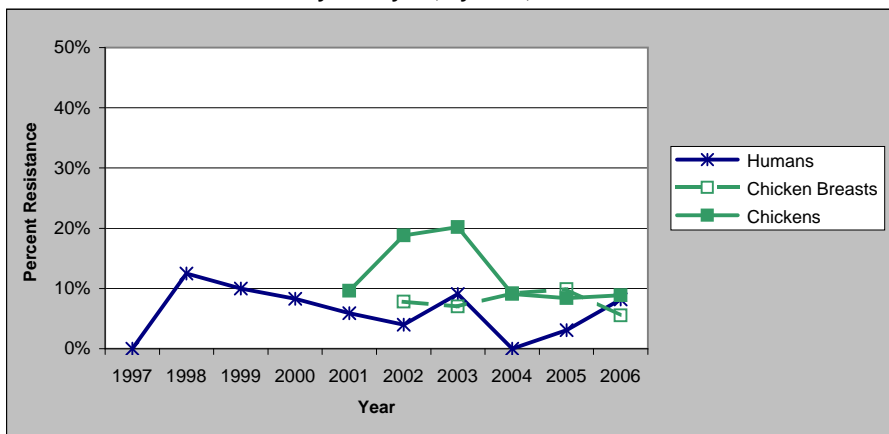
Figure 22. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2006¹



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, 1997-2006¹



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

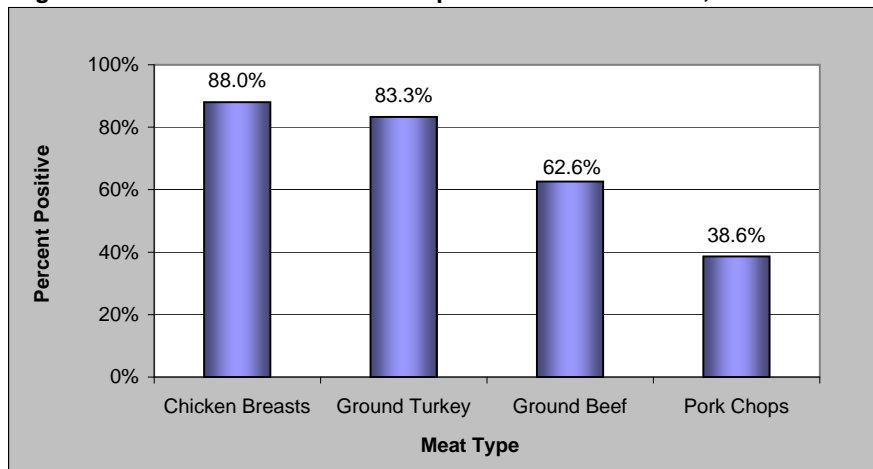


Figure 25. Percent of Retail Meat Samples Positive for *E. coli*, 2002-2006

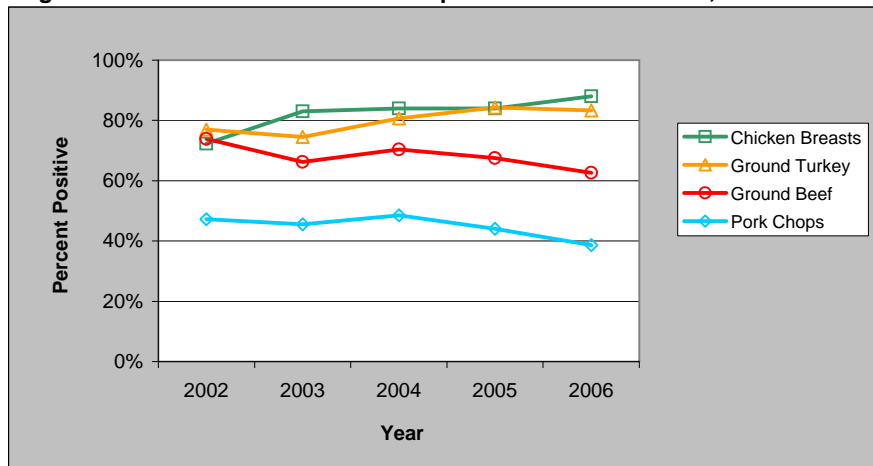


Table 45b. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 2006

Antimicrobial	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴													
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Cephalosporins																		
Ceftiofur	Chicken Breasts (418)	0.2	8.6	[6.1 - 11.7]														
	Ground Turkey (388)	0.0	3.1	[1.6 - 5.3]														
	Ground Beef (295)	0.3	1.0	[0.2 - 2.9]														
	Pork Chops (182)	0.5	0.0	[0.0 - 2.0]														
	Chickens (1357)	4.2	10.2	[8.7 - 12.0]														
Ceftriaxone	Chicken Breasts (418)	4.0	0.7	[0.1 - 2.1]														
	Ground Turkey (388)	2.3	0.3	[0.0 - 1.4]														
	Ground Beef (295)	1.0	0.0	[0.0 - 1.2]														
	Pork Chops (182)	0.0	0.0	[0.0 - 2.0]														
	Chickens (1357)	4.5	0.1	[0.0 - 0.4]														
Cephamycins																		
Cefoxitin	Chicken Breasts (418)	2.4	11.2	[8.4 - 14.7]														
	Ground Turkey (388)	2.3	6.2	[4.0 - 9.1]														
	Ground Beef (295)	1.7	2.0	[0.7 - 4.4]														
	Pork Chops (182)	2.7	1.6	[0.3 - 4.7]														
	Chickens (1357)	1.7	15.0	[13.2 - 17.0]														
Folate Pathway Inhibitors																		
Sulfisoxazole	Chicken Breasts (418)	N/A	46.9	[42.0 - 51.8]														
	Ground Turkey (388)	N/A	48.5	[43.4 - 53.6]														
	Ground Beef (295)	N/A	12.5	[9.0 - 16.9]														
	Pork Chops (182)	N/A	20.3	[14.7 - 26.9]														
	Chickens (1357)	N/A	48.6	[45.9 - 51.3]														
Trimethoprim-Sulfamethoxazole	Chicken Breasts (418)	N/A	8.9	[6.3 - 12.0]														
	Ground Turkey (388)	N/A	8.0	[5.5 - 11.1]														
	Ground Beef (295)	N/A	1.4	[0.4 - 3.4]														
	Pork Chops (182)	N/A	2.2	[0.6 - 5.5]														
	Chickens (1357)	N/A	8.4	[7.0 - 10.0]														
Phenicol																		
Chloramphenicol	Chicken Breasts (418)	1.0	2.6	[1.3 - 4.7]														
	Ground Turkey (388)	1.3	2.3	[1.1 - 4.4]														
	Ground Beef (295)	0.7	1.4	[0.4 - 3.4]														
	Pork Chops (182)	1.1	6.6	[3.5 - 11.2]														
	Chickens (1357)	0.7	1.9	[1.3 - 2.8]														

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

Antimicrobial	Isolate Source (# of Isolates)	%I ¹	%R ²	[95% CI] ³	Distribution (%) of MICs (µg/ml) ⁴												
					0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64
Quinolones																	
Ciprofloxacin	Chicken Breasts (418)	0.0	0.0	[0.0 - 0.9]													
	Ground Turkey (388)	0.0	0.5	[0.1 - 1.8]													
	Ground Beef (295)	0.0	0.0	[0.0 - 1.2]													
	Pork Chops (182)	0.0	0.0	[0.0 - 2.0]													
	Chickens (1357)	0.0	0.0	[0.0 - 0.3]													
Nalidixic Acid	Chicken Breasts (418)	N/A	5.0	[3.1 - 7.6]													
	Ground Turkey (388)	N/A	5.2	[3.2 - 7.8]													
	Ground Beef (295)	N/A	0.7	[0.1 - 2.4]													
	Pork Chops (182)	N/A	0.5	[0.0 - 3.0]													
	Chickens (1357)	N/A	5.4	[4.2 - 6.7]													
Tetracyclines																	
Tetracycline	Chicken Breasts (418)	2.2	50.7	[45.8 - 55.6]													
	Ground Turkey (388)	0.3	76.5	[72.0 - 80.7]													
	Ground Beef (295)	7.5	25.4	[20.6 - 30.8]													
	Pork Chops (182)	0.5	52.7	[45.2 - 60.2]													
	Chickens (1357)	1.3	49.0	[46.3 - 51.7]													

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 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 Tested									
	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source							
Aminoglycosides	Amikacin (MIC ≥ 64 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%
					0	0	0	0	0
		Ground Beef			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%
			0	0	0	0	0	0	0
	Gentamicin (MIC ≥ 16 µg/ml)	Chicken Breasts			23.0%	29.3%	30.0%	37.7%	37.3%
					65	116	120	148	156
		Ground Turkey			27.0%	29.7%	29.3%	27.5%	29.6%
					82	99	110	109	115
		Ground Beef			0.3%	1.0%	0.6%	0.0%	4.1%
					1	3	2	0	12
		Pork Chops			1.1%	1.4%	1.3%	0.0%	1.1%
					2	3	3	0	2
		Chickens	40.0%	33.4%	38.0%	38.8%	39.1%	36.7%	33.1%
			114	664	799	530	663	819	449
Kanamycin (MIC ≥ 64 µg/ml)	Chicken Breasts			6.0%	6.8%	6.8%	7.1%	11.5%	
				17	27	27	28	48	
	Ground Turkey			13.2%	16.8%	16.0%	11.4%	14.7%	
				40	56	60	45	57	
	Ground Beef			2.4%	2.9%	2.4%	0.6%	4.7%	
				7	9	8	2	14	
	Pork Chops			5.4%	8.7%	8.2%	7.3%	6.0%	
				10	19	19	15	11	
	Chickens	16.1%	14.5%	11.6%	10.3%	11.5%	10.3%	9.1%	
		46	288	243	140	196	231	123	
Streptomycin (MIC ≥ 64 µg/ml)	Chicken Breasts			49.3%	56.1%	56.8%	50.6%	48.1%	
				139	222	227	199	201	
	Ground Turkey			57.6%	54.7%	49.2%	43.4%	43.8%	
				175	182	185	172	170	
	Ground Beef			9.5%	9.0%	11.8%	5.4%	14.2%	
				28	28	40	17	42	
	Pork Chops			22.3%	19.7%	21.1%	13.2%	13.7%	
				41	43	49	27	25	
	Chickens	77.5%	65.8%	65.1%	64.2%	64.1%	58.0%	49.5%	
		221	1308	1368	877	1088	1295	672	
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Chicken Breasts			21.6%	25.3%	17.0%	24.7%	20.1%
					61	100	68	97	84
		Ground Turkey			31.3%	35.7%	33.2%	38.1%	42.0%
					95	119	125	151	163
		Ground Beef			6.1%	5.1%	5.3%	3.5%	9.2%
						18	16	18	11
	Pork Chops			13.6%	13.3%	15.1%	16.1%	15.9%	
				25	29	35	33	29	
	Chickens	20.0%	19.5%	19.0%	18.6%	17.6%	22.0%	25.6%	
		57	388	399	254	298	492	347	
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin-Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Chicken Breasts			12.1%	13.6%	10.0%	12.2%	11.5%
					34	54	40	48	48
		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
	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

Year		2000	2001	2002	2003	2004	2005	2006	
Number of Isolates Tested									
	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	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source							
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Chicken Breasts			7.1% 20	7.6% 30	5.8% 23	8.7% 34	8.6% 36
		Ground Turkey			1.0% 3	0.3% 1	1.1% 4	1.8% 7	3.1% 12
		Ground Beef			0.0% 0	0.3% 1	0.9% 3	0.6% 2	1.0% 3
		Pork Chops			0.5% 1	0.9% 2	0.4% 1	0.0% 0	0.0% 0
		Chickens	6.3% 18	4.4% 88	5.5% 115	7.1% 97	4.9% 83	6.5% 145	10.2% 139
	Ceftriaxone (MIC ≥ 64 µg/ml)	Chicken Breasts			0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.7% 3
		Ground Turkey			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1
		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% 1	0.0% 0	0.1% 1	0.0% 1	0.1% 1
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Chicken Breasts			11.0% 31	9.3% 37	8.3% 33	11.2% 44	11.2% 47
		Ground Turkey			3.3% 10	1.2% 4	4.5% 17	3.3% 13	6.2% 24
		Ground Beef			1.4% 4	0.3% 1	1.2% 4	0.9% 3	2.0% 6
		Pork Chops			3.3% 6	2.3% 5	2.2% 5	1.5% 3	1.6% 3
		Chickens	7.4% 21	8.7% 173	8.5% 178	8.3% 113	8.2% 139	9.9% 221	15.0% 204
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Chicken Breasts			32.3% 91	38.4% 152	41.3% 165	48.1% 189	46.9% 196
		Ground Turkey			48.0% 146	51.7% 172	48.4% 182	48.0% 190	48.5% 188
		Ground Beef			9.8% 29	10.3% 32	13.0% 44	7.0% 22	12.5% 37
		Pork Chops			12.5% 23	15.1% 33	19.4% 45	14.1% 29	20.3% 37
		Chickens	57.9% 165	58.2% 1157	46.1% 969	43.9% 599	53.2% 903	51.9% 1159	48.6% 660
	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Chicken Breasts			3.5% 10	7.1% 28	4.3% 17	7.4% 29	8.9% 37
		Ground Turkey			3.9% 12	6.9% 23	3.7% 14	5.1% 20	8.0% 31
		Ground Beef			0.7% 2	0.3% 1	0.6% 2	0.6% 2	1.4% 4
		Pork Chops			1.1% 2	2.8% 6	3.9% 9	1.5% 3	2.2% 4
		Chickens	17.2% 49	12.6% 251	10.4% 218	10.5% 144	10.7% 181	10.4% 232	8.4% 114
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Chicken Breasts			0.7% 2	0.0% 0	1.8% 7	0.5% 2	2.6% 11
		Ground Turkey			0.3% 1	3.6% 12	0.8% 3	4.0% 16	2.3% 9
		Ground Beef			1.0% 3	2.3% 7	3.6% 12	1.6% 5	1.4% 4
		Pork Chops			1.6% 3	4.1% 9	4.3% 10	3.4% 7	6.6% 12
		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 Tested									
	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	
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	0.0% 0
		Ground Turkey			0.0% 0	0.3% 1	0.8% 3	0.0% 0	0.5% 2
		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	0.5% 1	0.0% 0
		Chickens	0.0% 0	0.2% 3	0.0% 1	0.1% 1	0.2% 3	0.4% 8	0.0% 0
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Chicken Breasts			2.8% 8	4.0% 16	7.0% 28	6.6% 26	5.0% 21
		Ground Turkey			4.3% 13	11.7% 39	10.6% 40	10.4% 41	5.2% 20
		Ground Beef			0.0% 0	1.0% 3	1.5% 5	1.3% 4	0.7% 2
		Pork Chops			0.5% 1	0.5% 1	0.0% 0	1.5% 3	0.5% 1
		Chickens	10.2% 29	8.4% 168	6.8% 142	6.2% 84	6.8% 115	7.5% 168	5.4% 73
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Chicken Breasts			46.1% 130	42.9% 170	48.0% 192	46.6% 183	50.7% 212
		Ground Turkey			77.0% 234	77.8% 259	74.2% 279	78.0% 309	76.5% 297
		Ground Beef			30.8% 91	25.1% 78	22.8% 77	16.5% 52	25.4% 75
		Pork Chops			52.7% 97	46.3% 101	56.0% 130	45.9% 94	52.7% 96
		Chickens	68.4% 195	61.6% 1226	58.6% 1231	52.2% 713	50.3% 853	48.9% 1092	49.0% 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 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
Resistance Pattern	Isolate Source							
1. No Resistance Detected	Chicken Breasts			27.0% 76	20.5% 81	20.8% 83	20.6% 81	23.4% 98
	Ground Turkey			16.8% 51	14.7% 49	19.1% 72	16.2% 64	16.0% 62
	Ground Beef			63.1% 186	66.9% 208	73.1% 247	81.3% 257	71.5% 211
	Pork Chops			41.3% 76	44.5% 97	37.9% 88	48.8% 100	42.9% 78
	Chickens	10.2% 29	12.9% 257	15.9% 333	16.0% 219	17.0% 288	17.7% 395	18.6% 253
2. At Least ACSSuT¹ Resistant	Chicken Breasts			0.4% 1	0.0% 0	1.3% 5	0.3% 1	1.4% 6
	Ground Turkey			0.0% 0	2.7% 9	0.5% 2	1.8% 7	0.8% 3
	Ground Beef			0.3% 1	1.0% 3	1.5% 5	0.6% 2	0.3% 1
	Pork Chops			0.5% 1	1.4% 3	1.3% 3	1.0% 2	1.1% 2
	Chickens	3.5% 10	2.0% 40	1.3% 27	1.0% 14	0.8% 14	0.6% 14	1.3% 18
3. At Least ACT/S² Resistant	Chicken Breasts			0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.0% 0
	Ground Turkey			0.0% 0	0.9% 3	0.0% 0	0.8% 3	0.3% 1
	Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.3% 1
	Pork Chops			0.5% 1	0.0% 0	0.4% 1	0.5% 1	0.0% 0
	Chickens	1.4% 4	0.6% 11	0.3% 7	0.2% 3	0.3% 5	0.3% 7	0.2% 3
4. At Least ACSSuTAuCf³ Resistant	Chicken Breasts			0.4% 1	0.0% 0	1.0% 4	0.3% 1	1.0% 4
	Ground Turkey			0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.0% 0
	Ground Beef			0.0% 0	0.0% 0	0.9% 3	0.3% 1	0.0% 0
	Pork Chops			0.0% 0	0.5% 1	0.4% 1	0.0% 0	0.0% 0
	Chickens	2.8% 8	1.1% 22	0.8% 17	0.8% 11	0.6% 10	0.5% 11	1.0% 13
5. At Least Ceftiofur and Nalidixic Acid Resistant	Chicken Breasts			0.4% 1	0.5% 2	0.8% 3	0.3% 1	0.2% 1
	Ground Turkey			0.3% 1	0.3% 1	0.3% 1	0.0% 0	0.0% 0
	Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1
	Pork Chops			0.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Chickens	1.4% 4	0.3% 5	0.4% 9	0.9% 12	0.4% 7	0.7% 16	0.4% 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
Cephameycins	Cefoxitin	0.5 - 32
Folate Pathway Inhibitors	Sulfisoxazole	16 - 256
	Trimethoprim–Sulfamethoxazole	0.12 / 2.4 - 4 / 76
Phenicol	Chloramphenicol	2 - 32
Quinolones	Ciprofloxacin	0.015 - 4
	Nalidixic acid	0.5 - 32
Tetracyclines	Tetracycline	4 - 32

Table A2. Concentration Ranges Used for Susceptibility Testing of *Campylobacter*, 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
Phenicol	Florfenicol	0.03 - 64
Quinolones	Ciprofloxacin	0.015 - 64
	Nalidixic acid	4 - 64
Tetracyclines	Tetracycline	0.06 - 64