



U.S. Food and Drug Administration

Notice: Archived Document

The content in this document is provided on the FDA's website for reference purposes only. This content has not been altered or updated since it was archived.

**N
A
R
M
S**

**ational
ntimicrobial
esistance
onitoring
ystem**

2005

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.....	3
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> Typhimurium.....	34
F. Antimicrobial Susceptibility among <i>Salmonella</i> Enteritidis.....	41
G. Antimicrobial Susceptibility among <i>Salmonella</i> Newport.....	47
H. Antimicrobial Susceptibility among <i>Salmonella</i> Heidelberg	54
IV. <i>Campylobacter</i> Data	61
A. <i>Campylobacter jejuni</i> and <i>Campylobacter coli</i> Isolates Tested	61
B. Isolation of <i>Campylobacter</i> from Retail Meats	62
C. <i>Campylobacter</i> Species.....	63
D. Antimicrobial Susceptibility among <i>Campylobacter jejuni</i>	64
E. Antimicrobial Susceptibility among <i>Campylobacter coli</i>	69
V. <i>Escherichia coli</i> Data	73
A. <i>E. coli</i> Isolates Tested.....	73
B. Isolation of <i>E. coli</i> from Retail Meats.....	74
C. Antimicrobial Susceptibility among <i>E. coli</i>	75
Appendix.....	82

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 2005 from food animals at federally inspected plants, retail meats, and human clinical cases. The report also includes susceptibility data on *Escherichia coli* isolates recovered from retail meats and chickens in 2005. For comparison purposes, summary data from prior years are included.

Suggested Citation: FDA. National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS): 2005 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 involved in antimicrobial resistance monitoring in other countries so that information can be shared on the global dimensions of antimicrobial resistance in foodborne bacteria.

NARMS monitors antimicrobial susceptibility among enteric bacteria from humans, retail meats, and food animals. Monitoring is conducted for two categories of enteric bacteria: zoonotic bacterial pathogens (e.g., *Salmonella* and *Campylobacter*) and other bacteria (e.g., *Escherichia coli* and *Enterococcus*). *Salmonella* was chosen as the sentinel pathogen for the NARMS program at its inception in 1996. *Campylobacter* was later added, followed by *E. coli* and *Enterococcus*. Monitoring of *E. coli* and *Enterococcus* isolates was 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. NARMS also examines *Salmonella* and *Campylobacter* isolates for genetic relatedness using pulsed-field gel electrophoresis (PFGE). In addition, NARMS conducts epidemiologic and microbiologic research studies. These studies may examine isolates of a particular serotype or those exhibiting a particular resistance pattern, or they may focus on improving the culture, isolation, or antimicrobial susceptibility testing methodology of target bacteria. In addition to the Executive Report, comprehensive annual NARMS reports are published separately by CDC, FDA, and USDA.

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 or “arms” 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). 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.

The program initially included non-Typhi *Salmonella* and *E. coli* O157 isolates from 14 state and local health departments. It later expanded to include additional bacteria and testing sites. In 1997, testing was expanded to include monitoring of resistance among *Campylobacter* isolates from humans in five sites participating in FoodNet. In 1999, testing of *Salmonella* Typhi and *Shigella* isolates was added. Since 2003, all 50 states have been forwarding to CDC a representative sample of non-Typhi *Salmonella*, *Salmonella* Typhi, *Shigella*, and *E. coli* O157 isolates for antimicrobial susceptibility testing. Testing of *Campylobacter* also expanded over time and by 2003, 10 FoodNet states participated in *Campylobacter* surveillance.

An *Enterococcus* study began in 2001 to monitor antimicrobial resistance among strains isolated from human stool samples. Stool samples were collected from outpatients at four sites and healthy volunteers at one site. An *E. coli* component was added to the study in 2004. Stool specimens for the *E. coli* study were from outpatients at two sites.

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*. Bacterial identification and antimicrobial susceptibility testing of retail meat isolates were performed at CVM’s Office of Research in Laurel, Maryland.

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 antimicrobial susceptibility among *Salmonella* isolates. After testing only *Salmonella* in 1997, the NARMS animal component was 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.

D. Links to Additional Information

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

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

FDA: http://www.fda.gov/cvm/narms_pg.html

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. Sampling strategies necessarily differ among the three components of NARMS and 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. Subsequently, additional sites joined the program. Since 2003, *Salmonella* isolates have been collected from clinical laboratories by state and local health departments in all 50 states. *Salmonella* serotyping was performed by the participating state and local public health laboratories prior to shipping the stains 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.

Campylobacter surveillance began in 1997 with five FoodNet sites, and expanded to 10 sites by 2003 (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee). From 1997 to 2004, one isolate per week was submitted from each site. In 2005, a new scheme for selecting a representative sample of isolates was initiated. 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 FoodNet site attempted to purchase a total of 40 meat samples per month, which included 10 samples each of chicken breasts, ground turkey, ground beef, and pork chops. An attempt was made by each site to sample as many different stores as possible each month and to purchase as many different brands of fresh (not frozen) meat and poultry as possible. All sites cultured the retail meats for *Salmonella* and *Campylobacter*. Four sites (Georgia, Maryland, Oregon, and Tennessee) also cultured the meats for *E. coli*. Isolates were sent to CVM's Office of Research for serotype/species confirmation and antimicrobial susceptibility testing.

3. Animal Component

The animal component of NARMS began in 1997 after pilot studies were conducted in 1995 and 1996. The *Salmonella* isolates included in this report were recovered by USDA's Food Safety Inspection Service (FSIS) from carcass rinsates (chicken), carcass swabs (turkey, cattle, and swine), and ground products (chicken, turkey, and beef). The samples were collected from all

federally inspected slaughter and processing plants throughout the U.S. as part of the Pathogen Reduction/Hazard Analysis and Critical Control Point (PR/HACCP) verification testing program and pre-implementation testing. Serotyping was performed by the National Veterinary Services Laboratories (NVSL).

In 1998, *Campylobacter* isolates were submitted from the Eastern FSIS laboratory, and in 1999 and 2000, 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.¹ 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 spent 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 2005, when the new ARS isolation method was used.

USDA began testing *E. coli* isolates for antimicrobial susceptibility in 2000. ARS isolated the *E. coli* from spent 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 arrays 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 2005, *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.^{2,3,4}

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,

¹ http://www.fsis.usda.gov/Science/Microbiological_Lab_Guidebook/index.asp

² The organization was known as the National Committee on Clinical Laboratory Standards (NCCLS) until the name was changed in January of 2005 to CLSI. In this report, the name CLSI is used.

³ **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.

⁴ **CLSI.** 2005. Performance Standards for Antimicrobial Susceptibility Testing; Fifteenth Informational Supplement. CLSI document M100-S15. CLSI, Wayne, PA.

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.¹ 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 2006.² 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 the 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.^{3,4} For *Campylobacter*, CLSI breakpoints were available only for ciprofloxacin, doxycycline, erythromycin, and tetracycline.² 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 In USDA's NARMS annual reports, MIC values were not rounded up prior to interpretation.

² 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.

³ CLSI. 2009. Performance Standards for Antimicrobial Susceptibility Testing; Nineteenth Informational Supplement. CLSI document M100-S19. CLSI, Wayne, PA.

⁴ 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.

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
	Cephalothin ²	≤ 8	16	≥ 32
Cephameycins	Cefoxitin	≤ 8	16	≥ 32
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ³	≤ 256	N/A	≥ 512
	Trimethoprim–Sulfamethoxazole	≤ 2 / 38	N/A	≥ 4 / 76
Phenicol	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 Cephalothin was tested through 2003

³ 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 presented for all non-Typhi *Salmonella*, as well as the following four *Salmonella* serotypes: Typhimurium, Enteritidis, Newport, and Heidelberg. Section IV 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 all 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 2005. 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 2005.³ 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 report because surveillance was not conducted or isolates were not available for testing. Similar tables are presented for *Salmonella* serotypes Typhimurium, Enteritidis, Newport, and Heidelberg.

Resistance to ceftiofur and nalidixic acid among *Salmonella* isolates is highlighted in several pie charts and graphs (Figures 6-14).^{4,5} 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. Elevated MICs ($\geq 8 \mu\text{g/ml}$) to ceftiofur are usually indicative of the presence of the AmpC gene and 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 ($\text{MIC} \geq 0.125 \mu\text{g/ml}$).

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 2005, as described in Section IIA.

⁴ Note that the scales vary from figure to figure, based on the maximum percent resistance.

⁵ 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.

Finally, for *Salmonella* and *E. coli* isolates, data on multidrug resistance (MDR) phenotypes of public health importance are also presented (Tables 13-17, 20, 22, 25, 28, and 43).

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 specific isolates are retested. In a few cases, differences may be due to other reasons. For example, Etest[®] MIC results for *Campylobacter* that fell between the two-fold dilutions described in CLSI documents were rounded up to the next two-fold dilution prior to interpretation in this report, but not in USDA's annual reports.

III. *Salmonella* (non-Typhi) Data

A. *Salmonella* (non-Typhi) Isolates Tested

Table 3. Number of *Salmonella* (non-Typhi) Isolates Tested, by Source and Year, 1996-2005

Source	Year									
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052
Chicken Breasts							60	83	157	153
Ground Turkey							74	114	142	183
Ground Beef							9	10	14	8
Pork Chops							10	5	11	9
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989
Turkeys		107	240	713	518	550	244	262	236	227
Cattle		24	284	1610	1388	893	1008	670	607	329
Swine		111	793	876	451	418	379	211	308	301

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

Table 4. Number and Percent of Retail Meat Samples Positive for *Salmonella*, 2005

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	1194	1195	1196	1196
Number Positive for <i>Salmonella</i>	153	183	8	9
Percent Positive for <i>Salmonella</i>	12.8%	15.3%	0.7%	0.8%

Figure 1. Percent of Retail Meat Samples Positive for *Salmonella*, 2005

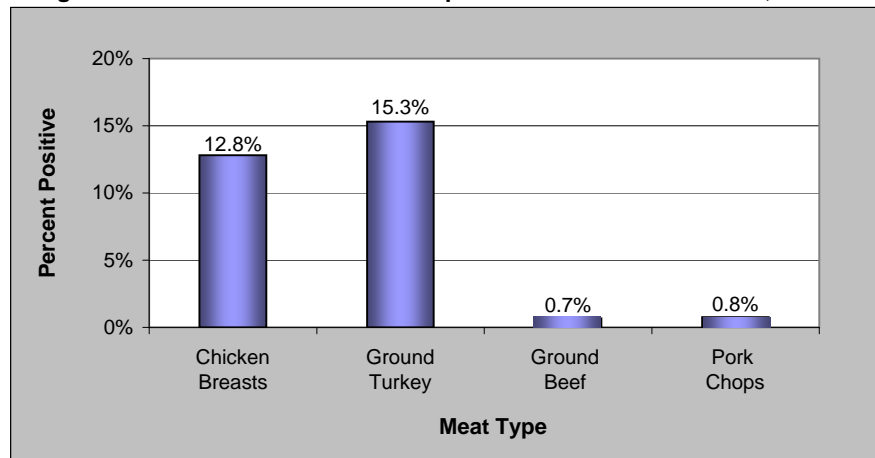
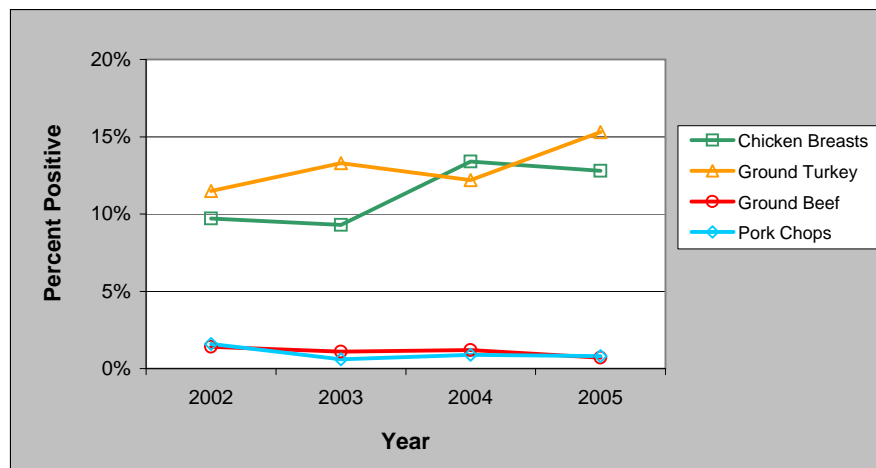


Figure 2. Percent of Retail Meat Samples Positive for *Salmonella*, 2002-2005



C. *Salmonella* (non-Typhi) Serotypes

Table 5. Most Common Serotypes among *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2005

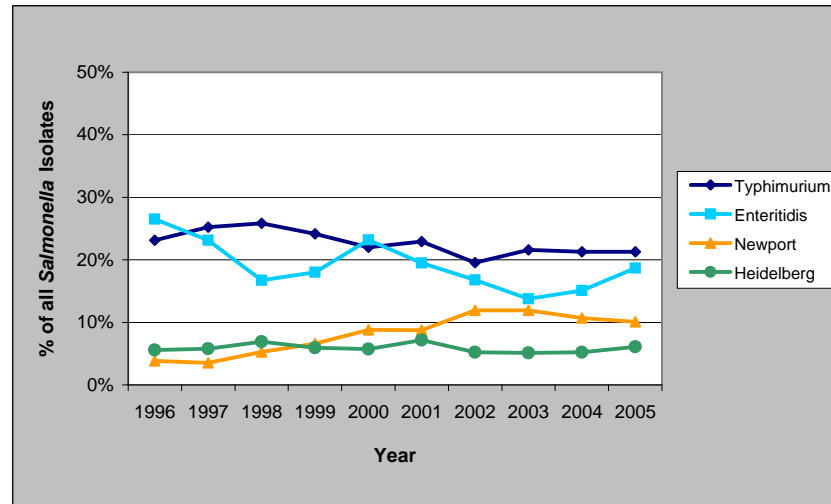
Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (n=2052)	Typhimurium	437	21.3	Chicken Breasts (n=153)	Kentucky	60	39.2	Chickens (n=1989)	Kentucky	919	46.2
	Enteritidis	383	18.7		Typhimurium	29	19.0		Heidelberg	283	14.2
	Newport	207	10.1		Heidelberg	22	14.4		Typhimurium	183	9.2
	Heidelberg	125	6.1		Enteritidis	12	7.8		Enteritidis	173	8.7
	Javiana	75	3.7		Hadar	9	5.9		I 4,[5],12:i:-	102	5.1
	Montevideo	48	2.3		I 4,[5],12:i:-	9	5.9		Montevideo	62	3.1
	Braenderup	47	2.3		Bredeney	2	1.3		Schwarzengrund	51	2.6
	Muechen	44	2.1		Mbandaka	2	1.3		Thompson	23	1.2
	Saintpaul	41	2.0		Anatum	1	0.7		Mbandaka	20	1.0
	Paratyphi B ¹	38	1.9		I 4,5,12:nonmotile	1	0.7		Other	173	8.7
	Mississippi	37	1.8	Other	6	3.9					
	I 4,[5],12:i:-	33	1.6								
	Oranienburg	33	1.6	Ground Turkey (n=183)	Heidelberg	53	29.0	Turkeys (n=227)	Hadar	48	21.1
	Infantis	30	1.5		Saintpaul	24	13.1		Saintpaul	29	12.8
	Thompson	26	1.3		Illa 18:z4,z23:-	17	9.3		Heidelberg	25	11.0
	Agona	22	1.1		Hadar	13	7.1		Reading	19	8.4
	Poona	19	0.9		Reading	10	5.5		Schwarzengrund	14	6.2
	Mbandaka	17	0.8		Brandenburg	8	4.4		Illa 18:z4,z23:-	11	4.8
	Stanley	17	0.8		Schwarzengrund	8	4.4		Senftenberg	8	3.5
	Other	373	18.2		Senftenberg	8	4.4		Agona	7	3.1
			Agona		5	2.7	Typhimurium		7	3.1	
			Montevideo		4	2.2	Albany		6	2.6	
			Berta	3	1.6	Muenchen	5	2.2			
			I 4,12:d:-	3	1.6	Kentucky	5	2.2			
			Muenster	3	1.6	Newport	5	2.2			
			Newport	3	1.6	Berta	4	1.8			
			Chester	2	1.1	Brandenburg	4	1.8			
			I 4, 5, 12:d:-	2	1.1	Worthington	4	1.8			
			Other	17	9.3	Other	26	11.5			
			Ground Beef (n=8)	Muenster	3	37.5	Cattle (n=329)	Montevideo	43	13.1	
				Montevideo	2	25.0		Typhimurium	34	10.3	
				Dublin	1	12.5		Newport	27	8.2	
				Minnesota	1	12.5		Muenster	24	7.3	
				Saintpaul	1	12.5		Anatum	21	6.4	
						Mbandaka		15	4.6		
						Agona		15	4.6		
						Dublin		13	4.0		
						Cerro		12	3.6		
						Reading		12	3.6		
						Other	113	34.3			
			Pork Chops (n=9)	Anatum	2	22.2	Swine (n=301)	Derby	85	28.2	
				Muenchen	2	22.2		Typhimurium	42	14.0	
				Typhimurium	2	22.2		Infantis	27	9.0	
				Agona	1	11.1		Anatum	16	5.3	
				Infantis	1	11.1		Johannesburg	15	5.0	
			Senftenberg	1	11.1	Saintpaul		11	3.7		
						Reading		11	3.7		
						London		11	3.7		
						Adelaide		10	3.3		
						Other		73	24.3		

¹ Paratyphi B var. L(+) tartrate+

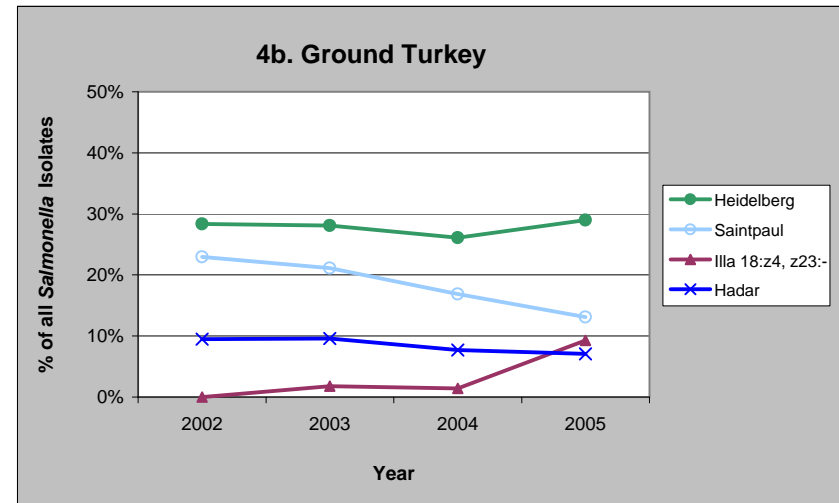
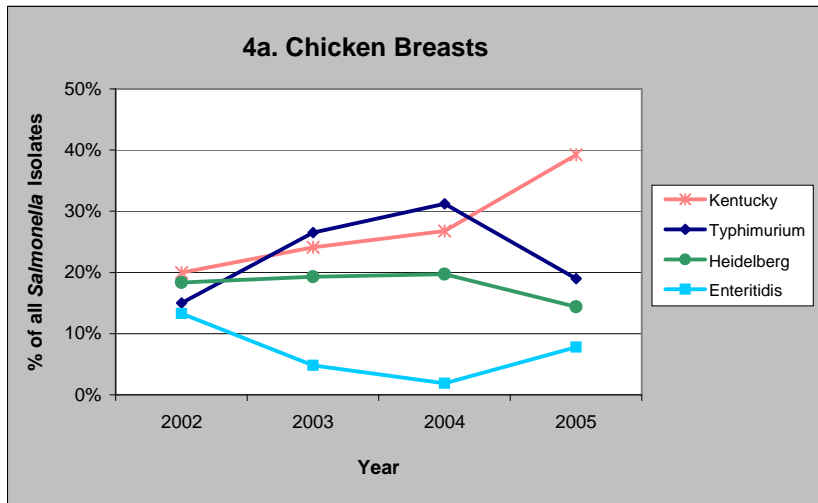
Table 6. Most Common *Salmonella* (non-Typhi) Serotypes in Humans and their Distributions among Retail Meat and Food Animal Isolates, by Meat Type and Animal Source, 2005

	Humans	Retail Meats				Food Animals			
	Humans (n=2052)	Chicken Breast (n=153)	Ground Turkey (n=183)	Ground Beef (n=8)	Pork Chops (n=9)	Chickens (n=1989)	Turkeys (n=227)	Cattle (n=329)	Swine (n=301)
1. Typhimurium	21.3% 437	19.0% 29	0.5% 1	0.0% 0	22.2% 2	9.2% 183	3.1% 7	10.3% 34	14.0% 42
2. Enteritidis	18.7% 383	7.8% 12	0.0% 0	0.0% 0	0.0% 0	8.7% 173	0.0% 0	0.6% 2	0.0% 0
3. Newport	10.1% 207	0.0% 0	1.6% 3	0.0% 0	0.0% 0	0.3% 6	2.2% 5	8.2% 27	0.3% 1
4. Heidelberg	6.1% 125	14.4% 22	29.0% 53	0.0% 0	0.0% 0	14.2% 283	11.0% 25	1.8% 6	2.7% 8
5. Javiana	3.7% 75	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.0% 0
6. Montevideo	2.3% 48	0.7% 1	2.2% 4	25.0% 2	0.0% 0	3.1% 62	1.3% 3	13.1% 43	0.3% 1
7. Braenderup	2.3% 47	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 7	0.0% 0	0.0% 0	0.0% 0
8. Muenchen	2.1% 44	0.0% 0	0.0% 0	0.0% 0	22.2% 2	0.1% 1	2.2% 5	2.4% 8	1.3% 4
9. Saintpaul	2.0% 41	0.0% 0	13.1% 24	12.5% 1	0.0% 0	0.0% 0	12.8% 29	0.3% 1	3.7% 11
10. Paratyphi B var L(+) tartrate+	1.9% 38	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.2% 4	0.0% 0

Figure 3. Most Common *Salmonella* (non-Typhi) Serotypes from Humans in 2005 and their Relative Frequencies, by Year, 1996-2005



Figures 4a-b. Most Common *Salmonella* (non-Typhi) Serotypes from Retail Poultry in 2005 and their Relative Frequencies, by Year, 2002-2005



Figures 5a-d. Most Common *Salmonella* (non-Typhi) Serotypes from Food Animals in 2005 and their Relative Frequencies, by Year, 1997-2005

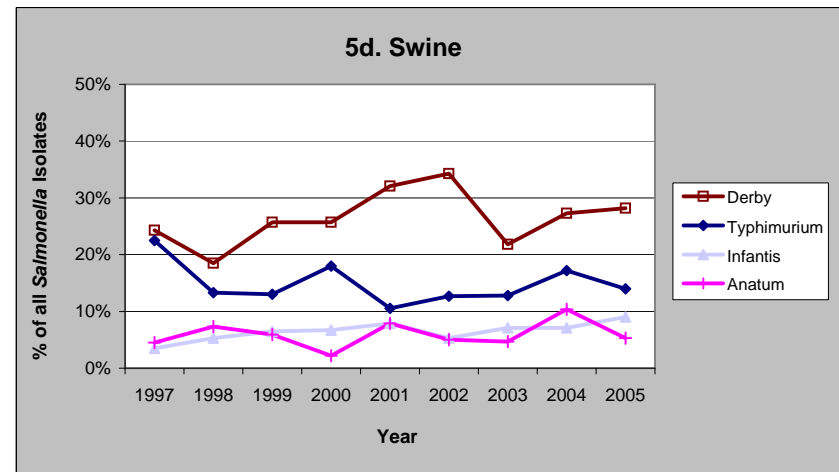
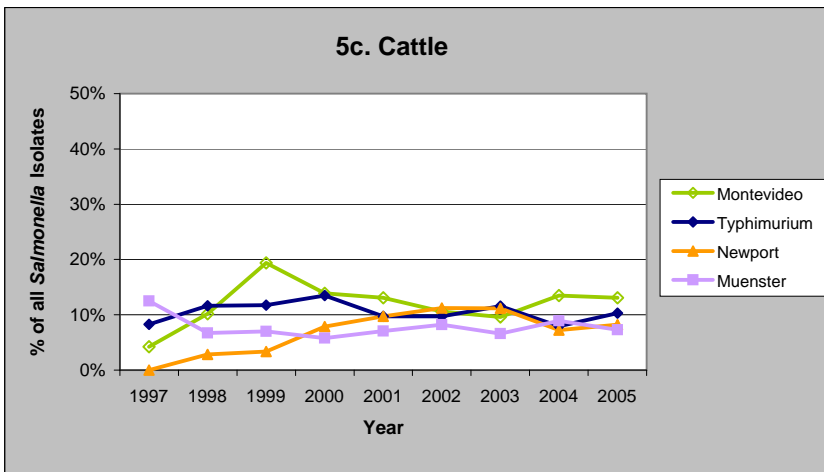
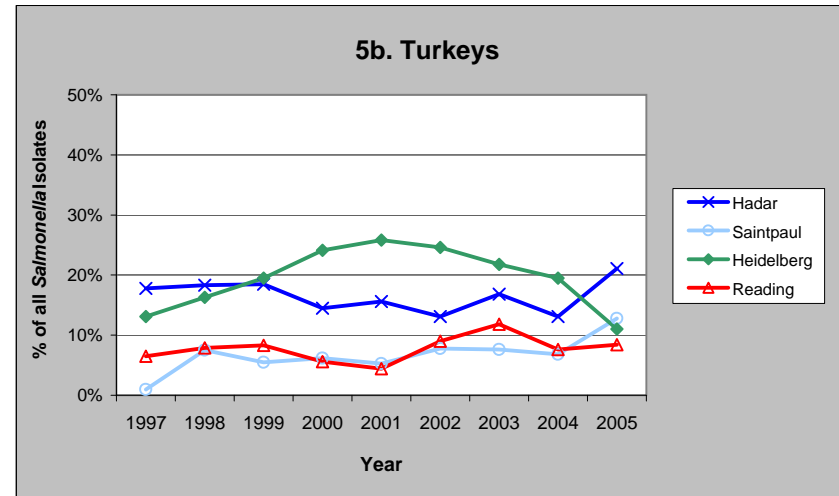
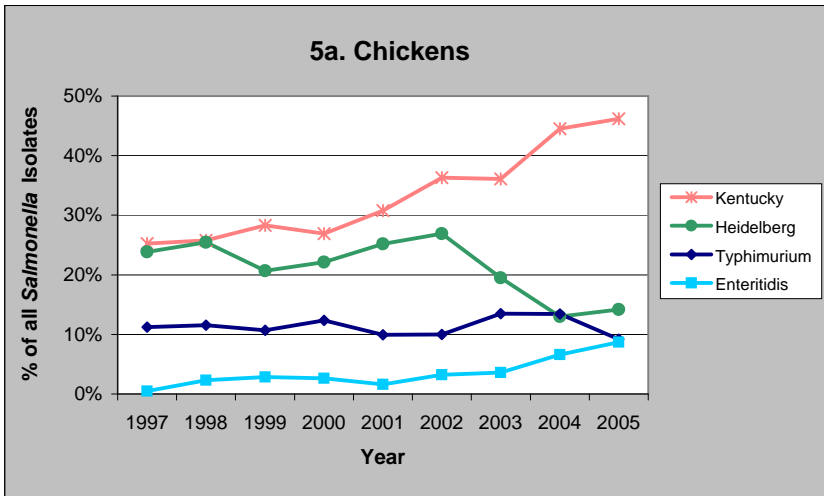


Table 7c. Distribution of MICs and Occurrence of Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2005

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
Cephamycins Cefoxitin	Humans (2052)	<0.1	3.0	[2.3 - 3.9]	0.4 35.9 47.2 12.3 1.1 <0.1 0.7 2.3														
	Chicken Breasts (153)	0.7	20.9	[14.8 - 28.2]	25.5 48.4 4.6 0.7 11.1 9.8														
	Ground Turkey (183)	0.0	7.1	[3.8 - 11.8]	23.5 46.4 20.8 2.2 3.8 3.3														
	Ground Beef (8)	0.0	0.0	[0.0 - 36.9]	50.0 37.5 12.5														
	Pork Chops (9)	11.1	0.0	[0.0 - 33.6]	11.1 22.2 55.6 11.1														
	Chickens (1989)	0.4	12.0	[10.6 - 13.5]	5.5 66.7 14.2 1.3 0.4 9.6 2.4														
	Turkeys (227)	0.0	3.5	[1.5 - 6.8]	1.3 56.8 34.4 4.0 0.9 2.6														
	Cattle (329)	2.1	19.8	[15.6 - 24.5]	3.0 32.8 39.2 3.0 2.1 8.5 11.2														
Swine (301)	0.7	3.7	[1.8 - 6.4]	0.3 2.3 33.6 56.1 3.3 0.7 2.0 1.7															
Folate Pathway Inhibitors Sulfisoxazole	Humans (2052)	N/A	12.5	[11.1 - 14.0]	23.4 48.7 14.6 0.7 0.1 12.5														
	Chicken Breasts (153)	N/A	17.0	[11.4 - 23.9]	11.1 28.1 41.8 2.0 17.0														
	Ground Turkey (183)	N/A	34.4	[27.6 - 41.8]	3.3 23.0 39.3 34.4														
	Ground Beef (8)	N/A	25.0	[3.2 - 65.1]	12.5 62.5 25.0														
	Pork Chops (9)	N/A	33.3	[7.5 - 70.1]	11.1 22.2 33.3 33.3														
	Chickens (1989)	N/A	8.5	[7.3 - 9.8]	44.0 38.9 7.6 0.9 0.2 8.5														
	Turkeys (227)	N/A	37.0	[30.7 - 43.6]	19.4 32.6 9.7 1.3 37.0														
	Cattle (329)	N/A	27.4	[22.6 - 32.5]	17.3 33.1 17.3 4.9 27.4														
Swine (301)	N/A	32.9	[27.6 - 38.5]	33.6 23.9 8.3 1.0 0.3 32.9															
Trimethoprim-Sulfamethoxazole	Humans (2052)	N/A	1.7	[1.2 - 2.3]	91.2 6.7 0.3 <0.1 1.7														
	Chicken Breasts (153)	N/A	0.0	[0.0 - 2.4]	98.7 1.3 0.5														
	Ground Turkey (183)	N/A	0.5	[0.0 - 3.0]	96.2 2.7 0.5 0.5														
	Ground Beef (8)	N/A	0.0	[0.0 - 36.9]	87.5 12.5 11.1														
	Pork Chops (9)	N/A	11.1	[0.3 - 48.2]	77.8 11.1 11.1														
	Chickens (1989)	N/A	0.2	[0.1 - 0.5]	77.8 21.3 0.5 0.2 0.1 0.2														
	Turkeys (227)	N/A	1.8	[0.5 - 4.5]	67.4 29.5 1.3 1.8														
	Cattle (329)	N/A	4.9	[2.8 - 7.8]	64.1 24.6 5.5 0.9 4.9														
Swine (301)	N/A	2.3	[0.9 - 4.7]	62.1 30.2 5.0 0.3 2.3															
Phenicol Chloramphenicol	Humans (2052)	0.5	7.7	[6.6 - 9.0]	2.0 64.6 25.1 0.5 0.1 7.6														
	Chicken Breasts (153)	0.0	0.7	[0.0 - 3.6]	1.3 65.4 32.7 0.7														
	Ground Turkey (183)	2.7	0.5	[0.0 - 3.0]	41.0 55.7 2.7 0.5														
	Ground Beef (8)	0.0	12.5	[0.3 - 52.7]	12.5 75.0 12.5														
	Pork Chops (9)	11.1	22.2	[2.8 - 60.0]	11.1 22.2 33.3 11.1 22.2														
	Chickens (1989)	0.6	1.8	[1.3 - 2.5]	4.0 53.5 40.1 0.6 0.2 1.7														
	Turkeys (227)	2.6	4.8	[2.4 - 8.5]	37.9 54.6 2.6 4.8														
	Cattle (329)	2.4	21.9	[17.5 - 26.7]	0.9 23.1 51.7 2.4 0.3 21.6														
Swine (301)	3.7	10.6	[7.4 - 14.7]	0.7 21.6 63.5 3.7 10.6															

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 2005 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, 2005

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
Quinolones																		
Ciprofloxacin	Humans (2052)	0.0	<0.1	[0.0 - 0.3]	96.2	1.0	0.3	1.1	0.6	0.8	<0.1				<0.1			
	Chicken Breasts (153)	0.0	0.0	[0.0 - 2.4]	88.2	11.1		0.7										
	Ground Turkey (183)	0.0	0.0	[0.0 - 2.0]	80.9	16.4	1.6	0.5	0.5									
	Ground Beef (8)	0.0	0.0	[0.0 - 36.9]	75.0	25.0												
	Pork Chops (9)	0.0	0.0	[0.0 - 33.6]	77.8	22.2												
	Chickens (1989)	0.0	0.0	[0.0 - 0.2]	96.2	3.5	0.1	0.2	0.1									
	Turkeys (227)	0.0	0.0	[0.0 - 1.6]	91.2	6.6			1.8	0.4								
	Cattle (329)	0.0	0.0	[0.0 - 1.1]	92.1	6.4		0.3	0.9	0.3								
	Swine (301)	0.0	0.0	[0.0 - 1.2]	92.0	7.6			0.3									
Nalidixic Acid																		
Nalidixic Acid	Humans (2052)	N/A	2.4	[1.8 - 3.2]						0.1	0.5	31.5	63.8	1.2	0.4			2.4
	Chicken Breasts (153)	N/A	0.7	[0.0 - 3.6]							0.7	27.5	69.3	1.3	0.7			0.7
	Ground Turkey (183)	N/A	1.1	[0.1 - 3.9]								14.2	80.9	3.8				1.1
	Ground Beef (8)	N/A	0.0	[0.0 - 36.9]									100.0					
	Pork Chops (9)	N/A	0.0	[0.0 - 33.6]									11.1	77.8	11.1			
	Chickens (1989)	N/A	0.3	[0.1 - 0.7]						0.2	39.7	58.5	1.3	0.1				0.3
	Turkeys (227)	N/A	2.2	[0.7 - 5.1]						0.4	17.2	77.5	2.6					2.2
	Cattle (329)	N/A	1.5	[0.5 - 3.5]						0.3	14.9	82.4	0.6	0.3				1.5
	Swine (301)	N/A	0.3	[0.0 - 1.8]						0.3	16.6	80.4	2.3					0.3
Tetracyclines																		
Tetracycline	Humans (2052)	0.1	13.7	[12.3 - 15.3]									86.2	0.1	1.4	4.4	8.0	
	Chicken Breasts (153)	0.0	43.8	[35.8 - 52.0]									56.2			0.7	43.1	
	Ground Turkey (183)	0.0	39.9	[32.7 - 47.4]									60.1			0.5	39.3	
	Ground Beef (8)	0.0	12.5	[0.3 - 52.7]									87.5				12.5	
	Pork Chops (9)	0.0	55.6	[21.2 - 86.3]									44.4			11.1	44.4	
	Chickens (1989)	0.4	28.3	[26.3 - 30.3]									71.3	0.4	0.2	1.2	26.9	
	Turkeys (227)	0.4	54.6	[47.9 - 61.2]									44.9	0.4		4.4	50.2	
	Cattle (329)	0.9	34.0	[28.9 - 39.4]									65.0	0.9	1.2	5.5	27.4	
	Swine (301)	1.0	54.8	[49.0 - 60.5]									44.2	1.0		11.3	43.5	

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 2005 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, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052	
	Chicken Breasts							60	83	157	153	
	Ground Turkey							74	114	142	183	
	Ground Beef							9	10	14	8	
	Pork Chops							10	5	11	9	
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	
	Turkeys		107	240	713	518	550	244	262	236	227	
	Cattle		24	284	1610	1388	893	1008	670	607	329	
Swine		111	793	876	451	418	379	211	308	301		
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%
		Chicken Breasts		0	0	1	0	0	0	0	0	1
		Ground Turkey							0.0%	0.0%	0.0%	0.0%
		Ground Beef							0	0	0	0
		Pork Chops							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%
		Turkeys		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine		0.0%	0.0%	0.0%	0.0%	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%
		Chicken Breasts	63	38	41	32	37	27	27	26	24	44
		Ground Turkey							10.0%	6.0%	3.8%	3.3%
		Ground Beef							6	5	6	5
		Pork Chops							14.9%	22.8%	20.4%	26.8%
		Chickens		17.8%	15.3%	10.4%	14.9%	7.9%	5.5%	6.3%	4.9%	4.3%
		Turkeys		20.6%	18.3%	17.5%	16.2%	20.9%	19.3%	21.0%	25.4%	22.9%
		Cattle		0.0%	1.8%	1.6%	2.1%	2.1%	2.6%	2.7%	1.8%	2.4%
		Swine		0.9%	0.8%	1.1%	1.3%	1.4%	0.8%	0.5%	1.3%	2.7%
	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%
		Chicken Breasts	66	67	83	65	77	68	76	64	50	70
		Ground Turkey							6.7%	4.8%	11.5%	4.6%
		Ground Beef							4	4	18	7
		Pork Chops							18.9%	27.2%	18.3%	20.2%
		Chickens		2.3%	3.2%	1.2%	4.1%	2.4%	2.0%	2.8%	2.7%	2.5%
		Turkeys		24.3%	17.1%	21.5%	21.4%	22.9%	24.2%	16.0%	14.4%	19.8%
		Cattle		8.3%	9.5%	7.1%	6.6%	6.9%	10.1%	13.7%	8.9%	13.1%
		Swine		11.7%	7.2%	6.7%	9.3%	6.9%	4.2%	5.7%	3.9%	5.0%
	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%
		Chicken Breasts	273	278	272	250	224	241	265	279	212	225
		Ground Turkey							28.3%	26.5%	28.0%	30.1%
		Ground Beef							17	22	44	46
		Pork Chops							37.8%	45.6%	34.5%	44.3%
		Chickens		24.3%	27.8%	27.5%	28.6%	21.0%	22.9%	19.6%	22.2%	23.3%
		Turkeys		34.6%	40.8%	43.6%	41.9%	46.7%	37.7%	29.4%	33.9%	40.1%
		Cattle		12.5%	16.2%	15.4%	21.3%	20.3%	25.9%	28.7%	20.9%	24.3%
		Swine		27.9%	29.4%	29.3%	39.2%	35.6%	40.1%	30.8%	36.4%	36.5%

Table 8b. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052	
	Chicken Breasts							60	83	157	153	
	Ground Turkey							74	114	142	183	
	Ground Beef							9	10	14	8	
	Pork Chops							10	5	11	9	
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	
	Turkeys		107	240	713	518	550	244	262	236	227	
	Cattle		24	284	1610	1388	893	1008	670	607	329	
Swine		111	793	876	451	418	379	211	308	301		
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
		Chicken Breasts							16.7% 10	33.7% 28	30.6% 48	26.8% 41
		Ground Turkey							16.2% 12	28.9% 33	20.4% 29	26.8% 49
		Ground Beef							22.2% 2	40.0% 4	21.4% 3	25.0% 2
		Pork Chops							40.0% 4	40.0% 2	9.1% 1	22.2% 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
		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
		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
		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
		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
Chicken Breasts									10.0% 6	25.3% 21	24.8% 39	21.6% 33
Ground Turkey									12.2% 9	11.4% 13	7.7% 11	8.7% 16
Ground Beef									22.2% 2	40.0% 4	14.3% 2	0.0% 0
Pork Chops									20.0% 2	20.0% 1	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
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
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
Swine				0.0% 0	0.4% 3	1.0% 9	1.8% 8	2.6% 11	3.7% 14	3.8% 8	1.9% 6	4.3% 13
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
		Chicken Breasts							10.0% 6	25.3% 21	24.8% 39	20.9% 32
		Ground Turkey							8.1% 6	2.6% 3	4.9% 7	7.1% 13
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	0.0% 0
		Pork Chops							20.0% 2	20.0% 1	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
		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
		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
		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
		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
	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	2.7% 5
	Ground Beef								0.0% 0	10.0% 1	7.1% 1	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	0.1% 1	0.0% 0	0.3% 5	0.1% 1	0.5% 6	0.3% 5
	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
	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
	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

Table 8c. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052	
	Chicken Breasts							60	83	157	153	
	Ground Turkey							74	114	142	183	
	Ground Beef							9	10	14	8	
	Pork Chops							10	5	11	9	
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	
	Turkeys		107	240	713	518	550	244	262	236	227	
	Cattle		24	284	1610	1388	893	1008	670	607	329	
Swine		111	793	876	451	418	379	211	308	301		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Humans	2.9% 39	2.2% 29	2.3% 33	3.5% 53	4.0% 55	4.0% 57	5.0% 101	5.4% 100		
		Chicken Breasts							13.3% 8	28.9% 24		
		Ground Turkey							14.9% 11	28.9% 33		
		Ground Beef							22.2% 2	40.0% 4		
		Pork Chops							20.0% 2	40.0% 2		
		Chickens		1.4% 3	4.5% 25	5.8% 83	7.8% 91	4.7% 62	10.5% 158	10.4% 121		
		Turkeys		5.6% 6	5.0% 12	10.5% 75	8.3% 43	13.1% 72	9.8% 24	11.1% 29		
		Cattle		0.0% 0	2.1% 6	4.7% 76	9.9% 137	11.6% 104	17.7% 178	21.2% 142		
		Swine		0.0% 0	0.1% 1	0.8% 7	2.4% 11	2.2% 9	3.2% 12	3.8% 8		
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
		Chicken Breasts							10.0% 6	25.3% 21	24.8% 39	20.9% 32
		Ground Turkey							8.1% 6	2.6% 3	4.9% 7	7.1% 13
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	0.0% 0
		Pork Chops							20.0% 2	20.0% 1	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
		Turkeys					3.3% 17	4.5% 25	2.5% 6	1.1% 3	5.1% 12	3.5% 8
		Cattle					9.1% 126	11.1% 99	15.9% 160	17.8% 119	13.2% 80	19.8% 65
		Swine					1.3% 6	2.2% 9	2.9% 11	4.3% 9	1.9% 6	3.7% 11
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
		Chicken Breasts							16.7% 10	14.5% 12	28.7% 45	17.0% 26
		Ground Turkey							20.3% 15	33.3% 38	28.2% 40	34.4% 63
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	25.0% 2
		Pork Chops							70.0% 7	40.0% 2	18.2% 2	33.3% 3
		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
		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
		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
		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
	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
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							1.4% 1	0.0% 0	0.0% 0	0.5% 1
		Ground Beef							0.0% 0	0.0% 0	7.1% 1	0.0% 0
		Pork Chops							20.0% 2	0.0% 0	0.0% 0	11.1% 1
		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
		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
		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
		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

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, 1996-2005

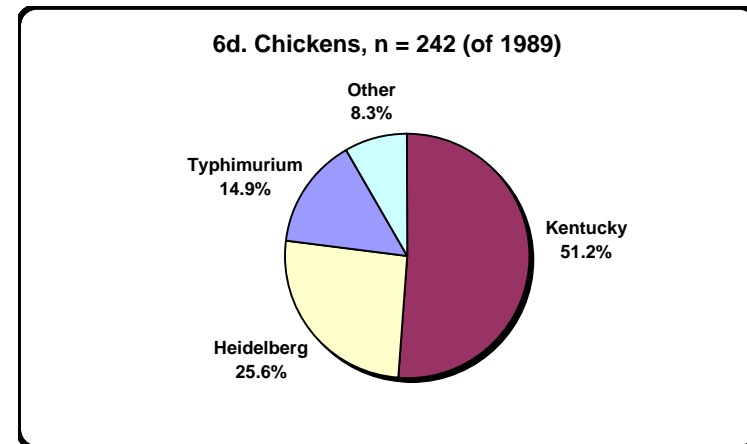
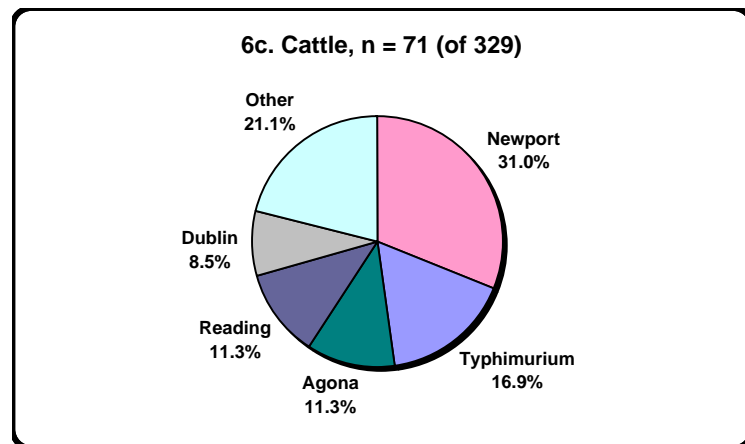
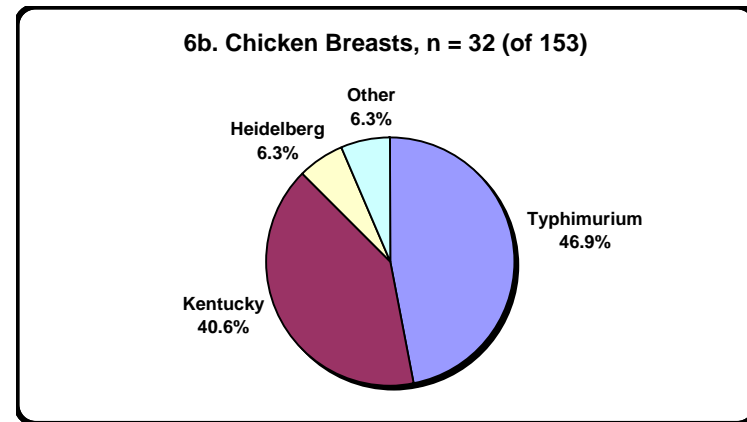
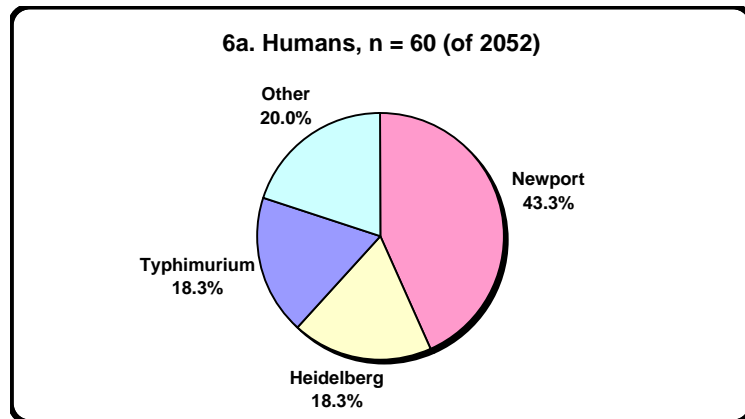
Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052	
	Chicken Breasts							60	83	157	153	
	Ground Turkey							74	114	142	183	
	Ground Beef							9	10	14	8	
	Pork Chops							10	5	11	9	
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	
	Turkeys		107	240	713	518	550	244	262	236	227	
	Cattle		24	284	1610	1388	893	1008	670	607	329	
Swine		111	793	876	451	418	379	211	308	301		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Phenicol	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
		Chicken Breasts							0.0% 0	2.4% 2	1.9% 3	0.7% 1
		Ground Turkey							1.4% 1	0.9% 1	2.8% 4	0.5% 1
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	12.5% 1
		Pork Chops							40.0% 4	40.0% 2	18.2% 2	22.2% 2
		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
		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
		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
		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
		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
Chicken Breasts									0.0% 0	0.0% 0	0.0% 0	0.0% 0
Ground Turkey									0.0% 0	0.0% 0	0.0% 0	0.0% 0
Ground Beef									0.0% 0	0.0% 0	0.0% 0	0.0% 0
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	0.1% 1	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		0.4% 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
	Chicken Breasts								0.0% 0	1.2% 1	0.0% 0	0.7% 1
	Ground Turkey								8.1% 6	4.4% 5	0.0% 0	1.1% 2
	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	0.2% 1	0.2% 3	0.5% 6	0.0% 0	0.8% 12	0.4% 5	0.5% 6	0.3% 6
	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
	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
	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
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
		Chicken Breasts							33.3% 20	27.7% 23	46.5% 73	43.8% 67
		Ground Turkey							55.4% 41	39.5% 45	56.3% 80	39.9% 73
		Ground Beef							22.2% 2	40.0% 4	14.3% 2	12.5% 1
		Pork Chops							70.0% 7	80.0% 4	54.5% 6	55.6% 5
		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
		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
		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
		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

Ceftiofur Resistance

Table 9. Ceftiofur-Resistant *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2005

Humans				Retail Meats				Food Animals				
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%	
Humans (n=60)	Newport	26	43.3	Chicken Breasts (n=32)	Typhimurium	15	46.9	Chickens (n=242)	Kentucky	124	51.2	
	Heidelberg	11	18.3		Kentucky	13	40.6		Heidelberg	62	25.6	
	Typhimurium	11	18.3		Heidelberg	2	6.3		Typhimurium	36	14.9	
	Agona	3	5.0		Anatum	1	3.1		I 4,[5],12:i:-	6	2.5	
	Ealing	2	3.3		I 4,5,12:nonmotile	1	3.1		Newport	3	1.2	
	Enteritidis	2	3.3						Schwarzengrund	2	0.8	
	Bredeney	1	1.7				Enteritidis		2	0.8		
	Edinburg	1	1.7				Other		7	2.9		
	I 4,[5],12:i:-	1	1.7									
	Mbandaka	1	1.7									
	Reading	1	1.7									
					Ground Turkey (n=13)	Heidelberg	5	38.5	Turkeys (n=8)	Agona	2	25.0
						Reading	3	23.1		Albert	2	25.0
				Bredeney		2	15.4	Orion		1	12.5	
				I 3,10:nonmotile		1	7.7	Senftenberg		1	12.5	
				I 4,12:r:-		1	7.7	I 4,[5],12:i:-		1	12.5	
				Typhimurium		1	7.7	Muenchen		1	12.5	
				Ground Beef (n=0)			Cattle (n=71)	Newport	22	31.0		
									Typhimurium	12	16.9	
									Agona	8	11.3	
									Reading	8	11.3	
									Dublin	6	8.5	
									Heidelberg	5	7.0	
									Muenster	2	2.8	
				Pork Chops (n=0)			Swine (n=11)	Agona	4	36.4		
									Reading	3	27.3	
									Typhimurium	2	18.2	
									Muenchen	1	9.1	
									Johannesburg	1	9.1	

Figures 6a-d. Ceftiofur-Resistant *Salmonella* (non-Typhi) Isolates, by Source and Serotype, 2005¹



¹ Pie charts are not provided for other sources due to the small number of ceftiofur-resistant isolates (13 from ground turkey, 11 from swine, 8 from turkeys, and none from ground beef and pork chops). 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, 1996-2005

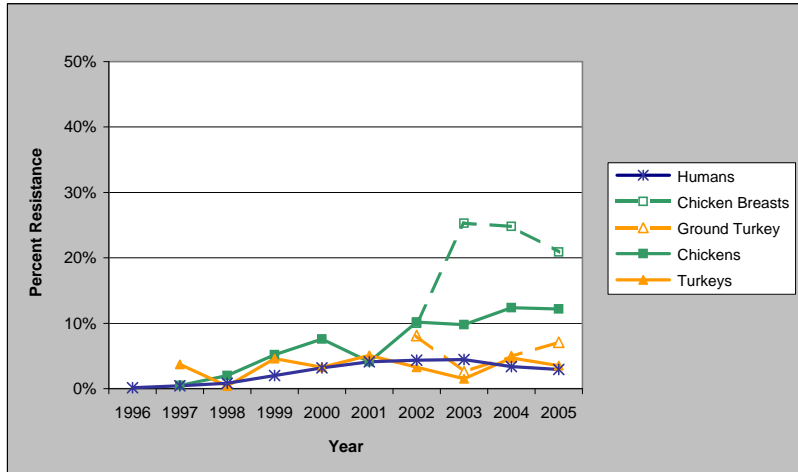
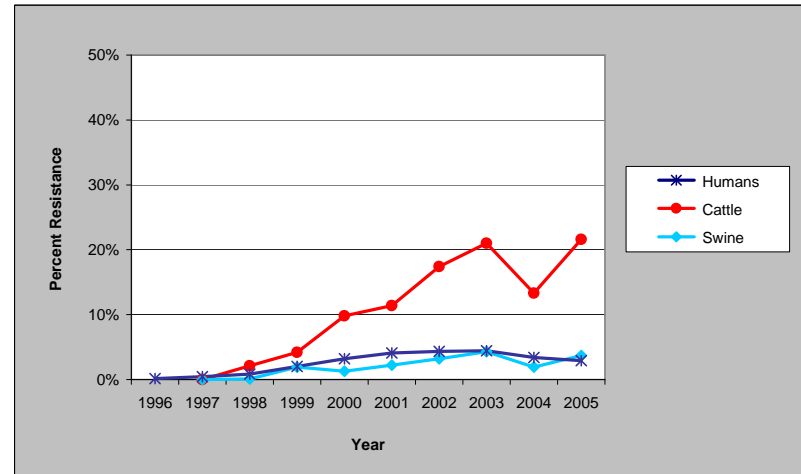


Figure 8. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Cattle, and Swine Resistant to Ceftiofur, by Year, 1996-2005¹



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, 1996-2005

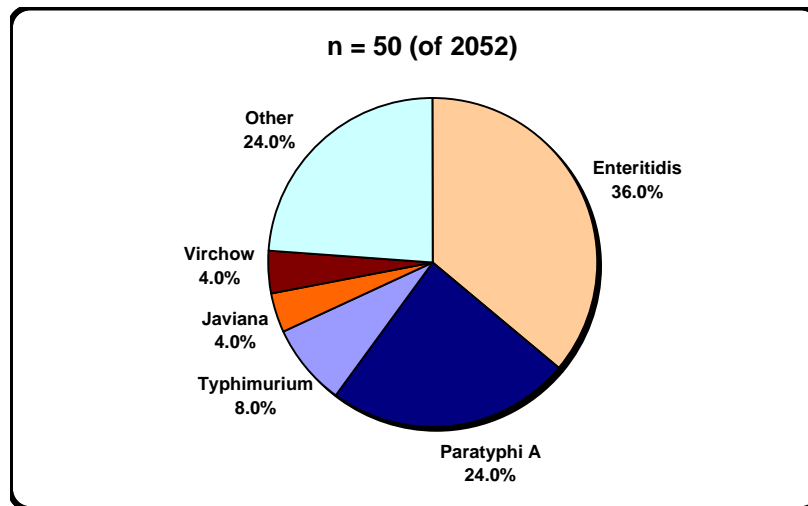
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052
Chicken Breasts							60	83	157	153
Ground Turkey							74	114	142	183
Ground Beef							9	10	14	8
Pork Chops							10	5	11	9
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989
Turkeys		107	240	713	518	550	244	262	236	227
Cattle		24	284	1610	1388	893	1008	670	607	329
Swine		111	793	876	451	418	379	211	308	301

Nalidixic Acid Resistance

Table 11. Nalidixic Acid-Resistant *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2005

Humans				Retail Meats				Food Animals				
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%	
Humans (n=50)	Enteritidis	18	36.0	Chicken Breasts (n=1)	Kentucky	1	100.0	Chickens (n=6)	Montevideo	3	50.0	
	Paratyphi A	12	24.0						Typhimurium	2	33.3	
	Typhimurium	4	8.0						Enteritidis	1	16.7	
	Javiana	2	4.0									
	Virchow	2	4.0									
	Agona	1	2.0									
	Albany	1	2.0									
	Blockley	1	2.0									
	Heidelberg	1	2.0									
	Infantis	1	2.0									
	Muenchen	1	2.0									
	Schwarzengrund	1	2.0									
	Senftenberg	1	2.0	Ground Turkey (n=2)	Heidelberg	1	50.0	Turkeys (n=5)	Albert	2	40.0	
	Tallahassee	1	2.0		Muenster	1	50.0		Hadar	2	40.0	
	Tennessee	1	2.0				Saintpaul		1	20.0		
	Thompson	1	2.0									
	Partial Serotype (Group C2)	1	2.0									
					Ground Beef (n=0)				Cattle (n=5)	Dublin	2	40.0
										Reading	1	20.0
								Uganda var. 15+		1	20.0	
								Untypeable		1	20.0	
				Pork Chops (n=0)				Swine (n=1)	Derby	1	100.0	

Figure 9. Nalidixic Acid-Resistant *Salmonella* (non-Typhi) Isolates from Humans, by Serotype, 2005¹



¹ Pie charts are not provided for other sources due to the small number of nalidixic acid-resistant isolates (6 from chickens, 5 from cattle, 5 from turkeys, 2 from ground turkey, 1 from chicken breasts, 1 from swine, and none from ground beef and pork chops). 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, 1996-2005

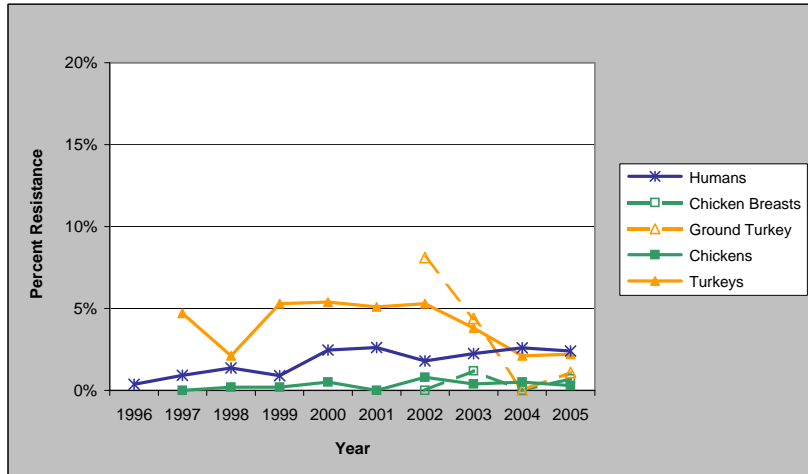
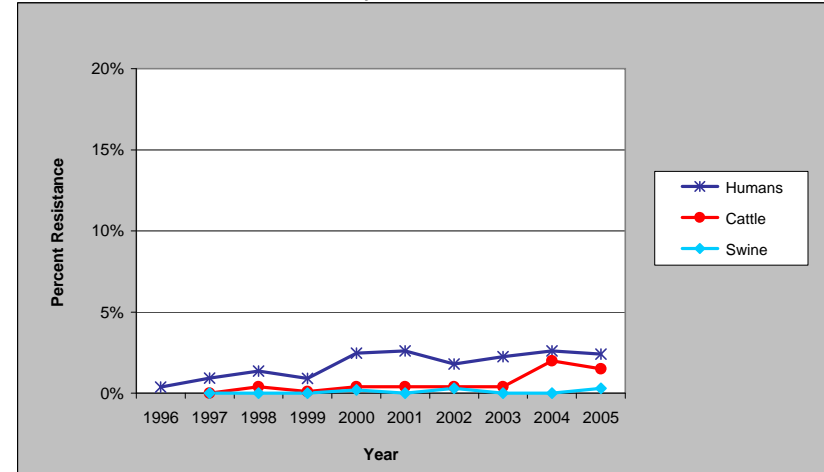


Figure 11. Percent of *Salmonella* (non-Typhi) Isolates from Humans, Cattle, and Swine Resistant to Nalidixic Acid, by Year, 1996-2005¹



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, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052
Chicken Breasts							60	83	157	153
Ground Turkey							74	114	142	183
Ground Beef							9	10	14	8
Pork Chops							10	5	11	9
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989
Turkeys		107	240	713	518	550	244	262	236	227
Cattle		24	284	1610	1388	893	1008	670	607	329
Swine		111	793	876	451	418	379	211	308	301

Multidrug Resistance

Table 13a. Resistance Patterns among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052
	Chicken Breasts							60	83	157	153
	Ground Turkey							74	114	142	183
	Ground Beef							9	10	14	8
	Pork Chops							10	5	11	9
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989
	Turkeys		107	240	713	518	550	244	262	236	227
	Cattle		24	284	1610	1388	893	1008	670	607	329
Swine		111	793	876	451	418	379	211	308	301	
Resistance Pattern	Isolate Source										
1. No Resistance Detected	Humans	66.2% 876	68.4% 890	72.9% 1064	74.1% 1109	74.4% 1024	72.3% 1026	79.0% 1586	77.7% 1449	79.6% 1427	80.6% 1654
	Chicken Breasts							51.7% 31	47.0% 39	40.1% 63	46.4% 71
	Ground Turkey							37.8% 28	34.2% 39	28.9% 41	30.1% 55
	Ground Beef							77.8% 7	60.0% 6	78.6% 11	75.0% 6
	Pork Chops							20.0% 2	20.0% 1	45.5% 5	44.4% 4
	Chickens		52.8% 113	58.6% 329	58.8% 846	56.9% 667	66.5% 869	62.0% 930	61.1% 708	62.7% 803	61.2% 1217
	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
	Cattle		66.7% 16	73.2% 208	74.5% 1199	70.0% 972	69.9% 624	64.3% 648	61.0% 409	65.6% 398	63.2% 208
	Swine		44.1% 49	49.2% 390	48.9% 428	43.2% 195	43.3% 181	40.1% 152	53.6% 113	37.3% 115	44.5% 134
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
	Ground Turkey							1.4% 1	0.9% 1	2.8% 4	0.5% 1
	Ground Beef							22.2% 2	40.0% 4	14.3% 2	12.5% 1
	Pork Chops							40.0% 4	40.0% 2	9.1% 1	22.2% 2
	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
	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
	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
	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
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
	Ground Turkey							1.4% 1	0.0% 0	0.0% 0	0.0% 0
	Ground Beef							0.0% 0	0.0% 0	7.1% 1	0.0% 0
	Pork Chops							20.0% 2	0.0% 0	0.0% 0	11.1% 1
	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
	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
	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
	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

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, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	1324	1301	1460	1495	1377	1419	2008	1864	1793	2052
	Chicken Breasts							60	83	157	153
	Ground Turkey							74	114	142	183
	Ground Beef							9	10	14	8
	Pork Chops							10	5	11	9
	Chickens		214	561	1438	1173	1307	1500	1158	1280	1989
	Turkeys		107	240	713	518	550	244	262	236	227
	Cattle		24	284	1610	1388	893	1008	670	607	329
Swine		111	793	876	451	418	379	211	308	301	
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
	Chicken Breasts							0.0% 0	0.0% 0	1.9% 3	0.0% 0
	Ground Turkey							1.4% 1	0.9% 1	2.1% 3	0.5% 1
	Ground Beef							22.2% 2	40.0% 4	14.3% 2	0.0% 0
	Pork Chops							20.0% 2	20.0% 1	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
	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
	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
	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
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
	Chicken Breasts							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
	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	0.1% 1	0.1% 1	0.0% 0	0.6% 9	0.1% 1	0.2% 3	0.1% 1
	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
	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
	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

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, 2005

Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (n=141)	Typhimurium	97	68.8	Chicken Breasts (n=1)	Typhimurium	1	100.0	Chickens (n=31)	Typhimurium	13	41.9
	Newport	26	18.4		Heidelberg	8	25.8				
	Dublin	4	2.8	Kentucky	5	16.1					
	Paratyphi B var. L(+) tartrate+	4	2.8	Newport	3	9.7					
	Agona	3	2.1	Other	2	6.5					
	Enteritidis	2	1.4	Ground Turkey (n=1)	I 4,12:r:-	1	100.0	Turkeys (n=9)	Typhimurium	4	44.4
	4,5,12 non-motile	1	0.7						Agona	2	22.2
	Bredeney	1	0.7						Albert	2	22.2
	Mbandaka	1	0.7	Senftenberg	1	11.1					
	Reading	1	0.7	Ground Beef (n=1)	Dublin	1	100.0	Cattle (n=67)	Newport	22	32.8
Partial Serotype (Group B)	1	0.7	Typhimurium						14	20.9	
			Agona						8	11.9	
			Reading						8	11.9	
			Dublin	4	6.0						
			Pork Chops (n=2)	Typhimurium	2	100.0	Heidelberg	3	4.5		
							Other	8	11.9		
							Swine (n=29)	Typhimurium	21	72.4	
								Agona	4	13.8	
			Reading	2	6.9						
			Krefeld	1	3.4						
			Muenchen	1	3.4						

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, 2005

Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (n=18)	Typhimurium	9	50.0	Chicken Breasts (n=0)				Chickens (n=2)	Newport	1	50.0
	Newport	4	22.2		Thompson	1	50.0				
	Agona	1	5.6	Ground Turkey (n=0)				Turkeys (n=0)			
	Albany	1	5.6								
	Bredeney	1	5.6								
	Give	1	5.6	Ground Beef (n=0)					Cattle (n=14)	Newport	7
	Mbandaka	1	5.6					Heidelberg		3	21.4
			Pork Chops (n=1)	Typhimurium	1	100.0	Agona	2		14.3	
							Other	2		14.3	
							Swine (n=5)	Typhimurium		3	60.0
			Agona	1	20.0						
			Muenchen	1	20.0						

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, 2005

Humans				Retail Meats				Food Animals			
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (n=41)	Newport	26	63.4	Chicken Breasts (n= 0)				Chickens (n=18)	Heidelberg	8	44.4
	Typhimurium	8	19.5						Kentucky	4	22.2
	Agona	3	7.3						Newport	3	16.7
	Bredeney	1	2.4						Typhimurium	2	11.1
	Enteritidis	1	2.4	Ground Turkey (n= 1)	I 4,12:r:-	1	100.0	Turkeys (n=4)	Agona	2	50.0
	Mbandaka	1	2.4						Albert	2	50.0
	Reading	1	2.4	Ground Beef (n=0)				Cattle (n=58)	Newport	22	37.9
			Agona						8	13.8	
			Reading						8	13.8	
			Typhimurium						9	15.5	
			Heidelberg						3	5.2	
			Other	8	13.8						
			Pork Chops (n=0)				Swine (n=8)	Agona	4	50.0	
								Reading	2	25.0	
								Typhimurium	1	12.5	
								Muenchen	1	12.5	

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, 2005

Humans				Retail Meats				Food Animals										
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%							
Humans (n=2)	Agona	1	50.0	Chicken Breasts (n=0)				Chickens (n=1)	Typhimurium	1	100.0							
	Enteritidis	1	50.0						Ground Turkey (n=0)			Turkeys (n=2)	Albert	2	100.0			
			Ground Beef (n=0)												Cattle (n=3)	Dublin	1	33.3
																Reading	1	33.3
							Uganda var. 15+	1	33.3									
				Pork Chops (n=0)				Swine (n=0)										

E. Antimicrobial Susceptibility among *Salmonella* Typhimurium

Table 18a. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	306	328	379	362	304	325	393	406	382	437	
	Chicken Breasts							9	22	49	29	
	Ground Turkey							2	2	2	1	
	Ground Beef							2	1	0	0	
	Pork Chops							2	1	2	2	
	Chickens		24	66	154	145	130	150	156	171	183	
	Turkeys		11	6	37	18	15	9	6	14	7	
	Cattle		2	33	189	187	87	98	78	48	34	
Swine		25	105	114	81	81	44	48	27	53	42	
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	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	0.0% 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	
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.2% 13	4.6% 15	3.7% 14	2.2% 8	2.6% 8	1.5% 5	2.3% 9	2.0% 8	2.1% 8	1.8% 8
		Chicken Breasts							0.0% 0	0.0% 0	2.0% 1	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		
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		20.8% 5	18.2% 12	16.9% 26	15.2% 22	3.1% 4	12.7% 19	5.1% 8	4.1% 7	4.4% 8
		Turkeys		45.5% 5	50.0% 3	29.7% 11	33.3% 6	53.3% 8	44.4% 4	83.3% 5	64.3% 9	14.3% 1
		Cattle		0.0% 0	3.0% 1	2.6% 5	1.6% 3	0.0% 0	2.0% 2	1.3% 1	0.0% 0	0.0% 0
	Swine		0.0% 0	0.0% 0	1.8% 2	0.0% 0	2.3% 1	2.1% 1	0.0% 0	3.8% 2	7.1% 3	
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	14.4% 44	15.5% 51	15.8% 60	13.0% 47	13.2% 40	8.3% 27	7.6% 30	7.1% 29	5.8% 22	5.7% 25
		Chicken Breasts							0.0% 0	18.2% 4	34.7% 17	24.1% 7
		Ground Turkey							0.0% 0	50.0% 1	50.0% 1	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens		8.3% 2	4.5% 3	3.9% 6	3.4% 5	3.1% 4	5.3% 8	7.7% 12	9.9% 17	7.7% 14
		Turkeys		81.8% 9	66.7% 4	59.5% 22	44.4% 8	73.3% 11	55.6% 5	50.0% 3	21.4% 3	0.0% 0
		Cattle		0.0% 0	54.5% 18	36.5% 69	27.3% 51	24.1% 21	26.5% 26	16.7% 13	14.6% 7	38.2% 13
	Swine		16.0% 4	18.1% 19	21.1% 24	14.8% 12	13.6% 6	2.1% 1	0.0% 0	9.4% 5	7.1% 3	
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	51.6% 158	55.2% 181	47.5% 180	43.1% 156	39.5% 120	40.0% 130	31.8% 125	35.2% 143	31.7% 121	27.9% 122
		Chicken Breasts							0.0% 0	18.2% 4	14.3% 7	3.4% 1
		Ground Turkey							0.0% 0	50.0% 1	50.0% 1	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							50.0% 1	100.0% 1	100.0% 2	100.0% 2
Chickens			41.7% 10	45.5% 30	40.9% 63	35.9% 52	16.9% 22	30.0% 45	16.7% 26	8.2% 14	13.7% 25	
Turkeys			81.8% 9	83.3% 5	81.1% 30	72.2% 13	93.3% 14	77.8% 7	100.0% 6	64.3% 9	57.1% 4	
Cattle			100.0% 2	57.6% 19	63.0% 119	63.1% 118	46.0% 40	66.3% 65	52.6% 41	56.3% 27	55.9% 19	
Swine		44.0% 11	82.9% 87	80.7% 92	77.8% 63	70.5% 31	77.1% 37	59.3% 16	77.4% 41	69.0% 29		

Table 18b. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	306	328	379	362	304	325	393	406	382	437	
	Chicken Breasts							9	22	49	29	
	Ground Turkey							2	2	2	1	
	Ground Beef							2	1	0	0	
	Pork Chops							2	1	2	2	
	Chickens		24	66	154	145	130	150	156	171	183	
	Turkeys		11	6	37	18	15	9	6	14	7	
	Cattle		2	33	189	187	87	98	78	48	34	
	Swine		25	105	114	81	44	48	27	53	42	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	50.0% 153	50.3% 165	45.4% 172	41.2% 149	42.1% 128	42.5% 138	33.6% 132	36.0% 146	31.9% 122	28.8% 126
		Chicken Breasts							33.3% 3	72.7% 16	53.1% 26	55.2% 16
		Ground Turkey							0.0% 0	100.0% 2	50.0% 1	100.0% 1
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							50.0% 1	100.0% 1	50.0% 1	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
		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
		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
		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
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
		Chicken Breasts							33.3% 3	63.6% 14	49.0% 24	51.7% 15
		Ground Turkey							0.0% 0	100.0% 2	0.0% 0	100.0% 1
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							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
		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
		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
		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
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
		Chicken Breasts							33.3% 3	63.6% 14	49.0% 24	51.7% 15
		Ground Turkey							0.0% 0	100.0% 2	0.0% 0	100.0% 1
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							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
		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
		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
		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
	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
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		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	1.3% 2	0.0% 0	1.8% 3	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
		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
		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

Table 18c. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	306	328	379	362	304	325	393	406	382	437	
	Chicken Breasts							9	22	49	29	
	Ground Turkey							2	2	2	1	
	Ground Beef							2	1	0	0	
	Pork Chops							2	1	2	2	
	Chickens		24	66	154	145	130	150	156	171	183	
	Turkeys		11	6	37	18	15	9	6	14	7	
	Cattle		2	33	189	187	87	98	78	48	34	
	Swine		25	105	114	81	44	48	27	53	42	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Humans	2.0% 6	4.3% 14	4.0% 15	4.4% 16	4.3% 13	3.1% 10	5.6% 22	6.2% 25		
		Chicken Breasts							33.3% 3	63.6% 14		
		Ground Turkey							0.0% 0	100.0% 2		
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							0.0% 0	100.0% 1		
		Chickens		0.0% 0	9.1% 6	29.9% 46	25.5% 37	13.8% 18	28.0% 42	25.6% 40		
		Turkeys		63.6% 7	50.0% 3	51.4% 19	38.9% 7	60.0% 9	22.2% 2	33.3% 2		
		Cattle		0.0% 0	3.0% 1	13.2% 25	12.8% 24	12.6% 11	16.3% 16	21.8% 17		
		Swine		0.0% 0	0.0% 0	0.9% 1	2.5% 2	0.0% 0	4.2% 2	0.0% 0		
Cephameycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					3.6% 11	3.1% 10	4.3% 17	4.4% 18	4.7% 18	2.5% 11
		Chicken Breasts							33.3% 3	63.6% 14	49.0% 24	51.7% 15
		Ground Turkey							0.0% 0	100.0% 2	0.0% 0	100.0% 1
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens					24.8% 36	14.6% 19	26.7% 40	23.7% 37	43.3% 74	19.7% 36
		Turkeys					38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0
		Cattle					9.1% 17	11.5% 10	11.2% 11	16.7% 13	25.0% 12	35.3% 12
		Swine					12.1% 1	0.0% 0	4.2% 2	3.7% 1	0.0% 0	4.8% 2
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Humans	53.3% 163	56.7% 186	49.9% 189	45.6% 165	45.4% 138	43.1% 140	31.2% 126	38.4% 156	35.9% 137	31.8% 139
		Chicken Breasts							44.4% 4	31.8% 7	73.5% 36	69.0% 20
		Ground Turkey							0.0% 0	50.0% 1	100.0% 2	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							50.0% 1	100.0% 1	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
		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
		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
		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
	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
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							0.0% 0	0.0% 0	0.0% 0	50.0% 1
		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
		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
		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
		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

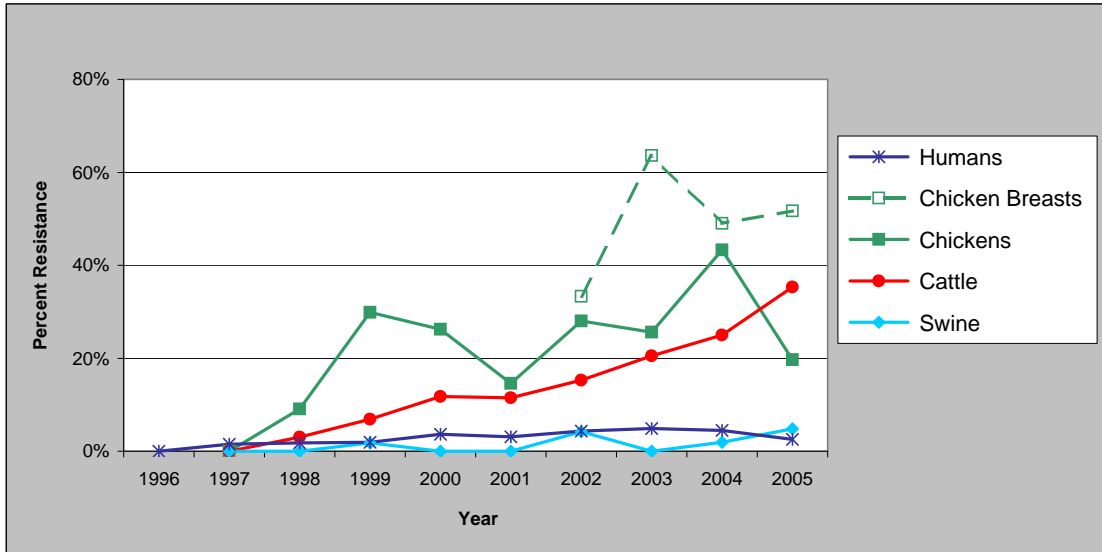
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 18d. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	306	328	379	362	304	325	393	406	382	437	
	Chicken Breasts							9	22	49	29	
	Ground Turkey							2	2	2	1	
	Ground Beef							2	1	0	0	
	Pork Chops							2	1	2	2	
	Chickens		24	66	154	145	130	150	156	171	183	
	Turkeys		11	6	37	18	15	9	6	14	7	
	Cattle		2	33	189	187	87	98	78	48	34	
	Swine		25	105	114	81	44	48	27	53	42	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Phenicol	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	39.9% 122	36.0% 118	33.8% 128	28.7% 104	30.9% 94	31.7% 103	23.2% 91	27.8% 113	24.1% 92	24.3% 106
		Chicken Breasts							0.0% 0	9.1% 2	4.1% 2	3.4% 1
		Ground Turkey							0.0% 0	50.0% 1	50.0% 1	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							50.0% 1	100.0% 1	100.0% 2	100.0% 2
		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
		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
		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
		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
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
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		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	0.0% 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	0.3% 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
		Chicken Breasts							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		
		Pork Chops							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
		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
		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
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		
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	49.3% 151	52.4% 172	46.2% 175	41.7% 151	43.4% 132	43.4% 141	31.8% 125	37.9% 154	30.1% 115	30.2% 132
		Chicken Breasts							44.4% 4	31.8% 7	71.4% 35	69.0% 20
		Ground Turkey							0.0% 0	50.0% 1	100.0% 2	0.0% 0
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops							100.0% 2	100.0% 1	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
		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
		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
		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

Ceftiofur Resistance

Figure 12. Percent of *Salmonella* Typhimurium Isolates from Humans, Retail Chicken Breasts, and Food Animals Resistant to Ceftiofur, by Year, 1996-2005¹



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 18 contains resistance data for *Salmonella* Typhimurium isolates from each source, by year

Table 19. Number of *Salmonella* Typhimurium Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Humans	306	328	379	362	304	325	393	406	382	437
Chicken Breasts							9	22	49	29
Ground Turkey							2	2	2	1
Ground Beef							2	1	0	0
Pork Chops							2	1	2	2
Chickens		24	66	154	145	130	150	156	171	183
Turkeys		11	6	37	18	15	9	6	14	7
Cattle		2	33	189	187	87	98	78	48	34
Swine		25	105	114	81	44	48	27	53	42

Multidrug Resistance

Table 20a. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	306	328	379	362	304	325	393	406	382	437
	Chicken Breasts							9	22	49	29
	Ground Turkey							2	2	2	1
	Ground Beef							2	1	0	0
	Pork Chops							2	1	2	2
	Chickens		24	66	154	145	130	150	156	171	183
	Turkeys		11	6	37	18	15	9	6	14	7
	Cattle		2	33	189	187	87	98	78	48	34
	Swine		25	105	114	114	81	44	48	27	53
Resistance Pattern	Isolate Source										
1. No Resistance Detected	Humans	37.9% 116	39.0% 128	46.7% 177	50.6% 183	49.3% 150	49.2% 160	60.3% 237	54.9% 223	60.7% 232	65.2% 285
	Chicken Breasts							22.2% 2	22.7% 5	14.3% 7	24.1% 7
	Ground Turkey							100.0% 2	0.0% 0	0.0% 0	0.0% 0
	Ground Beef							100.0% 2	100.0% 1		
	Pork Chops							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
	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
	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
	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
2. At Least ACSSuT¹ Resistant	Humans	33.7% 103	35.1% 115	32.2% 122	27.6% 100	28.0% 85	29.5% 96	21.4% 84	26.1% 106	23.3% 89	22.2% 97
	Chicken Breasts							0.0% 0	9.1% 2	4.1% 2	3.4% 1
	Ground Turkey							0.0% 0	50.0% 1	50.0% 1	0.0% 0
	Ground Beef							0.0% 0	0.0% 0		
	Pork Chops							50.0% 1	100.0% 1	50.0% 1	100.0% 2
	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
	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
	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
	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
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
	Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef							0.0% 0	0.0% 0		
	Pork Chops							0.0% 0	0.0% 0	0.0% 0	50.0% 1
	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
	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
	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
	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

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

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

Table 20b. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	306	328	379	362	304	325	393	406	382	437
	Chicken Breasts							9	22	49	29
	Ground Turkey							2	2	2	1
	Ground Beef							2	1	0	0
	Pork Chops							2	1	2	2
	Chickens		24	66	154	145	130	150	156	171	183
	Turkeys		11	6	37	18	15	9	6	14	7
	Cattle		2	33	189	187	87	98	78	48	34
	Swine		25	105	114	81	44	48	27	53	42
Resistance Pattern	Isolate Source										
4. At Least ACSSuTAuCf¹ Resistant	Humans	0.0% 0	1.2% 4	1.1% 4	0.6% 2	2.0% 6	1.2% 4	1.8% 7	2.2% 9	2.6% 10	1.8% 8
	Chicken Breasts							0.0% 0	0.0% 0	4.1% 2	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		
	Pork Chops							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
	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
	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
	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
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
	Chicken Breasts							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		
	Pork Chops							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
	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
	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
	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

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

F. Antimicrobial Susceptibility among *Salmonella* Enteritidis

Table 21a. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	351	301	244	269	319	277	337	257	271	383	
	Chicken Breasts							4	3	3	12	
	Ground Turkey							5	1	0	0	
	Ground Beef							1	1	0	0	
	Pork Chops							0	0	0	0	
	Chickens		1	13	41	31	21	48	42	84	173	
	Turkeys		0	0	1	1	0	0	0	0	0	
	Cattle		1	1	8	4	4	6	3	2	2	
	Swine		0	0	2	1	1	1	1	1	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%
		Chicken Breasts		0	0	0	0	0	0	0	0	0
		Ground Turkey							0.0%	0.0%	0.0%	0.0%
		Ground Beef							0	0	0	0
		Pork Chops							0	0	0	0
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys				0.0%	0.0%					
		Cattle		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.8%	0.3%	0.4%	0.0%	0.3%	0.0%	0.3%	0.4%	0.4%	0.8%
		Chicken Breasts	17	1	1	0	1	0	1	1	1	3
		Ground Turkey							0.0%	0.0%	0.0%	0.0%
		Ground Beef							0	0	0	0
		Pork Chops							0	0	0	0
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%
		Turkeys				0.0%	0.0%					
		Cattle		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.7%	0.4%	0.4%	0.3%	0.7%	0.3%	0.0%	0.7%	0.3%
		Chicken Breasts	0	2	1	1	1	2	1	0	2	1
		Ground Turkey							0.0%	0.0%	0.0%	0.0%
		Ground Beef							0	0	0	0
		Pork Chops							0	0	0	0
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%
		Turkeys				0.0%	0.0%					
		Cattle		0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine				0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	2.0%	4.3%	1.6%	2.2%	0.0%	1.4%	1.8%	1.2%	2.2%	1.0%
		Chicken Breasts	7	13	4	6	0	4	6	3	6	4
		Ground Turkey							0.0%	0.0%	0.0%	0.0%
		Ground Beef							0	0	0	0
		Pork Chops							0	0	0	0
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	1.2%	0.6%
		Turkeys				0.0%	0.0%					
		Cattle		0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine				0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%

Table 21b. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested			351	301	244	269	319	277	337	257	271	383
Humans												
Chicken Breasts									4	3	3	12
Ground Turkey									5	1	0	0
Ground Beef									1	1	0	0
Pork Chops									0	0	0	0
Chickens				1	13	41	31	21	48	42	84	173
Turkeys				0	0	1	1	0	0	0	0	0
Cattle				1	1	8	4	4	6	3	2	2
Swine				0	0	2	1	1	1	1	1	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
		Chicken Breasts							0.0% 0	66.7% 2	33.3% 1	0.0% 0
		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
		Turkeys				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
		Swine				0.0% 0	0.0% 0	100.0% 1	0.0% 0	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
		Chicken Breasts							0.0% 0	33.3% 1	33.3% 1	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
		Turkeys				0.0% 0	0.0% 0					
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine				0.0% 0	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
		Chicken Breasts							0.0% 0	33.3% 1	33.3% 1	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
		Turkeys				0.0% 0	0.0% 0					
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine				0.0% 0	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
		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
		Turkeys				0.0% 0	0.0% 0					
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine				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* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	351	301	244	269	319	277	337	257	271	383	
	Chicken Breasts							4	3	3	12	
	Ground Turkey							5	1	0	0	
	Ground Beef							1	1	0	0	
	Pork Chops							0	0	0	0	
	Chickens		1	13	41	31	21	48	42	84	173	
	Turkeys		0	0	1	1	0	0	0	0	0	
	Cattle		1	1	8	4	4	6	3	2	2	
	Swine		0	0	2	1	1	1	1	1	0	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Humans	4.0% 14	1.3% 4	0.0% 0	1.9% 5	0.9% 3	1.1% 3	0.6% 2	1.2% 3		
		Chicken Breasts							0.0% 0	66.7% 2		
		Ground Turkey							0.0% 0	0.0% 0		
		Ground Beef							0.0% 0	0.0% 0		
		Pork Chops										
		Chickens		0.0% 0	7.7% 1	4.9% 2	0.0% 0	0.0% 0	4.2% 2	0.0% 0		
		Turkeys				0.0% 0	0.0% 0					
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
		Swine				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		
Cephameycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.0% 0	1.0% 4
		Chicken Breasts							0.0% 0	33.3% 1	33.3% 1	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	2.1% 1	0.0% 0	1.2% 1	0.6% 1
		Turkeys					0.0% 0					
		Cattle					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Humans	8.5% 30	9.0% 27	2.0% 5	3.0% 8	0.9% 3	2.2% 6	1.8% 6	1.2% 3	1.8% 5	1.6% 6
		Chicken Breasts							0.0% 0	0.0% 0	33.3% 1	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	2.4% 1	1.2% 1	0.0% 0
		Turkeys				0.0% 0	0.0% 0					
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	6.6% 23	1.3% 4	0.8% 2	0.7% 2	0.0% 0	0.7% 2	0.6% 2	0.8% 2	0.0% 0	0.5% 2
		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					
		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	

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

Table 21d. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested			351	301	244	269	319	277	337	257	271	383	
Humans													
Chicken Breasts									4	3	3	12	
Ground Turkey									5	1	0	0	
Ground Beef									1	1	0	0	
Pork Chops									0	0	0	0	
Chickens				1	13	41	31	21	48	42	84	173	
Turkeys				0	0	1	1	0	0	0	0	0	
Cattle				1	1	8	4	4	6	3	2	2	
Swine				0	0	2	1	1	1	1	1	0	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source											
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0% 0	0.7% 2	0.0% 0	0.4% 1	0.0% 0	0.0% 0	0.6% 2	0.4% 1	0.4% 1	0.5% 2	
		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	
		Turkeys				0.0% 0	0.0% 0						
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		Swine				0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
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						
		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	
	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	
		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	
		Turkeys				0.0% 0	0.0% 0						
		Cattle		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	
		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	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	
		Chicken Breasts							0.0% 0	0.0% 0	33.3% 1	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	7.3% 3	0.0% 0	0.0% 0	2.1% 1	2.4% 1	2.4% 2	0.6% 1	
		Turkeys				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	
		Swine				0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	

Multidrug Resistance

Table 22a. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	351	301	244	269	319	277	337	257	271	383
	Chicken Breasts							4	3	3	12
	Ground Turkey							5	1	0	0
	Ground Beef							1	1	0	0
	Pork Chops							0	0	0	0
	Chickens		1	13	41	31	21	48	42	84	173
	Turkeys		0	0	1	1	0	0	0	0	0
	Cattle		1	1	8	4	4	6	3	2	2
	Swine		0	0	2	1	1	1	1	1	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% 352
	Chicken Breasts							100.0% 4	33.3% 1	66.7% 2	100.0% 12
	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
	Turkeys				100.0% 1	100.0% 1					
	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
	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
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					
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	
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
	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					
	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	

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

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

Table 22b. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	351	301	244	269	319	277	337	257	271	383
	Chicken Breasts							4	3	3	12
	Ground Turkey							5	1	0	0
	Ground Beef							1	1	0	0
	Pork Chops							0	0	0	0
	Chickens		1	13	41	31	21	48	42	84	173
	Turkeys		0	0	1	1	0	0	0	0	0
	Cattle		1	1	8	4	4	6	3	2	2
	Swine		0	0	2	1	1	1	1	1	0
Resistance Pattern	Isolate Source										
4. At Least ACSSuTAuCf ¹ 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
	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					
	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	
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
	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					
	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	

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

G. Antimicrobial Susceptibility among *Salmonella* Newport

Table 23a. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207	
	Chicken Breasts							0	0	0	0	
	Ground Turkey							3	2	2	3	
	Ground Beef							3	1	2	0	
	Pork Chops							2	1	0	0	
	Chickens		0	1	7	5	8	6	7	0	6	
	Turkeys		0	1	4	6	16	10	19	7	5	
	Cattle		0	8	54	109	87	113	75	44	27	
	Swine		0	1	5	5	2	7	0	3	0	
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	
		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
		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
		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
		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
		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
		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
		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
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	
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	
Swine				0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3		0.0% 0	

Table 23b. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207	
	Chicken Breasts							0	0	0	0	
	Ground Turkey							3	2	2	3	
	Ground Beef							3	1	2	0	
	Pork Chops							2	1	0	0	
	Chickens		0	1	7	5	8	6	7	0	6	
	Turkeys		0	1	4	6	16	10	19	7	5	
	Cattle		0	8	54	109	87	113	75	44	27	
	Swine		0	1	5	2	7	0	3	0	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
		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
		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
		Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		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
		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
		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
		Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		0.0% 0
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	0.0% 0	1.3% 1	18.2% 18	22.3% 27	27.4% 34	22.8% 55	22.0% 49	15.2% 29	12.6% 26
		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
		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
		Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		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
		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
		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
		Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0		0.0% 0

Table 23c. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207	
	Chicken Breasts						0	0	0	0	0	
	Ground Turkey						0	3	2	2	3	
	Ground Beef						0	3	1	2	0	
	Pork Chops						0	2	1	0	0	
	Chickens		0	1	7	5	8	6	7	0	6	
	Turkeys		0	1	4	6	16	10	19	7	5	
	Cattle		0	8	54	109	87	113	75	44	27	
	Swine		0	1	5	2	7	0	3	0	1	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Humans	3.9% 2	4.3% 2	2.6% 2	18.2% 18	22.3% 27	26.6% 33	22.8% 55	22.4% 50		
		Chicken Breasts										
		Ground Turkey							33.3% 1	0.0% 0		
		Ground Beef							66.7% 2	100.0% 1		
		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		
		Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	10.5% 2		
		Cattle			12.5% 1	37.0% 20	74.3% 81	69.0% 60	78.8% 89	81.3% 61		
		Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		
Cephamecins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					22.3% 27	25.8% 32	22.4% 54	21.5% 48	15.2% 29	12.6% 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	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
		Cattle					73.4% 80	66.7% 58	77.9% 88	74.7% 56	77.3% 34	81.5% 22
		Swine					0.0% 0	85.7% 6		100.0% 3		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
		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
		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
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3		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
		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% 0	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
		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
		Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1		0.0% 0

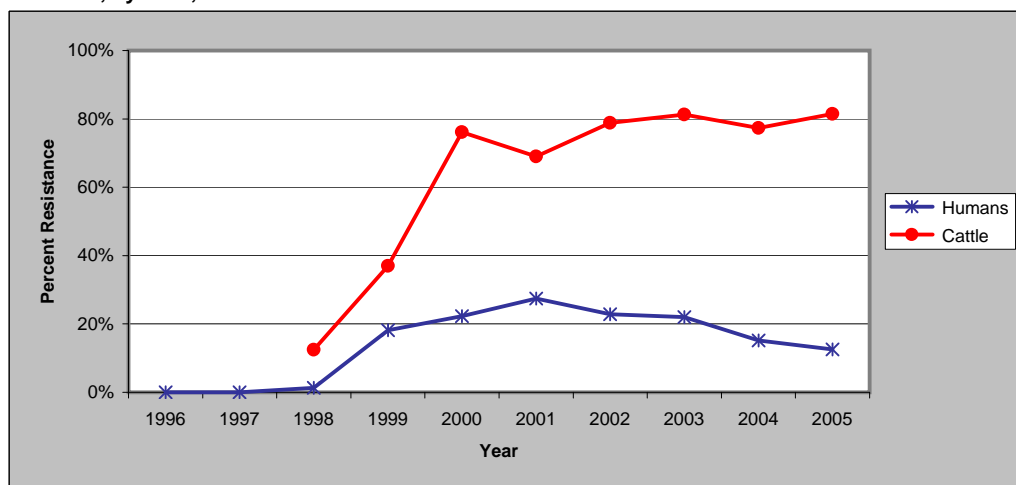
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 23d. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207	
	Chicken Breasts							0	0	0	0	
	Ground Turkey							3	2	2	3	
	Ground Beef							3	1	2	0	
	Pork Chops							2	1	0	0	
	Chickens		0	1	7	5	8	6	7	0	6	
	Turkeys		0	1	4	6	16	10	19	7	5	
	Cattle		0	8	54	109	87	113	75	44	27	
	Swine		0	1	5	2	7	0	3	0	1	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Phenicol	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
		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
		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
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3		0.0% 0
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
		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
		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	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
		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
		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
		Swine			100.0% 1	20.0% 1	50.0% 1	85.7% 6		100.0% 3		0.0% 0

Ceftiofur Resistance

Figure 13. Percent of *Salmonella* Newport Isolates from Humans and Cattle Resistant to Ceftiofur, by Year, 1996-2005¹



¹ Data for other sources are not included due to the small number of *Salmonella* Newport isolates. Table 23 contains resistance data for *Salmonella* Newport isolates from each source, by year

Table 24. Number of *Salmonella* Newport Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

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

Multidrug Resistance

Table 25a. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207
	Chicken Breasts							0	0	0	0
	Ground Turkey							3	2	2	3
	Ground Beef							3	1	2	0
	Pork Chops							2	1	0	0
	Chickens		0	1	7	5	8	6	7	0	6
	Turkeys		0	1	4	6	16	10	19	7	5
	Cattle		0	8	54	109	87	113	75	44	27
	Swine		0	1	5	2	7	0	3	0	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
	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
	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
	Swine		0.0% 0	0.0% 0	80.0% 4	50.0% 1	14.3% 1		0.0% 0		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
	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
	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
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		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
	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
	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
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1		0.0% 0

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

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

Table 25b. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	51	46	77	99	121	124	241	223	191	207
	Chicken Breasts							0	0	0	0
	Ground Turkey							3	2	2	3
	Ground Beef							3	1	2	0
	Pork Chops							2	1	0	0
	Chickens		0	1	7	5	8	6	7	0	6
	Turkeys		0	1	4	6	16	10	19	7	5
	Cattle		0	8	54	109	87	113	75	44	27
	Swine		0	1	5	2	7	0	3	0	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
	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
	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
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		0.0% 0
5. At Least Cefotiofur 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
	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
	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
	Swine		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 cefotiofur

H. Antimicrobial Susceptibility among *Salmonella* Heidelberg

Table 26a. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125	
	Chicken Breasts							11	16	31	22	
	Ground Turkey							21	32	37	53	
	Ground Beef							0	0	0	0	
	Pork Chops							3	0	3	0	
	Chickens		51	143	297	259	329	403	226	167	283	
	Turkeys		14	39	139	125	142	60	57	46	25	
	Cattle		1	11	28	6	10	8	9	1	6	
Swine		7	37	33	22	16	11	11	4	8		
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%
		Chicken Breasts		0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	0.0%	0.0%	0.0%
		Ground Beef							0	0	0	0
		Pork Chops							0.0%		0.0%	
		Chickens		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0	0	0	0	0	0	0	0	0
		Cattle		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Swine		0	0	0	0	0	0	0	0	0	
	Gentamicin (MIC ≥ 16)	Humans	23.0%	17.3%	16.8%	14.8%	8.9%	7.8%	3.8%	5.2%	4.3%	6.4%
		Chicken Breasts	17	13	17	13	7	8	4	5	4	8
		Ground Turkey							45.5%	18.8%	9.7%	13.6%
		Ground Beef							5	3	3	3
		Pork Chops							28.6%	12.5%	35.1%	37.7%
		Chickens		41.2%	26.6%	18.5%	32.0%	12.5%	8.9%	7.5%	10.2%	9.2%
		Turkeys		21	38	55	83	41	36	17	17	26
		Cattle		0.0%	17.9%	16.5%	12.0%	13.4%	18.3%	12.3%	17.4%	36.0%
	Swine		0	7	23	15	19	11	7	8	9	
	Kanamycin (MIC ≥ 64)	Humans	14.9%	8.0%	12.9%	9.1%	15.2%	19.6%	10.5%	8.3%	8.6%	12.8%
		Chicken Breasts	11	6	13	8	12	20	11	8	8	16
		Ground Turkey							36.4%	0.0%	0.0%	0.0%
		Ground Beef							4	0	0	0
		Pork Chops							42.9%	34.4%	27.0%	30.2%
		Chickens		0.0%	0.7%	1.3%	12.0%	4.3%	3.7%	5.3%	6.0%	6.7%
		Turkeys		7.1%	5.1%	17.3%	43.2%	31.0%	30.0%	21.1%	19.6%	44.0%
		Cattle		1	2	24	54	44	18	12	9	11
	Swine		0.0%	63.6%	42.9%	16.7%	10.0%	37.5%	55.6%	100.0%	50.0%	
	Streptomycin (MIC ≥ 64)	Humans	40.5%	24.0%	30.7%	23.9%	22.8%	25.5%	17.1%	12.5%	15.1%	13.6%
		Chicken Breasts	30	18	31	21	18	26	18	12	14	17
		Ground Turkey							63.6%	12.5%	22.6%	18.2%
		Ground Beef							7	2	7	4
		Pork Chops							61.9%	37.5%	43.2%	47.2%
Chickens			35.3%	32.9%	23.9%	36.7%	20.4%	18.6%	17.7%	18.0%	15.5%	
Turkeys			18	47	71	95	67	75	40	30	44	
Cattle			14.3%	30.8%	30.2%	52.8%	40.1%	35.0%	28.1%	21.7%	44.0%	
Swine		2	12	42	66	57	21	16	10	11		
		0.0%	72.7%	57.1%	16.7%	20.0%	37.5%	55.6%	100.0%	50.0%		
		0	8	16	1	2	3	5	1	3		
		57.1%	81.1%	63.6%	86.4%	75.0%	45.5%	100.0%	75.0%	87.5%		
		4	30	21	19	12	5	11	3	7		

Table 26b. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125	
	Chicken Breasts							11	16	31	22	
	Ground Turkey							21	32	37	53	
	Ground Beef							0	0	0	0	
	Pork Chops							3	0	3	0	
	Chickens		51	143	297	259	329	403	226	167	283	
	Turkeys		14	39	139	125	142	60	57	46	25	
	Cattle		1	11	28	6	10	8	9	1	6	
Swine		7	37	33	22	16	11	11	4	8		
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
		Chicken Breasts							18.2% 2	18.8% 3	25.8% 8	27.3% 6
		Ground Turkey							19.0% 4	9.4% 3	13.5% 5	18.9% 10
		Ground Beef										
		Pork Chops							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
		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
		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
		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
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
		Chicken Breasts							0.0% 0	6.3% 1	9.7% 3	13.6% 3
		Ground Turkey							19.0% 4	9.4% 3	5.4% 2	9.4% 5
		Ground Beef										
		Pork Chops							0.0% 0		0.0% 0	
		Chickens		2.0% 1	1.4% 2	1.3% 4	13.5% 35	7.0% 23	8.7% 35	9.3% 21	10.2% 17	21.9% 62
		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
		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
		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
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
		Chicken Breasts							0.0% 0	6.3% 1	9.7% 3	9.1% 2
		Ground Turkey							19.0% 4	0.0% 0	5.4% 2	9.4% 5
		Ground Beef										
		Pork Chops							0.0% 0		0.0% 0	
		Chickens		2.0% 1	1.4% 2	1.7% 5	13.9% 36	5.8% 19	8.9% 36	9.3% 21	10.2% 17	21.9% 62
		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
		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
		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
	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
		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	
		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
		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

Table 26c. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125	
	Chicken Breasts							11	16	31	22	
	Ground Turkey							21	32	37	53	
	Ground Beef							0	0	0	0	
	Pork Chops							3	0	3	0	
	Chickens		51	143	297	259	329	403	226	167	283	
	Turkeys		14	39	139	125	142	60	57	46	25	
	Cattle		1	11	28	6	10	8	9	1	6	
Swine		7	37	33	22	16	11	11	4	8		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Humans	6.8% 5	2.7% 2	5.9% 6	3.4% 3	5.1% 4	3.9% 4	10.5% 11	7.3% 7		
		Chicken Breasts							18.2% 2	12.5% 2		
		Ground Turkey							19.0% 4	12.5% 4		
		Ground Beef										
		Pork Chops							0.0% 0			
		Chickens		2.0% 1	9.8% 14	5.7% 17	15.4% 40	8.5% 28	9.9% 40	12.8% 29		
		Turkeys		0.0% 0	5.1% 2	2.2% 3	2.4% 3	7.0% 10	5.0% 3	1.8% 1		
		Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	0.0% 0	50.0% 4	55.6% 5		
		Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1		
Cephameycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					2.5% 2	2.9% 3	8.6% 9	5.2% 5	8.6% 8	8.8% 11
		Chicken Breasts							0.0% 0	6.3% 1	9.7% 3	9.1% 2
		Ground Turkey							19.0% 4	0.0% 0	5.4% 2	9.4% 5
		Ground Beef										
		Pork Chops							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
		Turkeys					2.4% 3	4.9% 7	1.7% 1	0.0% 0	6.5% 3	0.0% 0
		Cattle					0.0% 0	0.0% 0	37.5% 3	44.4% 4	100.0% 1	66.7% 4
		Swine					4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0
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
		Chicken Breasts							45.5% 5	12.5% 2	12.9% 4	13.6% 3
		Ground Turkey							33.3% 7	15.6% 5	37.8% 14	35.8% 19
		Ground Beef										
		Pork Chops							100.0% 3		0.0% 0	
		Chickens		45.1% 23	33.6% 48	26.6% 79	33.2% 86	16.4% 54	9.7% 39	11.1% 25	12.6% 21	10.6% 30
		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
		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
		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
	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
		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	
		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
		Turkeys		7.1% 1	5.1% 2	4.3% 6	0.8% 1	3.5% 5	3.3% 2	3.5% 2	0.0% 0	0.0% 0
		Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	10.0% 1	0.0% 0	55.6% 5	100.0% 1	50.0% 3
		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

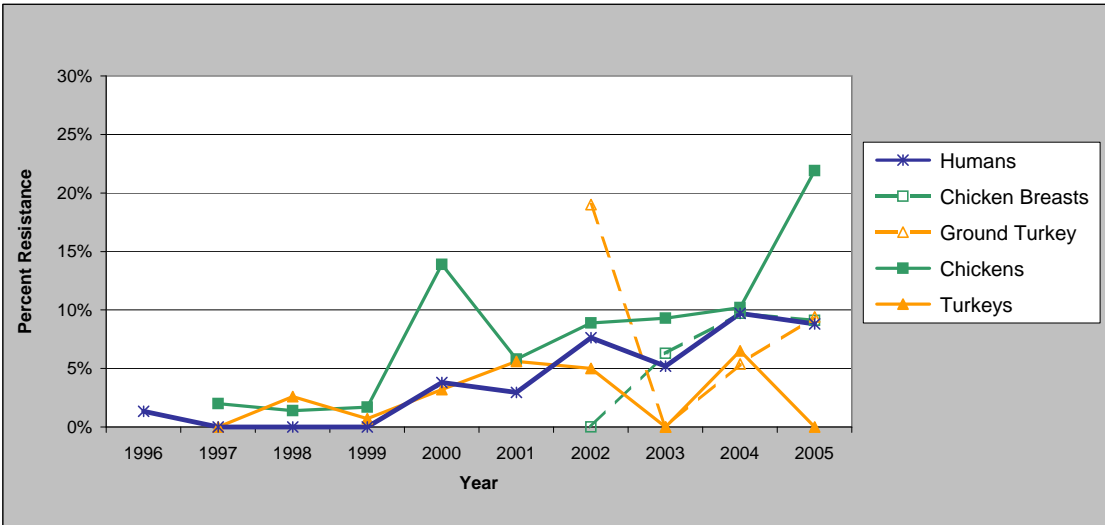
¹ Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 26d. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125	
	Chicken Breasts							11	16	31	22	
	Ground Turkey							21	32	37	53	
	Ground Beef							0	0	0	0	
	Pork Chops							3	0	3	0	
	Chickens		51	143	297	259	329	403	226	167	283	
	Turkeys		14	39	139	125	142	60	57	46	25	
	Cattle		1	11	28	6	10	8	9	1	6	
Swine		7	37	33	22	16	11	11	4	8		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source										
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
		Chicken Breasts							0.0% 0	0.0% 0	3.2% 1	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0	5.4% 2	0.0% 0
		Ground Beef										
		Pork Chops							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
		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
		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
		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
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	
		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
		Chicken Breasts							0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey							4.8% 1	0.0% 0	0.0% 0	1.9% 1
		Ground Beef										
		Pork Chops							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
		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
		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		
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
		Ground Turkey							57.1% 12	43.8% 14	70.3% 26	56.6% 30
		Ground Beef										
		Pork Chops							66.7% 2		100.0% 3	
		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
		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
		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
		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

Ceftiofur Resistance

Figure 14. Percent of *Salmonella* Heidelberg Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftiofur, by Year, 1996-2005¹



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 26 contains resistance data for *Salmonella* Heidelberg isolates from each source, by year

Table 27. Number of *Salmonella* Heidelberg Isolates Tested from Humans, Food Animals, and Retail Meats, by Year, 1996-2005

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

Multidrug Resistance

Table 28a. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125
	Chicken Breasts							11	16	31	22
	Ground Turkey							21	32	37	53
	Ground Beef							0	0	0	0
	Pork Chops							3	0	3	0
	Chickens		51	143	297	259	329	403	226	167	283
	Turkeys		14	39	139	125	142	60	57	46	25
	Cattle		1	11	28	6	10	8	9	1	6
Swine		7	37	33	22	16	11	11	4	8	
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
	Chicken Breasts							27.3% 3	62.5% 10	58.1% 18	54.5% 12
	Ground Turkey							33.3% 7	50.0% 16	16.2% 6	20.8% 11
	Ground Beef										
	Pork Chops							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
	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
	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
	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
	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
Chicken Breasts								0.0% 0	0.0% 0	3.2% 1	0.0% 0
Ground Turkey								0.0% 0	0.0% 0	5.4% 2	0.0% 0
Ground Beef											
Pork Chops								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
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
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
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
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
	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	
	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	1.4% 2	1.7% 1	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
	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

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

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

Table 28b. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2005

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Humans	74	75	101	88	79	102	105	96	93	125
	Chicken Breasts							11	16	31	22
	Ground Turkey							21	32	37	53
	Ground Beef							0	0	0	0
	Pork Chops							3	0	3	0
	Chickens		51	143	297	259	329	403	226	167	283
	Turkeys		14	39	139	125	142	60	57	46	25
	Cattle		1	11	28	6	10	8	9	1	6
	Swine		7	37	33	22	16	11	11	4	8
Resistance Pattern	Isolate Source										
4. At Least ACSSuTAuCf ¹ 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
	Chicken Breasts							0.0% 0	0.0% 0	3.2% 1	0.0% 0
	Ground Turkey							0.0% 0	0.0% 0	5.4% 2	0.0% 0
	Ground Beef										
	Pork Chops							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
	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
	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
	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
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
	Ground Turkey							0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Ground Beef										
	Pork Chops							0.0% 0		0.0% 0	
	Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 3	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
	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

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

IV. *Campylobacter* Data

A. *Campylobacter jejuni* and *Campylobacter coli* Isolates Tested

Table 29. Number of *Campylobacter jejuni* Isolates Tested, by Source and Year, 1997-2005

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

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

Table 30. Number of *Campylobacter coli* Isolates Tested, by Source and Year, 1997-2005

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

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 31. Number and Percent of Retail Meat Samples Positive for *Campylobacter*, 2005

	Chicken Breast	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	1190	1195	1196	1196
Number Positive for <i>Campylobacter</i>	554	20	0	2
Percent Positive for <i>Campylobacter</i>	46.6%	1.7%	0.0%	0.2%

Figure 15. Percent of Retail Meat Samples Positive for *Campylobacter*, 2005

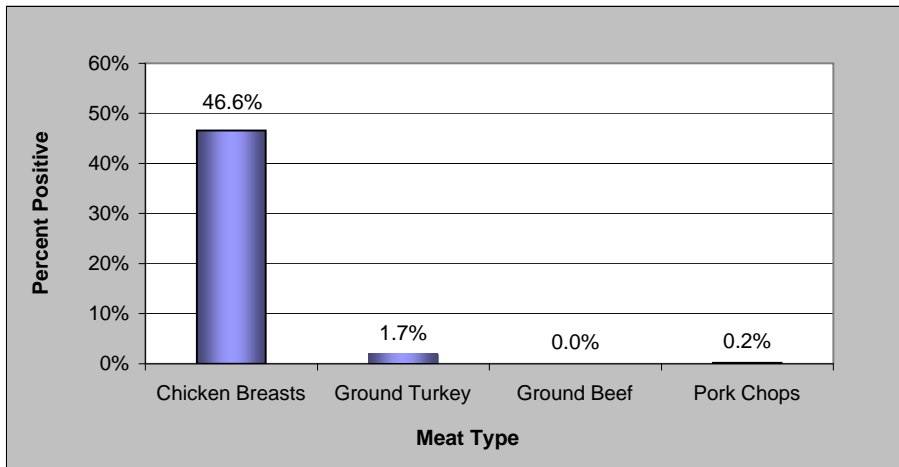
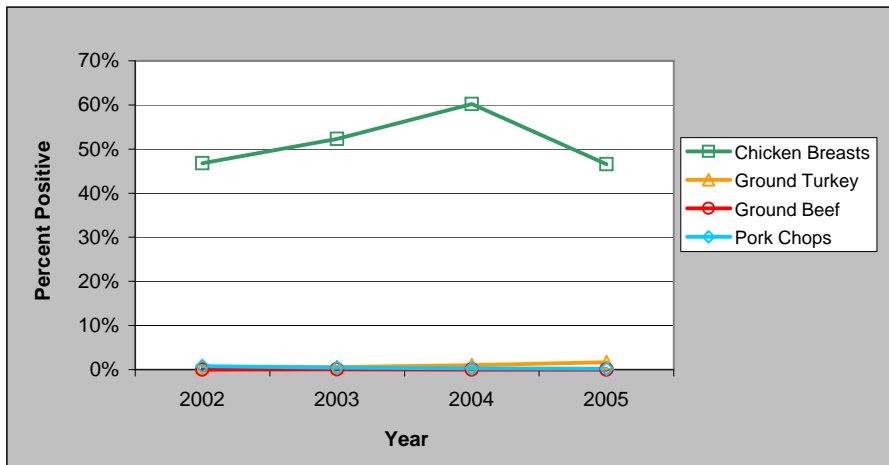


Figure 16. Percent of Retail Meat Samples Positive for *Campylobacter*, 2002-2005

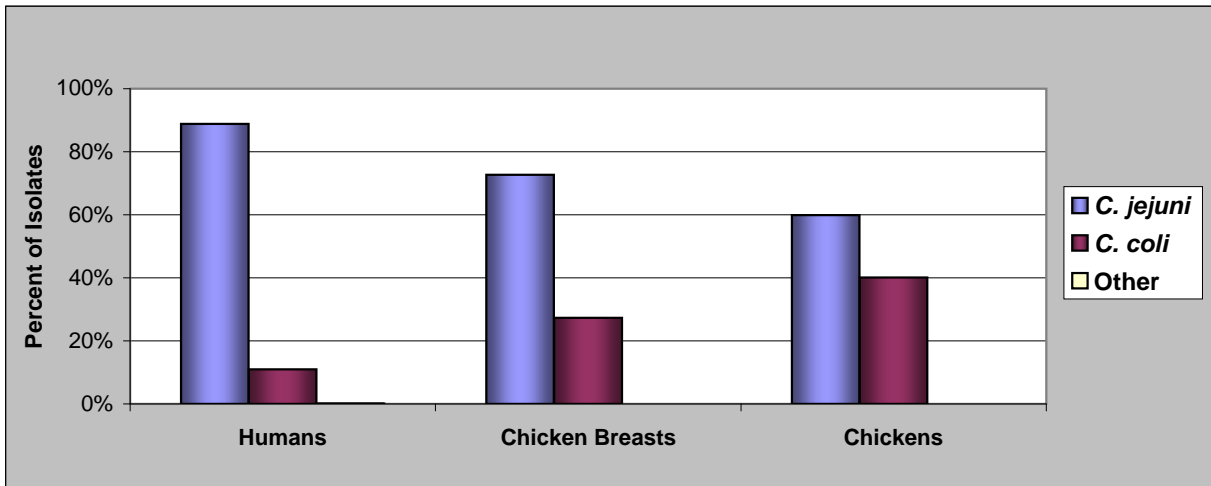


C. Campylobacter Species

Table 32. *Campylobacter* Species Isolated from Humans, Retail Meats, and Chickens, 2005

<i>Campylobacter</i> Species	Humans	Retail Meats				Food Animals
	Humans (n=890)	Chicken Breast (n= 554)	Ground Turkey (n= 20)	Ground Beef (n= 0)	Pork Chops (n= 2)	Chickens (n=947)
<i>C. jejuni</i>	88.8% 791	72.7% 403	50.0% 10	0.0% 0	50.0% 1	59.9% 567
<i>C. coli</i>	11.0% 98	27.3% 151	45.0% 9	0.0% 0	0.0% 0	40.1% 380
Other	0.1% 1	0.0% 0	5.0% 1	0.0% 0	50.0% 1	0.0% 0

Figure 17. *Campylobacter* Species Isolated from Humans, Chicken Breasts, and Chickens, 2005



D. Antimicrobial Susceptibility among *Campylobacter jejuni*

MIC Distributions

Table 33a. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, 2005

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
Aminoglycosides																	
Gentamicin	Humans (791)	0.0	0.5	[0.1 - 1.3]													
	Chicken Breasts (403)	0.0	0.0	[0.0 - 0.9]													
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (567)	0.0	0.0	[0.0 - 0.6]													
Ketolides																	
Telithromycin	Humans (791)	0.4	0.6	[0.2 - 1.5]													
	Chicken Breasts (403)	0.0	0.5	[0.1 - 1.8]													
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (567)	0.5	0.4	[0.0 - 1.3]													
Lincosamides																	
Clindamycin	Humans (791)	0.5	1.1	[0.5 - 2.1]													
	Chicken Breasts (403)	0.0	0.5	[0.1 - 1.8]													
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (567)	0.5	0.4	[0.0 - 1.3]													
Macrolides																	
Azithromycin	Humans (791)	0.1	1.8	[1.0 - 3.0]													
	Chicken Breasts (403)	0.0	0.5	[0.0 - 0.9]													
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (567)	0.0	1.4	[0.6 - 2.8]													
Erythromycin	Humans (791)	0.0	1.6	[0.9 - 2.8]													
	Chicken Breasts (403)	0.0	0.5	[0.1 - 1.8]													
	Ground Turkey (10)	0.0	0.0	[0.0 - 30.8]													
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]													
	Chickens (567)	0.0	1.1	[0.4 - 2.3]													

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 33b. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, 2005

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 (791)	N/A	0.5	[0.1 - 1.3]																
	Chicken Breasts (403)	N/A	0.0	[0.0 - 0.9]																
	Ground Turkey (10)	N/A	0.0	[0.0 - 30.8]																
	Pork Chops (1)	N/A	0.0	[0.0 - 97.5]																
	Chickens (567)	N/A	0.0	[0.0 - 0.6]																
Quinolones																				
Ciprofloxacin	Humans (791)	0.0	21.5	[18.7 - 24.5]	0.6	3.4	35.9	30.2	5.8	2.3	0.3	1.8	9.5	5.4	2.7	2.0	0.1			
	Chicken Breasts (403)	0.0	15.1	[11.8 - 19.0]																
	Ground Turkey (10)	0.0	10.0	[0.3 - 44.5]																
	Pork Chops (1)	0.0	100.0	[2.5 - 100.0]																
	Chickens (567)	0.0	15.0	[12.2 - 18.2]																
Nalidixic acid	0.8	21.9	[19.0 - 24.9]	0.4														7.1	53.3	20.8
Chicken Breasts (403)	0.2	14.9	[11.6 - 18.7]																	
Ground Turkey (10)	0.0	10.0	[0.3 - 44.5]																	
Pork Chops (1)	0.0	100.0	[2.5 - 100.0]																	
Chickens (567)	1.6	15.3	[12.5 - 18.6]																	
Tetracyclines																				
Tetracycline	Humans (791)	0.9	41.8	[38.4 - 45.4]																
	Chicken Breasts (403)	0.0	46.4	[41.5 - 51.4]																
	Ground Turkey (10)	0.0	70.0	[34.8 - 93.3]																
	Pork Chops (1)	0.0	0.0	[0.0 - 97.5]																
	Chickens (567)	0.7	44.1	[40.0 - 48.3]														15.2	22.4	11.8

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 34a. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2005

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	209	297	293	306	365	329	303	320	791	
	Chicken Breasts						198	325	510	403	
	Ground Turkey						2	4	7	10	
	Ground Beef						0	1	0	0	
	Pork Chops						2	0	0	1	
	Chickens					64 ¹	526	374	508	567	
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
		Chicken Breasts						0.0% 0	0.3% 1	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		
		Pork Chops						0.0% 0			0.0% 0
		Chickens					0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0
Ketolides	Telithromycin (MIC ≥ 16 µg/ml)	Humans									0.6% 5
		Chicken Breasts								0.4% 2	0.5% 2
		Ground Turkey								0.0% 0	0.0% 0
		Ground Beef									
		Pork Chops									0.0% 0
		Chickens									0.4% 2
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
		Chicken Breasts								0.4% 2	0.5% 2
		Ground Turkey								0.0% 0	0.0% 0
		Ground Beef									
		Pork Chops									0.0% 0
		Chickens					0.0% 0	0.4% 2	0.8% 3	0.2% 1	0.4% 2
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
		Chicken Breasts								0.8% 4	0.5% 2
		Ground Turkey								0.0% 0	0.0% 0
		Ground Beef									
		Pork Chops									0.0% 0
		Chickens					3.1% 2	0.6% 3	1.3% 5	1.6% 8	1.4% 8
	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
		Chicken Breasts						0.0% 0	0.0% 0	0.8% 4	0.5% 2
		Ground Turkey						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
		Chickens					3.1% 2	0.6% 3	1.6% 6	1.2% 6	1.1% 6

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 34b. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2005

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	209	297	293	306	365	329	303	320	791	
	Chicken Breasts						198	325	510	403	
	Ground Turkey						2	4	7	10	
	Ground Beef						0	1	0	1	
	Pork Chops						2	0	0	0	
	Chickens					64 ¹	526	374	508	567	
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
		Chicken Breasts								0.0% 0	0.0% 0
		Ground Turkey								0.0% 0	0.0% 0
		Ground Beef									
		Pork Chops									0.0% 0
Chickens									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
		Chicken Breasts						15.2% 30	14.5% 47	15.1% 77	15.1% 61
		Ground Turkey						50.0% 1	0.0% 0	28.6% 2	10.0% 1
		Ground Beef							0.0% 0		
		Pork Chops						0.0% 0			100.0% 1
		Chickens					20.3% 13	18.6% 98	14.7% 55	21.3% 108	15.0% 85
	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
		Chicken Breasts								15.1% 77	14.9% 60
		Ground Turkey								28.6% 2	10.0% 1
		Ground Beef									
		Pork Chops									100.0% 1
		Chickens					20.3% 13	22.1% 116	15.5% 58	21.7% 110	15.3% 87
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
		Chicken Breasts								50.2% 256	46.4% 187
		Ground Turkey								42.9% 3	70.0% 7
		Ground Beef									
		Pork Chops									0.0% 0
		Chickens					35.9% 23	45.1% 237	47.6% 178	42.3% 215	44.1% 250

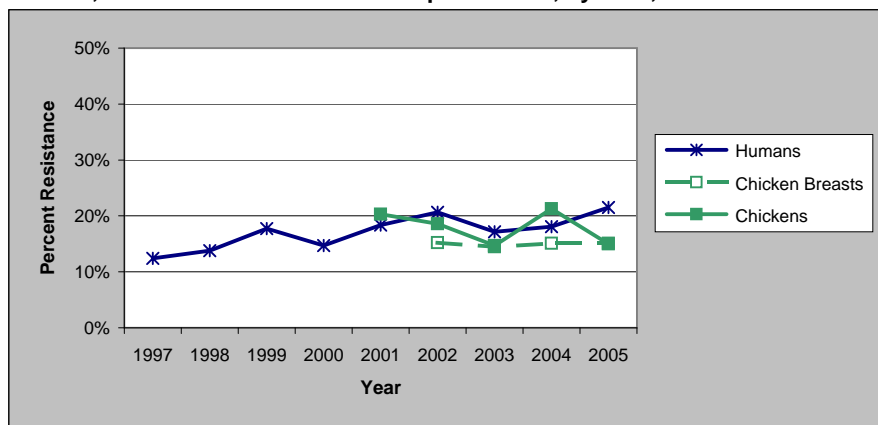
¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

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

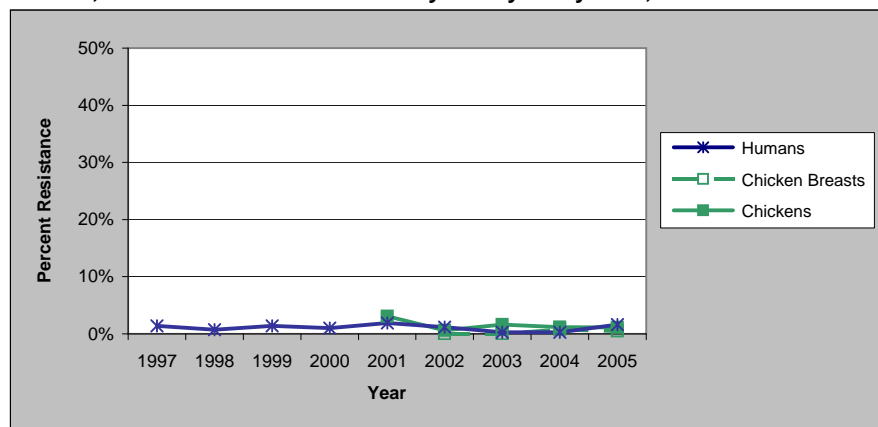
Figure 18. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2005¹



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 34 contains resistance data for *C. jejuni* isolates from each source, by year

Erythromycin Resistance

Figure 19. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Erythromycin by Year, 1997-2005¹



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 34 contains resistance data for *C. jejuni* isolates from each source, by year

Table 35. Number of *Campylobacter jejuni* Isolates Tested from Humans, Retail Meats, and Chickens by Year, 1997-2005

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

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 36. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, 2005

Antimicrobial	Isolate Source (# of Isolates) ¹	%I ²	%R ³	[95% CI] ⁴	Distribution (%) of MICs (µg/ml) ⁵															
					0.008	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Aminoglycosides																				
Gentamicin	Humans (98)	0.0	2.0	[0.2 - 7.2]					1.0	12.2	64.3	19.4	1.0			1.0	1.0			
	Chicken Breasts (151)	0.0	0.0	[0.0 - 2.4]						4.0	88.1	7.9								
	Ground Turkey (9)	0.0	0.0	[0.0 - 33.6]						22.2	77.8									
	Chickens (380)	0.0	0.3	[0.0 - 1.5]					4.2	24.5	68.7	2.4					0.3			
Ketolides																				
Telithromycin	Humans (98)	3.1	4.1	[1.1 - 10.1]	1.0					11.2	26.5	14.3	21.4	18.4	3.1	4.1				
	Chicken Breasts (151)	2.0	7.9	[4.2 - 13.5]				4.0	17.2	5.3	17.2	33.1	13.2	2.0	7.9					
	Ground Turkey (9)	0.0	22.2	[2.8 - 60.0]				11.1			22.2	44.4			22.2					
	Chickens (380)	2.1	5.5	[3.5 - 8.3]	0.3		0.5	9.5	17.6	6.1	25.8	30.0	2.6	2.1	5.5					
Lincosamides																				
Clindamycin	Humans (98)	0.0	4.1	[1.1 - 10.1]			3.1	8.2	19.4	31.6	18.4	12.2	3.1		3.1	1.0				
	Chicken Breasts (151)	1.3	8.6	[4.7 - 14.3]			0.7	0.7	20.5	42.4	25.2		0.7	1.3	5.3	3.3				
	Ground Turkey (9)	22.2	0.0	[0.0 - 33.6]					33.3	33.3	11.1			22.2						
	Chickens (380)	5.3	2.4	[1.1 - 4.4]			0.5	12.1	36.1	37.4	2.4	1.6	2.4	5.3	1.6	0.3	0.5			
Macrolides																				
Azithromycin	Humans (98)	0.0	3.1	[0.6 - 8.7]	1.0		11.2	18.4	38.8	26.5	1.0						3.1			
	Chicken Breasts (151)	0.0	9.9	[5.7 - 15.9]			13.2	44.4	29.1	3.3							9.9			
	Ground Turkey (9)	0.0	22.2	[2.8 - 60.0]			11.1	55.6	11.1								22.2			
	Chickens (380)	0.0	8.4	[5.8 - 11.7]		3.4	30.5	47.1	7.9	1.6	0.8	0.3					0.3	8.2		
Erythromycin	Humans (98)	0.0	3.1	[0.6 - 8.7]			1.0	3.1	11.2	25.5	31.6	15.3	9.2				3.1			
	Chicken Breasts (151)	0.0	9.9	[5.7 - 15.9]				2.6	21.2	10.6	39.1	15.9	0.7				9.9			
	Ground Turkey (9)	0.0	22.2	[2.8 - 60.0]				11.1		11.1	55.6						22.2			
	Chickens (380)	0.0	8.4	[5.8 - 11.7]		0.3	0.3	9.2	20.8	19.5	38.4	2.9	0.3			0.3	0.3	7.9		
Phenicol																				
Florfenicol ⁶	Humans (98)	N/A	1.0	[0.0 - 5.6]						9.2	54.1	24.5	11.2		1.0					
	Chicken Breasts (151)	N/A	0.0	[0.0 - 2.4]						3.3	55.6	39.1	2.0							
	Ground Turkey (9)	N/A	0.0	[0.0 - 33.6]							44.4	55.6								
	Chickens (380)	N/A	0.0	[0.0 - 1.0]							21.8	72.9	5.0	0.3						
Quinolones																				
Ciprofloxacin	Humans (98)	0.0	23.5	[15.5 - 33.1]			1.0	25.5	27.6	18.4	3.1	1.0		3.1	10.2	6.1	2.0	1.0	1.0	
	Chicken Breasts (151)	0.0	29.1	[22.0 - 37.1]				11.3	29.1	29.1	0.7	0.7			7.3	15.2	6.6			
	Ground Turkey (9)	0.0	55.6	[21.2 - 86.3]					33.3		11.1					55.6				
	Chickens (380)	0.0	22.1	[18.0 - 26.6]			3.2	28.9	35.3	10.0	0.5				1.3	6.8	11.8	2.1		
Nalidixic acid	Humans (98)	0.0	26.5	[18.1 - 36.4]										32.7	29.6	11.2			6.1	20.4
	Chicken Breasts (151)	0.0	29.1	[22.0 - 37.1]										44.4	26.5				5.3	23.8
	Ground Turkey (9)	0.0	55.6	[21.2 - 86.3]										22.2	22.2				44.4	11.1
	Chickens (380)	0.3	22.1	[18.0 - 26.6]										63.9	13.2	0.5	0.3		9.5	12.6
Tetracyclines																				
Tetracycline	Humans (98)	0.0	30.6	[21.7 - 40.7]				2.0	21.4	25.5	14.3	5.1	1.0				1.0	6.1	23.5	
	Chicken Breasts (151)	0.0	42.4	[34.4 - 50.7]					2.6	22.5	11.3	13.9	5.3	2.0				1.3	4.6	36.4
	Ground Turkey (9)	0.0	88.9	[51.8 - 99.7]								11.1							88.9	
	Chickens (380)	0.0	42.1	[37.1 - 47.2]			0.5	24.5	25.5	5.3	1.3	0.3	0.5				0.3	3.2	11.3	27.4

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

Resistance by Year

Table 37a. Antimicrobial Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2005

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	6	8	20	12	17	25	22	26	98	
	Chicken Breasts						90	142	196	151	
	Ground Turkey						2	1	5	9	
	Ground Beef						0	0	0	0	
	Pork Chops						3	4	3	0	
	Chickens					52 ¹	288	247	186	380	
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
		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	0.3% 1
Ketolides	Telithromycin (MIC ≥ 16 µg/ml)	Humans									4.1% 4
		Chicken Breasts							8.2% 16	7.9% 12	
		Ground Turkey							0.0% 0	22.2% 2	
		Ground Beef									
		Pork Chops							0.0% 0		
		Chickens									5.5% 21
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
		Chicken Breasts								7.1% 14	8.6% 13
		Ground Turkey								0.0% 0	0.0% 0
		Ground Beef									
		Pork Chops								33.3% 1	
		Chickens					1.9% 1	4.9% 14	4.5% 11	1.1% 2	2.4% 9
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
		Chicken Breasts								9.2% 18	9.9% 15
		Ground Turkey								0.0% 0	22.2% 2
		Ground Beef									
		Pork Chops								33.3% 1	
		Chickens					11.5% 6	19.4% 56	20.2% 50	9.1% 17	8.4% 32
	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
		Chicken Breasts						7.8% 7	7.0% 10	9.2% 18	9.9% 15
		Ground Turkey						0.0% 0	0.0% 0	0.0% 0	22.2% 2
		Ground Beef									
		Pork Chops						33.3% 1	75.0% 3	33.3% 1	
		Chickens					9.6% 5	18.8% 54	20.2% 50	9.1% 17	8.4% 32

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 37b. Antimicrobial Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2005

Year		1997	1998	1999	2000	2001	2002	2003	2004	2005	
Number of Isolates Tested	Humans	6	8	20	12	17	25	22	26	98	
	Chicken Breasts						90	142	196	151	
	Ground Turkey						2	1	5	9	
	Ground Beef						0	0	0	0	
	Pork Chops						3	4	3	0	
	Chickens					52 ¹	288	247	186	380	
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)²	Isolate Source									
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	50.0%	37.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Chickens					0.0%	0.0%	0.0%	0.0%	
	Florfenicol (MIC > 4) ³	Humans									1.0%
		Chicken Breasts								0.0%	0.0%
		Ground Turkey								0.0%	0.0%
		Ground Beef									
		Pork Chops								0.0%	
Chickens									0.0%		
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	33.3%	0.0%	30.0%	25.0%	47.1%	12.0%	22.7%	30.8%	23.5%
		Chicken Breasts						10.0%	13.4%	16.3%	29.1%
		Ground Turkey						50.0%	100.0%	0.0%	55.6%
		Ground Beef									
		Pork Chops						0.0%	0.0%	0.0%	
		Chickens					19.2%	16.0%	20.2%	26.9%	22.1%
	Nalidixic acid (MIC ≥ 64 µg/ml)	Humans	50.0%	50.0%	30.0%	25.0%	47.1%	12.0%	22.7%	34.6%	26.5%
		Chicken Breasts								16.3%	29.1%
		Ground Turkey								0.0%	55.6%
		Ground Beef									
		Pork Chops								0.0%	
		Chickens					19.2%	17.7%	21.5%	27.4%	22.1%
Tetracyclines	Doxycycline (MIC ≥ 8 µg/ml)	Chicken Breasts						44.4%	50.7%		
		Ground Turkey						50.0%	100.0%		
		Ground Beef									
		Pork Chops						33.3%	75.0%		
	Tetracycline (MIC ≥ 16 µg/ml)	Humans	66.7%	50.0%	30.0%	25.0%	58.8%	40.0%	45.5%	38.5%	30.6%
		Chicken Breasts								46.4%	42.4%
		Ground Turkey								0.0%	88.9%
		Ground Beef									
		Pork Chops								66.7%	
		Chickens					57.7%	49.0%	51.0%	48.4%	42.1%

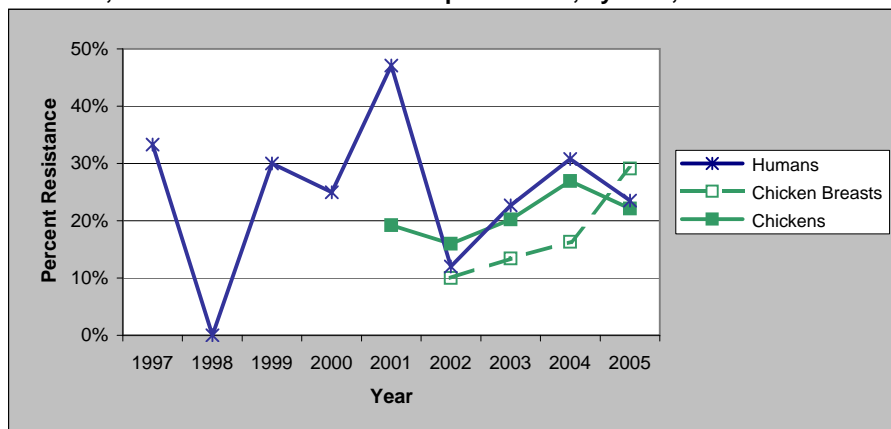
¹ These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

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

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

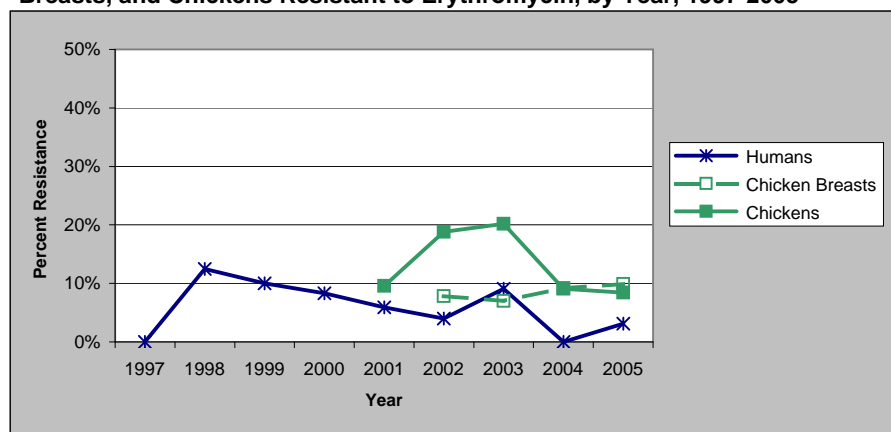
Figure 20. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2005¹



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 37 contains resistance data for *C. coli* isolates from each source, by year

Erythromycin Resistance

Figure 21. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Erythromycin, by Year, 1997-2005¹



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 37 contains resistance data for *C. coli* isolates from each source, by year

Table 38. Number of *Campylobacter coli* Isolates Tested from Humans, Retail Meats, and Chickens, by Year, 1997-2005

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

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 39. Number of *E. coli* Isolates Tested, by Source and Year, 2000-2005

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

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

Table 40. Number and Percent of Retail Meat Samples Positive for *E. coli*, 2005

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	468	470	468	465
Number Positive for <i>E. coli</i>	393	396	316	205
Percent Positive for <i>E. coli</i>	84.0%	84.3%	67.5%	44.1%

Figure 22. Percent of Retail Meat Samples Positive for *E. coli*, 2005

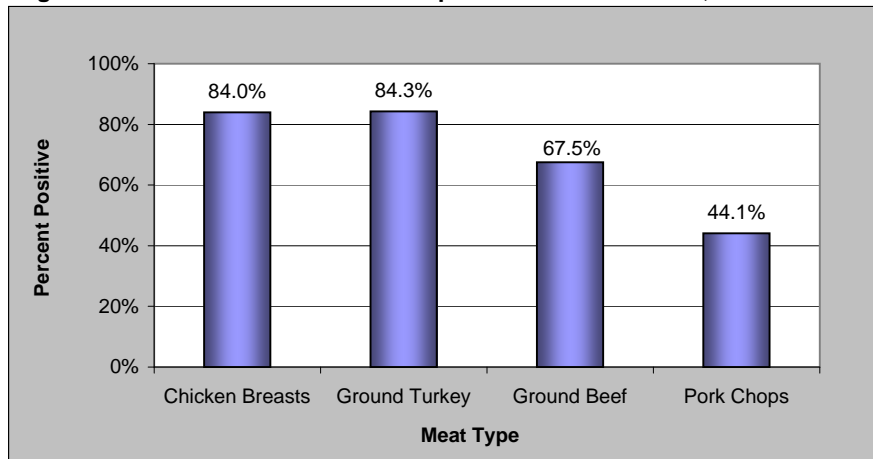
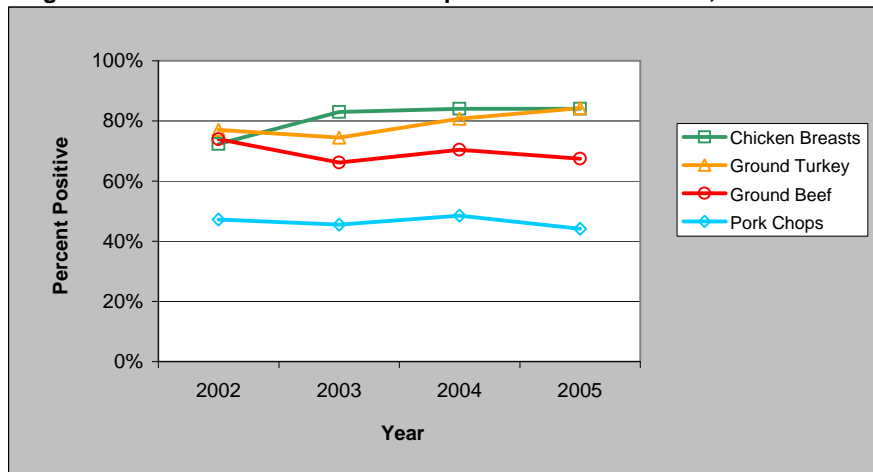


Figure 23. Percent of Retail Meat Samples Positive for *E. coli*, 2002-2005



C. Antimicrobial Susceptibility among *E. coli*

MIC Distributions

Table 41a. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 2005

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
Aminoglycosides																				
Amikacin	Chicken Breasts (393)	0.0	0.0	[0.0 - 0.9]							14.8	64.6	18.6	1.8	0.3					
	Ground Turkey (396)	0.0	0.0	[0.0 - 0.9]						0.3	16.7	68.2	12.1	2.8						
	Ground Beef (316)	0.0	0.0	[0.0 - 1.2]						0.3	11.7	68.4	18.0	1.6						
	Pork Chops (205)	0.5	0.0	[0.0 - 1.8]						1.5	11.2	62.0	19.5	5.4		0.5				
	Chickens (2232)	0.0	0.0	[0.0 - 0.2]						1.8	24.0	53.6	16.7	3.7	0.3					
Gentamicin	Chicken Breasts (393)	2.8	37.7	[32.9 - 42.7]		3.8	36.6	17.0	1.3	0.8	2.8	17.6	20.1							
	Ground Turkey (396)	3.0	27.5	[23.2 - 32.2]		4.0	46.2	17.2	2.0	3.0	12.4	15.2								
	Ground Beef (316)	0.0	0.0	[0.0 - 1.2]		6.3	65.2	26.3	2.2											
	Pork Chops (205)	1.0	0.0	[0.0 - 1.8]		6.8	56.1	34.1	2.0		1.0									
	Chickens (2232)	4.3	36.7	[34.7 - 38.7]		5.0	37.5	13.1	2.9	0.5	4.3	13.6	23.1							
Kanamycin	Chicken Breasts (393)	1.0	7.1	[4.8 - 10.1]																
	Ground Turkey (396)	0.5	11.4	[8.4 - 14.9]								84.0	7.9	1.0				7.1		
	Ground Beef (316)	0.0	0.6	[0.1 - 2.3]								84.1	4.0	0.5	0.3			11.1		
	Pork Chops (205)	0.0	7.3	[4.2 - 11.8]								98.1	1.3					0.6		
	Chickens (2232)	3.2	10.3	[9.1 - 11.7]								92.7						1.5	5.9	
Streptomycin	Chicken Breasts (393)	N/A	50.9	[45.8 - 55.9]													49.1	17.8	33.1	
	Ground Turkey (396)	N/A	43.4	[38.5 - 48.5]													56.6	19.2	24.2	
	Ground Beef (316)	N/A	5.4	[3.2 - 8.5]													94.6	3.5	1.9	
	Pork Chops (205)	N/A	13.2	[8.9 - 18.6]													86.8	7.3	5.9	
	Chickens (2232)	N/A	58.0	[55.9 - 60.1]													41.9	19.4	38.6	
Aminopenicillins																				
Ampicillin	Chicken Breasts (393)	0.8	24.7	[20.5 - 29.3]							5.9	35.4	31.8	1.5	0.8		0.3	24.4		
	Ground Turkey (396)	0.0	38.1	[33.3 - 43.1]							5.6	36.1	19.9	0.3				38.1		
	Ground Beef (316)	1.3	3.5	[1.8 - 6.1]							14.9	49.7	30.1	0.6	1.3				3.5	
	Pork Chops (205)	2.4	16.1	[11.3 - 21.9]							9.3	40.5	28.3	3.4	2.4		2.0	14.1		
	Chickens (2232)	0.3	22.0	[20.3 - 23.8]							6.1	38.3	25.6	7.7	0.3		0.4	21.5	0.1	
β-Lactam/β-Lactamase Inhibitor Combinations																				
Amoxicillin-Clavulanic Acid	Chicken Breasts (393)	1.8	12.0	[8.9 - 15.6]							3.1	16.8	47.3	19.1	1.8		9.7	2.3		
	Ground Turkey (396)	5.1	3.8	[2.1 - 6.2]							4.8	12.4	42.7	31.3	5.1		2.8	1.0		
	Ground Beef (316)	0.0	1.3	[0.3 - 3.2]							9.8	20.3	60.8	7.9				0.6	0.6	
	Pork Chops (205)	0.5	2.9	[1.1 - 6.3]							2.9	21.0	52.2	20.5	0.5		2.0	1.0		
	Chickens (2232)	1.7	10.6	[9.3 - 11.9]							2.3	24.3	44.8	16.4	1.7		4.8	5.7		

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 2005 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 41b. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 2005

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																																																																																									
Cephalosporins																																																																																																														
Ceftiofur	Chicken Breasts (393)	1.5	8.9	[6.3 - 12.2]	<table border="1"> <tr> <td>2.0</td><td>38.4</td><td>46.3</td><td>2.3</td><td>0.5</td><td>1.5</td><td>6.9</td><td>2.0</td> </tr> <tr> <td>1.3</td><td>51.3</td><td>41.7</td><td>2.0</td><td>1.8</td><td>0.3</td><td>0.8</td><td>1.0</td> </tr> <tr> <td>8.5</td><td>54.4</td><td>32.9</td><td>1.3</td><td>0.9</td><td>0.9</td><td>0.6</td><td>0.3</td> </tr> <tr> <td>3.4</td><td>58.0</td><td>34.6</td><td>2.0</td><td>0.5</td><td>1.0</td><td></td><td>0.5</td> </tr> <tr> <td>5.8</td><td>63.2</td><td>20.1</td><td>1.4</td><td>0.6</td><td>2.4</td><td>5.1</td><td>1.4</td> </tr> </table>																2.0	38.4	46.3	2.3	0.5	1.5	6.9	2.0	1.3	51.3	41.7	2.0	1.8	0.3	0.8	1.0	8.5	54.4	32.9	1.3	0.9	0.9	0.6	0.3	3.4	58.0	34.6	2.0	0.5	1.0		0.5	5.8	63.2	20.1	1.4	0.6	2.4	5.1	1.4																																																		
	2.0	38.4	46.3	2.3																	0.5	1.5	6.9	2.0																																																																																						
	1.3	51.3	41.7	2.0																	1.8	0.3	0.8	1.0																																																																																						
	8.5	54.4	32.9	1.3																	0.9	0.9	0.6	0.3																																																																																						
	3.4	58.0	34.6	2.0																	0.5	1.0		0.5																																																																																						
5.8	63.2	20.1	1.4	0.6	2.4	5.1	1.4																																																																																																							
Ground Turkey (396)	0.3	1.8	[0.7 - 3.6]																																																																																																											
Ground Beef (316)	0.9	0.9	[0.2 - 2.7]																																																																																																											
Pork Chops (205)	1.0	0.5	[0.0 - 2.7]																																																																																																											
Chickens (2232)	2.4	6.5	[5.5 - 7.6]																																																																																																											
Ceftriaxone	Chicken Breasts (393)	2.8	0.5	[0.1 - 1.8]	<table border="1"> <tr> <td>87.0</td><td>0.8</td><td>1.8</td><td>0.3</td><td>1.0</td><td>5.9</td><td>2.5</td><td>0.3</td><td>0.5</td> </tr> <tr> <td>93.7</td><td>1.8</td><td>2.0</td><td>0.3</td><td></td><td>1.0</td><td>1.0</td><td>0.3</td><td></td> </tr> <tr> <td>94.6</td><td>1.6</td><td>1.6</td><td></td><td>0.6</td><td>0.6</td><td>0.6</td><td>0.3</td><td></td> </tr> <tr> <td>96.1</td><td>2.4</td><td>1.0</td><td></td><td></td><td></td><td></td><td>0.5</td><td></td> </tr> <tr> <td>89.2</td><td>0.9</td><td>0.8</td><td>0.1</td><td>0.9</td><td>4.3</td><td>3.0</td><td>0.8</td><td></td> </tr> </table>																87.0	0.8	1.8	0.3	1.0	5.9	2.5	0.3	0.5	93.7	1.8	2.0	0.3		1.0	1.0	0.3		94.6	1.6	1.6		0.6	0.6	0.6	0.3		96.1	2.4	1.0					0.5		89.2	0.9	0.8	0.1	0.9	4.3	3.0	0.8																																														
	87.0	0.8	1.8	0.3																	1.0	5.9	2.5	0.3	0.5																																																																																					
	93.7	1.8	2.0	0.3																		1.0	1.0	0.3																																																																																						
	94.6	1.6	1.6																		0.6	0.6	0.6	0.3																																																																																						
	96.1	2.4	1.0																					0.5																																																																																						
89.2	0.9	0.8	0.1	0.9	4.3	3.0	0.8																																																																																																							
Ground Turkey (396)	1.3	0.0	[0.0 - 0.9]																																																																																																											
Ground Beef (316)	0.9	0.0	[0.0 - 1.2]																																																																																																											
Pork Chops (205)	0.5	0.0	[0.0 - 1.8]																																																																																																											
Chickens (2232)	3.8	0.0	[0.0 - 0.2]																																																																																																											
Cephamycins																																																																																																														
Cefoxitin	Chicken Breasts (393)	1.5	11.2	[8.3 - 14.7]	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td>1.0</td><td>24.9</td><td>49.9</td><td>11.5</td><td>1.5</td><td>4.3</td><td>6.9</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td>2.0</td><td>35.9</td><td>47.2</td><td>10.6</td><td>1.0</td><td>1.3</td><td>2.0</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td>7.9</td><td>37.3</td><td>45.9</td><td>7.6</td><td>0.3</td><td>0.3</td><td>0.6</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td>1.5</td><td>30.2</td><td>55.6</td><td>10.2</td><td>0.5</td><td>0.5</td><td>1.5</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td>0.1</td><td>0.4</td><td>14.0</td><td>55.3</td><td>18.0</td><td>2.3</td><td>5.3</td><td>4.6</td> </tr> </table>																					1.0	24.9	49.9	11.5	1.5	4.3	6.9						2.0	35.9	47.2	10.6	1.0	1.3	2.0						7.9	37.3	45.9	7.6	0.3	0.3	0.6						1.5	30.2	55.6	10.2	0.5	0.5	1.5						0.1	0.4	14.0	55.3	18.0	2.3	5.3	4.6																													
																						1.0	24.9	49.9	11.5	1.5	4.3	6.9																																																																																		
																						2.0	35.9	47.2	10.6	1.0	1.3	2.0																																																																																		
																						7.9	37.3	45.9	7.6	0.3	0.3	0.6																																																																																		
																						1.5	30.2	55.6	10.2	0.5	0.5	1.5																																																																																		
					0.1	0.4	14.0	55.3	18.0	2.3	5.3	4.6																																																																																																		
Ground Turkey (396)	1.0	3.3	[1.8 - 5.5]																																																																																																											
Ground Beef (316)	0.3	0.9	[0.2 - 2.7]																																																																																																											
Pork Chops (205)	0.5	2.0	[0.5 - 4.9]																																																																																																											
Chickens (2232)	2.3	9.9	[8.7 - 11.2]																																																																																																											
Folate Pathway Inhibitors																																																																																																														
Sulfisoxazole	Chicken Breasts (393)	N/A	48.1	[43.1 - 53.2]	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>39.4</td><td>9.2</td><td>2.8</td><td>0.3</td><td>0.3</td><td>48.1</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>33.1</td><td>14.4</td><td>4.5</td><td></td><td></td><td>48.0</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>75.3</td><td>13.6</td><td>4.1</td><td></td><td></td><td>7.0</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>62.4</td><td>18.0</td><td>4.4</td><td>0.5</td><td>0.5</td><td>14.1</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>45.6</td><td>2.0</td><td>0.2</td><td>0.1</td><td>0.2</td><td>51.9</td> </tr> </table>																												39.4	9.2	2.8	0.3	0.3	48.1													33.1	14.4	4.5			48.0													75.3	13.6	4.1			7.0													62.4	18.0	4.4	0.5	0.5	14.1													45.6	2.0	0.2	0.1	0.2	51.9
																													39.4	9.2	2.8	0.3	0.3	48.1																																																																												
																													33.1	14.4	4.5			48.0																																																																												
																													75.3	13.6	4.1			7.0																																																																												
																													62.4	18.0	4.4	0.5	0.5	14.1																																																																												
												45.6	2.0	0.2	0.1	0.2	51.9																																																																																													
Ground Turkey (396)	N/A	48.0	[43.0 - 53.0]																																																																																																											
Ground Beef (316)	N/A	7.0	[4.4 - 10.4]																																																																																																											
Pork Chops (205)	N/A	14.1	[9.7 - 19.7]																																																																																																											
Chickens (2232)	N/A	51.9	[49.8 - 54.0]																																																																																																											
Trimethoprim-Sulfamethoxazole	Chicken Breasts (393)	N/A	7.4	[5.0 - 10.4]	<table border="1"> <tr> <td>66.2</td><td>17.3</td><td>6.4</td><td>2.5</td><td>0.3</td><td>0.5</td><td>6.9</td> </tr> <tr> <td>69.4</td><td>18.2</td><td>5.8</td><td>1.3</td><td>0.3</td><td>0.3</td><td>4.8</td> </tr> <tr> <td>89.6</td><td>8.5</td><td>0.9</td><td>0.3</td><td></td><td></td><td>0.6</td> </tr> <tr> <td>75.1</td><td>18.0</td><td>4.4</td><td>1.0</td><td></td><td></td><td>1.5</td> </tr> <tr> <td>54.4</td><td>23.4</td><td>7.3</td><td>3.5</td><td>1.0</td><td>0.2</td><td>10.2</td> </tr> </table>																66.2	17.3	6.4	2.5	0.3	0.5	6.9	69.4	18.2	5.8	1.3	0.3	0.3	4.8	89.6	8.5	0.9	0.3			0.6	75.1	18.0	4.4	1.0			1.5	54.4	23.4	7.3	3.5	1.0	0.2	10.2																																																							
	66.2	17.3	6.4	2.5																	0.3	0.5	6.9																																																																																							
	69.4	18.2	5.8	1.3																	0.3	0.3	4.8																																																																																							
	89.6	8.5	0.9	0.3																			0.6																																																																																							
	75.1	18.0	4.4	1.0																			1.5																																																																																							
54.4	23.4	7.3	3.5	1.0	0.2	10.2																																																																																																								
Ground Turkey (396)	N/A	5.1	[3.1 - 7.7]																																																																																																											
Ground Beef (316)	N/A	0.6	[0.1 - 2.3]																																																																																																											
Pork Chops (205)	N/A	1.5	[0.3 - 4.2]																																																																																																											
Chickens (2232)	N/A	10.4	[9.2 - 11.7]																																																																																																											
Phenicol																																																																																																														
Chloramphenicol	Chicken Breasts (393)	2.0	0.5	[0.1 - 1.8]	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>2.5</td><td>41.2</td><td>53.7</td><td>2.0</td><td></td><td>0.5</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>0.5</td><td>34.1</td><td>58.8</td><td>2.5</td><td></td><td>4.0</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>1.9</td><td>36.7</td><td>58.5</td><td>1.3</td><td>0.3</td><td>1.3</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>2.9</td><td>35.1</td><td>56.1</td><td>2.4</td><td>2.0</td><td>1.5</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>3.8</td><td>62.9</td><td>31.9</td><td>0.4</td><td>0.2</td><td>0.8</td> </tr> </table>																						2.5	41.2	53.7	2.0		0.5							0.5	34.1	58.8	2.5		4.0							1.9	36.7	58.5	1.3	0.3	1.3							2.9	35.1	56.1	2.4	2.0	1.5							3.8	62.9	31.9	0.4	0.2	0.8																														
																							2.5	41.2	53.7	2.0		0.5																																																																																		
																							0.5	34.1	58.8	2.5		4.0																																																																																		
																							1.9	36.7	58.5	1.3	0.3	1.3																																																																																		
																							2.9	35.1	56.1	2.4	2.0	1.5																																																																																		
						3.8	62.9	31.9	0.4	0.2	0.8																																																																																																			
Ground Turkey (396)	2.5	4.0	[2.3 - 6.5]																																																																																																											
Ground Beef (316)	1.3	1.6	[0.5 - 3.7]																																																																																																											
Pork Chops (205)	2.4	3.4	[1.4 - 6.9]																																																																																																											
Chickens (2232)	0.4	1.0	[0.6 - 1.5]																																																																																																											

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 2005 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 41c. Distribution of MICs and Occurrence of Resistance among *E. coli* Isolates from Retail Meats and Chickens, 2005

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
Quinolones																				
Ciprofloxacin	Chicken Breasts (393)	0.0	0.0	[0.0 - 0.9]	84.0	4.8	2.3	4.1	4.6	0.3										
	Ground Turkey (396)	0.0	0.0	[0.0 - 0.9]	81.3	4.8	1.3	4.0	8.6											
	Ground Beef (316)	0.0	0.0	[0.0 - 1.2]	90.2	3.8	1.9	2.5	1.3		0.3									
	Pork Chops (205)	0.0	0.5	[0.0 - 2.7]	90.2	4.9	1.0	2.9	0.5											
	Chickens (2232)	0.0	0.4	[0.2 - 0.7]	91.6	0.6	0.3	3.8	2.7	0.5	0.1									
Nalidixic Acid	Chicken Breasts (393)	N/A	6.6	[4.4 - 9.5]							8.1	66.4	15.8	2.0	1.0		0.5	6.1		
	Ground Turkey (396)	N/A	10.4	[7.5 - 13.8]							7.1	60.9	19.2	1.8	0.8		0.8	9.6		
	Ground Beef (316)	N/A	1.3	[0.3 - 3.2]						0.3	6.3	70.9	17.1	1.3	2.8		0.9	0.3		
	Pork Chops (205)	N/A	1.5	[0.3 - 4.2]							9.8	67.3	18.0	2.4	1.0		1.5			
	Chickens (2232)	N/A	7.5	[6.5 - 8.7]						0.1	13.3	66.9	11.9	0.2			0.4	7.2		
Tetracyclines																				
Tetracycline	Chicken Breasts (393)	2.0	46.6	[41.5 - 51.6]																
	Ground Turkey (396)	0.3	78.0	[73.6 - 82.0]																
	Ground Beef (316)	6.3	16.5	[12.5 - 21.0]																
	Pork Chops (205)	1.0	45.9	[38.9 - 52.9]																
	Chickens (2232)	1.1	48.9	[46.8 - 51.0]																

¹ Percent of isolates with intermediate susceptibility

² Percent of isolates that were resistant

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

⁴ The unshaded areas indicate the dilution range of the Sensititre plates used to test 2005 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 42b. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2005

Year		2000	2001	2002	2003	2004	2005		
Number of Isolates Tested	Chicken Breasts			282	396	400	393		
	Ground Turkey			304	333	376	396		
	Ground Beef			295	311	338	316		
	Pork Chops			184	218	232	205		
	Chickens	285	1989	2100	1365	1697	2232		
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source							
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Chicken Breasts			7.1% 20	7.6% 30	5.8% 23	8.9% 35	
		Ground Turkey			1.0% 3	0.3% 1	1.1% 4	1.8% 7	
		Ground Beef			0.0% 0	0.3% 1	0.9% 3	0.9% 3	
		Pork Chops			0.5% 1	0.9% 2	0.4% 1	0.5% 1	
		Chickens	6.3% 18	4.4% 88	5.5% 115	7.1% 97	4.9% 83	6.5% 145	
	Ceftriaxone (MIC ≥ 64 µg/ml)	Chicken Breasts			0.0% 0	0.0% 0	0.0% 0	0.5% 2	
		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% 1	0.0% 0	0.1% 1	0.0% 1	
	Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Chicken Breasts			21.3% 60	22.0% 87		
			Ground Turkey			14.8% 45	18.9% 63		
			Ground Beef			5.8% 17	8.0% 25		
			Pork Chops			10.3% 19	11.9% 26		
			Chickens	17.9% 51	12.9% 256	15.1% 317	16.6% 226		
Cephameycins	Cefoxitin (MIC ≥ 32 µg/ml)	Chicken Breasts			11.0% 31	9.3% 37	8.3% 33	11.2% 44	
		Ground Turkey			3.3% 10	1.2% 4	4.5% 17	3.3% 13	
		Ground Beef			1.4% 4	0.3% 1	1.2% 4	0.9% 3	
		Pork Chops			3.3% 6	2.3% 5	2.2% 5	2.0% 4	
		Chickens	7.4% 21	8.7% 173	8.5% 178	8.3% 113	8.2% 139	9.9% 221	
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole ¹ (MIC ≥ 512 µg/ml)	Chicken Breasts			32.3% 91	38.4% 152	41.3% 165	48.1% 189	
		Ground Turkey			48.0% 146	51.7% 172	48.4% 182	48.0% 190	
		Ground Beef			9.8% 29	10.3% 32	13.0% 44	7.0% 22	
		Pork Chops			12.5% 23	15.1% 33	19.4% 45	14.1% 29	
		Chickens	57.9% 165	58.2% 1157	46.1% 969	43.9% 599	53.2% 903	51.9% 1159	
	Trimethoprim- Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Chicken Breasts			3.5% 10	7.1% 28	4.3% 17	7.4% 29	
		Ground Turkey			3.9% 12	6.9% 23	3.7% 14	5.1% 20	
		Ground Beef			0.7% 2	0.3% 1	0.6% 2	0.6% 2	
		Pork Chops			1.1% 2	2.8% 6	3.9% 9	1.5% 3	
		Chickens	17.2% 49	12.6% 251	10.4% 218	10.5% 144	10.7% 181	10.4% 232	

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

Table 42c. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2005

Year			2000	2001	2002	2003	2004	2005
Number of Isolates Tested		Chicken Breasts			282	396	400	393
		Ground Turkey			304	333	376	396
		Ground Beef			295	311	338	316
		Pork Chops			184	218	232	205
		Chickens	285	1989	2100	1365	1697	2232
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source						
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Chicken Breasts			0.7% 2	0.0% 0	1.8% 7	0.5% 2
		Ground Turkey			0.3% 1	3.6% 12	0.8% 3	4.0% 16
		Ground Beef			1.0% 3	2.3% 7	3.6% 12	1.6% 5
		Pork Chops			1.6% 3	4.1% 9	4.3% 10	3.4% 7
		Chickens	4.6% 13	2.4% 47	1.8% 38	1.3% 18	1.0% 17	1.0% 22
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Chicken Breasts			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
		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	0.5% 1
		Chickens	0.0% 0	0.2% 3	0.0% 1	0.1% 1	0.2% 3	0.4% 8
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Chicken Breasts			2.8% 8	4.0% 16	7.0% 28	6.6% 26
		Ground Turkey			4.3% 13	11.7% 39	10.6% 40	10.4% 41
		Ground Beef			0.0% 0	1.0% 3	1.5% 5	1.3% 4
		Pork Chops			0.5% 1	0.5% 1	0.0% 0	1.5% 3
		Chickens	10.2% 29	8.4% 168	6.8% 142	6.2% 84	6.8% 115	7.5% 168
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Chicken Breasts			46.1% 130	42.9% 170	48.0% 192	46.6% 183
		Ground Turkey			77.0% 234	77.8% 259	74.2% 279	78.0% 309
		Ground Beef			30.8% 91	25.1% 78	22.8% 77	16.5% 52
		Pork Chops			52.7% 97	46.3% 101	56.0% 130	45.9% 94
		Chickens	68.4% 195	61.6% 1226	58.6% 1231	52.2% 713	50.3% 853	48.9% 1092

Multidrug Resistance

Table 43. Resistance Patterns among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2005

Year		2000	2001	2002	2003	2004	2005
Number of Isolates Tested	Chicken Breasts			282	396	400	393
	Ground Turkey			304	333	376	396
	Ground Beef			295	311	338	316
	Pork Chops			184	218	232	205
	Chickens	285	1989	2100	1365	1697	2232
Resistance Pattern	Isolate Source						
1. No Resistance Detected	Chicken Breasts			27.0% 76	20.5% 81	20.8% 83	20.4% 80
	Ground Turkey			16.8% 51	14.7% 49	19.1% 72	16.2% 64
	Ground Beef			63.1% 186	66.9% 208	73.1% 247	81.0% 256
	Pork Chops			41.3% 76	44.5% 97	37.9% 88	48.8% 100
	Chickens	9.8% 28	12.6% 251	15.1% 317	15.6% 213	17.0% 288	17.7% 395
2. At Least ACSSuT¹ Resistant	Chicken Breasts			0.4% 1	0.0% 0	1.3% 5	0.3% 1
	Ground Turkey			0.0% 0	2.7% 9	0.5% 2	1.8% 7
	Ground Beef			0.3% 1	1.0% 3	1.5% 5	0.6% 2
	Pork Chops			0.5% 1	1.4% 3	1.3% 3	1.0% 2
	Chickens	3.5% 10	2.0% 40	1.3% 27	1.0% 14	0.8% 14	0.6% 14
3. At Least ACT/S² Resistant	Chicken Breasts			0.0% 0	0.0% 0	0.3% 1	0.0% 0
	Ground Turkey			0.0% 0	0.9% 3	0.0% 0	0.8% 3
	Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.3% 1
	Pork Chops			0.5% 1	0.0% 0	0.4% 1	0.5% 1
	Chickens	1.4% 4	0.6% 11	0.3% 7	0.2% 3	0.3% 5	0.3% 7
4. At Least ACSSuTAuCf³ Resistant	Chicken Breasts			0.4% 1	0.0% 0	1.0% 4	0.3% 1
	Ground Turkey			0.0% 0	0.3% 1	0.0% 0	0.3% 1
	Ground Beef			0.0% 0	0.0% 0	0.9% 3	0.3% 1
	Pork Chops			0.0% 0	0.5% 1	0.4% 1	0.0% 0
	Chickens	2.8% 8	1.1% 22	0.8% 17	0.8% 11	0.6% 10	0.5% 11
5. At Least Ceftiofur and Nalidixic Acid Resistant	Chicken Breasts			0.4% 1	0.5% 2	0.8% 3	0.3% 1
	Ground Turkey			0.3% 1	0.3% 1	0.3% 1	0.0% 0
	Ground Beef			0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Pork Chops			0.5% 1	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

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*, 2005

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*, 2005

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