National Antimicrobial Resistance Monitoring System-
Enteric Bacteria
2003 Executive Report

DEPARTMENT OF HEALTH & HUMAN SERVICES • USA
CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION
FDA
USDA

Contents

I. Introduction

A. Executive Report

This report summarizes National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS) data on *Salmonella* and *Campylobacter* isolates recovered in 2003 from human clinical cases, retail meats, and food animals at federally inspected slaughter and processing plants. For comparison purposes, data from prior years are also included in the report. This is the first NARMS report summarizing data from all three components of the program in an integrated format.

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B. Background

Antimicrobial resistance is a serious problem that threatens both human and animal health. In human medicine, antimicrobials are most often used to treat infectious diseases, whereas in food animals, antimicrobials are used for the prevention, control, and treatment of infectious diseases, as well as for enhancing growth and improving feed efficiency. An undesired consequence of antimicrobial use in any environment is the potential development of antimicrobial-resistant bacteria. In food animals, these bacteria can contaminate meats as well as dairy products, eggs, and (indirectly) produce. These resistant bacteria, and in particular resistant zoonotic pathogens, may be transferred to humans through the consumption, handling, or improper cooking of contaminated foods and may cause serious infections.

Recognizing this potential health hazard, the World Health Organization (WHO), the Food and Agriculture Organization (FAO), and the World Organization for Animal Health (OIE) recommend that countries implement national monitoring programs on the use of antimicrobials in animals and the occurrence of antimicrobial resistance in bacteria from animals, foods of animal origin, and cases of human illness.[1]

WHO, FAO, and OIE recognize that data obtained by such monitoring may be used to:

- Document the usage of antimicrobials and the occurrence of resistance, and identify epidemiological trends;
- Compare the usage of antimicrobials and the occurrence of resistance between countries or regions over time;
- Aid interpretation of patterns and trends regarding antimicrobial resistance and residues;
- Identify areas for targeted research;
- Develop risk assessment models;
- Develop policies for the containment of antimicrobial resistance;
- Evaluate the effectiveness of any control measures implemented.

[1] The Joint FAO/OIE/WHO Expert Workshop on Non-Human Antimicrobial Usage and Antimicrobial Resistance Scientific Assessment (Geneva, Dec. 1-5, 2003) can be found at: http://whqlibdoc.who.int/hq/2004/WHO_CDS_CPE_ZFK_2004.7.pdf

C. NARMS Program

In the United States, the National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS) is a national public health monitoring system 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 by the Food and Drug Administration's Center for Veterinary Medicine (CVM) as part of its overall strategy to assess the impact of antimicrobial use in food animals on public health. NARMS is a collaboration between three federal agencies: the 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, including Canada, Denmark, France, Greece, Italy, Mexico, the Netherlands, Norway, Sweden, and the United Kingdom, so that information can be shared on the global dimensions of antimicrobial resistant foodborne bacteria.

The NARMS program monitors antimicrobial susceptibility/resistance among enteric bacteria from humans, retail meats, and food animals. Surveillance is conducted for two categories of enteric bacteria: zoonotic bacterial pathogens (*Salmonella* and *Campylobacter*) and commensal (not usually pathogenic) bacteria (*Escherichia coli* and *Enterococcus*). *Salmonella* was chosen as the sentinel pathogen for the NARMS program. *Campylobacter* was subsequently 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. Recently, NARMS began testing *Salmonella* and *Campylobacter* isolates for genetic relatedness using pulsed-field gel electrophoresis (PFGE). Epidemiological and microbiological research studies are also conducted within and between agencies based on NARMS findings. These studies may include isolates of a particular serotype or those exhibiting a particular resistance pattern or they may focus on improving the culture, isolation, or antimicrobial testing methodology of target bacteria. Currently, each NARMS agency prepares a comprehensive annual report that is posted on each agency's website. Data and directed research studies are reported at scientific meetings and published in peer-reviewed scientific journals.

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

- Provide descriptive data on the extent and temporal trends of antimicrobial susceptibility/resistance in zoonotic foodborne bacterial pathogens and select commensal organisms to veterinarians, physicians, public health authorities, and other stakeholders;

- Provide a platform for successive epidemiology and research studies to better understand the emergence and transfer of antimicrobial resistance and the burden of illness posed by these organisms, and assist in the development of science-based strategies to contain or mitigate resistance;

- Assist the FDA in making decisions related to the approval of safe and effective drugs for humans and animals, as well as to promote judicious use of antimicrobial drugs.

D. NARMS Components

The NARMS program has three components or "arms" which are 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 human isolates is performed at CDC's laboratories in the National Center for Zoonotic, Vector-Borne and Enteric Diseases (NCZVED, proposed name) in Atlanta, Georgia.

The program initially included non-Typhi *Salmonella* and *E. coli* O157:H7 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 a representative sample of non-Typhi *Salmonella*, *Salmonella* Typhi, *Shigella*, and *E. coli* O157 isolates to CDC for antimicrobial susceptibility testing, and 10 FoodNet states have been participating in *Campylobacter* surveillance.

2. Retail Meat Component

The retail meat component of NARMS was launched in 2002, following a 15-month pilot study in Iowa. The retail meat component is conducted through an ongoing collaboration between FDA/CVM, CDC, and FoodNet laboratories. Bacterial identification and antimicrobial susceptibility testing of retail meat isolates is performed at CVM's Office of Research in Laurel, Maryland.

Retail meat sampling began in January of 2002 for FoodNet laboratories in Connecticut, Georgia, Maryland, Minnesota, and Tennessee. Oregon joined the program in September of 2002, while FoodNet laboratories in California and New York joined the program in 2003. All 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 (Georgia, Maryland, Oregon, and Tennessee) also tested for *E. coli* and *Enterococcus*.

3. Animal Component

The animal component of NARMS was launched in 1997 after pilot studies were conducted in 1995 and 1996. Antimicrobial susceptibility testing of animal isolates is conducted at the USDA's Agricultural Research Service (ARS) Bacterial Epidemiology and Antimicrobial Resistance Research Unit at the Russell Research Center in Athens, Georgia.

Salmonella slaughter isolates recovered from chickens, turkeys, cattle, and swine were submitted to the NARMS program through the USDA Food Safety and Inspection Service (FSIS) *Salmonella* HACCP (Hazard Analysis and Critical Control Point) Verification Testing Program. *Salmonella* isolates from USDA baseline studies, ready-to-eat sampling programs, and diagnostic and on-farm sources were also tested. In 1998, the program was expanded to include monitoring of resistance among *Campylobacter* isolates from chicken carcass rinsates collected at slaughter. In 2000, USDA began monitoring resistance among *E. coli* and *Enterococcus* isolates recovered from chicken carcass rinsates collected at slaughter as well.

II. Sampling and Testing 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 (arms) of NARMS and are described below.

1. Human Component

Sampling for the human isolates depends on public health laboratory-based surveillance and is driven by the occurrence of laboratory-confirmed cases. The NARMS program at CDC began in 1996 and initially included monitoring of antimicrobial resistance among non-Typhi *Salmonella* and *E. coli* O157 isolates in 14 states. Testing of *Salmonella* Typhi and *Shigella* isolates was added in 1999. Subsequently, additional states joined the program. Since 2003, *Salmonella*, *Shigella*, and *E. coli* O157 isolates have been collected from clinical laboratories by state and local health departments in all 50 states and sent to the CDC for susceptibility testing. In 2003, participating state and local public health laboratories sent every 20th non-Typhi *Salmonella*, *Shigella*, and *E. coli* O157:H7 isolate they received. *Salmonella* serotyping was performed by the participating laboratories prior to shipping. All isolates of *Salmonella* Typhi, *Listeria monocytogenes*, and non-cholerae *Vibrio* isolates were also forwarded to CDC for further analysis.

Surveillance for *Campylobacter* began in 1997 with five FoodNet sites submitting one isolate each week. This was expanded through the years, and in 2003 included isolates submitted from 10 FoodNet sites. Since not all states require submission of *Campylobacter* isolates from clinical laboratories, some states receive isolates from almost all clinical laboratories in their jurisdiction (five sites) while others receive isolates from sentinel laboratories (five sites).

2. Retail Meat Component

In 2002, retail meat sampling began in January with FoodNet laboratories in Connecticut, Georgia, Maryland, Minnesota, and Tennessee; Oregon joined in September. For calendar year 2003, retail meat sampling was expanded to include California and New York. An attempt was made by each FoodNet site to sample as many different stores as possible each month. The object was to purchase as many different brands of fresh (not frozen) meat and poultry as possible. Each site attempted to purchase a total of 40 food samples per month including 10 samples each of chicken breast, ground turkey, ground beef, and pork chops. For each meat and poultry sample, the FoodNet sites recorded the store name, brand name, lot number (if available), sell-by date, purchase date, and laboratory processing date on log sheets. Where possible, additional information, such as whether the meat or poultry was ground or cut in-store was also collected. Once isolated and identified, bacterial isolates were sent to the FDA-CVM Office of Research for further characterization including species confirmation and antimicrobial susceptibility testing.

3. Animal Component

The animal component of NARMS was launched in 1997 and initially included monitoring of antimicrobial resistance among *Salmonella*. *Salmonella* isolates included in the NARMS program have originated from diagnostic, on-farm, and slaughter sources.

Diagnostic *Salmonella* isolates from sick animals were submitted by sentinel sites, which served as state, regional, or local veterinary diagnostic laboratories and were primarily located at universities,

or were collected by ARS staff from the National Veterinary Services Laboratories (NVSL) in Ames, Iowa. Animal sources included food animals (e.g., poultry, swine, and cattle) as well as exotics, pets, and other non-food producing animals.

On-farm *Salmonella* isolates were obtained from healthy farm animals and were collected as part of epidemiological research studies or as part of the USDA-APHIS-National Animal Health Monitoring System (NAHMS) studies. The USDA initiated NAHMS in 1983 to collect, analyze, and disseminate data on the health, management, and productivity of America's domestic livestock populations. On-farm isolates were also submitted from smaller, specific studies conducted by the USDA or collaborators when available.

Slaughter *Salmonella* isolates were submitted to NARMS from all federally inspected plants throughout the United States and included carcass rinsates (chickens), carcass swabs (turkey, cattle, and swine), ground products (chicken, turkey, and beef), eggs/egg products, and certain ready-to-eat (RTE) foods. Isolates from food animals at slaughter were submitted through the USDA-FSIS *Salmonella* HACCP Verification Testing Program. Isolates from FSIS baseline and RTE sampling programs were also tested when available. This Executive Report only contains data for *Salmonella* slaughter isolates from carcass rinsates, carcass swabs, and ground products.

USDA began testing *Campylobacter* isolates in 1998. From 1998 to 2000, *Campylobacter* isolates from chickens were obtained from a variety of USDA-FSIS programs for inclusion in NARMS. In 1998, *Campylobacter* isolates were only submitted from the Eastern FSIS laboratory, whereas 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*. This likely resulted in an underreporting of quinolone/fluoroquinolone (Q/FQ) resistant *Campylobacter* until 2001, when use of this method was discontinued. From January through June, 2001, various isolation methods were compared and a new ARS method was adopted in July of 2001. Since that time, *Campylobacter* reported in the NARMS animal component have been isolated from spent chicken carcass rinsates submitted by the Eastern FSIS laboratory as part of the *Salmonella* HACCP Verification Program using the new ARS method. In addition to antimicrobial susceptibility testing, the ARS laboratory also speciates *Campylobacter* isolates.

This Executive Report contains data on *Campylobacter* recovered from chicken carcass rinsates for the period July, 2001 through December, 2003, when the new ARS isolation method was used. Additional data from the NARMS animal component can be found on USDA's NARMS website.

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

B. Antimicrobial Susceptibility Testing Methods

The dilution schemes and antimicrobial content of NARMS antimicrobial susceptibility testing panels have undergone several design iterations as the program has matured. This has resulted in testing arrays that now meet international standards for quality control. We also have amended the content of the panels, as appropriate, to accommodate new antimicrobial agents entering the market, to omit those no longer available or used, or to adjust dilution ranges. The susceptibility testing panel formats undergo annual review to consider possible improvements. Customized testing panels also have been designed, and are available for use in phenotypic assessment of extended spectrum beta-lactam and fluoroquinolone resistance.

Antimicrobial minimum inhibitory concentrations (MICs) for *Salmonella* were determined according to manufacturer's instructions using the Sensititre® semi-automated antimicrobial susceptibility system (Trek Diagnostic Systems, Westlake, Ohio). For isolates from humans that grew in all amikacin dilutions on the Sensititre® plate (MIC >4 µg/ml), Etest® (AB Biodisk, Solna, Sweden) was performed to determine amikacin MICs. MICs were interpreted using Clinical and Laboratory Standards Institute (CLSI, formerly NCCLS) standards, when available.[1,2] The antimicrobials tested included amikacin, amoxicillin-clavulanic acid, ampicillin, cefoxitin, ceftiofur, ceftriaxone, cephalothin, chloramphenicol, ciprofloxacin, gentamicin, kanamycin, nalidixic acid, streptomycin, sulfamethoxazole, tetracycline, and trimethoprim-sulfamethoxazole. The quality control organisms used included *E. coli* ATCC 35218, *Enterococcus faecalis* ATCC 29212, *Staphylococcus aureus* ATCC 29213, and *Pseudomonas aeruginosa* ATCC 27853 to ensure that all antimicrobial agents were appropriately quality controlled, except for streptomycin, for which CLSI quality control standards and interpretive criteria have not been set.

Antimicrobial MICs for *Campylobacter* were determined using two different methods for 2003. The human and animal components used Etest® (AB Biodisk) to determine MICs for *Campylobacter*, while the retail component used the CLSI-approved agar dilution method. *Campylobacter jejuni* ATCC 33560 was the quality control organism used for testing. The antimicrobials tested using Etest® included azithromycin, chloramphenicol, ciprofloxacin, clindamycin, erythromycin, gentamicin, nalidixic acid, and tetracycline. Based on Etest® manufacturer recommendations, MIC results that fell between the two-fold dilutions described in CLSI documents were rounded up to next two-fold dilution for interpretation.[3] The antimicrobials included in agar dilution testing were ciprofloxacin, doxycycline, erythromycin, gentamicin, and meropenem. The use of different methodologies and antimicrobials highlighted the need for a less cumbersome test method for *Campylobacter*, and prompted FDA-CVM to develop a broth microdilution method and an appropriate control strain. This method has been approved by CLSI and has been used throughout the NARMS program since 2005.

Tables 1 and 2 detail antimicrobials tested and corresponding CLSI interpretive criteria, where available, for *Salmonella* and *Campylobacter*, respectively.[1,2]

[1] **NCCLS/CLSI.** 2002. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals. Approved Standard, M31-A2. NCCLS, Wayne, PA.
[2] **CLSI**. 2006. Performance Standards for Antimicrobial Susceptibility Testing; Sixteenth Informational Supplement (M100-S16). CLSI, Wayne, PA.
[3] In USDA's NARMS annual reports, MIC values were not rounded up prior to interpretation.

Table 1. Breakpoints Used for Susceptibility Testing of *Salmonella* [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	≤ 8	16	≥ 32
Cephamycins	Cefoxitin	≤ 8	16	≥ 32
Folate Pathway Inhibitors	Sulfamethoxazole	≤ 256	N/A	≥ 512
	Trimethoprim–Sulfamethoxazole	≤ 2 / 38	N/A	≥ 4 / 76
Phenicols	Chloramphenicol	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin 1	≤	2	≥ 4
	Nalidixic acid	≤ 16	N/A	≥ 32
Tetracyclines	Tetracycline 4	≤	8	≥ 16

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

Table 2. Breakpoints Used for Susceptibility Testing of *Campylobacter* [1]

Antimicrobial Class	Antimicrobial Agent	Breakpoints (µg/ml)		
		Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin 4	≤	8	≥ 16
Lincosamides	Clindamycin	≤ 0.5	1 - 2	≥ 4
Macrolides	Azithromycin	≤ 0.25	0.5 - 1	≥ 2
	Erythromycin	≤ 0.5	1 - 4	≥ 8
Phenicols	Chloramphenicol	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin 1	≤	2	≥ 4
	Nalidixic acid	≤ 16	N/A	≥ 32
Tetracyclines	Doxycycline 4	≤	8	≥ 16
	Tetracycline 4	≤	8	≥ 16

[1] In 2003, there were no CLSI breakpoints available for susceptibility testing of *Campylobacter*

III. Results

A. Background

The next two sections present NARMS data on *Salmonella* and *Campylobacter* isolates recovered from humans, retail meats, and food animals at slaughter. Section IIIB contains *Salmonella* data, and Section IIIC contains *Campylobacter* data.

Each section reports the number of retail meat samples tested, the number of meat samples from which *Salmonella* and *Campylobacter* were recovered, the serotypes or species isolated and tested from humans, retail meats, and food animals, and antimicrobial susceptibility phenotypes. The *Salmonella* section not only includes data for all non-Typhi *Salmonella,* but also includes specific data for the top four *Salmonella* serotypes isolated from humans in 2003 (*Salmonella* serotypes Typhimurium, Enteritidis, Newport, and Heidelberg). The *Campylobacter* section provides separate antimicrobial susceptibility data for *C. jejuni* and *C. coli*.

The first set of antimicrobial susceptibility tables for each organism (Tables 7, 12, 17, 22, 27, 36, and 37) includes MIC distributions for 2003, the percent of isolates displaying intermediate susceptibility and resistance, and 95% confidence intervals for the percent resistant. The confidence intervals were calculated using the Clopper-Pearson exact method.[1] The non-shaded areas in the tables indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate antimicrobial susceptibility breakpoints, while double vertical bars indicate antimicrobial resistance breakpoints. CLSI interpretive criteria were used when available.

The MIC distribution tables are followed by tables that show the numbers and percentages of isolates that were resistant, for all years that each NARMS component conducted testing through 2003 (Tables 8, 13, 18, 23, 28, 38, and 39).[2] 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 in each of these tables, empty shaded boxes indicate that there are no data to report as either surveillance was not conducted or isolates were not available for testing.

Third-generation cephalosporins (such as ceftriaxone) and quinolones (such as ciprofloxacin) are antimicrobial agents commonly used for the treatment of severe *Salmonella* infections in humans. Therefore, resistance to these agents in *Salmonella* is highlighted using pie charts and graphs on ceftiofur and nalidixic acid resistance phenotypes (Figures 4-15).[3,4] Ceftiofur is the only third-generation cephalosporin approved for use in food animals in the U.S. and elevated MICs ($\geq$ 8 µg/ml) correlate well with decreased susceptibility to ceftriaxone (MIC $\geq$ 2 µg/ml). Similarly, nalidixic acid resistance (MIC $\geq$ 32 µg/ml) correlates well with decreased susceptibility to ciprofloxacin (MIC $\geq$ 0.125 µg/ml). For *Salmonella*, data on multidrug resistance (MDR) phenotypes of public health importance are also presented (Tables 11, 16, 21, 26, and 31).

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

[2] Data on *Campylobacter* recovered from chickens is presented only for July, 2001 through December, 2003, as described in Section IIA.

[3] Note that the scales vary from figure to figure, based on the maximum percent resistance.

[4] Below each graph is a table that shows the number of isolates exhibiting resistance. Grey boxes indicate that there were no isolates to test, while boxes with zeros indicate that there were isolates to test, but none exhibited resistance.

The data contained in this report may, in a few cases, differ slightly from those previously reported in each corresponding agency's annual report. These minor differences are due to the dynamic nature of the data, which are updated if new information is obtained about the bacterial isolates under surveillance or specific isolates were retested, and, in the case of the *Campylobacter* data reported from the NARMS animal arm, may be a result of MIC rounding, which was not done for the USDA annual reports.

B. *Salmonella* Data

1. *Salmonella* Isolates Tested

Table 3. Total Number of *Salmonella* (non-Typhi) Isolates Tested, by Source and Year, 1996-2003

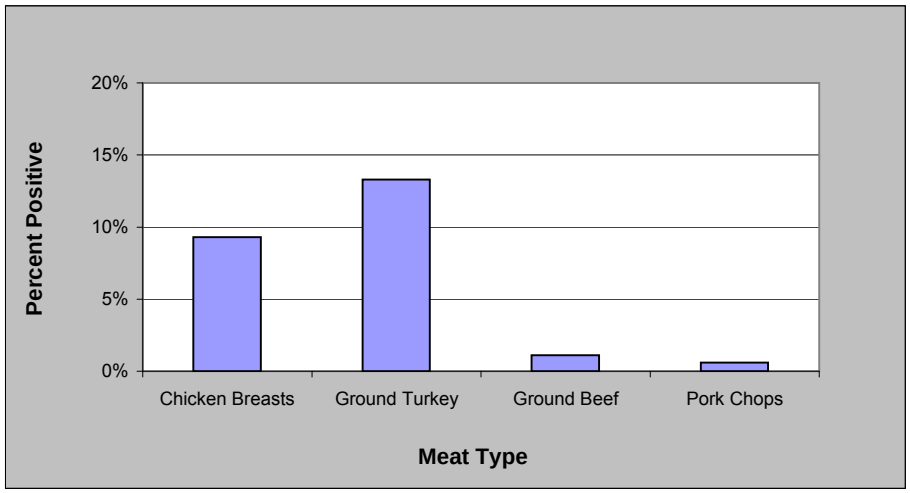
Source	Year							
	1996	1997	1998	1999	2000	2001	2002	2003
Humans	1324	1301	1460	1498	1377	1419	2008	1865
Chicken Breasts							60	83
Ground Turkey							74	114
Ground Beef							9	10
Pork Chops							10	5
Chickens		214	561	1438	1173	1307	1500	1158
Turkeys		107	240	713	518	550	244	262
Cattle		24	284	1610	1388	893	1008	670
Swine		111	793	876	451	418	379	211

2. Isolation of *Salmonella* from Retail Meats, 2003

Table 4. Number and Percent of Retail Meat Samples Positive for *Salmonella*, 2003

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	897	857	880	899
Number Positive for *Salmonella*	83	114	10	5
Percent Positive for *Salmonella*	9.3%	13.3%	1.1%	0.6%

Figure 1. Percent of Retail Meat Samples Positive for *Salmonella*, 2003



3. *Salmonella* Serotypes

Table 5. Most Common Serotypes among *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2003

Humans				Retail Meats				Food Animals			
Source	**Serotype**	**n**	**%**	**Meat Type**	**Serotype**	**n**	**%**	**Animal Source**	**Serotype**	**n**	**%**
Humans (n=1865)	Typhimurium	403	21.6	**Chicken Breasts (n=83)**	Typhimurium	22	26.5	**Chickens[1] (n=1158)**	Kentucky	418	36.1
	Enteritidis	257	13.8		Kentucky	20	24.1		Heidelberg	226	19.5
	Newport	222	11.9		Heidelberg	16	19.3		Typhimurium	156	13.5
	Heidelberg	96	5.1		Mbandaka	7	8.4		Hadar	51	4.4
	Javiana	85	4.6		Haardt	4	4.8		Enteritidis	42	3.6
	Saintpaul	58	3.1		Enteritidis	3	3.6		Montevideo	30	2.6
	Muenchen	48	2.6		Brandenburg	2	2.4		Thompson	29	2.5
	Montevideo	43	2.3		Hadar	2	2.4		Infantis	27	2.3
	Oranienburg	43	2.3		Saintpaul	2	2.4		Mbandaka	18	1.6
	I 4,[5],12:i:-	38	2.0		I 4,5,12:i:-	2	2.4		Senftenberg	12	1.0
	Agona	32	1.7								
	Braenderup	31	1.7								
	Infantis	31	1.7	**Ground Turkey (n=114)**	Heidelberg	32	28.1	**Turkeys (n=262)**	Heidelberg	57	21.8
	Java	30	1.6		Saintpaul	24	21.1		Hadar	44	16.8
	Mississippi	30	1.6		Reading	13	11.4		Arizona[2]	32	12.2
	Thompson	24	1.3		Hadar	11	9.6		Reading	31	11.8
	Hadar	19	1.0		Agona	6	5.3		Saintpaul	20	7.6
	Anatum	18	1.0		Senftenberg	5	4.4		Newport	19	7.3
	Bareilly	18	1.0		Kentucky	4	3.5		Senftenberg	12	4.6
	Senftenberg	18	1.0		Bredeney	2	1.8		Kentucky	9	3.4
					Montevideo	2	1.8		Muenchen	6	2.3
					Newport	2	1.8		Schwarzengrund	6	2.3
					Schwarzengrund	2	1.8		Typhimurium	6	2.3
					Typhimurium	2	1.8				
					IIIa 18:z4,z23:-	2	1.8				
					IIIa 18:z4,z32:-	2	1.8				
				Ground Beef (n=10)	Dublin	3	30.0	**Cattle (n=670)**	Typhimurium	78	11.6
					Montevideo	2	20.0		Newport	75	11.2
					Enteritidis	1	10.0		Montevideo	64	9.6
					Infantis	1	10.0		Anatum	58	8.7
					Muenchen	1	10.0		Agona	44	6.6
					Newport	1	10.0		Muenster	44	6.6
					Typhimurium	1	10.0		Mbandaka	31	4.6
									Dublin	30	4.5
									Kentucky	30	4.5
									Cerro	23	3.4
				Pork Chops (n=5)	Johannesburg	2	40.0	**Swine (n=211)**	Derby	46	21.8
					Brandenburg	1	20.0		Typhimurium	27	12.8
					Newport	1	20.0		Infantis	15	7.1
					Typhimurium	1	20.0		Heidelberg	11	5.2
									Anatum	10	4.7
									Johannesburg	10	4.7
									Agona	9	4.3
									Reading	9	4.3
									Saintpaul	9	4.3
									Adelaide	8	3.8

[1] There were 56 (4.8%) *Salmonella* isolates from chickens that were classified as monophasic. The antigenic formulas for these isolates are not available

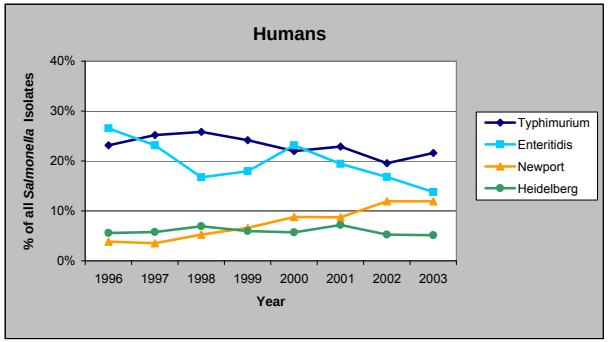
[2] *Salmonella* Arizona refers to *S. enterica* subspecies IIIa; antigenic formulas are not available for these isolates

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, 2003

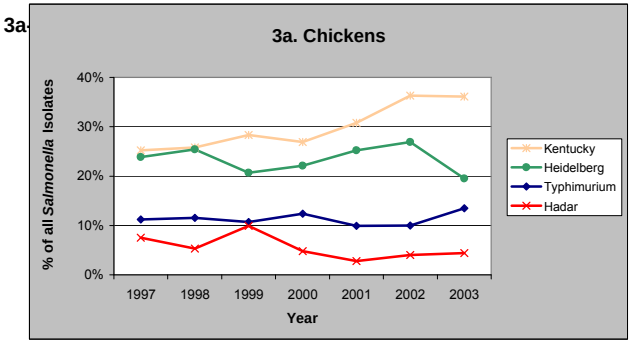
	Humans	Retail Meats				Food Animals			
	Humans (n=1865)	Chicken Breast (n=83)	Ground Turkey (n=114)	Ground Beef (n=10)	Pork Chops (n=5)	Chickens (n=1158)	Turkeys (n=262)	Cattle (n=670)	Swine (n=211)
1. Typhimurium	21.6% 403	26.5% 22	1.8% 2	10.0% 1	20.0% 1	13.5% 156	2.3% 6	11.6% 78	12.8% 27
2. Enteritidis	13.8% 257	3.6% 3	0.9% 1	10.0% 1	0.0% 0	3.6% 42	0.0% 0	0.4% 3	0.5% 1
3. Newport	11.9% 222	0.0% 0	1.8% 2	10.0% 1	20.0% 1	0.6% 7	7.3% 19	11.2% 75	1.4% 3
4. Heidelberg	5.1% 96	19.3% 16	28.1% 32	0.0% 0	0.0% 0	19.5% 226	21.8% 57	1.3% 9	5.2% 11
5. Javiana	4.6% 85	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.1% 1	0.0% 0
6. Saintpaul	3.1% 58	2.4% 2	21.1% 24	0.0% 0	0.0% 0	0.0% 0	7.6% 20	0.3% 2	4.3% 9
7. Muenchen	2.6% 48	0.0% 0	0.0% 0	10.0% 1	0.0% 0	0.1% 1	2.3% 6	2.4% 16	1.9% 4
8. Oranienburg	2.3% 43	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.5% 6	0.0% 0	0.7% 5	0.9% 2
9. Montevideo	2.3% 43	1.2% 1	1.8% 2	20.0% 2	0.0% 0	2.6% 30	0.4% 1	9.6% 64	0.9% 2
10. I 4,[5],12:i:- [1]	2.0% 38	2.4% 2	0.0% 0	0.0% 0	0.0% 0	Not Determined	Not Determined	Not Determined	Not Determined

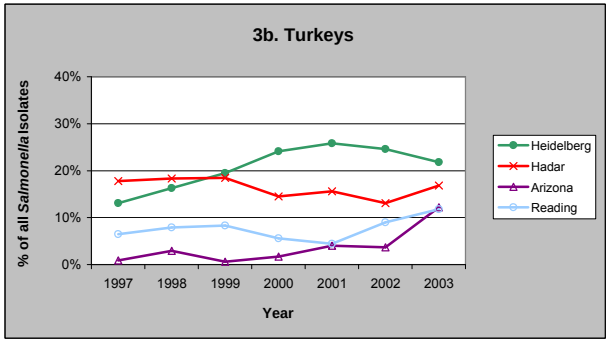
[1] Antigenic formulas are not available for monophasic *Salmonella* isolated from food animals, so the number of *Salmonella* I 4,[5],12:i:- isolates could not be determined

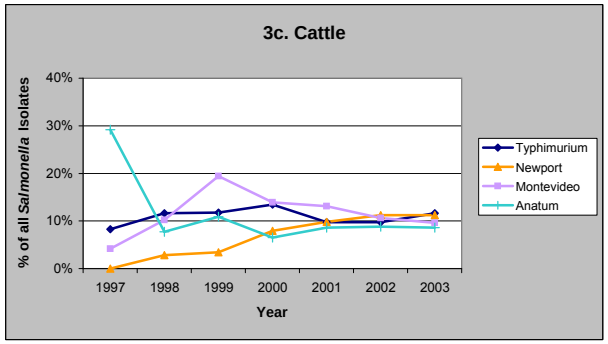
Figure 2. Most Common *Salmonella* (non-Typhi) Serotypes from Humans in 2003 and their Relative Frequencies, by Year, 1996-2003

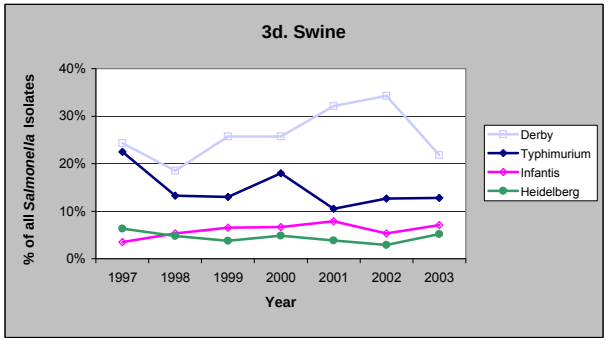


Figures 3a-3d. *Salmonella* Serotypes from Food Animals in 2003 and their Relative Frequencies, by Year, 1997-2003









4. Antimicrobial Susceptibility among all non-Typhi *Salmonella*

Table 7a. Distribution of MICs and Occurrence of Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2003

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Humans (1865)[5]	0.0	**0.0**	[0.0 - 0.2]						3.6	62.3	31.2	2.7	0.1	0.2						
	Chicken Breasts (83)	0.0	**0.0**	[0.0 - 4.3]						8.4	47.0	41.0	3.6								
	Ground Turkey (114)	0.0	**0.0**	[0.0 - 3.2]							52.6	44.7	2.6								
	Ground Beef (10)	0.0	**0.0**	[0.0 - 30.8]							60.0	40.0									
	Pork Chops (5)	0.0	**0.0**	[0.0 - 52.2]							100.0										
	Chickens (1158)[6]	≤ 0.2	**≤ 0.2**	[0.0 - 0.6]						25.2	48.2	24.0	2.4	0.2							
	Turkeys (262)	0.0	**0.0**	[0.0 - 1.4]						26.0	46.9	26.0	1.1								
	Cattle (670)[7]	≤ 0.1	**≤ 0.1**	[0.0 - 0.8]						24.3	50.1	24.0	1.5	0.1							
	Swine (211)	0.0	**0.0**	[0.0 - 1.7]						17.1	54.5	22.3	6.2								
Gentamicin	Humans (1865)	0.5	**1.4**	[0.9 - 2.0]					35.9	38.7	23.3	0.1	0.1	0.5	**0.6**	**0.8**					
	Chicken Breasts (83)	1.2	**6.0**	[2.0 - 13.5]					33.7	54.2	4.8			1.2	**2.4**	**3.6**					
	Ground Turkey (114)	5.3	**22.8**	[15.5 - 31.6]					25.4	37.7	5.3	3.5		5.3	**14.9**	**7.9**					
	Ground Beef (10)	0.0	**0.0**	[0.0 - 30.8]					30.0	40.0	30.0										
	Pork Chops (5)	20.0	**0.0**	[0.0 - 52.2]					40.0	40.0				20.0							
	Chickens (1158)	0.9	**6.3**	[5.0 - 7.9]					76.9	11.7	3.5	0.4	0.2	0.9	**3.5**	**2.8**					
	Turkeys (262)	7.3	**21.0**	[16.2 - 26.4]					58.0	8.8	2.7	1.5	0.8	7.3	**15.3**	**5.7**					
	Cattle (670)	0.9	**2.7**	[1.6 - 4.2]					72.4	19.3	4.5	0.1	0.1	0.9	**1.0**	**1.6**					
	Swine (211)	0.5	**0.5**	[0.0 - 2.6]					75.8	20.4	2.8			0.5		**0.5**					
Kanamycin	Humans (1865)	0.2	**3.4**	[2.7 - 4.4]										96.1	0.3	0.2	**0.2**	**3.3**			
	Chicken Breasts (83)	1.2	**4.8**	[1.3 - 11.9]										94.0		1.2		**4.8**			
	Ground Turkey (114)	2.6	**27.2**	[19.3 - 36.3]										70.2		2.6	**14.0**	**13.2**			
	Ground Beef (10)	0.0	**0.0**	[0.0 - 30.8]										100.0							
	Pork Chops (5)	20.0	**0.0**	[0.0 - 52.2]										80.0		20.0					
	Chickens (1158)	0.0	**2.8**	[1.9 - 3.9]										96.9	0.3		**0.4**	**2.3**			
	Turkeys (262)	3.8	**16.0**	[11.8 - 21.0]										79.4	0.8	3.8	**3.4**	**12.6**			
	Cattle (670)	0.1	**13.7**	[11.2 - 16.6]										85.6	0.4	0.1	**0.6**	**13.1**			
	Swine (211)	0.0	**5.7**	[3.0 - 9.7]										94.3			**0.5**	**5.2**			
Streptomycin	Humans (1865)	N/A	**15.0**	[13.4 - 16.7]												84.8	**7.1**	**7.9**			
	Chicken Breasts (83)	N/A	**26.5**	[17.4 - 37.3]												73.5	**14.5**	**12.0**			
	Ground Turkey (114)	N/A	**45.6**	[36.3 - 55.2]												54.4	**20.2**	**25.4**			
	Ground Beef (10)	N/A	**40.0**	[12.2 - 73.8]												60.0		**40.0**			
	Pork Chops (5)	N/A	**40.0**	[5.3 - 85.3]												60.0	**20.0**	**20.0**			
	Chickens (1158)	N/A	**19.6**	[17.4 - 22.0]												80.4	**14.8**	**4.8**			
	Turkeys (262)	N/A	**29.4**	[23.9 - 35.3]												70.6	**17.9**	**11.5**			
	Cattle (670)	N/A	**28.7**	[25.3 - 32.2]												71.3	**4.5**	**24.2**			
	Swine (211)	N/A	**30.8**	[24.6 - 37.5]												69.2	**13.7**	**17.1**			

[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 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

[5] For isolates from humans that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/ml), Etest was performed to determine amikacin MICs; the percentages reported in the shaded area (MIC≥8 µg/ml) are based on Etest results for these isolates. The amikacin Etest strip range of dilutions is 0.016-256 µg/ml

[6] There were 2 isolates from chickens that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/ml). Further testing of these isolates was not conducted. For the calculation of confidence intervals, these isolates were considered resistant

[7] There was 1 isolate from cattle that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/ml). Further testing of this isolate was not conducted. For the calculation of a confidence interval, this isolate was considered resistant

Table 7b. Distribution of MICs and Occurrence of Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2003

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	0.5	1	2	4	8	16	32	64	128	256	512	1024
Aminopenicillins																					
Ampicillin	Humans (1865)	0.1	**13.6**	[12.1 - 15.3]							49.7	32.8	3.4	0.3	0.1	**0.1**	**13.6**				
	Chicken Breasts (83)	0.0	**33.7**	[23.7 - 44.9]							43.4	22.9					**33.7**				
	Ground Turkey (114)	0.0	**28.9**	[20.8 - 38.2]							36.8	31.6	1.8	0.9			**28.9**				
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]							10.0	50.0					**40.0**				
	Pork Chops (5)	0.0	**40.0**	[5.3 - 85.3]							40.0	20.0					**40.0**				
	Chickens (1158)	0.0	**13.7**	[11.8 - 15.8]							67.8	17.4	1.0	0.1		**0.1**	**13.6**				
	Turkeys (262)	0.0	**18.7**	[14.2 - 24.0]							60.7	18.7	1.9			**0.4**	**18.3**				
	Cattle (670)	0.0	**28.1**	[24.7 - 31.6]							59.4	11.6	0.7	0.1		**0.1**	**27.9**				
	Swine (211)	0.0	**12.8**	[8.6 - 18.1]							70.1	14.7	2.4			**0.5**	**12.3**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (1865)	5.0	**4.6**	[3.7 - 5.7]							83.3	2.6	1.0	3.5	5.0	**0.8**	**3.8**				
	Chicken Breasts (83)	6.0	**25.3**	[16.4 - 36.0]							65.1	1.2		2.4	6.0		**25.3**				
	Ground Turkey (114)	15.8	**11.4**	[6.2 - 18.7]							58.8	11.4	0.9	1.8	15.8	**8.8**	**2.6**				
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]							50.0	10.0					**40.0**				
	Pork Chops (5)	20.0	**20.0**	[0.5 - 71.6]							40.0	20.0			20.0		**20.0**				
	Chickens (1158)	2.2	**9.7**	[8.0 - 11.5]							83.8	2.3	0.3	1.8	2.2	**0.6**	**9.1**				
	Turkeys (262)	9.2	**1.5**	[0.4 - 3.9]							78.2	2.7	2.7	5.7	9.2	**0.4**	**1.1**				
	Cattle (670)	2.5	**21.0**	[18.0 - 24.3]							69.6	1.0	2.2	3.6	2.5	**4.8**	**16.3**				
	Swine (211)	6.2	**3.8**	[1.7 - 7.3]							81.0	5.2	1.9	1.9	6.2	**0.5**	**3.3**				
Cephalosporins																					
Ceftiofur	Humans (1865)	0.1	**4.5**	[3.6 - 5.5]				0.3	1.0	61.8	31.3	1.1	0.1	**0.1**	**4.5**						
	Chicken Breasts (83)	0.0	**25.3**	[16.4 - 36.0]						51.8	21.7	1.2			**25.3**						
	Ground Turkey (114)	0.0	**2.6**	[0.5 - 7.5]						41.2	54.4	1.8			**2.6**						
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]						30.0	30.0				**40.0**						
	Pork Chops (5)	0.0	**20.0**	[0.5 - 71.6]						60.0		20.0			**20.0**						
	Chickens (1158)	0.0	**9.8**	[8.1 - 11.6]				0.1	1.8	78.1	9.6	0.7		**0.2**	**9.6**						
	Turkeys (262)	0.0	**1.5**	[0.4 - 3.9]					0.8	69.5	27.9	0.4			**1.5**						
	Cattle (670)	0.1	**21.0**	[18.0 - 24.3]				0.1	0.3	61.0	17.0	0.3	0.1	**1.3**	**19.7**						
	Swine (211)	0.0	**4.3**	[2.0 - 7.9]				0.5	1.4	71.1	22.7				**4.3**						
Ceftriaxone	Humans (1865)	3.4	**0.4**	[0.2 - 0.8]					95.3	0.2	0.1	0.1		0.5	2.3	1.1	**0.2**	**0.2**			
	Chicken Breasts (83)	24.1	**0.0**	[0.0 - 4.3]					73.5				1.2	1.2	16.9	7.2					
	Ground Turkey (114)	1.8	**0.0**	[0.0 - 3.2]					97.4					0.9		1.8					
	Ground Beef (10)	30.0	**10.0**	[0.3 - 44.5]					60.0						30.0		**10.0**				
	Pork Chops (5)	20.0	**0.0**	[0.0 - 52.2]					80.0							20.0					
	Chickens (1158)	5.6	**0.1**	[0.0 - 0.5]					90.2	0.1			0.1	3.9	4.7	0.9		**0.1**			
	Turkeys (262)	0.8	**0.4**	[0.0 - 2.1]					98.9						0.4	0.4	**0.4**				
	Cattle (670)	16.6	**0.1**	[0.0 - 0.8]					78.7	0.1		0.1	0.3	4.0	13.3	3.3	**0.1**				
	Swine (211)	3.3	**0.0**	[0.0 - 1.7]					95.7					0.9	1.9	1.4					

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

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

[4] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 7c. Distribution of MICs and Occurrence of Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2003

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
Cephalothin	Humans (1865)	0.9	**5.4**	[4.4 - 6.5]								68.6	21.7	3.4	0.9	**0.8**	**4.7**				
	Chicken Breasts (83)	2.4	**28.9**	[19.5 - 39.9]								21.7	42.2	4.8	2.4	**1.2**	**27.7**				
	Ground Turkey (114)	1.8	**28.9**	[20.8 - 38.2]								5.3	49.1	14.9	1.8	**2.6**	**26.3**				
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]									50.0	10.0			**40.0**				
	Pork Chops (5)	0.0	**40.0**	[5.3 - 85.3]									60.0			**20.0**	**20.0**				
	Chickens (1158)	1.4	**10.4**	[8.7 - 12.4]								69.4	16.4	2.3	1.4	**0.8**	**9.7**				
	Turkeys (262)	3.4	**11.1**	[7.5 - 15.5]								53.1	26.0	6.5	3.4	**8.8**	**2.3**				
	Cattle (670)	0.9	**21.2**	[18.2 - 24.5]								51.3	24.0	2.7	0.9	**0.1**	**21.0**				
	Swine (211)	1.4	**3.8**	[1.7 - 7.3]								63.0	28.0	3.8	1.4		**3.8**				
Cephamycins																					
Cefoxitin	Humans (1865)	0.6	**4.3**	[3.4 - 5.3]						0.2	16.1	63.1	13.5	2.1	0.6	**4.3**					
	Chicken Breasts (83)	0.0	**25.3**	[16.4 - 36.0]								60.2	13.3	1.2		**25.3**					
	Ground Turkey (114)	1.8	**2.6**	[0.5 - 7.5]							1.8	55.3	31.6	7.0	1.8	**2.6**					
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]								40.0	20.0			**40.0**					
	Pork Chops (5)	0.0	**20.0**	[0.5 - 71.6]								20.0	20.0	40.0		**20.0**					
	Chickens (1158)	1.6	**8.2**	[6.7 - 9.9]						0.1	16.2	59.3	13.2	1.4	1.6	**8.2**					
	Turkeys (262)	0.8	**1.1**	[0.2 - 3.3]							9.5	63.0	21.8	3.8	0.8	**1.1**					
	Cattle (670)	4.0	**17.8**	[14.9 - 20.9]						0.1	4.6	38.2	33.9	1.3	4.0	**17.8**					
	Swine (211)	0.0	**4.3**	[2.0 - 7.9]						0.5	4.7	38.9	46.4	5.2		**4.3**					
Folate Pathway Inhibitors																					
Sulfamethoxazole	Humans (1865)	N/A	**15.1**	[13.5 - 16.8]											76.6	7.9	0.4		0.1	**0.4**	**14.7**
	Chicken Breasts (83)	N/A	**14.5**	[7.7 - 23.9]											32.5	33.7	15.7	3.6			**14.5**
	Ground Turkey (114)	N/A	**33.3**	[24.8 - 42.8]											18.4	33.3	13.2	1.8		**0.9**	**32.5**
	Ground Beef (10)	N/A	**40.0**	[12.2 - 73.8]											20.0	30.0	10.0				**40.0**
	Pork Chops (5)	N/A	**40.0**	[5.3 - 85.3]											20.0	40.0					**40.0**
	Chickens (1158)	N/A	**10.3**	[8.6 - 12.2]											76.5	10.3	0.4	0.3	2.2	**7.3**	**3.0**
	Turkeys (262)	N/A	**28.2**	[22.9 - 34.1]											60.7	7.3	0.4		3.4	**18.3**	**9.9**
	Cattle (670)	N/A	**25.1**	[21.8 - 28.5]											55.8	9.9	2.1	0.4	6.7	**15.4**	**9.7**
	Swine (211)	N/A	**25.1**	[19.4 - 31.5]											64.0	6.6	0.9	0.9	2.4	**15.6**	**9.5**
Trimethoprim-Sulfamethoxazole	Humans (1865)	N/A	**1.9**	[1.4 - 2.7]				84.9	12.5	0.6	0.1			**1.9**							
	Chicken Breasts (83)	N/A	**0.0**	[0.0 - 4.3]				97.6	2.4												
	Ground Turkey (114)	N/A	**0.0**	[0.0 - 3.2]				86.0	13.2	0.9											
	Ground Beef (10)	N/A	**0.0**	[0.0 - 30.8]				60.0	40.0												
	Pork Chops (5)	N/A	**0.0**	[0.0 - 52.2]				60.0	40.0												
	Chickens (1158)	N/A	**0.3**	[0.1 - 0.9]				90.6	8.5	0.3	0.1	0.2		**0.3**							
	Turkeys (262)	N/A	**2.3**	[0.8 - 4.9]				75.6	20.6	1.5				**2.3**							
	Cattle (670)	N/A	**3.3**	[2.1 - 4.9]				71.3	22.7	2.5	0.1		**0.3**	**3.0**							
	Swine (211)	N/A	**2.4**	[0.8 - 5.4]				74.9	17.5	5.2				**2.4**							

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

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

[4] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 7d. Distribution of MICs and Occurrence of Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, 2003

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
Phenicols																					
Chloramphenicol	Humans (1865)	1.0	**10.0**	[8.7 - 11.5]								2.0	55.3	31.6	1.0	**0.3**	**9.8**				
	Chicken Breasts (83)	0.0	**2.4**	[0.3 - 8.4]									32.5	65.1			**2.4**				
	Ground Turkey (114)	2.6	**0.9**	[0.0 - 4.8]									13.2	83.3	2.6		**0.9**				
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]									10.0	50.0			**40.0**				
	Pork Chops (5)	0.0	**40.0**	[5.3 - 85.3]										60.0			**40.0**				
	Chickens (1158)	0.3	**2.1**	[1.3 - 3.1]								5.4	66.4	25.9	0.3		**2.1**				
	Turkeys (262)	2.3	**4.2**	[2.1 - 7.4]								5.0	56.1	32.4	2.3		**4.2**				
	Cattle (670)	0.7	**25.1**	[21.8 - 28.5]								0.7	42.7	30.7	0.7	**0.1**	**24.9**				
	Swine (211)	1.9	**8.5**	[5.1 - 13.1]									43.1	46.4	1.9		**8.5**				
Quinolones																					
Ciprofloxacin	Humans (1865)	0.1	**0.2**	[0.0 - 0.5]	96.4	1.3	0.3	0.8	0.7	0.4	0.1	0.1		**0.2**							
	Chicken Breasts (83)	0.0	**0.0**	[0.0 - 4.3]	83.1	14.5	1.2		1.2												
	Ground Turkey (114)	0.0	**0.0**	[0.0 - 3.2]	86.0	8.8	0.9		3.5	0.9											
	Ground Beef (10)	0.0	**0.0**	[0.0 - 30.8]	70.0	30.0															
	Pork Chops (5)	0.0	**0.0**	[0.0 - 52.2]	60.0	20.0	20.0														
	Chickens (1158)	0.0	**0.1**	[0.0 - 0.5]	98.1	1.5		0.1		0.2				**0.1**							
	Turkeys (262)	0.0	**0.0**	[0.0 - 1.4]	92.7	3.4	0.8	1.9	1.1												
	Cattle (670)	0.0	**0.0**	[0.0 - 0.5]	96.1	3.3		0.1	0.4												
	Swine (211)	0.0	**0.0**	[0.0 - 1.7]	94.8	5.2															
Nalidixic Acid	Humans (1865)	N/A	**2.3**	[1.7 - 3.1]						0.1	0.2	4.7	84.9	7.5	0.4	**0.2**	**2.1**				
	Chicken Breasts (83)	N/A	**1.2**	[0.0 - 6.5]							1.2	1.2	84.3	12.0			**1.2**				
	Ground Turkey (114)	N/A	**4.4**	[1.4 - 9.9]								0.9	82.5	11.4	0.9		**4.4**				
	Ground Beef (10)	N/A	**0.0**	[0.0 - 30.8]								10.0	70.0	20.0							
	Pork Chops (5)	N/A	**0.0**	[0.0 - 52.2]									80.0		20.0						
	Chickens (1158)	N/A	**0.4**	[0.1 - 1.0]						0.1		10.0	79.4	9.6	0.4	**0.1**	**0.3**				
	Turkeys (262)	N/A	**3.8**	[1.8 - 6.9]							0.8	9.2	75.2	10.7	0.4		**3.8**				
	Cattle (670)	N/A	**0.4**	[0.1 - 1.3]								5.7	87.2	6.0	0.7		**0.4**				
	Swine (211)	N/A	**0.0**	[0.0 - 1.7]								5.2	78.2	14.7	1.9						
Tetracyclines																					
Tetracycline	Humans (1865)	0.2	**16.3**	[14.7 - 18.1]									83.6	0.2	**3.6**	**4.1**	**8.6**				
	Chicken Breasts (83)	0.0	**27.7**	[18.4 - 38.6]									72.3			**1.2**	**26.5**				
	Ground Turkey (114)	2.6	**39.5**	[30.4 - 49.1]									57.9	2.6			**39.5**				
	Ground Beef (10)	0.0	**40.0**	[12.2 - 73.8]									60.0				**40.0**				
	Pork Chops (5)	0.0	**80.0**	[28.4 - 99.5]									20.0				**80.0**				
	Chickens (1158)	0.3	**26.2**	[23.7 - 28.8]									73.5	0.3	**1.5**	**3.3**	**21.4**				
	Turkeys (262)	1.1	**58.8**	[52.6 - 64.8]									40.1	1.1	**6.5**	**7.6**	**44.7**				
	Cattle (670)	0.1	**36.9**	[33.2 - 40.6]									63.0	0.1	**4.9**	**3.4**	**28.5**				
	Swine (211)	1.9	**43.1**	[36.3 - 50.1]									55.0	1.9	**5.7**	**5.7**	**31.8**				

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

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

[4] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 8a. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	1324	1301	1460	1498	1377	1419	2008	1865
		Chicken Breasts							60	83
		Ground Turkey							74	114
		Ground Beef							9	10
		Pork Chops							10	5
		Chickens		214	561	1438	1173	1307	1500	1158
		Turkeys		107	240	713	518	550	244	262
		Cattle		24	284	1610	1388	893	1008	670
		Swine		111	793	876	451	418	379	211
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Aminoglycosides	Amikacin (MIC ≥ 64 µg/ml)	Humans		0.0% 0	0.0% 0	0.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	≤ 0.2%[1] ≤ 2
		Turkeys		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	≤ 0.1%[2] ≤ 1
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.8% 63	2.9% 38	2.8% 41	2.1% 32	2.7% 37	1.9% 27	1.3% 27	1.4% 26
		Chicken Breasts							10.0% 6	6.0% 5
		Ground Turkey							14.9% 11	22.8% 26
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							30.0% 3	0.0% 0
		Chickens		17.8% 38	15.3% 86	10.4% 150	14.9% 175	7.9% 103	5.5% 83	6.3% 73
		Turkeys		20.6% 22	18.3% 44	17.5% 125	16.2% 84	20.9% 115	19.3% 47	21.0% 55
		Cattle		0.0% 0	1.8% 5	1.6% 25	2.1% 29	2.1% 19	2.6% 26	2.7% 18
		Swine		0.9% 1	0.8% 6	1.1% 10	1.3% 6	1.4% 6	0.8% 3	0.5% 1
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	5.0% 66	5.1% 67	5.7% 83	4.3% 65	5.6% 77	4.8% 68	3.8% 76	3.4% 64
		Chicken Breasts							6.7% 4	4.8% 4
		Ground Turkey							18.9% 14	27.2% 31
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							10.0% 1	0.0% 0
		Chickens		2.3% 5	3.2% 18	1.2% 17	4.0% 47	2.4% 31	2.0% 30	2.8% 32
		Turkeys		24.3% 26	17.1% 41	21.5% 153	21.4% 111	22.9% 126	24.2% 59	16.0% 42
		Cattle		8.3% 2	9.5% 27	7.1% 115	6.6% 92	6.9% 62	10.1% 102	13.7% 92
		Swine		11.7% 13	7.3% 57	6.7% 59	9.3% 42	6.9% 29	4.2% 16	5.7% 12
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	20.6% 273	21.4% 278	18.6% 272	16.8% 252	16.3% 224	17.0% 241	13.2% 265	15.0% 280
		Chicken Breasts							28.3% 17	26.5% 22
		Ground Turkey							37.8% 28	45.6% 52
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							70.0% 7	40.0% 2
		Chickens		24.3% 52	27.8% 156	27.5% 396	28.6% 335	21.0% 275	22.9% 343	19.6% 227
		Turkeys		34.6% 37	40.8% 98	43.6% 311	41.9% 217	46.7% 257	37.7% 92	29.4% 77
		Cattle		12.5% 3	16.2% 46	15.4% 248	21.3% 296	20.3% 181	25.9% 261	28.7% 192
		Swine		27.9% 31	29.4% 233	29.3% 257	39.2% 177	35.6% 149	40.1% 152	30.8% 65

[1] In 2003, there were 2 isolates from chickens that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/mL). Further testing was not conducted

[2] In 2003, there was 1 isolate from cattle that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/mL). Further testing was not conducted

Table 8b. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	1324	1301	1460	1498	1377	1419	2008	1865
		Chicken Breasts							60	83
		Ground Turkey							74	114
		Ground Beef							9	10
		Pork Chops							10	5
		Chickens		214	561	1438	1173	1307	1500	1158
		Turkeys		107	240	713	518	550	244	262
		Cattle		24	284	1610	1388	893	1008	670
		Swine		111	793	876	451	418	379	211
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	20.7% 274	18.3% 238	16.5% 241	15.6% 233	15.9% 219	17.4% 247	12.9% 259	13.6% 254
		Chicken Breasts							16.7% 10	33.7% 28
		Ground Turkey							16.2% 12	28.9% 33
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							40.0% 4	40.0% 2
		Chickens		11.7% 25	12.8% 72	12.4% 179	13.0% 152	9.4% 123	14.3% 215	13.7% 159
		Turkeys		12.1% 13	10.4% 25	17.7% 126	16.2% 84	19.5% 107	18.0% 44	18.7% 49
		Cattle		12.5% 3	9.2% 26	12.5% 202	18.7% 259	17.9% 160	23.9% 241	28.1% 188
		Swine		16.2% 18	12.9% 102	10.8% 95	18.8% 85	11.7% 49	13.7% 52	12.8% 27
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% 35	3.9% 54	4.7% 66	5.3% 106	4.6% 86
		Chicken Breasts							10.0% 6	25.3% 21
		Ground Turkey							12.2% 9	11.4% 13
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							20.0% 2	20.0% 1
		Chickens		0.5% 1	2.0% 11	4.9% 70	7.3% 86	4.5% 59	10.2% 153	9.7% 112
		Turkeys		4.7% 5	0.4% 1	4.3% 31	3.5% 18	6.9% 38	3.7% 9	1.5% 4
		Cattle		8.3% 2	2.5% 7	3.9% 62	9.9% 138	11.8% 105	17.7% 178	21.0% 141
		Swine		0.0% 0	0.4% 3	1.0% 9	1.8% 8	2.6% 11	3.7% 14	3.8% 8
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.2% 2	0.5% 6	0.8% 12	2.1% 31	3.2% 44	4.1% 58	4.3% 87	4.5% 84
		Chicken Breasts							10.0% 6	25.3% 21
		Ground Turkey							8.1% 6	2.6% 3
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							20.0% 2	20.0% 1
		Chickens		0.5% 1	2.0% 11	5.2% 75	7.6% 89	4.1% 54	10.2% 153	9.8% 113
		Turkeys		3.7% 4	0.4% 1	4.6% 33	3.3% 17	5.1% 28	3.3% 8	1.5% 4
		Cattle		0.0% 0	2.1% 6	4.2% 67	9.8% 136	11.4% 102	17.4% 175	21.0% 141
		Swine		0.0% 0	0.1% 1	1.9% 17	1.3% 6	2.2% 9	3.2% 12	4.3% 9
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.1% 1	0.0% 0	0.4% 6	0.0% 0	0.0% 0	0.2% 4	0.4% 8
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	10.0% 1
		Pork Chops							0.0% 0	0.0% 0
		Chickens	3	0.0% 0	≤ 0.5%[1] ≤	0.0% 0	0.1% 1	0.0% 0	0.3% 5	0.1% 1
		Turkeys	1	≤ 0.9%[2] ≤	0.0% 0	0.8% 6	0.4% 2	0.2% 1	0.0% 0	0.4% 1
		Cattle	2	0.0% 0	≤ 0.7%[3] ≤	0.1% 1	0.1% 1	0.1% 1	0.2% 2	0.1% 1
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0

[1] In 1998, there were 3 isolates from chickens that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

[2] In 1997, there was 1 isolate from turkeys that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

[3] In 1998, there were 2 isolates from cattle that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

Table 8c. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

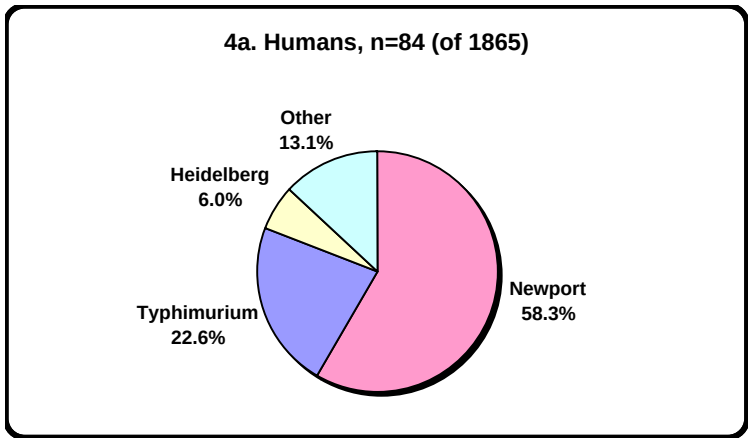
Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	1324	1301	1460	1498	1377	1419	2008	1865
		Chicken Breasts							60	83
		Ground Turkey							74	114
		Ground Beef							9	10
		Pork Chops							10	5
		Chickens		214	561	1438	1173	1307	1500	1158
		Turkeys		107	240	713	518	550	244	262
		Cattle		24	284	1610	1388	893	1008	670
		Swine		111	793	876	451	418	379	211
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Cephalosporins	Cephalothin (MIC ≥ 32 µg/ml)	Humans	2.9% 39	2.2% 29	2.3% 33	3.7% 55	4.0% 55	4.0% 57	5.0% 101	5.4% 101
		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	4.3% 80
		Chicken Breasts							10.0% 6	25.3% 21
		Ground Turkey							8.1% 6	2.6% 3
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							20.0% 2	20.0% 1
		Chickens					7.2% 85	4.1% 53	8.7% 130	8.2% 95
		Turkeys					3.3% 17	4.5% 25	2.5% 6	1.1% 3
		Cattle					9.1% 126	11.1% 99	15.9% 160	17.8% 119
		Swine					1.3% 6	2.2% 9	2.9% 11	4.3% 9
Folate Pathway Inhibitors	Sulfamethoxazole (MIC ≥ 512 µg/ml)	Humans	20.3% 269	22.8% 297	19.4% 283	18.1% 271	17.1% 235	17.7% 251	12.8% 258	15.1% 281
		Chicken Breasts							16.7% 10	14.5% 12
		Ground Turkey							20.3% 15	33.3% 38
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							70.0% 7	40.0% 2
		Chickens		24.8% 53	23.7% 133	15.9% 229	18.4% 216	11.8% 154	8.9% 133	10.3% 119
		Turkeys		37.4% 40	32.1% 77	36.0% 257	25.1% 130	38.0% 209	30.3% 74	28.2% 74
		Cattle		20.8% 5	15.5% 44	15.0% 242	19.9% 276	19.7% 176	22.3% 225	25.1% 168
		Swine		34.2% 38	29.0% 230	30.7% 269	35.7% 161	34.9% 146	34.6% 131	25.1% 53
	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	3.9% 51	1.8% 24	2.3% 34	2.1% 31	2.1% 29	2.0% 28	1.4% 28	1.9% 36
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							1.4% 1	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							20.0% 2	0.0% 0
		Chickens		0.5% 1	1.2% 7	1.1% 16	0.4% 5	0.5% 6	0.8% 12	0.3% 4
		Turkeys		3.7% 4	2.5% 6	4.2% 30	1.5% 8	2.5% 14	2.5% 6	2.3% 6
		Cattle		4.2% 1	2.5% 7	2.4% 39	2.2% 30	2.6% 23	2.5% 25	3.3% 22
		Swine		1.8% 2	0.3% 2	1.1% 10	0.9% 4	0.0% 0	1.6% 6	2.4% 5

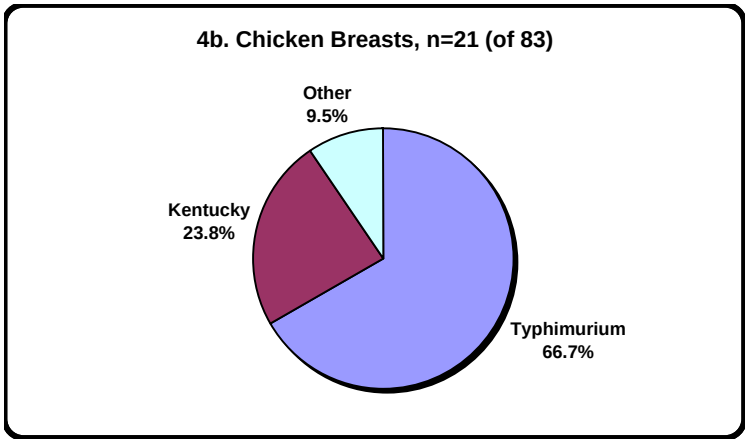
Table 8d. Antimicrobial Resistance among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

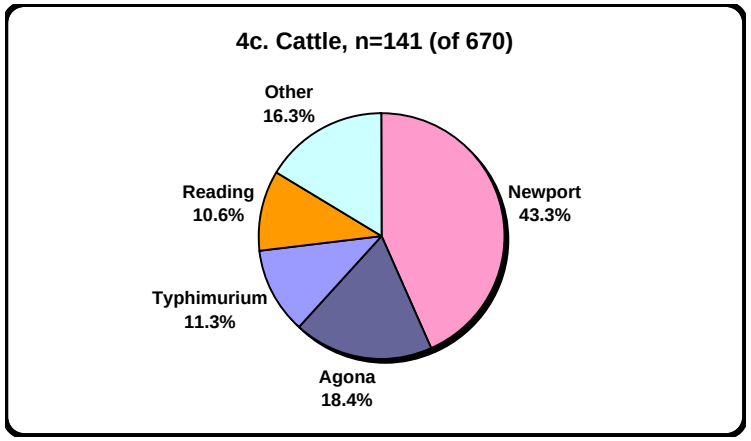
Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	1324	1301	1460	1498	1377	1419	2008	1865
		Chicken Breasts							60	83
		Ground Turkey							74	114
		Ground Beef							9	10
		Pork Chops							10	5
		Chickens		214	561	1438	1173	1307	1500	1158
		Turkeys		107	240	713	518	550	244	262
		Cattle		24	284	1610	1388	893	1008	670
		Swine		111	793	876	451	418	379	211
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	10.6% 140	10.1% 131	9.9% 145	9.2% 138	10.1% 139	11.6% 164	8.6% 172	10.0% 187
		Chicken Breasts							0.0% 0	2.4% 2
		Ground Turkey							1.4% 1	0.9% 1
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							40.0% 4	40.0% 2
		Chickens		2.3% 5	2.9% 16	1.8% 26	4.6% 54	2.5% 33	2.4% 36	2.1% 24
		Turkeys		3.7% 4	0.8% 2	4.1% 29	4.1% 21	3.8% 21	5.3% 13	4.2% 11
		Cattle		4.2% 1	5.6% 16	8.5% 137	15.1% 209	16.5% 147	20.6% 208	25.1% 168
		Swine		11.7% 13	8.4% 67	8.0% 70	12.4% 56	7.7% 32	10.0% 38	8.5% 18
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	0.0% 1	0.2% 3
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.1% 1
		Turkeys		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
		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	0.4% 5	0.9% 12	1.4% 20	1.1% 16	2.5% 34	2.6% 37	1.8% 36	2.3% 43
		Chicken Breasts							0.0% 0	1.2% 1
		Ground Turkey							8.1% 6	4.4% 5
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							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
		Turkeys		4.7% 5	2.1% 5	5.3% 38	5.4% 28	5.1% 28	5.3% 13	3.8% 10
		Cattle		0.0% 0	0.4% 1	0.1% 1	0.4% 6	0.4% 4	0.4% 4	0.4% 3
		Swine		0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.3% 1	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	24.2% 320	21.7% 282	20.2% 295	19.4% 291	18.6% 256	19.7% 280	14.9% 299	16.3% 304
		Chicken Breasts							33.3% 20	27.7% 23
		Ground Turkey							55.4% 41	39.5% 45
		Ground Beef							22.2% 2	40.0% 4
		Pork Chops							70.0% 7	80.0% 4
		Chickens		20.6% 44	20.5% 115	25.0% 359	26.3% 308	21.9% 286	24.9% 374	26.2% 303
		Turkeys		52.3% 56	45.8% 110	52.9% 377	56.2% 291	54.9% 302	54.5% 133	58.8% 154
		Cattle		25.0% 6	24.3% 69	20.9% 336	25.8% 358	26.3% 235	32.0% 323	36.9% 247
		Swine		51.3% 58	47.5% 377	48.4% 424	54.3% 245	53.1% 222	57.8% 219	43.1% 91

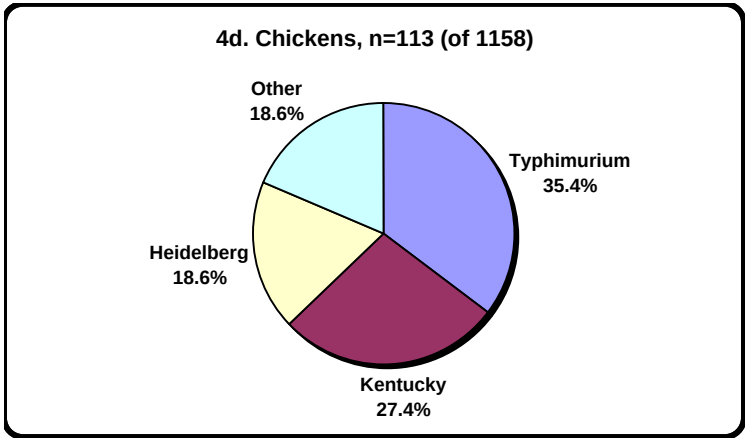
Ceftiofur Resistance

Figures 4a-d. Ceftiofur-Resistant *Salmonella* (non-Typhi) Isolates, by Source[1] and Serotype, 2003









[1] Pie charts are not provided for other sources due to the small number of ceftiofur-resistant isolates (3 from ground turkey, 4 from ground beef, 1 from pork chops, 4 fro turkeys, and 9 from swine)

Salmonella **(non-Typhi) Isolates from Humans and Food Animals Resistant to**

Figure 5. Percent of
Ceft

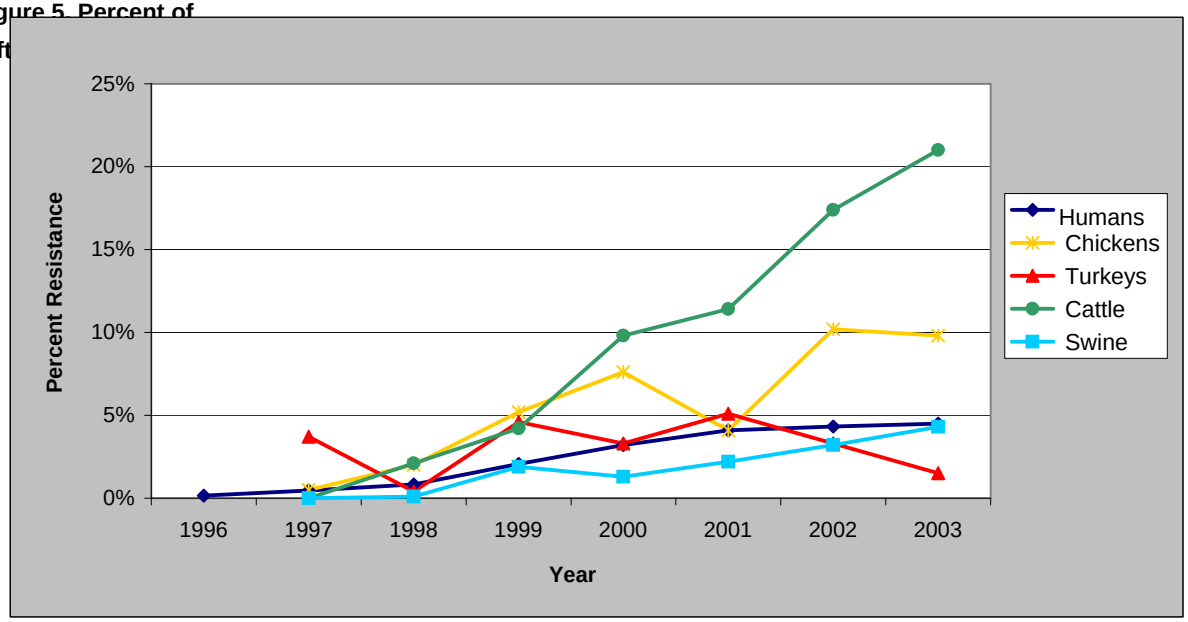
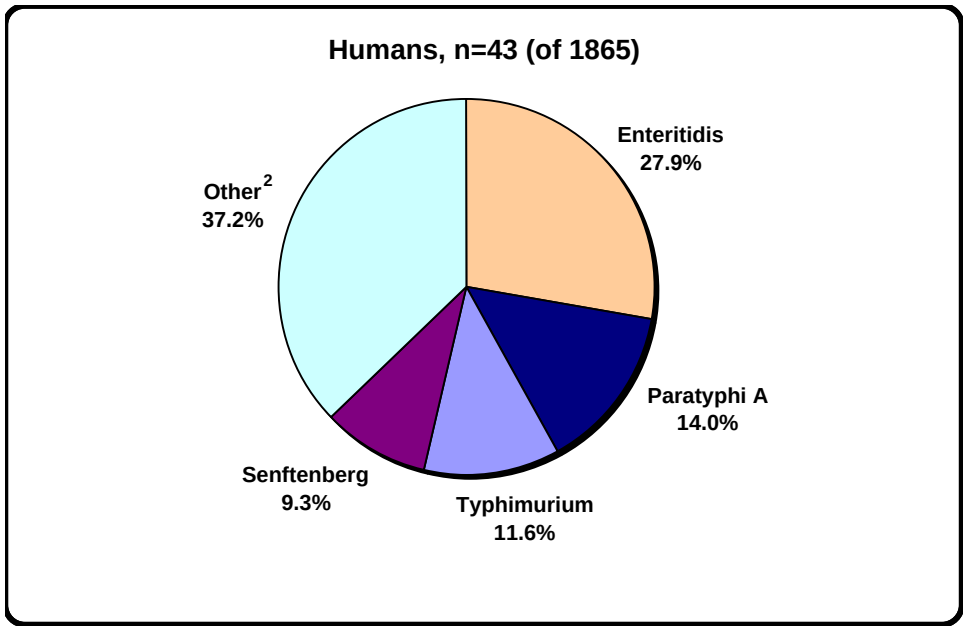


Table 9. Number of *Salmonella* (non-Typhi) Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	2	6	12	31	44	58	87	84
Chickens		1	11	75	89	54	153	113
Turkeys		4	1	33	17	28	8	4
Cattle		0	6	67	136	102	175	141
Swine		0	1	17	6	9	12	9

Figures 6. Nalidixic Acid-Resistant *Salmonella* (non-Typhi) Isolates from Humans,[1] by Serotype, 2003
Nalidixic Acid Resistance



[1] Pie charts are not provided for retail meats or food animals due to the small number of nalidixic acid-resistant isolates (1 from chicken breasts, 5 from ground turkey, 5 from chickens, 10 from turkeys, and 3 from cattle)

[2] This category includes 16 isolates from 11 different serotypes. There were 2 nalidixic acid-resistant isolates for each of the following serotypes: Agona, Blockley, Hadar, Infantis, and Virchow. There was 1 nalidixic acid-resistant isolate for each of the following serotypes: Heidelberg, Kentucky, I 4,[5],12:i:-, Newport, Poona, and Saintpaul

Figure 7. Percent of *Salmonella* (non-Typhi) Isolates from Humans and Food Animals Resistant to Nali

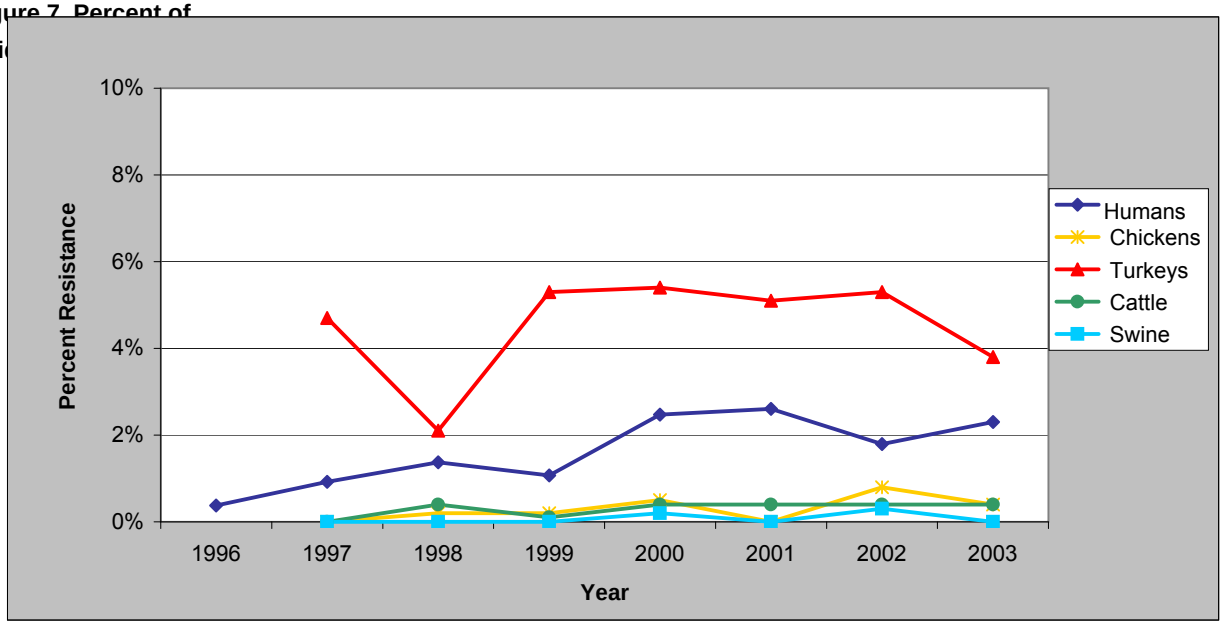


Table 10. Number of *Salmonella* (non-Typhi) Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	5	12	20	16	34	37	36	43
Chickens		0	1	3	6	0	12	5
Turkeys		5	5	38	28	28	13	10
Cattle		0	1	1	6	4	4	3
Swine		0	0	0	1	0	1	0

Table 11a. Resistance Patterns among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	1324	1301	1460	1498	1377	1419	2008	1865
	Chicken Breasts							60	83
	Ground Turkey							74	114
	Ground Beef							9	10
	Pork Chops							10	5
	Chickens		214	561	1438	1173	1307	1500	1158
	Turkeys		107	240	713	518	550	244	262
	Cattle		24	284	1610	1388	893	1008	670
	Swine		111	793	876	451	418	379	211
Resistance Pattern	**Isolate Source**								
1. No Resistance Detected	Humans	66.2% 876	68.4% 890	72.9% 1064	74.0% 1109	74.4% 1024	72.3% 1026	79.0% 1586	77.5% 1446
	Chicken Breasts							51.7% 31	47.0% 39
	Ground Turkey							37.8% 28	34.2% 39
	Ground Beef							77.8% 7	60.0% 6
	Pork Chops							20.0% 2	20.0% 1
	Chickens		52.8% 113	58.6% 329	58.8% 846	56.9% 667	66.5% 869	62.0% 930	61.1% 708
	Turkeys		32.7% 35	41.3% 99	32.5% 232	33.4% 173	31.6% 174	29.9% 73	24.0% 63
	Cattle		66.7% 16	73.2% 208	74.5% 1199	70.0% 972	69.9% 624	64.3% 648	61.0% 409
	Swine		44.1% 49	49.2% 390	48.9% 428	43.2% 195	43.3% 181	40.1% 152	53.6% 113
2. At Least ACSSuT[1] Resistant	Humans	8.8% 116	9.5% 124	8.9% 130	8.4% 126	8.9% 122	10.0% 142	7.8% 156	9.3% 173
	Chicken Breasts							0.0% 0	2.4% 2
	Ground Turkey							1.4% 1	0.9% 1
	Ground Beef							22.2% 2	40.0% 4
	Pork Chops							40.0% 4	40.0% 2
	Chickens		1.4% 3	2.7% 15	1.7% 24	4.3% 50	2.4% 32	1.9% 29	1.5% 17
	Turkeys		3.7% 4	0.8% 2	3.8% 27	3.3% 17	3.6% 20	4.5% 11	2.3% 6
	Cattle		4.2% 1	4.2% 12	7.6% 123	13.1% 182	14.6% 130	17.1% 172	18.1% 121
	Swine		4.5% 5	7.8% 62	7.1% 62	8.6% 39	7.2% 30	7.7% 29	7.6% 16
3. At Least ACT/S[2] Resistant	Humans	0.8% 10	0.4% 5	0.9% 13	1.0% 15	1.0% 14	0.5% 7	1.0% 21	1.2% 23
	Chicken Breasts							0.0% 0	0.0% 0
	Ground Turkey							1.4% 1	0.0% 0
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							20.0% 2	0.0% 0
	Chickens		0.0% 0	0.2% 1	0.1% 2	0.0% 0	0.1% 1	0.0% 0	0.0% 0
	Turkeys		0.0% 0	0.4% 1	0.4% 3	0.8% 4	0.7% 4	0.8% 2	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
	Swine		0.0% 0	0.5% 4	0.5% 4	0.0% 0	1.0% 4	0.5% 2	0.9% 2

[1] ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole, and tetracycline

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

Table 11b. Resistance Patterns among all *Salmonella* (non-Typhi) Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	1324	1301	1460	1498	1377	1419	2008	1865
	Chicken Breasts							60	83
	Ground Turkey							74	114
	Ground Beef							9	10
	Pork Chops							10	5
	Chickens		214	561	1438	1173	1307	1500	1158
	Turkeys		107	240	713	518	550	244	262
	Cattle		24	284	1610	1388	893	1008	670
	Swine		111	793	876	451	418	379	211
Resistance Pattern	**Isolate Source**								
4. At Least ACSSuTAuCf [1] 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
	Chicken Breasts							0.0% 0	0.0% 0
	Ground Turkey							1.4% 1	0.9% 1
	Ground Beef							22.2% 2	40.0% 4
	Pork Chops							20.0% 2	20.0% 1
	Chickens		0.0% 0	0.5% 3	0.3% 5	2.7% 32	1.1% 14	0.9% 13	1.0% 12
	Turkeys		3.7% 4	0.4% 1	3.4% 24	1.9% 10	2.9% 16	1.6% 4	0.8% 2
	Cattle		0.0% 0	2.1% 6	3.7% 59	8.9% 124	11.0% 98	14.6% 147	15.1% 101
	Swine		0.0% 0	0.1% 1	0.6% 5	1.3% 6	2.2% 9	1.8% 7	1.9% 4
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.2% 2	0.0% 0	0.1% 2	0.1% 1	0.1% 2	0.2% 4	0.2% 3
	Chicken Breasts							0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	0.9% 1
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							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
	Turkeys		1.9% 2	0.0% 0	2.7% 19	1.2% 6	1.5% 8	1.2% 3	0.4% 1
	Cattle		0.0% 0	0.0% 0	0.1% 1	0.1% 1	0.3% 3	0.2% 2	0.4% 3
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.3% 1	0.0% 0

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

5. Antimicrobial Susceptibility among *Salmonella* Typhimurium

Table 12a. Distribution of MICs and Occurrence of Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, 2003

Antimicrobial	Isolate Source (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Humans (403)[5]	0.0	**0.0**	[0.0 - 0.9]						1.2	58.1	37.7	2.7		0.2						
	Chicken Breasts (22)	0.0	**0.0**	[0.0 - 15.4]						18.2	36.4	40.9	4.5								
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]							100.0										
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Chickens (156)	0.0	**0.0**	[0.0 - 2.3]						25.6	53.2	16.7	4.5								
	Turkeys (6)	0.0	**0.0**	[0.0 - 45.9]							16.7	83.3									
	Cattle (78)	0.0	**0.0**	[0.0 - 4.6]						23.1	46.0	28.2	2.6								
	Swine (27)	0.0	**0.0**	[0.0 - 12.8]						18.5	59.3	18.5	3.7								
Gentamicin	Humans (403)	0.7	**2.0**	[0.9 - 3.9]					24.3	48.1	24.6		0.2	0.7	**0.5**	**1.5**					
	Chicken Breasts (22)	0.0	**0.0**	[0.0 - 15.4]					36.4	54.5	9.1										
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]							50.0	50.0									
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Pork Chops (1)	100.0	**0.0**	[0.0 - 97.5]										100.0							
	Chickens (156)	1.9	**5.1**	[2.2 - 9.9]					71.2	14.7	5.1	1.3	0.6	1.9	**3.8**	**1.3**					
	Turkeys (6)	0.0	**83.3**	[35.9 - 99.6]					16.7						**66.7**	**16.7**					
	Cattle (78)	0.0	**1.3**	[0.0 - 6.9]					75.6	17.9	5.1				**1.3**						
	Swine (27)	0.0	**0.0**	[0.0 - 12.8]					74.1	25.9											
Kanamycin	Humans (403)	0.0	**7.2**	[4.9 - 10.2]										91.8	1.0			**7.2**			
	Chicken Breasts (22)	0.0	**18.2**	[5.2 - 40.3]										81.8				**18.2**			
	Ground Turkey (2)	0.0	**50.0**	[1.3 - 98.7]										50.0				**50.0**			
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Pork Chops (1)	100.0	**0.0**	[0.0 - 97.5]												100.0					
	Chickens (156)	0.0	**7.7**	[4.0 - 13.1]										92.3				**7.7**			
	Turkeys (6)	0.0	**50.0**	[11.8 - 88.2]										50.0				**50.0**			
	Cattle (78)	0.0	**16.7**	[9.2 - 26.8]										83.3				**16.7**			
	Swine (27)	0.0	**0.0**	[0.0 - 12.8]										100.0							
Streptomycin	Humans (403)	N/A	**35.0**	[30.3 - 39.9]												65.0	**20.3**	**14.6**			
	Chicken Breasts (22)	N/A	**18.2**	[5.2 - 40.3]												81.8	**9.1**	**9.1**			
	Ground Turkey (2)	N/A	**50.0**	[1.3 - 98.7]												50.0		**50.0**			
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]												100.0					
	Pork Chops (1)	N/A	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (156)	N/A	**16.7**	[11.2 - 23.5]												83.3	**13.5**	**3.2**			
	Turkeys (6)	N/A	**100.0**	[54.1 - 100.0]													**50.0**	**50.0**			
	Cattle (78)	N/A	**52.6**	[40.9 - 64.0]												47.4	**21.8**	**30.8**			
	Swine (27)	N/A	**59.3**	[38.8 - 77.6]												40.7	**48.1**	**11.1**			

[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 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

[5] For isolates from humans that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/ml), Etest was performed to determine amikacin MICs; the percentages reported in the shaded area (MIC ≥ 8 µg/ml) are based on Etest results for these isolates. The amikacin Etest strip range of dilutions is 0.016-256 µg/ml

Table 12b. Distribution of MICs and Occurrence of Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, 2003

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
Aminopenicillins																					
Ampicillin	Humans (403)	0.0	**35.5**	[30.8 - 40.4]							32.5	28.8	2.7	0.5		**0.2**	**35.2**				
	Chicken Breasts (22)	0.0	**72.7**	[49.8 - 89.3]							13.6	13.6					**72.7**				
	Ground Turkey (2)	0.0	**100.0**	[15.8 - 100.0]													**100.0**				
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (156)	0.0	**32.1**	[24.8 - 40.0]							48.1	19.2	0.6				**32.1**				
	Turkeys (6)	0.0	**66.7**	[22.3 - 95.7]							33.3						**66.7**				
	Cattle (78)	0.0	**59.0**	[47.3 - 70.0]							25.6	12.8	1.3	1.3			**59.0**				
	Swine (27)	0.0	**51.9**	[31.9 - 71.3]							18.5	22.2	7.4			**3.7**	**48.1**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (403)	19.4	**5.2**	[3.3 - 7.9]							61.8	2.7	0.7	10.4	19.4	**0.7**	**4.5**				
	Chicken Breasts (22)	9.1	**63.6**	[40.7 - 82.8]							27.3				9.1		**63.6**				
	Ground Turkey (2)	0.0	**100.0**	[15.8 - 100.0]													**100.0**				
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Pork Chops (1)	100.0	**0.0**	[0.0 - 97.5]											100.0						
	Chickens (156)	3.8	**25.6**	[19.0 - 33.2]							65.4	1.9	0.6	2.6	3.8		**25.6**				
	Turkeys (6)	16.7	**16.7**	[0.4 - 64.1]							33.3			33.3	16.7		**16.7**				
	Cattle (78)	19.2	**20.5**	[12.2 - 31.2]							33.3	3.8	3.8	19.2	19.2	**1.3**	**19.2**				
	Swine (27)	44.4	**0.0**	[0.0 - 12.8]							29.6	18.5		7.4	44.4						
Cephalosporins																					
Ceftiofur	Humans (403)	0.2	**4.7**	[2.9 - 7.3]				0.7	0.7	60.5	31.8	1.5	0.2		**4.7**						
	Chicken Breasts (22)	0.0	**63.6**	[40.7 - 82.8]						27.3	4.5	4.5			**63.6**						
	Ground Turkey (2)	0.0	**100.0**	[15.8 - 100.0]											**100.0**						
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
	Chickens (156)	0.0	**25.6**	[19.0 - 33.2]						67.9	6.4			**1.3**	**24.4**						
	Turkeys (6)	0.0	**16.7**	[0.4 - 64.1]						66.7	16.7				**16.7**						
	Cattle (78)	0.0	**20.5**	[12.2 - 31.2]						65.4	12.8	1.3		**1.3**	**19.2**						
	Swine (27)	0.0	**0.0**	[0.0 - 12.8]					3.7	55.6	40.7										
Ceftriaxone	Humans (403)	3.2	**0.2**	[0.0 - 1.4]					95.0			0.2		1.2	2.5	0.7		**0.2**			
	Chicken Breasts (22)	59.1	**0.0**	[0.0 - 15.4]					36.4					4.5	36.4	22.7					
	Ground Turkey (2)	50.0	**0.0**	[0.0 - 84.2]										50.0		50.0					
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Chickens (156)	16.7	**0.0**	[0.0 - 2.3]					74.4				0.6	8.3	13.5	3.2					
	Turkeys (6)	0.0	**16.7**	[0.4 - 64.1]					83.3									**16.7**			
	Cattle (78)	14.1	**0.0**	[0.0 - 4.6]					79.5					6.4	11.5	2.6					
	Swine (27)	0.0	**0.0**	[0.0 - 12.8]					100.0												

[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 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 12c. Distribution of MICs and Occurrence of Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, 2003

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
Cephalothin	Humans (403)	1.7	**6.0**	[3.9 - 8.7]								57.1	27.3	7.9	1.7	**0.7**	**5.2**				
	Chicken Breasts (22)	4.5	**63.6**	[40.7 - 82.8]									22.7	9.1	4.5		**63.6**				
	Ground Turkey (2)	0.0	**100.0**	[15.8 - 100.0]													**100.0**				
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]												**100.0**					
	Chickens (156)	1.3	**25.6**	[19.0 - 33.2]								49.4	22.4	1.3	1.3		**25.6**				
	Turkeys (6)	16.7	**33.3**	[4.3 - 77.7]								16.7	33.3		16.7	**16.7**	**16.7**				
	Cattle (78)	0.0	**21.8**	[13.2 - 32.6]								37.2	33.3	7.7		**1.3**	**20.5**				
	Swine (27)	7.4	**0.0**	[0.0 - 12.8]								40.7	40.7	11.1	7.4						
Cephamycins																					
Cefoxitin	Humans (403)	1.5	**4.2**	[2.5 - 6.7]						0.2	12.4	70.7	7.4	3.5	1.5	**4.2**					
	Chicken Breasts (22)	0.0	**63.6**	[40.7 - 82.8]								27.3	4.5	4.5		**63.6**					
	Ground Turkey (2)	0.0	**100.0**	[15.8 - 100.0]												**100.0**					
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Chickens (156)	1.9	**23.7**	[17.3 - 31.2]							8.3	55.8	9.0	1.3	1.9	**23.7**					
	Turkeys (6)	0.0	**16.7**	[0.4 - 64.1]							16.7	50.0		16.7		**16.7**					
	Cattle (78)	5.1	**16.7**	[9.2 - 26.8]							3.8	62.8	11.5		5.1	**16.7**					
	Swine (27)	0.0	**3.7**	[0.1 - 19.0]							7.4	66.7	11.1	11.1		**3.7**					
Folate Pathway Inhibitors																					
Sulfamethoxazole	Humans (403)	N/A	**38.2**	[33.4 - 43.2]											60.0	1.2			0.5	**1.0**	**37.2**
	Chicken Breasts (22)	N/A	**31.8**	[13.9 - 54.9]											36.4	18.2	13.6				**31.8**
	Ground Turkey (2)	N/A	**50.0**	[1.3 - 98.7]												50.0					**50.0**
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]											100.0						
	Pork Chops (1)	N/A	**100.0**	[2.5 - 100.0]																	**100.0**
	Chickens (156)	N/A	**28.2**	[21.3 - 36.0]											59.6	6.4			5.8	**17.9**	**10.3**
	Turkeys (6)	N/A	**100.0**	[54.1 - 100.0]																**50.0**	**50.0**
	Cattle (78)	N/A	**44.9**	[33.6 - 56.6]											35.9	6.4	1.3		11.5	**24.4**	**20.5**
	Swine (27)	N/A	**63.0**	[42.4 - 80.6]											33.3	3.7				**37.0**	**25.9**
Trimethoprim-Sulfamethoxazole	Humans (403)	N/A	**3.5**	[1.9 - 5.8]				69.5	26.1	1.2				**3.5**							
	Chicken Breasts (22)	N/A	**0.0**	[0.0 - 15.4]				90.9	9.1												
	Ground Turkey (2)	N/A	**0.0**	[0.0 - 84.2]				50.0	50.0												
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]				100.0													
	Pork Chops (1)	N/A	**0.0**	[0.0 - 97.5]					100.0												
	Chickens (156)	N/A	**0.6**	[0.0 - 3.5]				76.9	21.2	1.3				**0.6**							
	Turkeys (6)	N/A	**0.0**	[0.0 - 45.9]				50.0	50.0												
	Cattle (78)	N/A	**2.6**	[0.3 - 9.0]				50.0	39.7	7.7			**1.3**	**1.3**							
	Swine (27)	N/A	**3.7**	[0.1 - 19.0]				44.4	37.0	14.8				**3.7**							

[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 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 12d. Distribution of MICs and Occurrence of Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, 2003

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
Phenicols																					
Chloramphenicol	Humans (403)	1.0	**27.5**	[23.2 - 32.2]								3.0	43.9	24.6	1.0	**0.2**	**27.3**				
	Chicken Breasts (22)	0.0	**9.1**	[1.1 - 29.2]									13.6	77.3			**9.1**				
	Ground Turkey (2)	0.0	**50.0**	[1.3 - 98.7]										50.0			**50.0**				
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (156)	0.0	**5.1**	[2.2 - 9.9]								0.6	67.3	26.9			**5.1**				
	Turkeys (6)	0.0	**50.0**	[11.8 - 88.2]									33.3	16.7			**50.0**				
	Cattle (78)	0.0	**42.3**	[31.2 - 54.0]									32.1	25.6			**42.3**				
	Swine (27)	7.4	**48.1**	[28.7 - 68.1]									14.8	29.6	7.4		**48.1**				
Quinolones																					
Ciprofloxacin	Humans (403)	0.0	**0.0**	[0.0 - 0.9]	96.3	2.7	0.2		1.0												
	Chicken Breasts (22)	0.0	**0.0**	[0.0 - 15.4]	77.3	18.2	4.5														
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]		50.0			50.0												
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]	100.0																
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]			100.0														
	Chickens (156)	0.0	**0.0**	[0.0 - 2.3]	98.7	1.3															
	Turkeys (6)	0.0	**0.0**	[0.0 - 45.9]	66.7			16.7	16.7												
	Cattle (78)	0.0	**0.0**	[0.0 - 4.6]	96.2	3.8															
	Swine (27)	0.0	**0.0**	[0.0 - 12.8]	74.1	25.9															
Nalidixic Acid	Humans (403)	N/A	**1.2**	[0.4 - 2.9]						0.2	0.2	4.7	83.4	9.9	0.5	**0.2**	**1.0**				
	Chicken Breasts (22)	N/A	**0.0**	[0.0 - 15.4]								4.7	78.0	17.4							
	Ground Turkey (2)	N/A	**50.0**	[1.3 - 98.7]									50.0				**50.0**				
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]									100.0								
	Pork Chops (1)	N/A	**0.0**	[0.0 - 97.5]											100.0						
	Chickens (156)	N/A	**0.0**	[0.0 - 2.3]								5.1	86.5	8.3							
	Turkeys (6)	N/A	**33.3**	[4.3 - 77.7]									66.7				**33.3**				
	Cattle (78)	N/A	**0.0**	[0.0 - 4.6]								5.1	88.5	6.4							
	Swine (27)	N/A	**0.0**	[0.0 - 12.8]						74.1	25.9										
Tetracyclines																					
Tetracycline	Humans (403)	0.2	**37.7**	[33.0 - 42.6]									62.3	0.2	**14.4**	**9.7**	**13.6**				
	Chicken Breasts (22)	0.0	**31.8**	[13.9 - 54.9]									68.2			**4.5**	**27.3**				
	Ground Turkey (2)	0.0	**50.0**	[1.3 - 98.7]									50.0				**50.0**				
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (156)	0.0	**33.3**	[26.0 - 41.3]									66.7		**5.1**	**3.8**	**24.4**				
	Turkeys (6)	0.0	**100.0**	[54.1 - 100.0]											**33.3**		**66.7**				
	Cattle (78)	1.3	**53.8**	[42.2 - 65.2]									44.9	1.3	**24.4**	**5.1**	**24.4**				
	Swine (27)	0.0	**74.1**	[53.7 - 88.9]									25.9		**29.6**	**14.8**	**29.6**				

[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 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 13a. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	306	328	377	362	303	325	393	403
		Chicken Breasts							9	22
		Ground Turkey							2	2
		Ground Beef							2	1
		Pork Chops							2	1
		Chickens		24	66	154	145	130	150	156
		Turkeys		11	6	37	18	15	9	6
		Cattle		2	33	189	187	87	98	78
		Swine		25	105	114	81	44	48	27
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
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys		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
		Swine		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
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							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
		Turkeys		45.5% 5	50.0% 3	29.7% 11	33.3% 6	53.3% 8	44.4% 4	83.3% 5
		Cattle		0.0% 0	3.0% 1	2.6% 5	1.6% 3	0.0% 0	2.0% 2	1.3% 1
		Swine		0.0% 0	0.0% 0	1.8% 2	0.0% 0	2.3% 1	2.1% 1	0.0% 0
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	14.4% 44	15.5% 51	15.9% 60	13.0% 47	13.2% 40	8.3% 27	7.6% 30	7.2% 29
		Chicken Breasts							0.0% 0	18.2% 4
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							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
		Turkeys		81.8% 9	66.7% 4	59.5% 22	44.4% 8	73.3% 11	55.6% 5	50.0% 3
		Cattle		0.0% 0	54.5% 18	36.5% 69	27.3% 51	24.1% 21	26.5% 26	16.7% 13
		Swine		16.0% 4	18.1% 19	21.1% 24	14.8% 12	13.6% 6	2.1% 1	0.0% 0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	51.6% 158	55.2% 181	47.2% 178	43.1% 156	39.3% 119	40.0% 130	31.8% 125	35.0% 141
		Chicken Breasts							0.0% 0	18.2% 4
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							50.0% 1	100.0% 1
		Chickens		41.7% 10	45.5% 30	40.9% 63	35.9% 52	16.9% 22	30.0% 45	16.7% 26
		Turkeys		81.8% 9	83.3% 5	81.1% 30	72.2% 13	93.3% 14	77.8% 7	100.0% 6
		Cattle		100.0% 2	57.6% 19	63.0% 119	63.1% 118	46.0% 40	66.3% 65	52.6% 41
		Swine		44.0% 11	82.9% 87	80.7% 92	77.8% 63	70.5% 31	77.1% 37	59.3% 16

Table 13b. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	306	328	377	362	303	325	393	403
		Chicken Breasts							9	22
		Ground Turkey							2	2
		Ground Beef							2	1
		Pork Chops							2	1
		Chickens		24	66	154	145	130	150	156
		Turkeys		11	6	37	18	15	9	6
		Cattle		2	33	189	187	87	98	78
		Swine		25	105	114	81	44	48	27
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	50.0% 153	50.3% 165	45.1% 170	41.2% 149	41.9% 127	42.5% 138	33.6% 132	35.5% 143
		Chicken Breasts							33.3% 3	72.7% 16
		Ground Turkey							0.0% 0	100.0% 2
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							50.0% 1	100.0% 1
		Chickens		33.3% 8	30.3% 20	43.5% 67	42.1% 61	26.2% 34	45.3% 68	32.1% 50
		Turkeys		72.7% 8	50.0% 3	64.9% 24	66.7% 12	80.0% 12	55.6% 5	66.7% 4
		Cattle		100.0% 2	57.6% 19	66.1% 125	63.1% 118	57.5% 50	71.4% 70	59.0% 46
		Swine		72.0% 18	75.2% 79	64.0% 73	82.7% 67	63.6% 28	62.5% 30	51.9% 14
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	5.2% 21
		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	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
		Turkeys		63.6% 7	0.0% 0	51.4% 19	38.9% 7	53.3% 8	22.2% 2	16.7% 1
		Cattle		50.0% 1	6.1% 2	6.9% 13	12.8% 24	13.8% 12	17.3% 17	20.5% 16
		Swine		0.0% 0	1.9% 2	1.8% 2	2.5% 2	4.5% 2	8.3% 4	0.0% 0
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	0.0% 0	1.5% 5	1.9% 7	1.9% 7	3.6% 11	3.1% 10	4.3% 17	4.7% 19
		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	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
		Turkeys		63.6% 7	0.0% 0	48.6% 18	38.9% 7	53.3% 8	22.2% 2	16.7% 1
		Cattle		0.0% 0	3.0% 1	6.9% 13	11.8% 22	11.5% 10	15.3% 15	20.5% 16
		Swine		0.0% 0	0.0% 0	1.8% 2	0.0% 0	0.0% 0	4.2% 2	0.0% 0
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.2% 1
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens	1	0.0% 0	≤ 1.5%[1] ≤	0.0% 0	0.0% 0	0.0% 0	1.3% 2	0.0% 0
		Turkeys	1		≤ 9.1%[2] ≤	0.0% 0	8.1% 3	11.1% 2	6.7% 1	0.0% 0	16.7% 1
		Cattle	1		0.0% 0	≤ 3.0%[3] ≤	0.5% 1	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

[1] In 1998, there was 1 isolate from chickens that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

[2] In 1997, there was 1 isolate from turkeys that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

[3] In 1998, there was 1 isolate from cattle that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

Table 13c. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	306	328	377	362	303	325	393	403
		Chicken Breasts							9	22
		Ground Turkey							2	2
		Ground Beef							2	1
		Pork Chops							2	1
		Chickens		24	66	154	145	130	150	156
		Turkeys		11	6	37	18	15	9	6
		Cattle		2	33	189	187	87	98	78
		Swine		25	105	114	81	44	48	27
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	6.0% 24
		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
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					3.6% 11	3.1% 10	4.3% 17	4.2% 17
		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	0.0% 0
		Chickens					24.8% 36	14.6% 19	26.7% 40	23.7% 37
		Turkeys					38.9% 7	53.3% 8	22.2% 2	16.7% 1
		Cattle					9.1% 17	11.5% 10	11.2% 11	16.7% 13
		Swine					12.1% 1	0.0% 0	4.2% 2	3.7% 1
Folate Pathway Inhibitors	Sulfamethoxazole (MIC ≥ 512 µg/ml)	Humans	53.3% 163	56.7% 186	49.6% 187	45.6% 165	45.2% 137	43.1% 140	32.1% 126	38.2% 154
		Chicken Breasts							44.4% 4	31.8% 7
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							50.0% 1	100.0% 1
		Chickens		41.7% 10	37.9% 25	32.5% 50	34.5% 50	18.5% 24	31.3% 47	28.2% 44
		Turkeys		81.8% 9	83.3% 5	75.7% 28	66.7% 12	86.7% 13	77.8% 7	100.0% 6
		Cattle		100.0% 2	60.6% 20	64.6% 122	64.2% 120	54.0% 47	58.2% 57	44.9% 35
		Swine		80.0% 20	83.8% 88	78.9% 90	86.4% 70	75.0% 33	68.8% 33	63.0% 17
	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	3.5% 14
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens		0.0% 0	1.5% 1	1.3% 2	0.0% 0	0.8% 1	13.0% 2	0.6% 1
		Turkeys		0.0% 0	0.0% 0	0.0% 0	11.1% 2	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
		Swine		4.0% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.1% 1	3.7% 1

Table 13d. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	306	328	377	362	303	325	393	403
		Chicken Breasts							9	22
		Ground Turkey							2	2
		Ground Beef							2	1
		Pork Chops							2	1
		Chickens		24	66	154	145	130	150	156
		Turkeys		11	6	37	18	15	9	6
		Cattle		2	33	189	187	87	98	78
		Swine		25	105	114	81	44	48	27
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	39.9% 122	36.0% 118	33.4% 126	28.7% 104	30.7% 93	31.7% 103	23.2% 91	27.5% 111
		Chicken Breasts							0.0% 0	9.1% 2
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							50.0% 1	100.0% 1
		Chickens		20.8% 5	19.7% 13	10.4% 16	14.5% 21	11.5% 15	16.0% 24	5.1% 8
		Turkeys		63.6% 7	0.0% 0	54.1% 20	55.6% 10	73.3% 11	66.7% 6	50.0% 3
		Cattle		100.0% 2	27.3% 9	37.0% 70	42.8% 80	37.9% 33	49.0% 48	42.3% 33
		Swine		52.0% 13	57.1% 60	49.1% 56	53.1% 43	47.7% 21	56.3% 27	48.1% 13
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
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys		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
		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	0.3% 1	0.9% 3	0.5% 2	0.0% 0	1.3% 4	0.6% 2	1.3% 5	1.2% 5
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							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
		Turkeys		45.5% 5	0.0% 0	51.4% 19	33.3% 6	60.0% 9	55.6% 5	33.3% 2
		Cattle		0.0% 0	0.0% 0	0.5% 1	0.0% 0	0.0% 0	1.0% 1	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
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	49.3% 151	52.4% 172	45.9% 173	41.7% 151	43.2% 131	43.4% 141	31.8% 125	37.7% 152
		Chicken Breasts							44.4% 4	31.8% 7
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							100.0% 2	100.0% 1
		Chickens		33.3% 8	31.8% 21	32.5% 50	32.4% 47	16.2% 21	28.0% 42	33.3% 52
		Turkeys		90.9% 10	83.3% 5	78.4% 29	83.3% 15	93.3% 14	77.8% 7	100.0% 6
		Cattle		100.0% 2	63.6% 21	58.7% 111	61.5% 115	44.8% 39	64.3% 63	53.8% 42
		Swine		84.0% 21	89.5% 94	84.2% 96	91.1% 73	79.5% 35	89.6% 43	74.1% 20

Ceftiofur Resistance

Figure 8. Percent of *Salmonella* Typhimurium Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

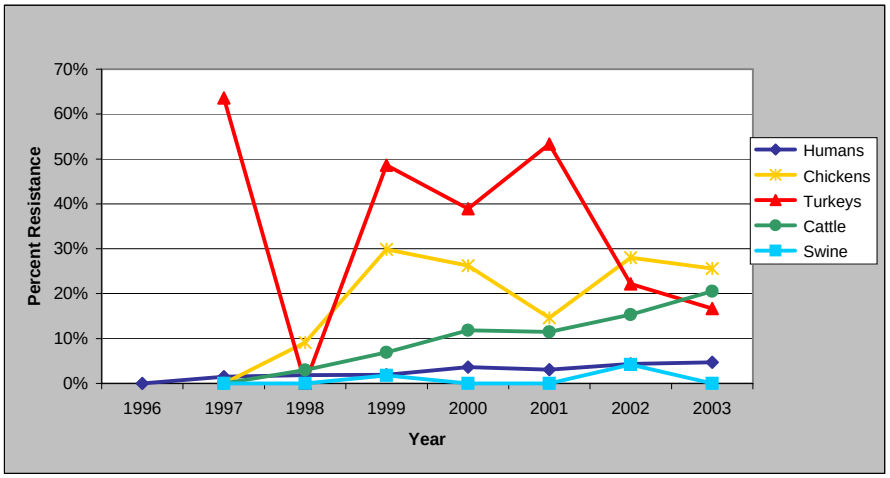


Table 14. Number of *Salmonella* Typhimurium Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	0	5	7	7	11	10	17	19
Chickens		0	6	46	38	19	42	40
Turkeys		7	0	18	7	8	2	1
Cattle		0	1	13	22	10	15	16
Swine		0	0	2	0	0	2	0

Nalidixic Acid Resistance

Figure 9. Percent of *Salmonella* Typhimurium Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

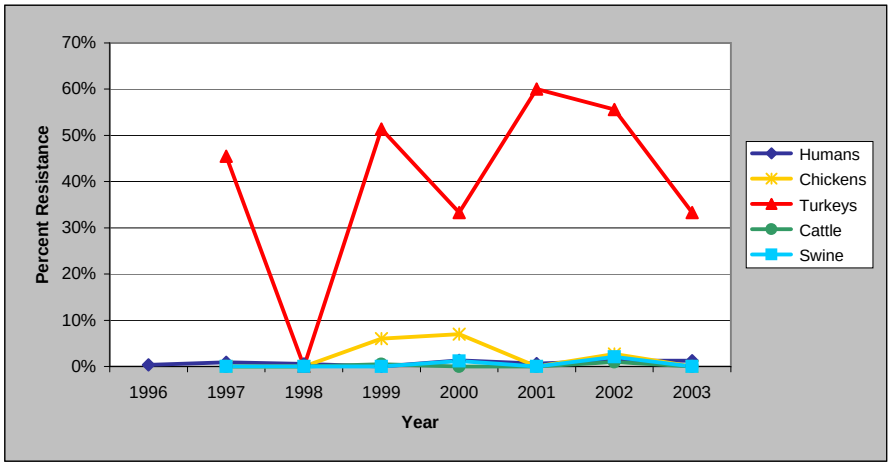


Table 15. Number of *Salmonella* Typhimurium Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	1	3	2	0	4	2	5	5
Chickens		0	0	1	1	0	4	0
Turkeys		5	0	19	6	9	5	2
Cattle		0	0	1	0	0	1	0
Swine		0	0	0	1	0	1	0

Table 16a. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	306	328	377	362	303	325	393	403
	Chicken Breasts							9	22
	Ground Turkey							2	2
	Ground Beef							2	1
	Pork Chops							2	1
	Chickens		24	66	154	145	130	150	156
	Turkeys		11	6	37	18	15	9	6
	Cattle		2	33	189	187	87	98	78
	Swine		25	105	114	81	44	48	27
Resistance Pattern	**Isolate Source**								
1. No Resistance Detected	Humans	37.9% 116	39.0% 128	46.9% 177	50.6% 183	49.5% 150	49.2% 160	60.3% 237	55.3% 223
	Chicken Breasts							22.2% 2	22.7% 5
	Ground Turkey							100.0% 2	0.0% 0
	Ground Beef							100.0% 2	100.0% 1
	Pork Chops							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
	Turkeys		0.0% 0	16.7% 1	10.8% 4	5.6% 1	6.7% 1	0.0% 0	0.0% 0
	Cattle		0.0% 0	36.4% 12	29.1% 55	26.7% 50	34.5% 30	19.4% 19	39.7% 31
	Swine		12.0% 3	7.6% 8	7.9% 9	2.5% 2	13.6% 6	8.3% 4	18.5% 5
2. At Least ACSSuT[1] Resistant	Humans	33.7% 103	35.1% 115	31.8% 120	27.6% 100	27.7% 84	29.5% 96	21.4% 84	25.8% 104
	Chicken Breasts							0.0% 0	9.1% 2
	Ground Turkey							0.0% 0	50.0% 1
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							50.0% 1	100.0% 1
	Chickens		12.5% 3	16.7% 11	9.7% 15	13.1% 19	11.5% 15	12.7% 19	3.2% 5
	Turkeys		27.3% 3	0.0% 0	51.4% 19	50.0% 9	66.7% 10	44.4% 4	50.0% 3
	Cattle		50.0% 1	21.2% 7	32.8% 62	37.4% 70	31.0% 27	31.6% 31	28.2% 22
	Swine		20.0% 5	54.3% 57	46.5% 53	39.5% 32	45.5% 20	47.9% 23	44.4% 12
3. At Least ACT/S[2] Resistant	Humans	2.0% 6	0.6% 2	2.7% 10	2.2% 8	1.7% 5	0.9% 3	2.0% 8	3.2% 13
	Chicken Breasts							0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	0.0% 0
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							0.0% 0	0.0% 0
	Chickens		0.0% 0	0.0% 0	0.6% 1	0.7% 1	0.0% 0	2.7% 4	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
	Cattle		0.0% 0	0.0% 0	0.5% 1	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	2.1% 1	0.0% 0

[1] ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole, and tetracycline

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

Table 16b. Resistance Patterns among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	306	328	377	362	303	325	393	403
	Chicken Breasts							9	22
	Ground Turkey							2	2
	Ground Beef							2	1
	Pork Chops							2	1
	Chickens		24	66	154	145	130	150	156
	Turkeys		11	6	37	18	15	9	6
	Cattle		2	33	189	187	87	98	78
	Swine		25	105	114	81	44	48	27
Resistance Pattern	**Isolate Source**								
4. At Least ACSSuTAuCf [1] 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
	Chicken Breasts							0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	50.0% 1
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							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
	Turkeys		27.3% 3	0.0% 0	45.9% 17	33.3% 6	53.3% 8	11.1% 1	16.7% 1
	Cattle		0.0% 0	3.0% 1	6.3% 12	11.8% 22	10.3% 9	11.2% 11	12.8% 10
	Swine		0.0% 0	0.0% 0	1.8% 2	0.0% 0	0.0% 0	4.2% 2	0.0% 0
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.3% 1	0.0% 0	0.0% 0	0.3% 1	0.3% 1	0.5% 2	0.0% 0
	Chicken Breasts							0.0% 0	0.0% 0
	Ground Turkey							0.0% 0	50.0% 1
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							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
	Turkeys		18.2% 2	0.0% 0	48.6% 18	33.3% 6	53.3% 8	22.2% 2	16.7% 1
	Cattle		0.0% 0	0.0% 0	0.5% 1	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	2.1% 1	0.0% 0

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

6. Antimicrobial Susceptibility among *Salmonella* Enteritidis

Table 17a. Distribution of MICs and Occurrence of Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Aminoglycosides																					
Amikacin	Humans (257)	0.0	**0.0**	[0.0 - 1.4]						10.9	71.2	16.7	1.2								
	Chicken Breasts (3)	0.0	**0.0**	[0.0 - 70.8]						66.7		33.3									
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]						52.4	31.0	16.7									
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]							100.0										
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
Gentamicin	Humans (257)	0.0	**0.4**	[0.0 - 2.1]					63.4	22.2	14.0					**0.4**					
	Chicken Breasts (3)	0.0	**0.0**	[0.0 - 70.8]					66.7	33.3											
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Chickens (42)	2.4	**0.0**	[0.0 - 8.4]					90.5	7.1				2.4							
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]					100.0												
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
Kanamycin	Humans (257)	0.0	**0.0**	[0.0 - 1.4]										100.0							
	Chicken Breasts (3)	0.0	**0.0**	[0.0 - 70.8]										100.0							
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]										100.0							
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]										100.0							
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
Streptomycin	Humans (257)	N/A	**1.2**	[0.2 - 3.4]												98.8	**0.4**	**0.8**			
	Chicken Breasts (3)	N/A	**0.0**	[0.0 - 70.8]												100.0					
	Ground Turkey (1)	N/A	**0.0**	[0.0 - 97.5]												100.0					
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]												100.0					
	Chickens (42)	N/A	**0.0**	[0.0 - 8.4]												100.0					
	Cattle (3)	N/A	**0.0**	[0.0 - 70.8]												100.0					
	Swine (1)	N/A	**0.0**	[0.0 - 97.5]												100.0					

[1] There were no *Salmonella* Enteritidis isolates from pork chops and turkeys

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 17b. Distribution of MICs and Occurrence of Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Aminopenicillins																					
Ampicillin	Humans (257)	0.0	**2.3**	[0.9 - 5.0]							33.5	55.3	8.6	0.4			**2.3**				
	Chicken Breasts (3)	0.0	**66.7**	[9.4 - 99.2]							33.3						**66.7**				
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]							50.0	50.0									
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]							66.7	33.3									
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (257)	0.8	**0.0**	[0.0 - 1.4]							94.2	3.5		1.6	0.8						
	Chicken Breasts (3)	33.3	**33.3**	[0.8 - 90.6]								33.3			33.3		**33.3**				
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]							97.6	2.4									
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]							100.0										
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
Cephalosporins																					
Ceftiofur	Humans (257)	0.0	**0.0**	[0.0 - 1.4]					1.9	47.9	48.2	1.9									
	Chicken Breasts (3)	0.0	**33.3**	[0.8 - 90.6]						33.3	33.3				**33.3**						
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]						88.1	11.9										
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]						66.7	33.3										
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
Ceftriaxone	Humans (257)	0.0	**0.0**	[0.0 - 1.4]					100.0												
	Chicken Breasts (3)	33.3	**0.0**	[0.0 - 70.8]					66.6						33.3						
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]					100.0												
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]					100.0												
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												

[1] There were no *Salmonella* Enteritidis isolates from pork chops and turkeys

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 17c. Distribution of MICs and Occurrence of Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Cephalothin	Humans (257)	0.8	**1.2**	[0.2 - 3.4]								75.1	22.2	0.8	0.8	**0.8**	**0.4**				
	Chicken Breasts (3)	0.0	**66.7**	[9.4 - 99.2]									33.3			**33.3**	**33.3**				
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]								73.8	26.2								
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]								100.0									
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
Cephamycins																					
Cefoxitin	Humans (257)	0.0	**0.0**	[0.0 - 1.4]						0.4	14.4	79.8	4.7	0.8							
	Chicken Breasts (3)	0.0	**33.3**	[0.8 - 90.6]								33.3	33.3			**33.3**					
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]							19.0	78.6	2.4								
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]								100.0									
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
Folate Pathway Inhibitors																					
Sulfamethoxazole	Humans (257)	N/A	**1.2**	[0.2 - 3.4]											86.8	11.7	0.4				**1.2**
	Chicken Breasts (3)	N/A	**0.0**	[0.0 - 70.8]											66.7			33.3			
	Ground Turkey (1)	N/A	**0.0**	[0.0 - 97.5]													100.0				
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]												100.0					
	Chickens (42)	N/A	**2.4**	[0.1 - 12.6]											78.6	19.0				**2.4**	
	Cattle (3)	N/A	**0.0**	[0.0 - 70.8]											66.7	33.3					
	Swine (1)	N/A	**0.0**	[0.0 - 97.5]											100.0						
Trimethoprim-Sulfamethoxazole	Humans (257)	N/A	**0.8**	[0.1 - 2.8]				93.8	5.1	0.4				**0.8**							
	Chicken Breasts (3)	N/A	**0.0**	[0.0 - 70.8]				100.0													
	Ground Turkey (1)	N/A	**0.0**	[0.0 - 97.5]				100.0													
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]				100.0													
	Chickens (42)	N/A	**0.0**	[0.0 - 8.4]				95.2	4.8												
	Cattle (3)	N/A	**0.0**	[0.0 - 70.8]				100.0													
	Swine (1)	N/A	**0.0**	[0.0 - 97.5]				100.0													

[1] There were no *Salmonella* Enteritidis isolates from pork chops and turkeys

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 17d. Distribution of MICs and Occurrence of Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Phenicols																					
Chloramphenicol	Humans (257)	0.4	**0.4**	[0.0 - 2.1]								1.6	65.4	32.3	0.4		**0.4**				
	Chicken Breasts (3)	0.0	**0.0**	[0.0 - 70.8]										100.0							
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]									50.0	50.0							
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]									100.0								
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
Quinolones																					
Ciprofloxacin	Humans (257)	0.0	**0.0**	[0.0 - 1.4]	94.2	1.2	0.8	3.1	0.4	0.4											
	Chicken Breasts (3)	0.0	**0.0**	[0.0 - 70.8]	100.0																
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]		100.0															
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]	100.0																
	Chickens (42)	0.0	**0.0**	[0.0 - 8.4]	100.0																
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]	100.0																
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]	100.0																
Nalidixic Acid	Humans (257)	N/A	**4.7**	[2.4 - 8.0]							0.4	1.9	81.7	11.3			**4.7**				
	Chicken Breasts (3)	N/A	**0.0**	[0.0 - 70.8]									100.0								
	Ground Turkey (1)	N/A	**0.0**	[0.0 - 97.5]										100.0							
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]								100.0									
	Chickens (42)	N/A	**0.0**	[0.0 - 8.4]									88.1	11.9							
	Cattle (3)	N/A	**0.0**	[0.0 - 70.8]									100.0								
	Swine (1)	N/A	**0.0**	[0.0 - 97.5]									100.0								
Tetracyclines																					
Tetracycline	Humans (257)	0.0	**1.6**	[0.4 - 3.9]									98.4		**0.4**	**0.4**	**0.8**				
	Chicken Breasts (3)	0.0	**0.0**	[0.0 - 70.8]									100.0								
	Ground Turkey (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Chickens (42)	0.0	**2.4**	[0.1 - 12.6]									97.6				**2.4**				
	Cattle (3)	0.0	**0.0**	[0.0 - 70.8]									100.0								
	Swine (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								

[1] There were no *Salmonella* Enteritidis isolates from pork chops and turkeys

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 18a. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	351	301	244	269	319	276	337	257
		Chicken Breasts							4	3
		Ground Turkey							5	1
		Ground Beef							1	1
		Pork Chops							0	0
		Chickens		1	13	41	31	21	48	42
		Turkeys		0	0	1	1	0	0	0
		Cattle		1	1	8	4	4	6	3
		Swine		0	0	2	1	1	1	1
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
		Chicken Breasts							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
		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
	Gentamicin (MIC ≥ 16 µg/ml)	Humans	4.8% 17	0.3% 1	0.4% 1	0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.4% 1
		Chicken Breasts							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
		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
	Kanamycin (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.7% 2	0.4% 1	0.4% 1	0.3% 1	0.7% 2	0.3% 1	0.0% 0
		Chicken Breasts							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
		Turkeys				0.0% 0	0.0% 0			
		Cattle		0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine				0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	2.0% 7	4.3% 13	1.6% 4	2.2% 6	0.0% 0	1.4% 4	1.8% 6	1.2% 3
		Chicken Breasts							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
		Turkeys				0.0% 0	0.0% 0			
		Cattle		0.0% 0	0.0% 0	12.5% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine				0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0

Table 18b. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	351	301	244	269	319	276	337	257
		Chicken Breasts							4	3
		Ground Turkey							5	1
		Ground Beef							1	1
		Pork Chops							0	0
		Chickens		1	13	41	31	21	48	42
		Turkeys		0	0	1	1	0	0	0
		Cattle		1	1	8	4	4	6	3
		Swine		0	0	2	1	1	1	1
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
		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		100.0% 1	30.8% 4	12.2% 5	9.7% 3	0.0% 0	4.2% 2	0.0% 0
		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
		Swine				0.0% 0	0.0% 0	100.0% 1	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
		Chicken Breasts							0.0% 0	33.3% 1
		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
		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
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
		Chicken Breasts							0.0% 0	33.3% 1
		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
		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
	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
		Chicken Breasts							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
		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

Table 18c. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	351	301	244	269	319	276	337	257
		Chicken Breasts							4	3
		Ground Turkey							5	1
		Ground Beef							1	1
		Pork Chops							0	0
		Chickens		1	13	41	31	21	48	42
		Turkeys		0	0	1	1	0	0	0
		Cattle		1	1	8	4	4	6	3
		Swine		0	0	2	1	1	1	1
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%	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
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					0.0% 0	0.4% 1	0.0% 0	0.0% 0
		Chicken Breasts							0.0% 0	33.3% 1
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops								
		Chickens					0.0% 0	2.1% 0	0.0% 0	0.0% 0
		Turkeys					0.0% 0			
		Cattle					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
Folate Pathway Inhibitors	Sulfamethoxazole (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
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops								
		Chickens		0.0% 0	0.0% 0	4.9% 0	3.2% 0	0.0% 0	4.2% 0	2.4% 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
		Swine				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
		Chicken Breasts							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
		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

Table 18d. Antimicrobial Resistance among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	351	301	244	269	319	276	337	257
		Chicken Breasts							4	3
		Ground Turkey							5	1
		Ground Beef							1	1
		Pork Chops							0	0
		Chickens		1	13	41	31	21	48	42
		Turkeys		0	0	1	1	0	0	0
		Cattle		1	1	8	4	4	6	3
		Swine		0	0	2	1	1	1	1
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
		Chicken Breasts							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
		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
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
		Chicken Breasts							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
		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
	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
		Chicken Breasts							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
		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
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
		Chicken Breasts							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	7.3% 3	0.0% 0	0.0% 0	2.1% 1	2.4% 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
		Swine				0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0

Ceftiofur Resistance

Figure 10. Percent of *Salmonella* Enteritidis Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

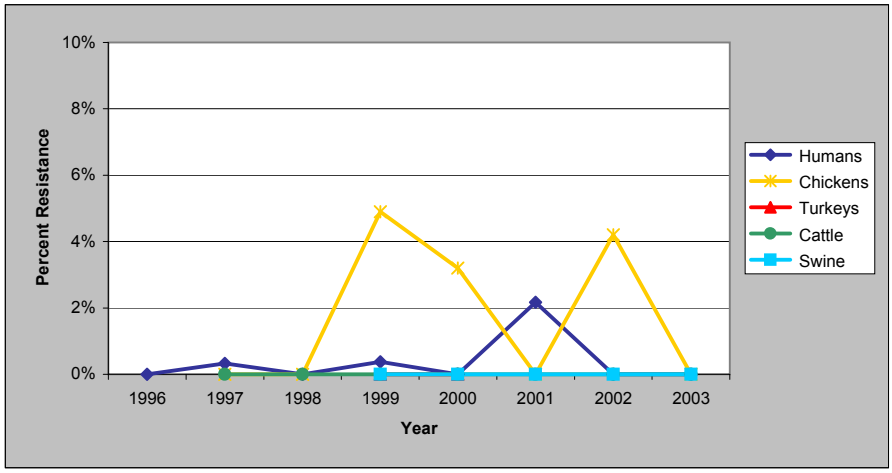


Table 19. Number of *Salmonella* Enteritidis Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	0	1	0	1	0	6	0	0
Chickens		0	0	2	1	0	2	0
Turkeys				0	0			
Cattle		0	0	0	0	0	0	0
Swine				0	0	0	0	0

Nalidixic Acid Resistance

Figure 11. Percent of *Salmonella* Enteritidis Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

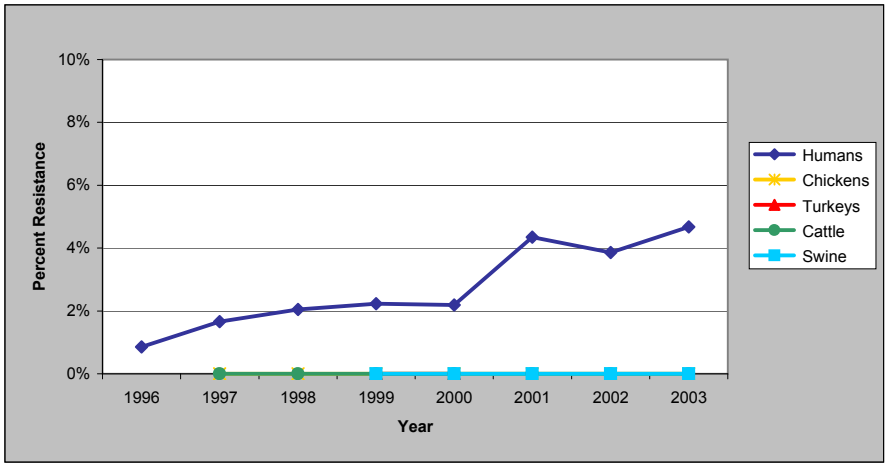


Table 20. Number of *Salmonella* Enteritidis Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	3	5	5	6	7	12	13	12
Chickens		0	0	0	0	0	0	0
Turkeys				0	0			
Cattle		0	0	0	0	0	0	0
Swine				0	0	0	0	0

Table 21a. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	351	301	244	269	319	276	337	257
	Chicken Breasts							4	3
	Ground Turkey							5	1
	Ground Beef							1	1
	Pork Chops							0	0
	Chickens		1	13	41	31	21	48	42
	Turkeys		0	0	1	1	0	0	0
	Cattle		1	1	8	4	4	6	3
	Swine		0	0	2	1	1	1	1
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% 239	87.2% 294	91.4% 235
	Chicken Breasts							100.0% 4	33.3% 1
	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
	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
	Swine				100.0% 2	100.0% 1	0.0% 0	100.0% 1	100.0% 1
2. At Least ACSSuT[1] 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
	Chicken Breasts							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
	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
3. At Least ACT/S[2] 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
	Chicken Breasts							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
	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

[1] ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole, and tetracycline

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

Table 21b. Resistance Patterns among *Salmonella* Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	351	301	244	269	319	276	337	257
	Chicken Breasts							4	3
	Ground Turkey							5	1
	Ground Beef							1	1
	Pork Chops							0	0
	Chickens		1	13	41	31	21	48	42
	Turkeys		0	0	1	1	0	0	0
	Cattle		1	1	8	4	4	6	3
	Swine		0	0	2	1	1	1	1
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
	Chicken Breasts							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
	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
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
	Chicken Breasts							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
	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

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

7. Antimicrobial Susceptibility among *Salmonella* Newport

Table 22a. Distribution of MICs and Occurrence of Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Aminoglycosides																					
Amikacin	Humans (222)[6]	0.0	**0.0**	[0.0 - 1.6]						1.4	78.4	18.0	1.4	0.9							
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]								50.0	50.0								
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]							100.0										
	Chickens (7)	0.0	**0.0**	[0.0 - 41.0]						42.9	14.3	14.3	28.6								
	Turkeys (19)	0.0	**0.0**	[0.0 - 17.6]						52.6	36.8	10.5									
	Cattle (75)	0.0	**0.0**	[0.0 - 4.8]						49.3	32.0	17.3	1.3								
	Swine (3)	0.0	**0.0**	[0.0 - 70.8]						66.7		33.3									
Gentamicin	Humans (222)	0.5	**3.2**	[1.3 - 6.4]					44.6	35.6	16.2			0.5	**1.4**	**1.8**					
	Ground Turkey (2)	0.0	**50.0**	[1.3 - 98.7]						50.0					**50.0**						
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]					100.0												
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
	Chickens (7)	0.0	**0.0**	[0.0 - 41.0]					85.7	14.3											
	Turkeys (19)	5.3	**52.6**	[28.9 - 75.6]					42.1					5.3	**36.8**	**15.8**					
	Cattle (75)	0.0	**1.3**	[0.0 - 7.2]					90.7	6.7	1.3					**1.3**					
	Swine (3)	0.0	**0.0**	[0.0 - 70.8]					100.0												
Kanamycin	Humans (222)	0.5	**4.5**	[2.2 - 8.1]										95.0		0.5		**4.5**			
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]										100.0							
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]										100.0							
	Chickens (7)	0.0	**0.0**	[0.0 - 41.0]										100.0							
	Turkeys (19)	0.0	**21.1**	[6.1 - 45.6]										78.9			**5.3**	**15.8**			
	Cattle (75)	0.0	**17.3**	[9.6 - 27.8]										82.7				**17.3**			
	Swine (3)	0.0	**0.0**	[0.0 - 70.8]										100.0							
Streptomycin	Humans (222)	N/A	**23.9**	[18.4 - 30.0]												76.1	**1.8**	**22.1**			
	Ground Turkey (2)	N/A	**50.0**	[1.3 - 98.7]												50.0	**50.0**				
	Ground Beef (1)	N/A	**100.0**	[2.5 - 100.0]														**100.0**			
	Pork Chops (1)	N/A	**100.0**	[2.5 - 100.0]														**100.0**			
	Chickens (7)	N/A	**85.7**	[42.1 - 99.6]												14.3		**85.7**			
	Turkeys (19)	N/A	**31.6**	[12.6 - 56.6]												68.4	**10.5**	**21.1**			
	Cattle (75)	N/A	**84.0**	[73.7 - 91.4]												16.0	**2.7**	**81.3**			
	Swine (3)	N/A	**100.0**	[29.2 - 100.0]														**100.0**			

[1] There were no *Salmonella* Newport isolates from chicken breasts

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

[6] For isolates from humans that grew in all amikacin dilutions on the Sensititre plate (MIC>4 µg/ml), Etest was performed to determine amikacin MICs; the percentages reported in the shaded area (MIC≥8 µg/ml) are based on Etest results for these isolates. The amikacin Etest strip range of dilutions is 0.016-256 µg/ml

Table 22b. Distribution of MICs and Occurrence of Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Aminopenicillins																					
Ampicillin	Humans (222)	0.5	**22.1**	[16.8 - 28.1]							49.5	25.7	1.8	0.5	0.5		**22.1**				
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]							100.0										
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (7)	0.0	**85.7**	[42.1 - 99.6]								14.3					**85.7**				
	Turkeys (19)	0.0	**15.8**	[3.4 - 39.6]							68.4	15.8					**15.8**				
	Cattle (75)	0.0	**82.7**	[72.2 - 90.4]							14.7	1.3	1.3				**82.7**				
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]													**100.0**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (222)	0.5	**21.2**	[16.0 - 27.1]							75.7	1.4	0.9	0.5	0.5	**3.6**	**17.6**				
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]							50.0	50.0									
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (7)	0.0	**85.7**	[42.1 - 99.6]							14.3						**85.7**				
	Turkeys (19)	0.0	**10.5**	[1.3 - 33.1]							84.2			5.3			**10.5**				
	Cattle (75)	0.0	**81.3**	[70.7 - 89.4]							16.0			2.7		**16.0**	**65.3**				
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]													**100.0**				
Cephalosporins																					
Ceftiofur	Humans (222)	0.0	**22.1**	[16.8 - 28.1]					0.9	50.5	25.7	0.9			**22.1**						
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]						100.0											
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]											**100.0**						
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]											**100.0**						
	Chickens (7)	0.0	**85.7**	[42.1 - 99.6]						14.3					**85.7**						
	Turkeys (19)	0.0	**10.5**	[1.3 - 33.1]						84.2	5.3				**10.5**						
	Cattle (75)	0.0	**81.3**	[70.7 - 89.4]						18.7					**81.3**						
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]											**100.0**						
Ceftriaxone	Humans (222)	18.9	**1.8**	[0.5 - 4.5]					78.4					0.9	11.7	7.2	**0.9**	**0.9**			
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]					100.0												
	Ground Beef (1)	100.0	**0.0**	[0.0 - 97.5]											100.0						
	Pork Chops (1)	100.0	**0.0**	[0.0 - 97.5]												100.0					
	Chickens (7)	71.4	**0.0**	[0.0 - 41.0]					14.3					14.3	71.4						
	Turkeys (19)	10.5	**0.0**	[0.0 - 17.6]					89.5						5.3	5.3					
	Cattle (75)	74.7	**1.3**	[0.0 - 7.2]					18.7					5.3	64.0	10.7	**1.3**				
	Swine (3)	100.0	**0.0**	[0.0 - 70.8]											66.7	33.3					

[1] There were no *Salmonella* Newport isolates from chicken breasts

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 22c. Distribution of MICs and Occurrence of Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Cephalothin	Humans (222)	0.5	**22.1**	[16.8 - 28.1]								63.1	13.1	1.4	0.5	**0.9**	**21.2**				
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]									100.0								
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (7)	0.0	**85.7**	[42.1 - 99.6]								14.3					**85.7**				
	Turkeys (19)	0.0	**10.5**	[1.3 - 33.1]								78.9	10.5				**10.5**				
	Cattle (75)	0.0	**81.3**	[70.7 - 89.4]								13.3	4.0	1.3			**81.3**				
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]													**100.0**				
Cephamycins																					
Cefoxitin	Humans (222)	0.5	**21.6**	[16.4 - 27.6]							12.2	59.5	5.4	0.9	0.5	**21.6**					
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]								100.0									
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]												**100.0**					
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]												**100.0**					
	Chickens (7)	14.3	**71.4**	[29.0 - 96.3]								14.3			14.3	**71.4**					
	Turkeys (19)	0.0	**10.5**	[1.3 - 33.1]							21.1	52.6	10.5	5.3		**10.5**					
	Cattle (75)	6.7	**74.7**	[63.3 - 84.0]							4.0	14.7			6.7	**74.7**					
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]												**100.0**					
Folate Pathway Inhibitors																					
Sulfamethoxazole	Humans (222)	N/A	**24.3**	[18.8 - 30.5]											62.2	12.6	0.9			**0.9**	**23.4**
	Ground Turkey (2)	N/A	**50.0**	[1.3 - 98.7]													50.0				**50.0**
	Ground Beef (1)	N/A	**100.0**	[2.5 - 100.0]																	**100.0**
	Pork Chops (1)	N/A	**100.0**	[2.5 - 100.0]																	**100.0**
	Chickens (7)	N/A	**71.4**	[29.0 - 96.3]											14.3				14.3	**42.9**	**28.6**
	Turkeys (19)	N/A	**52.6**	[28.9 - 75.6]											26.3	10.5			10.5	**26.3**	**26.3**
	Cattle (75)	N/A	**73.3**	[61.9 - 82.9]											10.7	4.0			12.0	**50.7**	**22.7**
	Swine (3)	N/A	**100.0**	[29.2 - 100.0]																**66.7**	**33.3**
Trimethoprim-Sulfamethoxazole	Humans (222)	N/A	**0.9**	[0.1 - 3.2]				82.4	15.8	0.5	0.5			**0.9**							
	Ground Turkey (2)	N/A	**0.0**	[0.0 - 84.2]				100.0													
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]					100.0												
	Pork Chops (1)	N/A	**0.0**	[0.0 - 97.5]					100.0												
	Chickens (7)	N/A	**0.0**	[0.0 - 41.0]				42.9	57.1												
	Turkeys (19)	N/A	**0.0**	[0.0 - 17.6]				73.7	26.3												
	Cattle (75)	N/A	**0.0**	[0.0 - 4.8]				46.7	49.3	4.0											
	Swine (3)	N/A	**33.3**	[0.8 - 90.6]				33.3	33.3					**33.3**							

[1] There were no *Salmonella* Newport isolates from chicken breasts

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 22d. Distribution of MICs and Occurrence of Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Phenicols																					
Chloramphenicol	Humans (222)	0.5	**21.6**	[16.4 - 27.6]								0.9	65.8	11.3	0.5		**21.6**				
	Ground Turkey (2)	0.0	0.0	[0.0 - 84.2]										100.0							
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (7)	0.0	**85.7**	[42.1 - 99.6]									14.3				**85.7**				
	Turkeys (19)	0.0	**21.1**	[6.1 - 45.6]								5.3	57.9	15.8			**21.1**				
	Cattle (75)	0.0	**78.7**	[67.7 - 87.3]									21.3				**78.7**				
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]													**100.0**				
Quinolones																					
Ciprofloxacin	Humans (222)	0.0	**0.0**	[0.0 - 1.6]	99.1	0.5					0.5										
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]	100.0																
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]	100.0																
	Pork Chops (1)	0.0	**0.0**	[0.0 - 97.5]	100.0																
	Chickens (7)	0.0	**0.0**	[0.0 - 41.0]	100.0																
	Turkeys (19)	0.0	**0.0**	[0.0 - 17.6]	100.0																
	Cattle (75)	0.0	**0.0**	[0.0 - 4.8]	98.7				1.3												
	Swine (3)	0.0	**0.0**	[0.0 - 70.8]	100.0																
Nalidixic Acid	Humans (222)	N/A	**0.5**	[0.0 - 2.5]								3.2	86.9	8.6	0.9		**0.5**				
	Ground Turkey (2)	N/A	**0.0**	[0.0 - 84.2]									100.0								
	Ground Beef (1)	N/A	**0.0**	[0.0 - 97.5]									100.0								
	Pork Chops (1)	N/A	**0.0**	[0.0 - 97.5]									100.0								
	Chickens (7)	N/A	**0.0**	[0.0 - 41.0]									71.4	28.6							
	Turkeys (19)	N/A	**0.0**	[0.0 - 17.6]								10.5	78.9	10.5							
	Cattle (75)	N/A	**1.3**	[0.0 - 7.2]								9.3	84.0	5.3			**1.3**				
	Swine (3)	N/A	**0.0**	[0.0 - 70.8]									100.0								
Tetracyclines																					
Tetracycline	Humans (222)	0.0	**23.9**	[18.4 - 30.0]									76.1			**5.4**	**18.5**				
	Ground Turkey (2)	0.0	**0.0**	[0.0 - 84.2]									100.0								
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Pork Chops (1)	0.0	**100.0**	[2.5 - 100.0]													**100.0**				
	Chickens (7)	0.0	**85.7**	[42.1 - 99.6]									14.3				**85.7**				
	Turkeys (19)	5.3	**36.8**	[16.3 - 61.6]									57.9	5.3	**5.3**		**31.6**				
	Cattle (75)	0.0	**84.0**	[73.7 - 91.4]									16.0		**1.3**	**4.0**	**78.7**				
	Swine (3)	0.0	**100.0**	[29.2 - 100.0]													**100.0**				

[1] There were no *Salmonella* Newport isolates from chicken breasts

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 23a. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	51	46	77	99	121	124	239	222
		Chicken Breasts							0	0
		Ground Turkey							3	2
		Ground Beef							3	1
		Pork Chops							2	1
		Chickens		0	1	7	5	8	6	7
		Turkeys		0	1	4	6	16	10	19
		Cattle		0	8	54	109	87	113	75
		Swine		0	1	5	2	7	0	3
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
		Chicken Breasts								
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		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
	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	3.2% 7
		Chicken Breasts								
		Ground Turkey							0.0% 0	50.0% 1
		Ground Beef							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
		Turkeys			0.0% 0	0.0% 0	16.7% 1	6.3% 1	0.0% 0	52.6% 10
		Cattle			0.0% 0	1.9% 1	11.0% 12	6.9% 6	7.1% 8	1.3% 1
		Swine			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	9.6% 23	4.5% 10
		Chicken Breasts								
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys			0.0% 0	0.0% 0	0.0% 0	0.0% 0	10.0% 1	21.1% 4
		Cattle			0.0% 0	0.0% 0	9.2% 10	6.9% 6	15.9% 18	17.3% 13
		Swine			0.0% 0	0.0% 0	0.0% 0	57.1% 4		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	24.7% 59	23.9% 53
		Chicken Breasts								
		Ground Turkey							33.3% 1	50.0% 1
		Ground Beef							66.7% 2	100.0% 1
		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
		Turkeys			0.0% 0	0.0% 0	16.7% 1	12.5% 2	0.0% 0	31.6% 6
		Cattle			12.5% 1	37.0% 20	79.8% 87	73.6% 64	80.5% 91	84.0% 63
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3

Table 23b. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	51	46	77	99	121	124	239	222
		Chicken Breasts							0	0
		Ground Turkey							3	2
		Ground Beef							3	1
		Pork Chops							2	1
		Chickens		0	1	7	5	8	6	7
		Turkeys		0	1	4	6	16	10	19
		Cattle		0	8	54	109	87	113	75
		Swine		0	1	5	2	7	0	3
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	24.3% 58	22.1% 49
		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			100.0% 1	0.0% 0	0.0% 0	37.5% 3	16.7% 1	85.7% 6
		Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	15.8% 3
		Cattle			12.5% 1	37.0% 20	77.1% 84	70.1% 61	78.8% 89	82.7% 62
		Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3
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	22.2% 53	21.2% 47
		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	76.1% 83	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
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	22.2% 53	22.1% 49
		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	76.1% 83	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
	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
		Chicken Breasts								
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Cattle			≤12.5%[1] ≤1	0.0% 0	0.9% 1	1.1% 1	0.9% 1	1.3% 1
		Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0

[1] In 1998, there was 1 isolate from cattle that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

Table 23c. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	51	46	77	99	121	124	239	222
		Chicken Breasts						0	0	0
		Ground Turkey						0	3	2
		Ground Beef						0	3	1
		Pork Chops						0	2	1
		Chickens		0	1	7	5	8	6	7
		Turkeys		0	1	4	6	16	10	19
		Cattle		0	8	54	109	87	113	75
		Swine		0	1	5	2	7	0	3
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	22.2% 53	22.1% 49
		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
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					22.3% 27	25.8% 32	22.2% 53	21.6% 48
		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	37.5% 3	0.0% 0	71.4% 5
		Turkeys					0.0% 0	12.5% 2	0.0% 0	10.5% 2
		Cattle					73.4% 80	66.7% 58	77.9% 88	74.7% 56
		Swine					0.0% 0	85.7% 6		100.0% 3
Folate Pathway Inhibitors	Sulfamethoxazole (MIC ≥ 512 µg/ml)	Humans	11.8% 6	4.3% 2	3.9% 3	22.2% 22	23.1% 28	32.3% 40	25.1% 60	24.3% 54
		Chicken Breasts								
		Ground Turkey							33.3% 1	50.0% 1
		Ground Beef							66.7% 2	100.0% 1
		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
		Turkeys			0.0% 0	0.0% 0	16.7% 1	12.5% 2	0.0% 0	52.6% 10
		Cattle			12.5% 1	35.2% 19	73.4% 80	72.4% 63	74.3% 84	73.3% 55
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3
	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	4.2% 10	0.9% 2
		Chicken Breasts								
		Ground Turkey							33.3% 1	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		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
		Turkeys			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
		Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1

Table 23d. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	51	46	77	99	121	124	239	222
		Chicken Breasts							0	0
		Ground Turkey							3	2
		Ground Beef							3	1
		Pork Chops							2	1
		Chickens		0	1	7	5	8	6	7
		Turkeys		0	1	4	6	16	10	19
		Cattle		0	8	54	109	87	113	75
		Swine		0	1	5	2	7	0	3
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	5.9% 3	4.3% 2	2.6% 2	18.2% 18	23.1% 28	28.2% 35	24.7% 59	21.6% 48
		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	21.1% 4
		Cattle			12.5% 1	37.0% 20	78.9% 86	73.6% 64	77.9% 88	78.7% 59
		Swine			0.0% 0	0.0% 0	50.0% 1	85.7% 6		100.0% 3
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
		Chicken Breasts								
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		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
	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	0.5% 1
		Chicken Breasts								
		Ground Turkey							0.0% 0	0.0% 0
		Ground Beef							0.0% 0	0.0% 0
		Pork Chops							0.0% 0	0.0% 0
		Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		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	1.3% 1
		Swine			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	25.1% 60	23.9% 53
		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			100.0% 1	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	40.0% 4	36.8% 7
		Cattle			12.5% 1	38.9% 21	80.7% 88	73.6% 64	80.5% 91	84.0% 63
		Swine			100.0% 1	20.0% 1	50.0% 1	85.7% 6		100.0% 3

Ceftiofur Resistance

Figure 12. Percent of *Salmonella* Newport Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

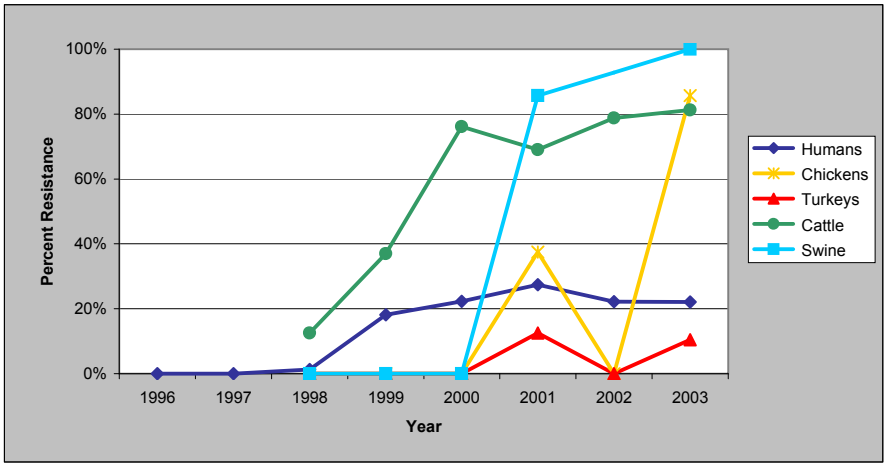


Table 24. Number of *Salmonella* Newport Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	0	0	1	18	27	34	53	49
Chickens			0	0	0	3	0	6
Turkeys			0	0	0	2	0	2
Cattle			1	20	83	60	89	61
Swine			0	0	0	6		3

Nalidixic Acid Resistance

Figure 13. Percent of *Salmonella* Newport Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

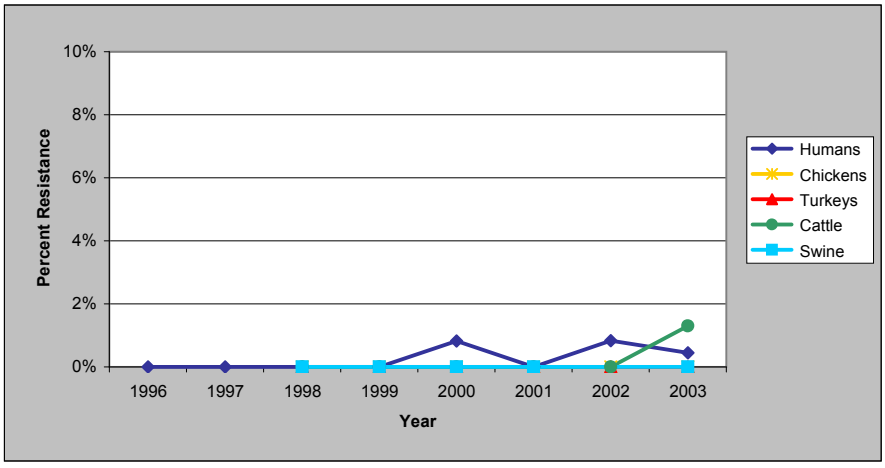


Table 25. Number of *Salmonella* Newport Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	0	0	0	0	1	0	2	1
Chickens			0	0	0	0	0	0
Turkeys			0	0	0	0	0	0
Cattle			0	0	0	0	0	1
Swine			0	0	0	0		0

Table 26a. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	51	46	77	99	121	124	239	222
	Chicken Breasts							0	0
	Ground Turkey							3	2
	Ground Beef							3	1
	Pork Chops							2	1
	Chickens		0	1	7	5	8	6	7
	Turkeys		0	1	4	6	16	10	19
	Cattle		0	8	54	109	87	113	75
	Swine		0	1	5	2	7	0	3
Resistance Pattern	**Isolate Source**								
1. No Resistance Detected	Humans	86.3% 44	93.5% 43	94.8% 73	75.8% 75	75.2% 91	64.5% 80	72.8% 174	73.9% 164
	Chicken Breasts								
	Ground Turkey							66.7% 2	50.0% 1
	Ground Beef							33.3% 1	0.0% 0
	Pork Chops							0.0% 0	0.0% 0
	Chickens			0.0% 0	100.0% 7	80.0% 4	62.5% 5	83.3% 5	14.3% 1
	Turkeys			100.0% 1	100.0% 4	83.3% 5	87.5% 14	60.0% 6	21.1% 4
	Cattle			87.5% 7	61.1% 33	19.3% 21	25.3% 22	19.5% 22	14.7% 11
	Swine			0.0% 0	80.0% 4	50.0% 1	14.3% 1		0.0% 0
2. At Least ACSSuT[1] Resistant	Humans	5.9% 3	4.3% 2	1.3% 1	18.2% 18	23.1% 28	25.8% 32	23.0% 55	21.2% 47
	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	71.4% 5
	Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	5.3% 1
	Cattle			12.5% 1	35.2% 19	70.6% 77	67.8% 59	70.8% 80	66.7% 50
	Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3
3. At Least ACT/S[2] Resistant	Humans	3.9% 2	4.3% 2	1.3% 1	2.0% 2	4.1% 5	0.8% 1	3.8% 9	0.9% 2
	Chicken Breasts								
	Ground Turkey							33.3% 1	0.0% 0
	Ground Beef							0.0% 0	0.0% 0
	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
	Turkeys			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	13.8% 15	11.5% 10	7.1% 8	0.0% 0
	Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1

[1] ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole, and tetracycline

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

Table 26b. Resistance Patterns among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	51	46	77	99	121	124	239	222
	Chicken Breasts							0	0
	Ground Turkey							3	2
	Ground Beef							3	1
	Pork Chops							2	1
	Chickens		0	1	7	5	8	6	7
	Turkeys		0	1	4	6	16	10	19
	Cattle		0	8	54	109	87	113	75
	Swine		0	1	5	2	7	0	3
Resistance Pattern	**Isolate Source**								
4. At Least ACSSuTAuCf [1] Resistant	Humans	0.0% 0	0.0% 0	1.3% 1	18.2% 18	22.3% 27	25.0% 31	22.2% 53	20.7% 46
	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	71.4% 5
	Turkeys			0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	5.3% 1
	Cattle			12.5% 1	35.2% 19	69.7% 76	66.7% 58	70.8% 80	66.7% 50
	Swine			0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3
5. At Least Ceftiofur and Nalidixic Acid Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.4% 1	0.5% 1
	Chicken Breasts								
	Ground Turkey							0.0% 0	0.0% 0
	Ground Beef							0.0% 0	0.0% 0
	Pork Chops							0.0% 0	0.0% 0
	Chickens			0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	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	1.3% 1
	Swine			0.0% 0	0.0% 0	0.0% 0	0.0% 0		0.0% 0

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

8. Antimicrobial Susceptibility among *Salmonella* Heidelberg

Table 27a. Distribution of MICs and Occurrence of Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Aminoglycosides																					
Amikacin	Humans (96)	0.0	**0.0**	[0.0 - 3.8]						11.5	58.3	27.1	3.1								
	Chicken Breasts (16)	0.0	**0.0**	[0.0 - 20.6]						6.3	50.0	37.5	6.3								
	Ground Turkey (32)	0.0	**0.0**	[0.0 - 10.9]							53.1	46.9									
	Chickens (226)	0.0	**0.0**	[0.0 - 1.6]						26.1	47.8	26.1									
	Turkeys (57)	0.0	**0.0**	[0.0 - 6.3]						42.1	33.3	22.8	1.8								
	Cattle (9)	0.0	**0.0**	[0.0 - 33.6]							22.2	77.8									
	Swine (11)	0.0	**0.0**	[0.0 - 28.5]						9.1	45.5	45.5									
Gentamicin	Humans (96)	0.0	**5.2**	[1.7 - 11.7]					53.1	27.1	14.6				3.1	**2.1**					
	Chicken Breasts (16)	0.0	**18.8**	[4.0 - 45.6]					18.8	62.5					**6.3**	**12.5**					
	Ground Turkey (32)	3.1	**12.5**	[3.5 - 29.0]					46.9	37.5				3.1	**6.3**	**6.3**					
	Chickens (226)	1.3	**7.5**	[4.4 - 11.8]					81.9	7.5	1.8			1.3	**3.5**	**4.0**					
	Turkeys (57)	5.3	**12.3**	[5.1 - 23.7]					73.7	5.3		1.8	1.8	5.3	**8.8**	**3.5**					
	Cattle (9)	11.1	**0.0**	[0.0 - 33.6]					55.6	33.3				11.1							
	Swine (11)	0.0	**0.0**	[0.0 - 28.5]					72.7	27.3											
Kanamycin	Humans (96)	0.0	**8.3**	[3.7 - 15.8]										91.7				**8.3**			
	Chicken Breasts (16)	0.0	**0.0**	[0.0 - 20.6]										100.0							
	Ground Turkey (32)	0.0	**34.4**	[18.6 - 53.2]										65.6			**6.3**	**28.1**			
	Chickens (226)	0.0	**5.3**	[2.8 - 9.1]										94.7			**0.9**	**4.4**			
	Turkeys (57)	0.0	**21.1**	[11.4 - 33.9]										77.2	1.8			**21.1**			
	Cattle (9)	0.0	**55.6**	[21.2 - 86.3]										44.4				**55.6**			
	Swine (11)	0.0	**100.0**	[71.5 - 100.0]														**100.0**			
Streptomycin	Humans (96)	N/A	**12.5**	[6.6 - 20.8]												87.5	**8.3**	**4.2**			
	Chicken Breasts (16)	N/A	**12.5**	[1.6 - 38.3]												87.5	**6.3**	**6.3**			
	Ground Turkey (32)	N/A	**37.5**	[21.1 - 56.3]												62.5	**6.3**	**31.3**			
	Chickens (226)	N/A	**17.7**	[13.0 - 23.3]												82.3	**10.6**	**7.1**			
	Turkeys (57)	N/A	**28.1**	[17.0 - 41.5]												71.9	**21.1**	**7.0**			
	Cattle (9)	N/A	**55.6**	[21.2 - 86.3]												44.4		**55.6**			
	Swine (11)	N/A	**100.0**	[71.5 - 100.0]													**72.7**	**27.3**			

[1] There were no *Salmonella* Heidelberg isolates from ground beef and pork chops

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 27b. Distribution of MICs and Occurrence of Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Aminopenicillins																					
Ampicillin	Humans (96)	0.0	**10.4**	[5.1 - 18.3]							45.8	39.6	4.2				**10.4**				
	Chicken Breasts (16)	0.0	**18.8**	[4.0 - 45.6]							56.3	25.0					**18.8**				
	Ground Turkey (32)	0.0	**9.4**	[2.0 - 25.0]							53.1	31.3	3.1	3.1			**9.4**				
	Chickens (226)	0.0	**19.0**	[14.1 - 24.8]							60.2	20.4	0.4				**19.0**				
	Turkeys (57)	0.0	**3.5**	[0.4 - 12.1]							73.7	19.3	3.5				**3.5**				
	Cattle (9)	0.0	**55.6**	[21.2 - 86.3]							44.4						**55.6**				
	Swine (11)	0.0	**9.1**	[0.2 - 41.3]							72.7	18.2					**9.1**				
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Humans (96)	1.0	**5.2**	[1.7 - 11.7]							87.5	2.1	1.0	3.1	1.0	**2.1**	**3.1**				
	Chicken Breasts (16)	6.3	**6.3**	[0.2 - 30.2]							81.3			6.3	6.3		**6.3**				
	Ground Turkey (32)	3.1	**9.4**	[2.0 - 25.0]							75.0	12.5			3.1	**9.4**					
	Chickens (226)	7.5	**9.3**	[5.8 - 13.9]							79.2	1.8		2.2	7.5	**1.3**	**8.0**				
	Turkeys (57)	1.8	**0.0**	[0.0 - 6.3]							93.0	3.5		1.8	1.8						
	Cattle (9)	0.0	**55.6**	[21.2 - 86.3]							44.4					**22.2**	**33.3**				
	Swine (11)	0.0	**9.1**	[0.2 - 41.3]							90.9						**9.1**				
Cephalosporins																					
Ceftiofur	Humans (96)	0.0	**5.2**	[1.7 - 11.7]				1.0		74.0	19.8				**5.2**						
	Chicken Breasts (16)	0.0	**6.3**	[0.2 - 30.2]						50.0	43.8				**6.3**						
	Ground Turkey (32)	0.0	**0.0**	[0.0 - 10.9]						71.9	28.1										
	Chickens (226)	0.0	**9.3**	[5.8 - 13.9]						85.0	5.3	0.4			**9.3**						
	Turkeys (57)	0.0	**0.0**	[0.0 - 6.3]						91.2	8.8										
	Cattle (9)	0.0	**55.6**	[21.2 - 86.3]						44.4					**55.6**						
	Swine (11)	0.0	**9.1**	[0.2 - 41.3]						81.8	9.1				**9.1**						
Ceftriaxone	Humans (96)	3.1	**0.0**	[0.0 - 3.8]					94.8					2.1	2.1	1.0					
	Chicken Breasts (16)	6.3	**0.0**	[0.0 - 20.6]					93.8						6.3						
	Ground Turkey (32)	0.0	**0.0**	[0.0 - 10.9]					100.0												
	Chickens (226)	5.8	**0.0**	[0.0 - 1.6]					90.7					3.5	5.3	0.4					
	Turkeys (57)	0.0	**0.0**	[0.0 - 6.3]					100.0												
	Cattle (9)	33.3	**0.0**	[0.0 - 33.6]					44.4					22.2	11.1	22.2					
	Swine (11)	0.0	**0.0**	[0.0 - 28.5]					90.9					9.1							

[1] There were no *Salmonella* Heidelberg isolates from ground beef and pork chops

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 27c. Distribution of MICs and Occurrence of Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Cephalothin	Humans (96)	1.0	**7.3**	[3.0 - 14.4]								80.2	9.4	2.1	1.0	**2.1**	**5.2**				
	Chicken Breasts (16)	0.0	**12.5**	[1.6 - 38.3]								25.0	56.3	6.3			**12.5**				
	Ground Turkey (32)	0.0	**12.5**	[3.5 - 29.0]								9.4	68.8	9.4		**3.1**	**9.4**				
	Chickens (226)	4.4	**12.8**	[8.8 - 17.9]								69.5	11.1	2.2	4.4	**3.5**	**9.3**				
	Turkeys (57)	0.0	**1.8**	[0.0 - 9.4]								84.2	14.0			**1.8**					
	Cattle (9)	0.0	**55.6**	[21.2 - 86.3]								44.4					**55.6**				
	Swine (11)	0.0	**9.1**	[0.2 - 41.3]								72.7	18.2				**9.1**				
Cephamycins																					
Cefoxitin	Humans (96)	0.0	**5.2**	[1.7 - 11.7]							40.6	49.0	5.2			**5.2**					
	Chicken Breasts (16)	0.0	**6.3**	[0.2 - 30.2]								87.5	6.3			**6.3**					
	Ground Turkey (32)	0.0	**0.0**	[0.0 - 10.9]							3.1	78.1	12.5	6.3							
	Chickens (226)	2.2	**7.1**	[4.1 - 11.2]							31.4	54.0	4.9	0.4	2.2	**7.1**					
	Turkeys (57)	0.0	**0.0**	[0.0 - 6.3]							24.6	71.9	1.8	1.8							
	Cattle (9)	11.1	**44.4**	[13.7 - 78.8]							11.1	33.3			11.1	**44.4**					
	Swine (11)	0.0	**9.1**	[0.2 - 41.3]							18.2	72.7				**9.1**					
Folate Pathway Inhibitors																					
Sulfamethoxazole	Humans (96)	N/A	**7.3**	[3.0 - 14.4]											90.6	2.1					**7.3**
	Chicken Breasts (16)	N/A	**12.5**	[1.6 - 38.3]											62.5	25.0					**12.5**
	Ground Turkey (32)	N/A	**15.6**	[5.3 - 32.8]											31.3	40.6	12.5				**15.6**
	Chickens (226)	N/A	**11.1**	[7.3 - 15.9]											84.5	1.8			2.7	**7.5**	**3.5**
	Turkeys (57)	N/A	**19.3**	[10.0 - 31.9]											73.7	3.5	1.8		1.8	**14.0**	**5.3**
	Cattle (9)	N/A	**44.4**	[13.7 - 78.8]											44.4				11.1	**44.4**	
	Swine (11)	N/A	**0.0**	[0.0 - 28.5]											100.0						
Trimethoprim-Sulfamethoxazole	Humans (96)	N/A	**2.1**	[0.3 - 7.3]				89.6	8.3					**2.1**							
	Chicken Breasts (16)	N/A	**0.0**	[0.0 - 20.6]				100.0													
	Ground Turkey (32)	N/A	**0.0**	[0.0 - 10.9]				100.0													
	Chickens (226)	N/A	**0.9**	[0.1 - 3.2]				90.7	8.0	0.4			**0.9**								
	Turkeys (57)	N/A	**3.5**	[0.4 - 12.1]				84.2	12.3					**3.5**							
	Cattle (9)	N/A	**55.6**	[21.2 - 86.3]				44.4						**55.6**							
	Swine (11)	N/A	**0.0**	[0.0 - 28.5]				90.9	9.1												

[1] There were no *Salmonella* Heidelberg isolates from ground beef and pork chops

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 27d. Distribution of MICs and Occurrence of Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, 2003

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	512	1024
Phenicols																					
Chloramphenicol	Humans (96)	1.0	**0.0**	[0.0 - 3.8]									55.2	43.8	1.0						
	Chicken Breasts (16)	0.0	**0.0**	[0.0 - 20.6]									6.3	93.8							
	Ground Turkey (32)	0.0	**0.0**	[0.0 - 10.9]									3.1	96.9							
	Chickens (226)	0.4	**3.1**	[1.3 - 6.3]									48.2	48.2	0.4		**3.1**				
	Turkeys (57)	0.0	**0.0**	[0.0 - 6.3]								1.8	45.6	52.6							
	Cattle (9)	0.0	**44.4**	[13.7 - 78.8]									33.3	22.2			**44.4**				
	Swine (11)	0.0	**0.0**	[0.0 - 28.5]									27.3	72.7							
Quinolones																					
Ciprofloxacin	Humans (96)	0.0	**0.0**	[0.0 - 3.8]	96.9	2.1		1.0													
	Chicken Breasts (16)	0.0	**0.0**	[0.0 - 20.6]	75.0	25.0															
	Ground Turkey (32)	0.0	**0.0**	[0.0 - 10.9]	100.0																
	Chickens (226)	0.0	**0.0**	[0.0 - 1.6]	99.1	0.9															
	Turkeys (57)	0.0	**0.0**	[0.0 - 6.3]	100.0																
	Cattle (9)	0.0	**0.0**	[0.0 - 33.6]	66.7	33.3															
	Swine (11)	0.0	**0.0**	[0.0 - 28.5]	100.0																
Nalidixic Acid	Humans (96)	N/A	**1.0**	[0.0 - 5.7]								3.1	84.4	11.5			**1.0**				
	Chicken Breasts (16)	N/A	**0.0**	[0.0 - 20.6]							6.3		81.3	12.5							
	Ground Turkey (32)	N/A	**0.0**	[0.0 - 10.9]									78.1	21.9							
	Chickens (226)	N/A	**0.0**	[0.0 - 1.6]								0.4	83.6	14.6	1.3						
	Turkeys (57)	N/A	**0.0**	[0.0 - 6.3]							1.8		86.0	12.3							
	Cattle (9)	N/A	**0.0**	[0.0 - 33.6]									77.8	22.2							
	Swine (11)	N/A	**0.0**	[0.0 - 28.5]									63.6	36.4							
Tetracyclines																					
Tetracycline	Humans (96)	0.0	**16.7**	[9.8 - 25.6]									83.3				**16.7**				
	Chicken Breasts (16)	0.0	**0.0**	[0.0 - 20.6]									100.0								
	Ground Turkey (32)	3.1	**43.8**	[26.4 - 62.3]									53.1	3.1			**43.8**				
	Chickens (226)	0.9	**16.4**	[11.8 - 21.9]									82.7	0.9	**0.4**	**1.3**	**14.6**				
	Turkeys (57)	0.0	**84.2**	[72.1 - 92.5]									15.8				**84.2**				
	Cattle (9)	0.0	**55.6**	[21.2 - 86.3]									44.4				**55.6**				
	Swine (11)	0.0	**100.0**	[71.5 - 100]													**100.0**				

[1] There were no *Salmonella* Heidelberg isolates from ground beef and pork chops

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

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

[5] The unshaded areas indicate the dilution range of the Sensititre plates used to test 2003 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. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin

Table 28a. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	74	75	101	89	79	102	105	96
		Chicken Breasts							11	16
		Ground Turkey							21	32
		Ground Beef							0	0
		Pork Chops							3	0
		Chickens		51	143	297	259	329	403	226
		Turkeys		14	39	139	125	142	60	57
		Cattle		1	11	28	6	10	8	9
		Swine		7	37	33	22	16	11	11
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
		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	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
		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	0.0% 0	0.0% 0
	Gentamicin (MIC ≥ 16)	Humans	23.0% 17	17.3% 13	16.8% 17	14.6% 13	8.9% 7	7.8% 8	3.8% 4	5.2% 5
		Chicken Breasts							45.5% 5	18.8% 3
		Ground Turkey							28.6% 6	12.5% 4
		Ground Beef								
		Pork Chops							100.0% 3	
		Chickens		41.2% 21	26.6% 38	18.5% 55	32.0% 83	12.5% 41	8.9% 36	7.5% 17
		Turkeys		0.0% 0	17.9% 7	16.5% 23	12.0% 15	13.4% 19	18.3% 11	12.3% 7
		Cattle		0.0% 0	27.3% 3	39.3% 11	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Swine		0.0% 0	0.0% 0	0.0% 0	9.1% 2	0.0% 0	9.1% 1	0.0% 0
	Kanamycin (MIC ≥ 64)	Humans	14.9% 11	8.0% 6	12.9% 13	9.0% 8	15.2% 12	19.6% 20	10.5% 11	8.3% 8
		Chicken Breasts							36.4% 4	0.0% 0
		Ground Turkey							42.9% 9	34.4% 11
		Ground Beef								
		Pork Chops							0.0% 0	
		Chickens		0.0% 0	0.7% 1	1.3% 4	12.0% 31	4.3% 14	3.7% 15	5.3% 12
		Turkeys		7.1% 1	5.1% 2	17.3% 24	43.2% 54	31.0% 44	30.0% 18	21.1% 12
		Cattle		0.0% 0	63.6% 7	42.9% 12	16.7% 1	10.0% 1	37.5% 3	55.6% 5
		Swine		85.7% 6	64.9% 24	60.6% 20	77.3% 17	75.0% 12	54.5% 6	100.0% 11
	Streptomycin (MIC ≥ 64)	Humans	40.5% 30	24.0% 18	30.7% 31	24.7% 22	22.8% 18	25.5% 26	17.1% 18	12.5% 12
		Chicken Breasts							63.6% 7	12.5% 2
		Ground Turkey							61.9% 13	37.5% 12
		Ground Beef								
		Pork Chops							100.0% 3	
		Chickens		35.3% 18	32.9% 47	23.9% 71	36.7% 95	20.4% 67	18.6% 75	17.7% 40
		Turkeys		14.3% 2	30.8% 12	30.2% 42	52.8% 66	40.1% 57	35.0% 21	28.1% 16
		Cattle		0.0% 0	72.7% 8	57.1% 16	16.7% 1	20.0% 2	37.5% 3	55.6% 5
		Swine		57.1% 4	81.1% 30	63.6% 21	86.4% 19	75.0% 12	45.5% 5	100.0% 11

Table 28b. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	74	75	101	89	79	102	105	96
		Chicken Breasts							11	16
		Ground Turkey							21	32
		Ground Beef							0	0
		Pork Chops							3	0
		Chickens		51	143	297	259	329	403	226
		Turkeys		14	39	139	125	142	60	57
		Cattle		1	11	28	6	10	8	9
		Swine		7	37	33	22	16	11	11
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Aminopenicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	14.9% 11	13.3% 10	16.8% 17	7.9% 7	10.1% 8	9.8% 10	12.4% 13	10.4% 10
		Chicken Breasts							18.2% 2	18.8% 3
		Ground Turkey							19.0% 4	9.4% 3
		Ground Beef								
		Pork Chops							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
		Turkeys		7.1% 1	12.8% 5	8.6% 12	4.0% 5	9.2% 13	13.3% 8	3.5% 2
		Cattle		0.0% 0	27.3% 3	50.0% 14	0.0% 0	0.0% 0	50.0% 4	55.6% 5
		Swine		0.0% 0	5.4% 2	0.0% 0	9.1% 2	0.0% 0	18.2% 2	9.1% 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
		Chicken Breasts							0.0% 0	6.3% 1
		Ground Turkey							19.0% 4	9.4% 3
		Ground Beef								
		Pork Chops							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
		Turkeys		0.0% 0	2.6% 1	0.7% 1	2.4% 3	5.6% 8	5.0% 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
		Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1
Cephalosporins	Ceftiofur (MIC ≥ 8 µg/ml)	Humans	1.4% 1	0.0% 0	0.0% 0	0.0% 0	3.8% 3	2.9% 3	7.6% 8	5.2% 5
		Chicken Breasts							0.0% 0	6.3% 1
		Ground Turkey							19.0% 4	0.0% 0
		Ground Beef								
		Pork Chops							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
		Turkeys		0.0% 0	2.6% 1	0.7% 1	3.2% 4	5.6% 8	5.0% 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
		Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1
	Ceftriaxone (MIC ≥ 64 µg/ml)	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		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	≤0.7%[1] ≤1	0.0% 0	0.4% 1	0.0% 0	0.2% 1	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
		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	0.0% 0	0.0% 0

[1] In 1998, there was 1 isolate from chickens that grew in all ceftriaxone dilutions on the Sensititre plate (MIC >16 µg/mL). Further testing was not conducted

Table 28c. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	74	75	101	89	79	102	105	96
		Chicken Breasts							11	16
		Ground Turkey							21	32
		Ground Beef							0	0
		Pork Chops							3	0
		Chickens		51	143	297	259	329	403	226
		Turkeys		14	39	139	125	142	60	57
		Cattle		1	11	28	6	10	8	9
		Swine		7	37	33	22	16	11	11
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
Cephamycins	Cefoxitin (MIC ≥ 32 µg/ml)	Humans					2.5% 2	2.9% 3	8.6% 9	5.2% 5
		Chicken Breasts							0.0% 0	6.3% 1
		Ground Turkey							19.0% 4	0.0% 0
		Ground Beef								
		Pork Chops							0.0% 0	
		Chickens					13.5% 35	5.2% 17	7.4% 30	7.1% 16
		Turkeys					2.4% 3	4.9% 7	1.7% 1	0.0% 0
		Cattle					0.0% 0	0.0% 0	37.5% 3	44.4% 4
		Swine					4.5% 1	0.0% 0	9.1% 1	9.1% 1
Folate Pathway Inhibitors	Sulfamethoxazole (MIC ≥ 512 µg/ml)	Humans	17.6% 13	21.3% 16	21.8% 22	19.1% 17	11.4% 9	8.8% 9	6.7% 7	7.3% 7
		Chicken Breasts							45.5% 5	12.5% 2
		Ground Turkey							33.3% 7	15.6% 5
		Ground Beef								
		Pork Chops							100.0% 3	
		Chickens		45.1% 23	33.6% 48	26.6% 79	33.2% 86	16.4% 54	9.7% 39	11.1% 25
		Turkeys		50.0% 7	35.9% 14	33.8% 47	15.2% 19	27.5% 39	30.0% 18	19.3% 11
		Cattle		0.0% 0	36.4% 4	57.1% 16	0.0% 0	10.0% 1	12.5% 1	44.4% 4
		Swine		0.0% 0	21.6% 8	21.2% 7	13.6% 3	0.0% 0	0.0% 0	0.0% 0
	Trimethoprim-Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Humans	0.0% 0	0.0% 0	2.0% 2	1.1% 1	1.3% 1	2.0% 2	1.0% 1	2.1% 2
		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	0.7% 1	0.7% 2	0.4% 1	0.3% 1	0.7% 3	0.9% 2
		Turkeys		7.1% 1	5.1% 2	4.3% 6	0.8% 1	3.5% 5	3.3% 2	3.5% 2
		Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	10.0% 1	0.0% 0	55.6% 5
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	9.1% 1	0.0% 0

Table 28d. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year			1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	74	75	101	89	79	102	105	96
		Chicken Breasts							11	16
		Ground Turkey							21	32
		Ground Beef							0	0
		Pork Chops							3	0
		Chickens		51	143	297	259	329	403	226
		Turkeys		14	39	139	125	142	60	57
		Cattle		1	11	28	6	10	8	9
		Swine		7	37	33	22	16	11	11
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**								
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	1.4% 1	0.0% 0	1.0% 1	2.2% 2	1.3% 1	1.0% 1	1.0% 1	0.0% 0
		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	0.7% 1	1.3% 4	11.6% 30	3.3% 11	1.7% 7	3.1% 7
		Turkeys		0.0% 0	2.6% 1	0.7% 1	1.6% 2	2.8% 4	1.7% 1	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
		Swine		0.0% 0	0.0% 0	3.0% 1	4.5% 1	0.0% 0	9.1% 1	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
		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	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
		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	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
		Chicken Breasts							0.0% 0	0.0% 0
		Ground Turkey							4.8% 1	0.0% 0
		Ground Beef								
		Pork Chops							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
		Turkeys		0.0% 0	0.0% 0	0.7% 1	0.8% 1	0.0% 0	1.7% 1	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	0.0% 0	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	20.3% 15	12.0% 9	19.8% 20	19.1% 17	21.5% 17	24.5% 25	19.0% 20	16.7% 16
		Chicken Breasts							45.5% 5	0.0% 0
		Ground Turkey							57.1% 12	43.8% 14
		Ground Beef								
		Pork Chops							66.7% 2	
		Chickens		2.0% 1	7.7% 11	7.7% 23	20.1% 52	14.9% 49	11.7% 47	16.4% 37
		Turkeys		14.3% 2	23.1% 9	38.1% 53	64.0% 80	54.2% 77	70.0% 42	84.2% 48
		Cattle		0.0% 0	63.6% 7	60.7% 17	33.3% 2	40.0% 4	62.5% 5	55.6% 5
		Swine		85.7% 6	73.0% 27	72.7% 24	81.8% 18	93.8% 15	72.7% 8	100.0% 11

Ceftiofur Resistance

Figure 14. Percent of *Salmonella* Heidelberg Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

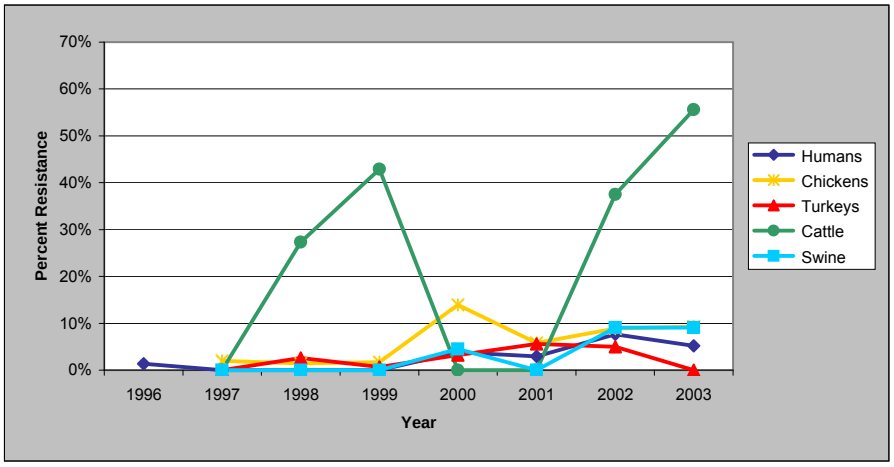


Table 29. Number of *Salmonella* Heidelberg Isolates from Humans and Food Animals Resistant to Ceftiofur, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	1	0	0	0	3	3	8	5
Chickens		1	2	5	36	19	36	21
Turkeys		0	1	1	4	8	3	0
Cattle		0	3	12	0	0	3	5
Swine		0	0	0	1	0	1	1

Nalidixic Acid Resistance

Figure 15. Percent of *Salmonella* Heidelberg Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

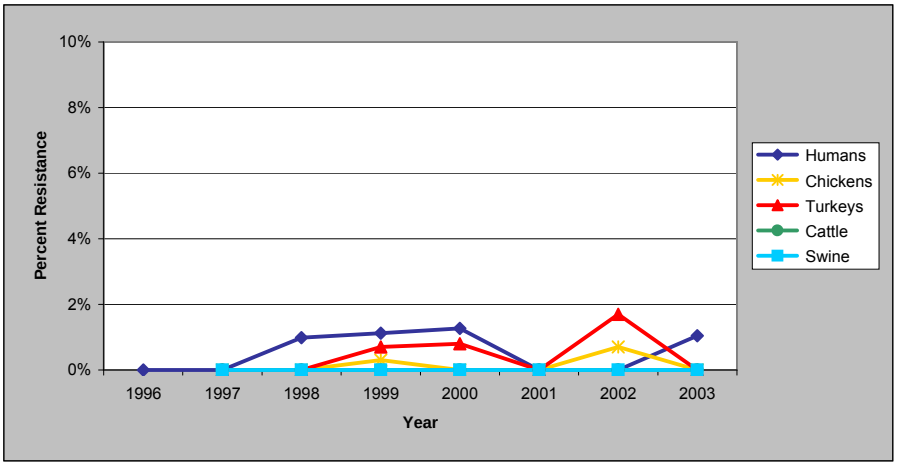


Table 30. Number of *Salmonella* Heidelberg Isolates from Humans and Food Animals Resistant to Nalidixic Acid, by Year, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
Humans	0	0	1	1	1	0	0	1
Chickens		0	0	1	0	0	3	0
Turkeys		0	0	1	1	0	1	0
Cattle		0	0	0	0	0	0	0
Swine		0	0	0	0	0	0	0

Table 31a. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	74	75	101	89	79	102	105	96
	Chicken Breasts							11	16
	Ground Turkey							21	32
	Ground Beef							0	0
	Pork Chops							3	0
	Chickens		51	143	297	259	329	403	226
	Turkeys		14	39	139	125	142	60	57
	Cattle		1	11	28	6	10	8	9
	Swine		7	37	33	22	16	11	11
Resistance Pattern	**Isolate Source**								
1. No Resistance Detected	Humans	54.1% 40	66.7% 50	56.4% 57	67.4% 60	63.3% 50	64.7% 66	67.6% 71	68.8% 66
	Chicken Breasts							27.3% 3	62.5% 10
	Ground Turkey							33.3% 7	50.0% 16
	Ground Beef								
	Pork Chops							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
	Turkeys		50.0% 7	46.2% 18	43.2% 60	28.8% 36	31.0% 44	15.0% 9	8.8% 5
	Cattle		100.0% 1	27.3% 3	25.0% 7	66.7% 4	60.0% 6	12.5% 1	44.4% 4
	Swine		14.3% 1	18.9% 7	27.3% 9	13.6% 3	6.3% 1	27.3% 3	0.0% 0
2. At Least ACSSuT[1] Resistant	Humans	1.4% 1	0.0% 0	0.0% 0	1.1% 1	1.3% 1	1.0% 1	1.0% 1	0.0% 0
	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	0.7% 1	1.3% 4	11.2% 29	3.0% 10	1.5% 6	2.2% 5
	Turkeys		0.0% 0	2.6% 1	0.7% 1	1.6% 2	2.8% 4	1.7% 1	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
	Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	0.0% 0	0.0% 0	0.0% 0
3. At Least ACT/S[2] Resistant	Humans	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	1.0% 1	0.0% 0
	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	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
	Cattle		0.0% 0	27.3% 3	42.9% 12	0.0% 0	0.0% 0	0.0% 0	44.4% 4
	Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	9.1% 1	0.0% 0

[1] ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole, and tetracycline

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

Table 31b. Resistance Patterns among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1996-2003

Year		1996	1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested	Humans	74	75	101	89	79	102	105	96
	Chicken Breasts							11	16
	Ground Turkey							21	32
	Ground Beef							0	0
	Pork Chops							3	0
	Chickens		51	143	297	259	329	403	226
	Turkeys		14	39	139	125	142	60	57
	Cattle		1	11	28	6	10	8	9
	Swine		7	37	33	22	16	11	11
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
	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	0.7% 1	0.7% 2	11.2% 29	2.7% 9	1.5% 6	2.2% 5
	Turkeys		0.0% 0	2.6% 1	0.7% 1	0.8% 1	2.8% 4	1.7% 1	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
	Swine		0.0% 0	0.0% 0	0.0% 0	4.5% 1	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
	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	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.7% 3	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
	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	0.0% 0	0.0% 0

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

C. *Campylobacter* Data

1. *Campylobacter* Isolates Tested

Table 32. Total Number of *Campylobacter jejuni* Isolates Tested, by Source and Year, 1997-2003

Source	Year						
	1997	1998	1999	2000	2001	2002	2003
Humans	209	297	293	306	365	329	303
Chicken Breasts						198	325
Ground Turkey						2	4
Ground Beef						0	1
Pork Chops						2	0
Chickens					64[1]	526	374

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

Table 33. Total Number of *Campylobacter coli* Isolates Tested, by Source and Year, 1997-2003

Source	Year						
	1997	1998	1999	2000	2001	2002	2003
Humans	6	8	20	12	17	25	22
Chicken Breasts						90	142
Ground Turkey						2	1
Ground Beef						0	0
Pork Chops						3	4
Chickens					52[1]	288	247

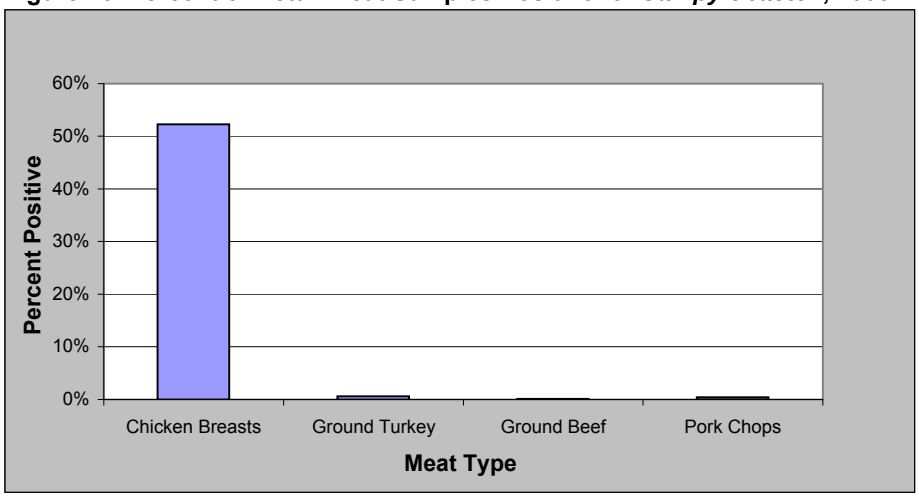
[1] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

2. Isolation of *Campylobacter* from Retail Meats

Table 34. Number and Percent of Retail Meat Samples Positive for *Campylobacter*, 2003

	Chicken Breast	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	897	857	880	899
Number Positive for *Campylobacter*	469	5	1	4
Percent Positive for *Campylobacter*	52.3%	0.6%	0.1%	0.4%

Figure 16. Percent of Retail Meat Samples Positive for *Campylobacter*, 2003

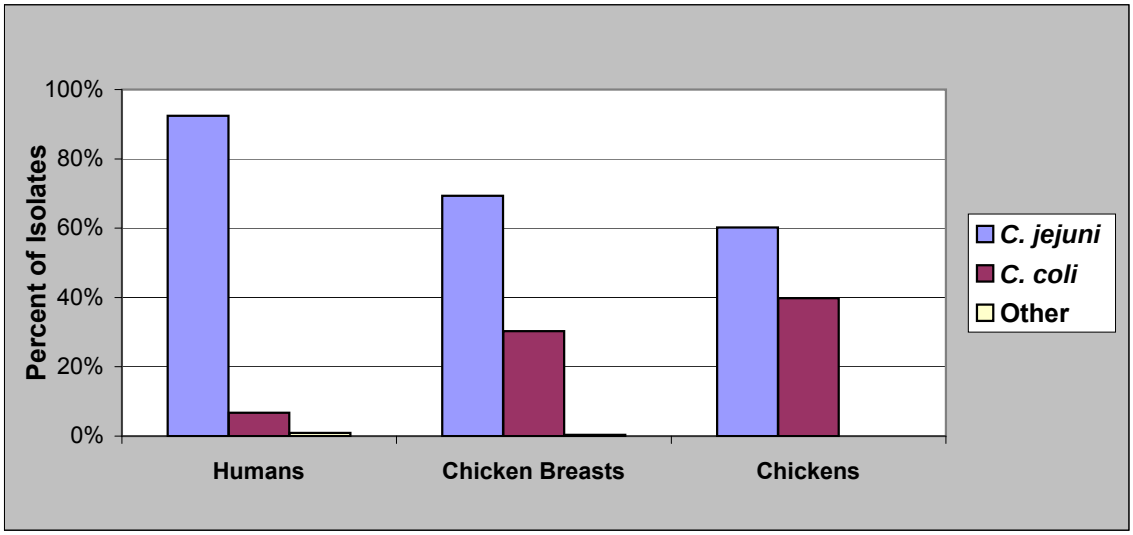


3. *Campylobacter* Species

Table 35. *Campylobacter* Species Isolated from Humans, Retail Meats, and Chickens, 2003

	Humans	Retail Meats				Food Animals
Campylobacter Species	Humans (n=328)	Chicken Breast (n=469)	Ground Turkey (n=5)	Ground Beef (n=1)	Pork Chops (n=4)	Chickens (n=621)
C. jejuni	92.4% 303	69.3% 325	80.0% 4	100.0% 1	0.0% 0	60.2% 374
C. coli	6.7% 22	30.3% 142	20.0% 1	0.0% 0	100.0% 4	39.8% 247
Other	0.9% 3	0.4% 2	0.0% 0	0.0% 0	0.0% 0	0.0% 0

Figure 17. *Campylobacter* Species Isolated from Humans, Chicken Breasts, and Chickens, 2003



4. Antimicrobial Susceptibility among *Campylobacter*

Table 36. Distribution of MICs and Occurrence of Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, 2003

Antimicrobial	Isolate Source (# of Isolates) [1]	%I [2]	%R [3]	[95% CI] [4]	Distribution (%) of MICs (µg/ml) [5] 0.002	0.004	0.008	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512
Aminoglycosides																							
Gentamicin	Humans (303)	0.0	0.0	[0.0 - 1.2]						0.3	1.3	16.8	65.7	13.5	2.3								
	Chicken Breasts (325)	0.0	0.3	[0.0 - 1.7]							0.9	15.4	67.7	15.7					**0.3**				
	Ground Turkey (4)	0.0	0.0	[0.0 - 60.2]									50.0	50.0									
	Ground Beef (1)	0.0	0.0	[0.0 - 97.5]									100.0										
	Chickens (374)	0.0	0.0	[0.0 - 1.0]					1.3	2.4	19.3	48.4	23.8	4.0	0.8								
Lincosamides																							
Clindamycin	Humans (303)	4.0	0.3	[0.0 - 1.8]						5.0	23.4	49.2	18.2	3.6	0.3	**0.3**							
	Chickens (374)	2.4	1.3	[0.4 - 3.1]				1.1	2.1	12.3	34.5	35.0	11.2	1.6	0.8	**0.5**	**0.3**	**0.3**		**0.3**			
Macrolides																							
Azithromycin	Humans (303)	1.0	0.3	[0.0 - 1.8]					5.9	34.0	45.9	12.5	1.0										**0.3**
	Chickens (374)	1.3	1.3	[0.4 - 3.1]				9.1	42.8	34.5	9.9	1.1	1.3				**0.3**						**1.1**
Erythromycin	Humans (303)	32.3	0.3	[0.0 - 1.8]							2.3	16.2	49.2	25.1	5.9	1.3							**0.3**
	Chicken Breasts (325)	80.6	0.0	[0.0 - 1.1]								0.9	18.5	55.7	21.2	3.7							
	Ground Turkey (4)	75.0	0.0	[0.0 - 60.2]									25.0	50.0	25.0								
	Ground Beef (1)	100.0	0.0	[0.0 - 97.5]										100.0									
	Chickens (374)	8.3	1.6	[0.6 - 3.5]						3.5	12.6	41.2	32.9	7.5	0.8						**0.3**		**1.3**
Phenicols																							
Chloramphenicol	Humans (303)	0.7	0.0	[0.0 - 1.2]								0.3	11.2	50.8	30.0	5.9	1.0	0.7					
	Chickens (374)	0.3	0.0	[0.0 - 1.0]						0.5		1.3	10.7	60.4	23.8	2.9		0.3					
Quinolones																							
Ciprofloxacin	Humans (303)	0.3	17.2	[13.1 - 21.9]				2.0	51.5	23.8	5.0		0.3		0.3			**0.3**		**16.8**			
	Chicken Breasts (325)	0.3	14.5	[10.8 - 18.8]						2.2	58.2	21.5	3.4		0.3	**0.6**	**2.5**	**6.2**	**4.9**	**0.3**			
	Ground Turkey (4)	0.0	0.0	[0.0 - 60.2]							50.0	50.0											
	Ground Beef (1)	0.0	0.0	[0.0 - 97.5]								100.0											
	Chickens (374)	0.0	14.7	[11.3 - 18.7]			0.5	1.6	24.9	46.3	10.7	1.3				**0.3**	**0.5**	**0.5**		**13.4**			
Nalidixic acid	Humans (303)	N/A	17.8	[13.7 - 22.6]							0.3		2.0	26.1	40.9	10.2	2.6	0.7					**17.8**
	Chickens (374)	N/A	15.8	[12.2 - 19.9]										0.5	4.8	54.0	21.4	3.5	**0.3**	**0.5**			**15.0**
Tetracyclines																							
Doxycycline	Chicken Breasts (325)	17.8	22.8	[18.3 - 27.7]						23.4	20.9	4.0	1.5	0.6	2.8	6.2	17.8	**16.6**	**6.2**				
	Ground Turkey (4)	0.0	75.0	[19.4 - 99.4]							25.0							**50.0**	**25.0**				
	Ground Beef (1)	0.0	0.0	[0.0 - 97.5]						100.0													
Tetracycline	Humans (303)	2.0	38.3	[32.8 - 44.0]					16.2	26.7	10.6	4.3	1.7		0.7		2.0	**2.3**	**4.3**	**5.0**	**1.3**		**25.4**
	Chickens (374)	1.6	47.6	[42.4 - 52.8]						1.3	12.0	19.3	12.0	3.7	1.3	1.1	1.6	**2.7**	**5.1**	**4.3**	**2.9**		**32.6**

[1] There were no *C. jejuni* isolates from pork chops

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

[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. Etest was used to test human and food animal isolates while an agar dilution method was used to test the retail meat isolates. In 2003, there were no CLSI breakpoints available for susceptibility testing of *Campylobacter*

Table 37. Distribution of MICs and Occurrence of Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, 2003

Antimicrobial	Isolate Source (# of Isolates)[1]	%I[2]	%R[3]	[95% CI][4]	Distribution (%) of MICs (µg/ml)[5] 0.002	0.004	0.008	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512
Aminoglycosides																							
Gentamicin	Humans (22)	0.0	4.5	[0.1 - 22.8]									45.5	50.0									4.5
	Chicken Breasts (142)	0.0	0.0	[0.0 - 2.6]							1.4	36.6	52.8	9.2									
	Ground Turkey (1)	0.0	0.0	[0.0 - 97.5]								100.0											
	Pork Chops (4)	0.0	0.0	[0.0 - 60.2]									25.0	50.0	25.0								
	Chickens (247)	0.0	0.0	[0.0 - 1.5]						0.4	9.7	47.4	39.3	3.2									
Lincosamides																							
Clindamycin	Humans (22)	18.2	13.6	[2.9 - 34.9]							4.5	18.2	45.5	13.6	4.5	**4.5**	**4.5**						**4.5**
	Chickens (247)	9.7	10.9	[7.3 - 15.5]					2.8	6.9	33.6	27.5	8.5	2.0	7.7	**6.5**	**2.0**	**1.2**	**0.8**				**0.4**
Macrolides																							
Azithromycin	Humans (22)	4.5	9.1	[1.1 - 29.2]						4.5	40.9	40.9		4.5									**9.1**
	Chickens (247)	0.0	20.2	[15.4 - 25.8]				2.0	21.9	41.3	12.6	2.0											**20.2**
Erythromycin	Humans (22)	54.5	9.1	[1.1 - 29.2]								13.6	22.7	13.6	22.7	18.2							**9.1**
	Chicken Breasts (142)	73.9	9.2	[5.0 - 15.1]								5.6	11.3	16.9	27.5	29.6	**1.4**	**0.7**			**7.0**		
	Ground Turkey (1)	100.0	0.0	[0.0 - 97.5]										100.0									
	Pork Chops (4)	25.0	75.0	[19.4 - 99.4]											25.0						**75.0**		
	Chickens (247)	21.5	20.2	[15.4 - 25.8]							6.9	20.6	30.8	19.0	2.4								**20.2**
Phenicols																							
Chloramphenicol	Humans (22)	4.5	0.0	[0.0 - 15.4]										13.6	54.5	22.7	4.5	4.5					
	Chickens (247)	0.0	0.0	[0.0 - 1.5]									1.6	29.1	49.0	18.6	1.6						
Quinolones																							
Ciprofloxacin	Humans (22)	0.0	22.7	[7.8 - 45.4]					36.4	27.3	9.1	4.5								**22.7**			
	Chicken Breasts (142)	0.0	13.4	[8.3 - 20.1]						1.4	28.2	37.3	19.7				**0.7**	**0.7**	**11.3**	**0.7**			
	Ground Turkey (1)	0.0	100.0	[2.5 - 100.0]														**100.0**					
	Pork Chops (4)	0.0	0.0	[0.0 - 60.2]							50.0	50.0											
	Chickens (247)	0.0	20.2	[15.4 - 25.8]				0.4	12.1	40.1	25.1	2.0						**0.4**		**19.8**			
Nalidixic acid	Humans (22)	N/A	22.7	[7.8 - 45.4]										4.5	36.4	18.2	18.2						**22.7**
	Chickens (247)	N/A	24.7	[19.4 - 30.6]								0.4			0.4	8.5	42.1	23.9	**3.2**	**0.4**	**0.4**		**20.6**
Tetracyclines																							
Doxycycline	Chicken Breasts (142)	5.6	45.1	[36.7 - 53.6]						3.5	30.3	7.7	2.1	2.8	2.1	0.7	5.6	**14.8**	**23.9**	**6.3**			
	Ground Turkey (1)	100.0	0.0	[0.0 - 97.5]													100.0						
	Pork Chops (4)	25.0	50.0	[6.8 - 93.2]										25.0			25.0	**50.0**					
Tetracycline	Humans (22)	0.0	45.5	[24.4 - 67.8]					4.5	9.1	31.8	4.5	4.5					**4.5**					**40.9**
	Chickens (247)	1.6	51.0	[44.6 - 57.4]							0.4	6.1	18.6	16.6	4.9	0.8	1.6	**0.4**		**0.4**	**0.8**		**49.4**

[1] There were no *C. coli* isolates from ground beef

[2] Percent of isolates with intermediate susceptibility

[3] Percent of isolates that were resistant

[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. Etest was used to test human and food animal isolates while an agar dilution method was used to test the retail meat isolates. In 2003, there were no CLSI breakpoints available for susceptibility testing of *Campylobacter*

Table 38. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2003

Year			1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	209	297	293	306	365	329	303
		Chicken Breasts						198	325
		Ground Turkey						2	4
		Ground Beef						0	1
		Pork Chops						2	0
		Chickens					64[1]	526	374
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**							
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chicken Breasts						0.0% 0	0.3% 1
		Ground Turkey						0.0% 0	0.0% 0
		Ground Beef							0.0% 0
		Pork Chops						0.0% 0	
		Chickens					0.0% 0	0.0% 0	0.0% 0
Lincosamides	Clindamycin (MIC ≥ 4 µg/ml)	Humans	1.4% 3	1.0% 3	1.0% 3	1.0% 3	2.5% 9	1.8% 6	0.3% 1
		Chickens					0.0% 0	1.0% 5	1.3% 5
Macrolides	Azithromycin (MIC ≥ 2 µg/ml)	Humans		0.3% 1	2.7% 8	1.6% 5	1.9% 7	1.8% 6	0.3% 1
		Chickens					3.1% 2	1.1% 6	1.3% 5
	Erythromycin (MIC ≥ 8 µg/ml)	Humans	2.9% 6	1.0% 3	2.4% 7	1.6% 5	1.9% 7	1.8% 6	0.3% 1
		Chicken Breasts						0.0% 0	0.0% 0
		Ground Turkey						0.0% 0	0.0% 0
		Ground Beef							0.0% 0
		Pork Chops						0.0% 0	
		Chickens					3.1% 2	0.6% 3	1.6% 6
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
		Chickens					0.0% 0	0.0% 0	0.0% 0
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	12.4% 26	13.8% 41	17.7% 52	14.7% 45	18.4% 67	20.7% 68	17.2% 52
		Chicken Breasts						15.2% 30	14.5% 47
		Ground Turkey						50.0% 1	0.0% 0
		Ground Beef							0.0% 0
		Pork Chops						0.0% 0	
		Chickens					20.3% 13	18.6% 98	14.7% 55
	Nalidixic acid (MIC ≥ 32 µg/ml)	Humans	19.1% 40	16.5% 49	20.1% 59	16.0% 49	19.5% 71	21.3% 70	17.8% 54
		Chickens					20.3% 13	23.2% 122	15.8% 59
Tetracyclines	Doxycycline (MIC ≥ 16 µg/ml)	Chicken Breasts						20.2% 40	22.8% 74
		Ground Turkey						50.0% 1	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
		Chickens					35.9% 23	45.1% 237	47.6% 178

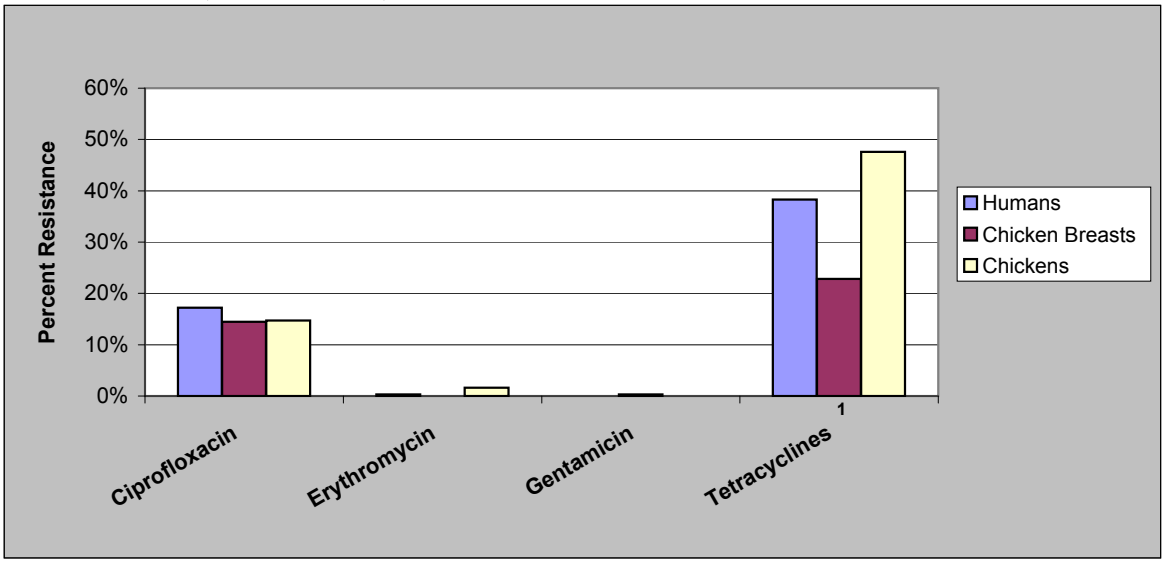
[1] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

Table 39. Antimicrobial Resistance among *Campylobacter coli* Isolates from Humans, Retail Meats, and Chickens, by Year, 1997-2003

Year			1997	1998	1999	2000	2001	2002	2003
Number of Isolates Tested		Humans	6	8	20	12	17	25	22
		Chicken Breasts						90	142
		Ground Turkey						2	1
		Ground Beef						0	0
		Pork Chops						3	4
		Chickens					52[1]	288	247
Antimicrobial Class	**Antimicrobial (Resistance Breakpoint)**	**Isolate Source**							
Aminoglycosides	Gentamicin (MIC ≥ 16 µg/ml)	Humans		0.0% 0	0.0% 0	8.3% 1	0.0% 0	0.0% 0	4.5% 1
		Chicken Breasts						0.0% 0	0.0% 0
		Ground Turkey						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
Lincosamides	Clindamycin (MIC ≥ 4 µg/ml)	Humans	16.7% 1	12.5% 1	10.0% 2	8.3% 1	11.8% 2	4.0% 1	13.6% 3
		Chickens					3.8% 2	10.8% 31	10.9% 27
Macrolides	Azithromycin (MIC ≥ 2 µg/ml)	Humans		37.5% 3	10.0% 2	8.3% 1	5.9% 1	4.0% 1	9.1% 2
		Chickens					11.5% 6	19.4% 56	20.2% 50
	Erythromycin (MIC ≥ 8 µg/ml)	Humans	0.0% 0	37.5% 3	10.0% 2	8.3% 1	5.9% 1	4.0% 1	9.1% 2
		Chicken Breasts						18.9% 17	9.2% 13
		Ground Turkey						0.0% 0	0.0% 0
		Ground Beef							
		Pork Chops						33.3% 1	75.0% 3
		Chickens					11.5% 6	18.8% 54	20.2% 50
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	50.0% 3	37.5% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Chickens					0.0% 0	0.0% 0	0.0% 0
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	33.3% 2	0.0% 0	30.0% 6	25.0% 3	47.1% 8	12.0% 3	22.7% 5
		Chicken Breasts						10.0% 9	13.4% 19
		Ground Turkey						50.0% 1	100.0% 1
		Ground Beef							
		Pork Chops						0.0% 0	0.0% 0
		Chickens					19.2% 10	16.0% 46	20.2% 50
	Nalidixic acid (MIC ≥ 32 µg/ml)	Humans	66.7% 4	50.0% 4	30.0% 6	25.0% 3	47.1% 8	12.0% 3	22.7% 5
		Chickens					23.1% 12	19.4% 56	24.7% 61
Tetracyclines	Doxycycline (MIC ≥ 16 µg/ml)	Chicken Breasts						42.2% 38	45.1% 64
		Ground Turkey						50.0% 1	0.0% 0
		Ground Beef							
		Pork Chops						33.3% 1	50.0% 2
	Tetracycline (MIC ≥ 16 µg/ml)	Humans	66.7% 4	50.0% 4	30.0% 6	25.0% 3	58.8% 10	40.0% 10	45.5% 10
		Chickens					57.7% 30	49.0% 141	51.0% 126

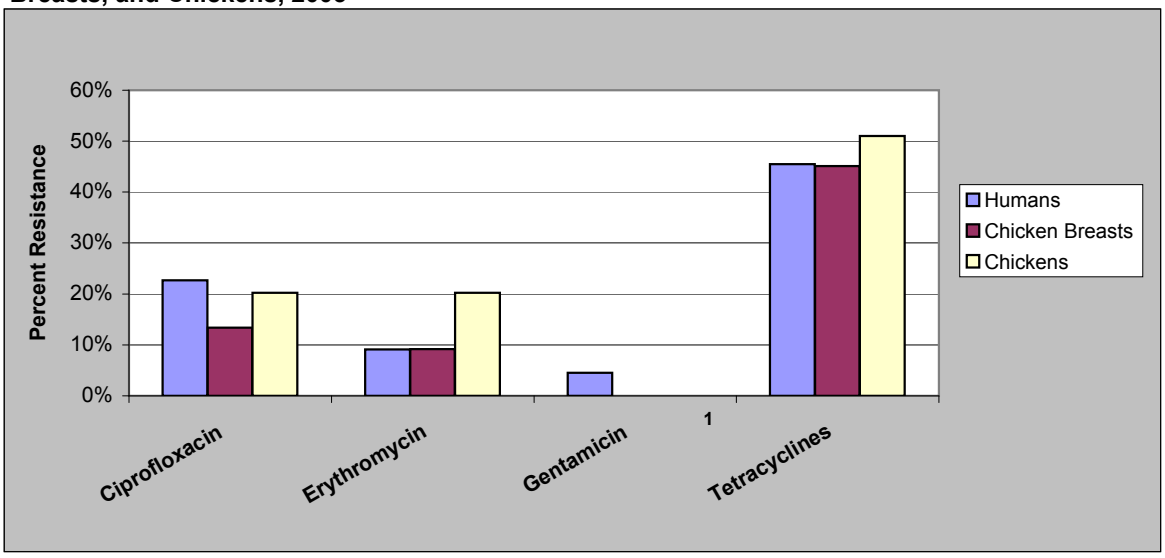
[1] These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

Figure 18. Antimicrobial Resistance among *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens, 2003



[1] Isolates from humans and chickens were tested for tetracycline resistance while isolates from chicken breasts were tested for doxycycline resistance

Figure 19. Antimicrobial Resistance among *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens, 2003



[1] Isolates from humans and chickens were tested for tetracycline resistance while isolates from chicken breasts were tested for doxycycline resistance

IV. 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.

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

General information about CDC's Foodborne Diseases Active Surveillance Network (FoodNet) can be found at: http://www.cdc.gov/foodnet/

General information about USDA's National Animal Health Monitoring System (NAHMS) can be found at: http://nahms.aphis.usda.gov/index.htm