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# Contents

	Page Number
I. Introd	uction 1
A.	Executive Report
В.	NARMS Program
C.	NARMS Components
D.	Links to Additional Information
II. Metho	ds 4
A.	Sampling Methodology
B.	Antimicrobial Susceptibility Testing Methods
C.	Breakpoints6
D.	Reporting Methods
III. Non-T	yphoidal Salmonella Data11
A.	Non-Typhoidal Salmonella Isolates Tested
B.	Isolation of Non-Typhoidal Salmonella from Retail Meats
C.	Non-Typhoidal Salmonella Serotypes
D.	Antimicrobial Susceptibility among all Non-Typhoidal Salmonella
E.	Antimicrobial Susceptibility among Salmonella serotype Enteritidis
F.	Antimicrobial Susceptibility among Salmonella serotype Typhimurium
G.	Antimicrobial Susceptibility among Salmonella serotype Newport
H.	Antimicrobial Susceptibility among Salmonella serotype Heidelberg
I.	Antimicrobial Susceptibility among Salmonella serotype I 4,[5],12:i:
IV. Camp	ylobacter Data
Α.	Campylobacter jejuni and Campylobacter coli Isolates Tested
В.	Isolation of Campylobacter from Retail Meats
C.	Campylobacter Species
D.	Antimicrobial Susceptibility among Campylobacter jejuni
E.	Antimicrobial Susceptibility among Campylobacter coli
V. Esche	richia coli Data91
A.	E. coli Isolates Tested
B.	Isolation of <i>E. coli</i> from Retail Meats
C.	Antimicrobial Susceptibility among <i>E. coli</i>
Appendi	ces 100

 Appendix A
 100

 Appendix B
 102

#### I. Introduction

#### A. Executive Report

This report summarizes, in an integrated format, National Antimicrobial Resistance Monitoring System data on *Salmonella* (non-typhoidal) and *Campylobacter* recovered in 2009 from human clinical cases, retail meats and food animals at federally inspected slaughter and processing plants. In addition, the report includes susceptibility data for *Escherichia coli* recovered from retail meats and chicken carcasses in 2009. Summary data from prior years are also included.

Suggested Citation: FDA. National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS): 2009 Executive Report. Rockville, MD: U.S. Department of Health and Human Services, Food and Drug Administration, 2011.

#### **B. NARMS Program**

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

NARMS monitors antimicrobial susceptibility among enteric bacteria from humans, retail meats, and food animals. Monitoring is conducted for several enteric pathogens, including *Salmonella*, *Campylobacter*, and *Shigella* (humans only). Generic *Escherichia coli* (*E. coli*) and *Enterococcus* are also tested due to their ubiquitous presence in animals, foods, and humans and their potential to serve as reservoirs of antimicrobial resistance genes for bacterial pathogens.

In addition to monitoring antimicrobial susceptibility, NARMS conducts epidemiologic and microbiologic research studies. Some studies examine risk factors and clinical outcomes of infections with specific bacterial serotypes or subsets of bacteria that exhibit particular resistance patterns. Other studies focus on understanding the genetic mechanisms of antimicrobial resistance in enteric bacteria and the mechanisms that permit the transfer of resistance between bacteria, on improving methods for isolation and typing, and on developing new methods for antimicrobial susceptibility testing. Additionally, NARMS examines *Salmonella* and *Campylobacter* strains for genetic relatedness using pulsed-field gel electrophoresis (PFGE). PFGE patterns are entered into CDC's PulseNet database or USDA's VetNet database. PulseNet and VetNet are national molecular subtyping networks for foodborne and zoonotic disease surveillance.

The following are the primary objectives of NARMS:

- To monitor trends in antimicrobial resistance among enteric bacteria from humans, retail meats, and animals
- To disseminate timely information on antimicrobial resistance to promote interventions that reduce resistance among foodborne bacteria
- To conduct research to better understand the emergence, persistence, and spread of antimicrobial resistance
- To provide data that assist the FDA in making decisions related to the approval of safe and effective antimicrobial drugs for animals

#### C. NARMS Components

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

#### 1. Human Component

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

#### 2. Retail Meat Component

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

#### 3. Animal Component

The animal component of NARMS began in 1997 with monitoring of *Salmonella*, and later expanded to include *Campylobacter* (1998), *E. coli* (2000), and *Enterococcus* (2003) isolated from chicken carcasses. This report includes data for *Campylobacter* and *E. coli* from chicken carcass rinsates and data for *Salmonella* from carcass rinsates (chicken), carcass swabs (turkey, cattle and swine), and ground products (chicken, turkey, and beef). Isolates were recovered from samples obtained at federally inspected slaughter and processing plants. Antimicrobial susceptibility testing for the animal component of NARMS was conducted at the USDA's Agricultural Research Service (ARS) Bacterial Epidemiology and Antimicrobial Resistance Research Unit at the Russell Research Center in Athens, Georgia.

#### D. Links to Additional Information

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

<sup>1</sup> Most of the sites were participating FoodNet sites. In 2008, the Pennsylvania Department of Health joined the NARMS retail meat surveillance program, testing for *Salmonella* only.

<sup>&</sup>lt;sup>2</sup> From 2002 through 2006, four sites cultured retail meats for *E. coli* and *Enterococcus* and from 2007-2009, three sites cultured retail meats for *E. coli* and *Enterococcus*.

FDA: <a href="http://www.fda.gov/AnimalVeterinary/SafetyHealth/AntimicrobialResistance/NationalAntimicrobialResistanceMonitoringSystem/default.htm">http://www.fda.gov/AnimalVeterinary/SafetyHealth/AntimicrobialResistance/NationalAntimicrobialResistanceMonitoringSystem/default.htm</a>

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

USDA: http://ars.usda.gov/saa/bear/narms

Information about the Foodborne Diseases Active Surveillance Network (FoodNet) can be found

on the following CDC website: <a href="http://www.cdc.gov/foodnet/">http://www.cdc.gov/foodnet/</a>

#### II. Methods

#### A. Sampling Methodology

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

#### 1. Human Component

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

NARMS *Campylobacter* surveillance began in 1997 with five FoodNet sites and expanded to 10 sites (Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York) by 2003. From 1997 to 2004, the first *Campylobacter* isolate received per week by a participating laboratory was submitted from each site to CDC. In 2005, FoodNet sites changed form submitting the first isolate received each week to submitting every isolate (Georgia, Maryland, New Mexico, Oregon, and Tennessee), every other isolate (California, Colorado, Connecticut, and New York), or every fifth isolate received (Minnesota).

#### 2. Retail Meat Component

Retail meat sampling began in January 2002 with FoodNet sites in Connecticut, Georgia, Maryland, Minnesota, and Tennessee; Oregon joined in September. FoodNet sites in California and New York joined in 2003, and FoodNet sites in Colorado and New Mexico joined in 2004. Each month, participating FoodNet sites purchased approximately 40 meat samples, comprising 10 samples each of chicken breasts, ground turkey, ground beef, and pork chops. From 2004 through 2007, all sites (with the exception of Maryland in 2007) cultured all meats for *Salmonella* and *Campylobacter*. In 2008, Pennsylvania joined the NARMS retail meat surveillance program; this site tested the same sample sources for *Salmonella* only that year, but then began testing for *Campylobacter* also in 2009. Beginning in 2009, all states tested for *Campylobacter* in retail poultry only. From 2004 through 2006, four sites (Georgia, Maryland, Oregon, and Tennessee) cultured meats for *E. coli* and *Enterococcus*, but between 2007 and 2009 only Georgia, Oregon, and Tennessee, tested for these organisms. Isolates were sent to CVM for species/serotype confirmation and antimicrobial susceptibility testing.

#### 3. Animal Component

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

Sampling methods used by FSIS for the PR/HACCP *Salmonella* verification testing program have changed since NARMS animal testing began. Before June of 2006, there were two phases of the FSIS regulatory program for *Salmonella* in raw products: non-targeted and targeted testing. Non-targeted or "A" set samples were collected at establishments randomly selected from the population of eligible

establishments, with a goal of scheduling every eligible establishment at least once a year. Other sample sets (e.g., "B", "C", and "D") were collected from establishments targeted for follow-up testing after HACCP compliance standards were not met. All sets were included in NARMS testing, but most isolates were from "A" set samples. Beginning in June of 2006, establishment testing was scheduled using risk-based criteria designed to focus FSIS resources on establishments with the most samples positive for *Salmonella* and the greatest number of samples with serotypes most frequently associated with human salmonellosis.<sup>1</sup>

In 1998, Campylobacter isolates from chickens were submitted to ARS from the Eastern FSIS laboratory, and in 1999 and 2000, Campylobacter isolates were obtained from all three FSIS laboratories (Eastern, Midwestern, and Western laboratories). FSIS cultured samples for Campylobacter using the most probable number method described in the FSIS Microbiology Laboratory Guidebook. Nalidixic acid susceptibility and cephalothin resistance were initially used as identification criteria for Campylobacter jejuni/coli, which likely resulted in an underreporting of quinolone-resistant Campylobacter. A new ARS method was adopted in July of 2001, after which Campylobacter were isolated by ARS from chicken carcass rinsates submitted by the Eastern FSIS laboratory. Each FSIS laboratory tested samples collected throughout the U.S. This Executive Report contains data on Campylobacter recovered from chicken carcass rinsates for the period July 2001 through December 2009, when the new ARS isolation method was used. The rinsates were collected as part of the Salmonella PR/HACCP verification testing program described above.

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

#### **B.** Antimicrobial Susceptibility Testing Methods

The dilution schemes and antimicrobial content of the susceptibility testing panels used by NARMS have undergone several design changes. The content of the panels has changed to accommodate new antimicrobial agents, to omit those no longer available or used, or to adjust dilution ranges for quality control and monitoring purposes. For example, in 2004, cephalothin was removed and sulfamethoxazole was replaced with sulfisoxazole on the *Salmonellal E. coli* panel. Appendix B shows the antimicrobial agents and antimicrobial susceptibility testing methods used since the program began.

Antimicrobial minimal inhibitory concentrations (MICs) for *Salmonella* and *E. coli* were determined according to manufacturer instructions using the Sensititre® semi-automated antimicrobial susceptibility system (Trek Diagnostic Systems, Westlake, Ohio). In 2008, *Salmonella* and *E. coli* were tested using a custom panel developed for Gram-negative bacteria (Trek catalog # CMV1AGNF). The quality control organisms include *Escherichia coli* ATCC 25922, *Enterococcus faecalis* ATCC 29212, *Staphylococcus aureus* ATCC 29213, and *Pseudomonas aeruginosa* ATCC 27853, according to Clinical and Laboratory Standards Institute (CLSI) recommendations.<sup>3,4</sup>

Methods used to determine MICs for *Campylobacter* have changed over time. Through 2004, the human and animal components of NARMS used Etest® (AB Biodisk, Solna, Sweden). The antimicrobial agents tested using Etest® included: azithromycin, chloramphenicol, ciprofloxacin, clindamycin, erythromycin, gentamicin, nalidixic acid, and tetracycline. Based on Etest® manufacturer recommendations, MIC results that fell between the two-fold dilutions described in CLSI documents were rounded up to next two-fold

<sup>&</sup>lt;sup>1</sup> http://www.fsis.usda.gov/Science/Serotypes Profile Salmonella Isolates/index.asp

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

<sup>&</sup>lt;sup>3</sup> CLSI. 2008. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard—Third Edition. CLSI document M31-A3. CLSI, Wayne, PA.

<sup>&</sup>lt;sup>4</sup> CLSI. 2010. Performance Standards for Antimicrobial Susceptibility Testing; Twentieth Informational Supplement. CLSI document M100-S20. CLSI, Wayne, PA.

dilution for interpretation. The retail component of NARMS used the agar dilution method in 2002 and 2003. The antimicrobial agents tested using agar dilution included ciprofloxacin, doxycycline, erythromycin, gentamicin, and meropenem. Recognizing the need for a standardized semi-automated method, CVM developed a broth microdilution method which was approved and published by CLSI in 2006. The retail component began using this method in 2004 and the human and food animal components adopted the method in 2005. Testing was done using the Sensititre semiautomated antimicrobial susceptibility system (Trek Diagnostic Systems, Westlake, Ohio) and a custom panel developed for *Campylobacter* (Trek catalog # CAMPY). The antimicrobial agents included in broth microdilution testing were azithromycin, ciprofloxacin, clindamycin, erythromycin, florfenicol, gentamicin, nalidixic acid, telithromycin, and tetracycline. *Campylobacter jejuni* ATCC 33560 was used as the quality control organism.

#### C. Breakpoints

The breakpoints used in this report are shown in Tables 1 and 2. CLSI-approved breakpoints were used when available and were adopted from CLSI documents M45-A2, M100-S20, and M31-A3. For Salmonella and E. coli, CLSI breakpoints were available for all antimicrobial agents tested except streptomycin. For Campylobacter, CLSI breakpoints were available only for ciprofloxacin, doxycycline, erythromycin, and tetracycline. NARMS breakpoints were used when CLSI breakpoints were not available. NARMS breakpoints were established based on the MIC distributions of NARMS isolates and the presence of known resistance genes or mutations. For the Enterobacteriaceae, CLSI revised the breakpoints for several cephalosporins in its M100-S20 document published in January 2010. The ceftriaxone breakpoint for resistance changed from  $\geq$  64 µg/ml to  $\geq$  4 µg/ml. NARMS began applying the new breakpoint in all 2008 reports.

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<sup>&</sup>lt;sup>1</sup> In USDA's NARMS annual reports, MIC values were not rounded up prior to interpretation.

<sup>&</sup>lt;sup>2</sup> CLSI. 2006. Methods for Antimicrobial Dilution and Disk Susceptibility Testing of Infrequently Isolated or Fastidious Bacteria; Approved Guideline. CLSI document M45-A. CLSI, Wayne, PA.

<sup>&</sup>lt;sup>3</sup> CLSI. 2010. Methods for Antimicrobial Dilution and Disk Susceptibility Testing of Infrequently Isolated or Fastidious Bacteria; Approved Guideline- Second Edition. CLSI document M45-A2. CLSI, Wayne, PA.

<sup>&</sup>lt;sup>4</sup> CLSI. 2010. Performance Standards for Antimicrobial Susceptibility Testing; Twentieth Informational Supplement. CLSI document M100-S20. CLSI, Wayne, PA.
<sup>5</sup> CLSI. 2008. Performance Standards for Antimicrobial Susceptibility Testing; Twentieth Informational Supplement.

<sup>&</sup>lt;sup>5</sup> CLSI. 2008. Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard—Third Edition. CLSI document M31-A3. CLSI, Wayne, PA.

# C. Breakpoints

Table 1. Interpretive Criteria Used for Susceptibility Testing of Salmonella and E. coli

·	teria Osed for Susceptibility		eakpoints (μg/r	
Antimicrobial Class	Antimicrobial Agent	Susceptible	Intermediate	Resistant
Aminoglycosides	Amikacin	≤ 16	32	≥ 64
	Gentamicin	≤ 4	8	≥ 16
	Kanamycin	≤ 16	32	≥ 64
	Streptomycin	≤ 32	N/A	≥ 64
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	≤ 8 / 4	16 / 8	≥ 32 / 16
Cephems	Cefoxitin	≤ 8	16	≥ 32
	Ceftiofur	≤ 2	4	≥ 8
	Ceftriaxone	≤ 1	2	≥ 4
Folate Pathway Inhibitors	Sulfamethoxazole/Sulfisoxazole <sup>2</sup>	≤ 256	N/A	≥ 512
	Trimethoprim-Sulfamethoxazole	≤ 2 / 38	N/A	≥ 4 / 76
Penicillins	Ampicillin	≤ 8	16	≥ 32
Phenicols	Chloramphenicol	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin	≤ 1	2	≥ 4
	Nalidixic acid	≤ 16	N/A	≥ 32
Tetracyclines	Tetracycline	≤ 4	8	≥ 16

<sup>&</sup>lt;sup>1</sup>Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute), except for streptomycin, which has no CLSI breakpoints

 $<sup>^{\</sup>rm 2}$  Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

Table 2. Interpretive Criteria Used for Susceptibility Testing of Campylobacter <sup>1</sup>

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

<sup>&</sup>lt;sup>1</sup>Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute), when available

 $<sup>^2</sup>$  For florfenicol, only a susceptible breakpoint ( ≤ 4 μg/ml) has been established. In this report, isolates with an MIC ≥ 8 μg/ml are categorized as resistant

#### D. Reporting Methods

The remaining three sections of this report contain NARMS surveillance data for *Salmonella*, *Campylobacter*, and *E. coli*. Antimicrobial agents are listed in alphabetical order by CLSI designated antimicrobial classes.

Section III of the report contains data for non-typhoidal *Salmonella enterica* isolates recovered from humans, retail meats and food animals at slaughter. The number of *Salmonella* isolates reported for humans each year is slightly lower than in reports prior to 2007 because typhoidal *Salmonella enterica* serotypes (Paratyphi A, tartrate-negative Paratyphi B, and Paratyphi C), which cause enteric fever in humans but are not associated with food animal reservoirs, have now been combined with serotype Typhi for reporting. Prior to 2007, NARMS reports combined data for all *Salmonella enterica* serotypes except for serotype Typhi. Data for typhoidal *Salmonella* can be found in the NARMS Human Isolates Final Report, 2009 published by CDC.

Antimicrobial susceptibility data are first presented for all non-typhoidal *Salmonella enterica* serotypes. Data then presented the following top non-typhoidal *Salmonella enterica* serotypes in humans: Enteritidis, Typhimurium, Newport, Heidelberg, and I 4,[5],12;i:-. During 2009, Javiana was the fourth most common non-typhoidal *Salmonella* serotype in humans. However, those data are not presented separately in this report because no *Salmonella* ser. Javiana isolates were recovered from retail meats or food animals. *Salmonella* serotype I 4,[5]12:i:- includes *Salmonella* enterica strains with the antigenic formulas I 4,12:i:- and I 4,5,12:i:- Food animal data for *Salmonella* enterica serotype I 4,[5],12:i:- are not available before 2004 because NVSL, which serotyped the *Salmonella* isolates, did not report antigenic formulas for most monophasic *Salmonella* enterica serotypes at that time.

Section IV of the report contains data for *Campylobacter* recovered from humans, retail poultry, and chicken carcass rinsates. Due to low recovery of *Campylobacter* from ground beef and pork chops, states discontinued testing these meat types for *Campylobacter* in 2008. All resistance data on *Campylobacter* isolated from ground beef and pork chops can be found in reports prior to 2008. Antimicrobial susceptibility data for *C. jejuni* and *C. coli* are presented separately. Section V of the report contains susceptibility data for *E. coli* from retail meats and chicken carcass rinsates.

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

Data on antimicrobial susceptibility testing follows. MIC tables are presented for non-typhoidal *Salmonella*, *C. jejuni*, *C. coli*, and *E. coli*. The tables include MIC distributions, percentages of isolates displaying intermediate susceptibility and resistance, and 95% confidence intervals for the percent resistant, by source for 2009. Confidence intervals were calculated using the Clopper-Pearson exact method. The unshaded areas in the MIC tables indicate the range of concentrations tested for each antimicrobial agent. Single vertical bars indicate breakpoints for susceptibility, while double vertical bars indicate breakpoints for resistance.

The MIC distributions are followed by tables that show the numbers and percentages of isolates that were resistant, by year, from 1998 through 2009.<sup>3</sup> Due to space constraints, data from years 1996 and 1997 are not shown in the resistance tables. Resistance data from 1996 and 1997 can be found in reports

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

<sup>&</sup>lt;sup>2</sup> The concentration ranges are also listed in Appendix A.

<sup>&</sup>lt;sup>3</sup> Data on *Campylobacter* recovered from chickens is presented only for the period of July 2001 through December 2009, as described in Section IIA.

prior to 2008.<sup>1,2</sup> The total number of isolates tested per year for each source is listed at the top of each table. An empty cell in this area indicates that surveillance was not conducted for that particular source, whereas a zero indicates that surveillance was conducted, but no isolates were available for testing. Below the section containing the number of isolates tested, empty shaded boxes indicate that there are no data to report because surveillance was not conducted or isolates were not available for testing. Similar tables are presented for *Salmonella* serotypes Enteritidis, Typhimurium, Newport, Heidelberg, and I 4,[5],12;i:-.

Third-generation cephalosporins (such as ceftriaxone) and fluoroquinolones (such as ciprofloxacin) are antimicrobial agents commonly used for the treatment of severe *Salmonella* infections in humans. Resistance to ceftriaxone and nalidixic acid in *Salmonella* is highlighted in several pie charts and graphs (Figures 6-16). Prior to 2008, NARMS reports highlighted resistance to ceftiofur (an extended-spectrum cephalosporin used in food animals), which is usually indicative of the presence of an AmpC betalactamase gene (blaCMY), to represent resistance to third-generation cephalosporins. With the revised ceftriaxone breakpoints, ceftriaxone resistance (MIC  $\geq$  4  $\mu$ g/ml) is now nearly identical to ceftiofur resistance. Resistance to the quinolone nalidixic acid (MIC  $\geq$  32  $\mu$ g/ml) indicates certain chromosomal point mutations that also cause decreased susceptibility to ciprofloxacin (MIC  $\geq$  0.125  $\mu$ g/ml), which is associated with greater risk of treatment failure.

Finally, multidrug resistance data for all three genera are presented (Tables 13-29, 32, 35, 38, 41, 44, 52, 56, and 61). Data for specific multidrug resistance phenotypes of public health importance are reported along with data on resistance to CLSI antimicrobial classes. Tables 13-21 show the number of resistant *Salmonella* isolates by antimicrobial agent and the number of antimicrobial classes in a resistance pattern for each of the top serotypes (comprising at least 2% of isolates) from each source. For *Salmonella* and *E. coli*, resistance to multiple antimicrobial classes is limited to the eight CLSI antimicrobial classes tested in all years from 1996 through 2009 represented by 15 agents: amikacin, amoxicillin-clavulanic acid, ampicillin, cefoxitin, ceftiofur, ceftriaxone, chloramphenicol, ciprofloxacin, gentamicin, kanamycin, nalidixic acid, streptomycin, sulfamethoxazole/ sulfisoxazole, tetracycline, and trimethoprim-sulfamethoxazole. Amikacin was not tested for all isolates from 1996, and cefoxitin was not tested prior to 2000. Multidrug resistance data for *Campylobacter* is also in the 2009 report. All seven antimicrobial classes and all nine antimicrobial agents included in broth microdilution testing of *Campylobacter* isolates are represented in Tables 52 and 56.

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

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<sup>&</sup>lt;sup>1</sup> FDA. National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS): 2008 Executive Report. Rockville, MD: U.S. Department of Health and Human Services, Food and Drug Administration, 2011.

<sup>&</sup>lt;sup>2</sup> Data from 1996 and 1997 are still included in the graphs and supporting tables.

<sup>&</sup>lt;sup>3</sup> Note that the scales vary from figure to figure, based on the maximum percent resistance.

<sup>&</sup>lt;sup>4</sup> Below each graph is a table that shows the number of isolates tested. Empty grey boxes indicate that surveillance was not conducted, while boxes with zeros indicate that there were no isolates available for testing.

was not conducted, while boxes with zeros indicate that there were no isolates available for testing.

<sup>5</sup> Crump JA, Barrett TJ, Nelson JT, Angulo FJ. Reevaluating fluoroquinolone breakpoints for *Salmonella enterica* serotype Typhi and for Non-Typhi salmonellae. Clin Inf Dis 2003;37:75-81.

# III. Non-Typhoidal Salmonella Data

## A. Non-Typhoidal Salmonella Isolates Tested

Table 3. Number of Non-Typhoidal Salmonella Isolates Tested, by Source and Year, 1996-2009 1

							Year							
Source	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	1318	1297	1455	1493	1372	1410	1998	1855	1782	2034	2173	2144	2380	2192
Chicken Breasts							60	83	157	153	152	99	199	277
<b>Ground Turkey</b>							74	114	142	183	159	190	245	190
Ground Beef							9	10	14	8	19	13	24	14
Pork Chops							10	5	11	9	8	18	23	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551
Turkeys		107	240	713	518	550	244	262	236	227	304	271	148	121
Cattle		24	284	1610	1388	893	1008	670	607	329	389	439	443	200
Swine		111	793	876	451	418	379	211	308	301	304	211	111	120

<sup>&</sup>lt;sup>1</sup> NARMS reports for the years 1996-2006 combined data for all non-Typhi*Salmonella* isolates from humans. Beginning in 2007, NARMS reported data separately for all typhoidal *Salmonella* serotypes (i.e. Typhi, Paratyphi A, tartrate-negative Paratyphi B, and Paratyphi C). This report includes data only for non-typhoidal isolates from humans. Data for typhoidal *Salmonella* can be found in the NARMS Human Isolates Final Reports, published by CDC

# B. Isolation of Non-Typhoidal Salmonella from Retail Meats

Table 4. Number and Percent of Retail Meat Samples Culture Positive for Salmonella, 2009

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	1320	1320	1320	1320
Number Positive for Salmonella	277	190	14	8
Percent Positive for Salmonella	21.0%	14.4%	1.1%	0.6%

Figure 1. Percent of Retail Meat Samples Culture Positive for Salmonella, 2009

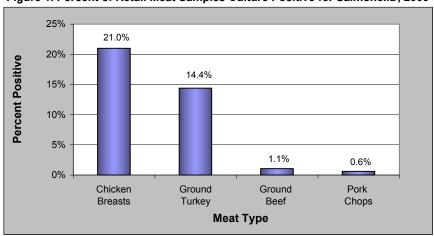
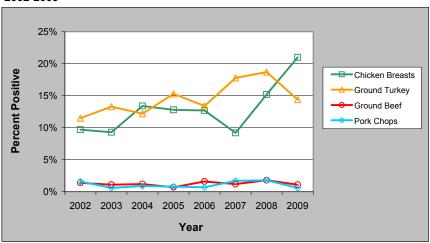


Figure 2. Percent of Retail Meat Samples Culture Positive for *Salmonella*, 2002-2009



# C. Non-Typhoidal Salmonella Serotypes

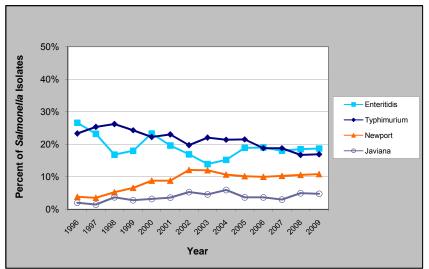
Table 5. Most Common Serotypes among Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, 2009

Animals	Humans				Retail Meats	8			Food Anima	als	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans	Enteritidis	410	18.7	Chicken	Typhimurium	123	44.4	Chickens	Kentucky	214	38.8
(N=2192)	Typhimurium	371	16.9	Breasts (N=277)	Heidelberg	45	16.2	(N=551)	Enteritidis	118	21.4
	Newport	236	10.8	(N-211)	Kentucky	44	15.9		Heidelberg	74	13.4
	Javiana	105 86	4.8 3.9		Enteritidis	27 8	9.7 2.9		Typhimurium	36 21	6.5 3.8
	Heidelberg I 4,[5],12:i:-	72	3.3		I 4,[5],12:i:- Mbandaka	4	1.4		I 4,[5],12:i:- I 8,20:-:z6	13	2.4
	Oranienburg	64	2.9		Montevideo	4	1.4		Montevideo	10	1.8
	Saintpaul	57	2.6		Braenderup	3	1.1		Schwarzengrund	8	1.5
	Montevideo	56	2.6		Hadar	3	1.1		Hadar	6	1.1
	Braenderup	46	2.1		Infantis	3	1.1		Senftenberg	6	1.1
	Infantis	44	2.0		I 9,12:nonmotile	2	0.7		Worthington	6	1.1
	Muenchen	42	1.9		Senftenberg	2	0.7		Braenderup	4	0.7
	Mississippi	28	1.3		Other	9	3.2		Other	35	6.4
	Thompson	27	1.2								
	Agona	21	1.0		0	70	40.0				00.4
	Bareilly	20	0.9	Ground	Saintpaul	76 20	40.0	Turkeys (N=121)	Hadar	32	26.4
	Litchfield Paratyphi B var. L(+) tartrate+	20 20	0.9 0.9	Turkey (N=190)	Hadar IIIa 18:z4,z23:-	20 18	10.5 9.5	(14-121)	Saintpaul	18 15	14.9 12.4
	Hadar	19	0.9	<u> </u>	Heidelberg	10	5.3		Agona Schwarzengrund	7	5.8
	Poona	16	0.5		Senftenberg	10	5.3		Senftenberg	7	5.8
	All other serotypes	373	17.0		I 4,12:d:-	9	4.7		IIIa 18:z4,z23:-	6	5.0
	Unknown serotype	19	0.9		Schwarzengrund	9	4.7		Albany	5	4.1
	Partially serotyped	20	0.9		Albany	6	3.2		Derby	4	3.3
	Rough/Nonmotile isolates	20	0.9		Derby	5	2.6		Heidelberg	3	2.5
					I 4,5,12:r:-	4	2.1		Muenchen	3	2.5
					Montevideo	4	2.1		Newport	3	2.5
					Agona	3	1.6		Other	18	14.9
					Berta	3	1.6				
					Newport	3	1.6				
					Kentucky Other	2 8	1.1 4.2				
				0	Montevideo	4	28.6	Cattle	Montevideo	59	29.5
				Ground Beef	Dublin	3	21.4	(N=200)	Dublin	21	10.5
				(N=14)	Saintpaul	3	21.4		Typhimurium	18	9.0
					Newport	2	14.3		Newport	17	8.5
					Give	1	7.1		Kentucky	10	5.0
					Muenster	1	7.1		Cerro	9	4.5
									Meleagridis	8	4.0
									Anatum	7	3.5
									Muenchen .	6	3.0
									Agona	5	2.5
									Muenster Other	4 36	2.0 18.0
				Pork	Derby	3	37.5	Swine	Derby	24	20.0
				Chops (N=8)	Infantis	2	25.0	(N=120)	Typhimurium	20	16.7
				( 5,	Heidelberg Ohio	1 1	12.5		Johannesburg Anatum	11 10	9.2
					Onio Typhimurium	1 1	12.5 12.5		Anatum Infantis	10 10	8.3 8.3
					, ypriimanum	'	12.0		Adelaide	5	4.2
									Agona	4	3.3
									Bredeney	4	3.3
									Heidelberg	4	3.3
									Saintpaul	4	3.3
									Other	24	20.0
									Saintpaul	4	

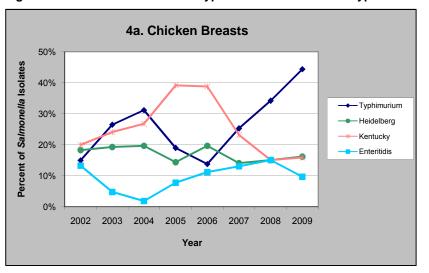
Table 6. Most Common Non-Typhoidal *Salmonella* Serotypes in Humans and their Distributions among Retail Meat and Food Animal Isolates, by Meat Type and Animal Source, 2009

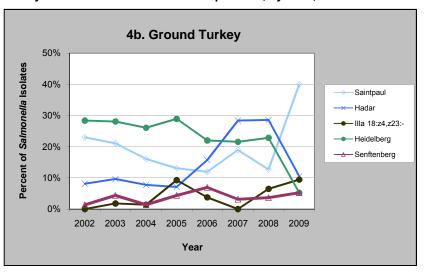
	Humans		Retail	Meats			Food A	Animals	
	Humans (N=2192)	Chicken Breast (N=277)	Ground Turkey (N=190)	Ground Beef (N=14)	Pork Chops (N=8)	Chickens (N=551)	Turkeys (N=121)	Cattle (N=200)	Swine (N=120)
4 = 4 - 20 - 10 - 10 - 10 - 10 - 10 - 10 - 10	18.7%	9.7%	0.0%	0.0%	0.0%	21.4%	0.0%	0.0%	0.0%
1. Enteritidis	410	27	0	0	0	118	0	0	0
2. Typhimurium	16.9%	44.4%	0.5%	0.0%	12.5%	6.5%	1.7%	9.0%	16.7%
2. Typiiiiiuiiuiii	371	123	1	0	1	36	2	18	20
3. Newport	10.8%	0.4%	1.6%	14.3%	0.0%	0.0%	2.5%	8.5%	0.0%
3. Newport	236	1	3	2	0	0	3	17	0
4 leviene	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4. Javiana	105	0	0	0	0	0	0	0	0
5. Heidelberg	3.9%	16.2%	5.3%	0.0%	12.5%	13.4%	2.5%	0.0%	3.3%
5. Heldelberg	86	45	10	0	1	74	3	0	4
6. I 4,[5],12:i-	3.3%	2.9%	0.0%	0.0%	0.0%	3.8%	0.0%	0.5%	0.8%
6. 1 4,[5], 12.1-	72	8	0	0	0	21	0	1	1
7 Overslandsver	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%
7. Oranienburg	64	0	0	0	0	0	0	1	0
9. Caintmani	2.6%	0.4%	40.0%	21.4%	0.0%	0.0%	14.9%	0.0%	3.3%
6. Saintpaul	57	1	76	3	0	0	18	0	4
0. Montovidos	2.6%	1.4%	2.1%	28.6%	0.0%	1.8%	0.8%	29.5%	1.7%
9. Wontevideo	56	4	4	4	0	10	1	59	2
10 Proondorus	2.1%	1.1%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.8%
7. Oranienburg 8. Saintpaul 9. Montevideo 0. Braenderup	46	3	0	0	0	4	0	0	1

Figure 3. Most Common Non-Typhoidal *Salmonella* Serotypes from Humans in 2009 and their Relative Frequencies, by Year, 1996-2009



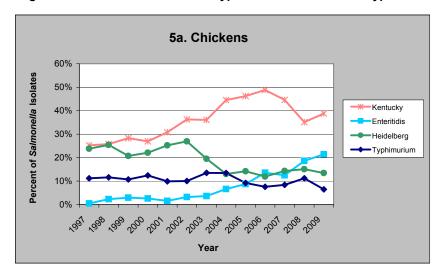
Figures 4a-b. Most Common Non-Typhoidal Salmonella Serotypes from Retail Poultry in 2009 and their Relative Frequencies, by Year, 2002-2009<sup>1</sup>

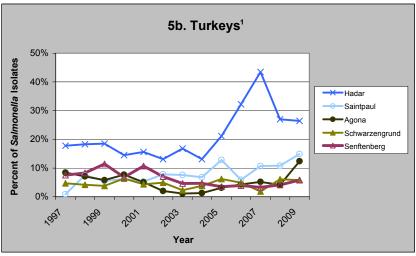




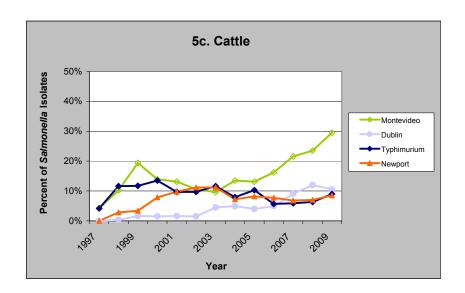
<sup>&</sup>lt;sup>1</sup> Graphs are not provided for ground beef and pork chops due to the small number of Salmonella isolates from these sources

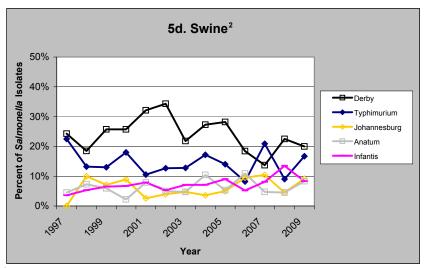
Figures 5a-d. Most Common Non-Typhoidal Salmonella Serotypes from Food Animals in 2009 and their Relative Frequencies, by Year, 1997-2009





<sup>&</sup>lt;sup>1</sup> There are five serotypes shown because the fourth highest frequency was shared by two serotypes. See table 5





<sup>&</sup>lt;sup>2</sup> There are five serotypes shown because the fourth highest frequency was shared by two serotypes. See table 5

# D. Antimicrobial Susceptibility among all Non-Typhoidal Salmonella

#### **MIC Distributions**

Table 7a. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals, 2009

	Isolate Source										Distribu	ition (	%) of N	IICs (µ	g/ml) <sup>4</sup>						
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R²	[95% CI] <sup>3</sup>	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 (2192)	0.0	0.0	[0.0 - 0.2]						7.8	74.6	15.9	1.6	<0.1							
	Chicken Breasts (277)	0.0	0.0	[0.0 - 1.3]						8.3	48.0	39.4	4.3								
	Ground Turkey (190)	0.0	0.0	[0.0 - 1.9]						0.5	36.8		7.4								
	Ground Beef (14)	0.0	0.0							0.5	28.6		14.3								
	` '			[0.0 - 23.2]							20.0	75.0	25.0								
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]																	
	Chickens (551)	0.0	0.0	[0.0 - 0.7]						9.6	71.3		0.5	0.2							
	Turkeys (121)	0.0	0.0	[0.0 - 3.0]						5.8	58.7	31.4	4.1								
	Cattle (200)	0.0	0.0	[0.0 - 1.8]						2.0	47.0	48.5	2.5								
	Swine (120)	0.0	0.0	[0.0 - 3.0]						3.3	83.3	12.5	8.0								
Gentamicin	Humans (2192)	0.2	1.3	[0.9 - 1.8]					64.2	32.8	1.3	0.1		0.2	0.7	0.6					
	Chicken Breasts (277)	0.7	3.6	[1.7 - 6.5]					51.6	40.4	3.3		0.4	0.7	1.4	2.2					
	Ground Turkey (190)	1.6	18.4	[13.2 - 24.7]					25.8	46.3	6.8	0.5	0.5	1.6	2.6	15.8					
	Ground Beef (14)	0.0	14.3	[1.8 - 42.8]					7.1		14.3				7.1	7.1					
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]					12.5		12.5										
	Chickens (551)	0.9	5.6	[3.9 - 7.9]					70.4	22.1	0.7		0.2	0.9	2.5	3.1					
	Turkeys (121)	0.8	14.9	[9.1 - 22.5]					40.5	43.0			0.8	0.8	4.1	10.7					
	Cattle (200)	0.0	2.0	[0.5 - 5.0]					39.0	55.5	3.0	0.5				2.0					
	Swine (120)	0.8	0.0	[0.0 - 3.0]					66.7	30.8	0.8	0.0	0.8	0.8							
Kanamycin	Humans (2192)	<0.1	2.5	[1.9 - 3.2]										97.3	0.2	<0.1	<0.1	2.4			
,	Chicken Breasts (277)	0.0	15.2	[11.2 - 19.9]										84.5	0.4			15.2			
	Ground Turkey (190)	0.0	6.8	[3.7 - 11.4]										91.6	1.6			6.8			
	Ground Beef (14)	0.0	14.3	[3.7 - 11.4]										85.7	1.0			14.3			
	` '		12.5											87.5				12.5			
	Pork Chops (8)	0.0		[0.3 - 52.7]																	
	Chickens (551)	0.2	3.1	[1.8 - 4.9]										96.4	0.4	0.2	0.7	2.4			
	Turkeys (121)	0.0	10.7	[5.8 - 17.7]										89.3				10.7			
	Cattle (200)	0.0	9.0	[5.4 - 13.9]										91.0				9.0			
	Swine (120)	0.0	4.2	[1.4 - 9.5]										95.0	8.0	$\sqcup \sqcup$		4.2			
Streptomycin	Humans (2192)	N/A	8.9	[7.8 - 10.2]												91.1	4.2	4.8			
	Chicken Breasts (277)	N/A	23.1	[18.3 - 28.5]												76.9	15.9	7.2			
	Ground Turkey (190)	N/A	27.9	[21.6 - 34.8]												72.1	17.9	10.0			
	Ground Beef (14)	N/A	28.6	[8.4 - 58.1]												71.4		28.6			
	Pork Chops (8)	N/A	37.5	[8.5 - 75.5]												62.5		37.5			
	Chickens (551)	N/A	30.5	[26.7 - 34.5]												69.5	20.9	9.6			
	Turkeys (121)	N/A	38.8	[30.1 - 48.1]												61.2	23.1	15.7			
	Cattle (200)	N/A	22.0	[16.5 - 28.4]												78.0	5.5	16.5			
	Swine (120)	N/A	29.2	[21.2 - 38.2]												70.8	10.8	18.3			

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 7b. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals, 2009

Table 7b. Distribution of	Isolate Source					<u>, , , , , , , , , , , , , , , , , , , </u>					Distribu				-	•			·		
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R <sup>2</sup>	[95% CI] <sup>3</sup>	0.015	0.03	0.06	0.125	0.25	0.5	1	2 `	4	8	16	32	64	128	256	512	1024
β-Lactam/β-Lactamase																					
Inhibitor Combinations																1					
Amoxicillin-Clavulanic Acid	Humans (2192)	3.6	3.4	[2.7 - 4.3]							87.5	2.5	0.4	2.6	3.6	8.0	2.6				
	Chicken Breasts (277)	4.3	37.2	[31.5 - 43.2]							50.2	3.6	0.4	4.3	4.3	6.5	30.7				
	Ground Turkey (190)	18.4	5.8	[2.9 - 10.1]							37.9	4.2		33.7	18.4	2.1	3.7				
	Ground Beef (14)	14.3	14.3	[1.8 - 42.8]							50.0	21.4			14.3		14.3				
	Pork Chops (8)	12.5	25.0	[3.2 - 65.1]							62.5				12.5	12.5	12.5				
	Chickens (551)	0.0	12.9	[10.2 - 16.0]							84.0	2.0	0.2	0.9		3.8	9.1				
	Turkeys (121)	18.2	13.2	[7.8 - 20.6]							60.3	0.8	0.2	7.4	18.2	3.3	9.9				
	Cattle (200)	2.5	15.0	[10.4 - 20.7]							74.5		1.0	4.0	2.5	6.5	8.5				
	Swine (120)	10.8	4.2	[1.4 - 9.5]							78.3		2.5	1.7	10.8		4.2				
	(			[																	
Cephems																					
Cefoxitin	Humans (2192)	0.3	3.2	[2.5 - 4.1]						0.1	36.1	47 4	11.8	1.0	0.3	1.4	1.9				
COTOXILIT										0.1											
	Chicken Breasts (277)	5.1	32.5	[27.0 - 40.1]								43.0	16.2	2.5	5.1	16.2	16.2				
	Ground Turkey (190)	0.0	5.8	[2.9 - 10.1]							1.6	63.7	26.3	2.6		2.1	3.7				
	Ground Beef (14)	0.0	14.3	[1.8 - 42.8]								57.1	14.3	14.3		40.5	14.3				
	Pork Chops (8)	0.0	25.0	[3.2 - 65.1]								12.5	62.5			12.5	12.5				
	Chickens (551)	1.3	11.4	[8.9 - 14.4]							25.2	50.8	10.7	0.5	1.3	9.3	2.2				
	Turkeys (121)	0.0	12.4	[7.1 - 19.6]							15.7		19.0	1.7		1.7	10.7				
	Cattle (200)	2.0	13.5	[9.1 - 19.0]								36.0	27.0	3.0	2.0	5.5	8.0				
	Swine (120)	0.0	4.2	[1.4 - 9.5]							10.8	39.2	42.5	3.3		0.8	3.3				
Ceftiofur	Humans (2192)	<0.1	3.4	[2.7 - 4.3]				0.1	0.8	21.1	73.2	1.3	<0.1	0.2	3.2						
	Chicken Breasts (277)	0.4	36.8	[31.1 - 42.8]						14.1	46.9	1.8	0.4	10.1	26.7						
	Ground Turkey (190)	0.0	5.8	[2.9 - 10.1]					0.5	10.5	80.5	2.6		1.1	4.7						
	Ground Beef (14)	0.0	14.3	[1.8 - 42.8]						14.3	71.4				14.3						
	Pork Chops (8)	0.0	25.0	[3.2 - 65.1]							75.0				25.0						
	Chickens (551)	0.2	12.7	[10.0 - 15.8]				0.2		47.5	39.0	0.4	0.2	0.7	12.0						
	Turkeys (121)	0.0	12.4	[7.1 - 19.6]				0.2		29.8	57.9	UT	U.2	0.8	11.6						
	Cattle (200)	0.5	14.5	[9.9 - 20.2]					2.0	37.5	43.5	2.0	0.5	1.0	13.5						
	Swine (120)	0.0	4.2	[1.4 - 9.5]					0.8		63.3				4.2						
Ceftriaxone	Humans (2192)	0.0	3.4	[2.7 - 4.3]					96.5	<0.1			0.2	0.7	1.4	0.6	0.4	0.2			
	Chicken Breasts (277)	0.0	37.5	[31.8 - 43.5]					62.5					9.7	18.4	8.7	0.4				
	Ground Turkey (190)	0.0	37.5 5.8	[31.8 - 43.5]					94.2				0.4	9.7 0.5	18.4 2.6	8.7 2.1	0.4 0.5				
	Ground Beef (14)	0.0	5.o 14.3	[1.8 - 42.8]					85.7					0.5	2.0	7.1	7.1				
	Pork Chops (8)	0.0	25.0	[3.2 - 65.1]					75.0							25.0					
	Chickens (551)	0.0	12.9	[10.2 - 16.0]					86.9	0.2			0.9	3.4	6.5	1.5	0.4	0.2			
	Turkeys (121)	0.0	12.4	[7.1 - 19.6]					87.6			0.5	4.0	0.8	4.1	6.6	8.0				
	Cattle (200)	0.5 0.0	14.5	[9.9 - 20.2]					85.0 95.8			0.5	1.0	1.0	9.0	3.5					
	Swine (120)	0.0	4.2	[1.4 - 9.5]					95.6					0.8	1.7	1.7					

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 7c. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals, 2009

Table 7c. Distribution of N	Isolate Source												%) of N								
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R²	[95% CI] <sup>3</sup>	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway Inhibitors																					
Sulfisoxazole	Humans (2192)	N/A	9.9	[8.7 - 11.2]											5.0	35.2	47.0	2.8	0.1	9.9	
	Chicken Breasts (277)	N/A	48.0	[42.0 - 54.1]											4.7	15.5	29.2	2.2	0.4	48.0	
	Ground Turkey (190)	N/A	20.0	[14.6 - 26.4]											4.7	13.2	60.0	2.1		20.0	
	Ground Beef (14)	N/A	35.7	[12.8 - 64.9]												7.1	57.1			35.7	
	Pork Chops (8)	N/A	37.5	[8.5 - 75.5]												12.5	50.0			37.5	
	Chickens (551)	N/A	10.0	[7.6 - 12.8]											27.2	50.8	11.6	0.4		10.0	
	Turkeys (121)	N/A	28.9	[21.0 - 37.9]											14.9	41.3	13.2	1.7		28.9	
	Cattle (200)	N/A	24.5	[18.7 - 31.1]											21.0	43.5	10.0	1.0		24.5	
	Swine (120)	N/A	30.8	[22.7 - 39.9]											26.7	30.8	10.8		8.0	30.8	
Trimethoprim-Sulfamethoxazole	Humans (2192)	N/A	1.7	[1.2 - 2.4]				95.8	2.2	0.2	<0.1			1.7							
	Chicken Breasts (277)	N/A	0.4	[0.0 - 2.0]				97.8	1.4	0.4			0.4								
	Ground Turkey (190)	N/A	1.6	[0.3 - 4.5]				96.8	1.6	***				1.6							
	Ground Beef (14)	N/A	0.0	[0.0 - 23.2]				71.4	28.6												
	Pork Chops (8)	N/A	25.0	[3.2 - 65.1]				75.0	20.0					25.0							
	Chickens (551)	N/A	0.2	[0.0 - 1.0]				94.0	5.8					0.2							
	Turkeys (121)	N/A	1.7	[0.2 - 5.8]				89.3	9.1					1.7							
	Cattle (200)	N/A	1.5	[0.3 - 4.3]				80.5	15.0	2.0	1.0			1.5							
	Swine (120)	N/A	2.5	[0.5 - 7.1]				73.3	23.3	0.8				2.5							
Penicillins	(,			[0.0]																	
Ampicillin	Humans (2192)	<0.1	9.9	[8.6 - 11.2]							83.7	5.9	0.3	0.2	<0.1		9.9				
	Chicken Breasts (277)	0.0	45.8	[39.9 - 51.9]							44.8	9.0	0.4				45.9				
	Ground Turkey (190)	0.0	57.9	[50.5 - 65.0]							34.7	6.8	0.5				57.9				
	Ground Beef (14)	0.0	28.6	[8.4 - 58.1]							42.9	28.6					28.6				
	Pork Chops (8)	0.0	37.5	[8.5 - 75.5]							62.5						37.5				
	Chickens (551)	0.0	13.8	[11.0 - 17.0]							81.5	4.4	0.4				13.8				
	Turkeys (121)	0.0	38.8	[30.1 - 48.1]							57.9	2.5	0.8				38.8				
	Cattle (200)	0.0	22.5	[16.9 - 28.9]							74.0		0.5	0.5			22.5				
	Swine (120)	0.0	19.2	[12.6 - 27.4]								6.7					19.2				
Phenicols																					
Chloramphenicol	Humans (2192)	1.0	5.7	[4.8 - 6.8]								0.7	49.0	43.6	1.0	<0.1	5.6				
	Chicken Breasts (277)	0.4	0.0	[0.0 - 1.3]									23.1	76.5	0.4						
	Ground Turkey (190)	1.1	1.6	[0.3 - 4.5]								1.1	22.6	73.7	1.1	1.1	0.5				
	Ground Beef (14)	0.0	21.4	[4.7 - 50.8]									7.1	71.4			21.4				
	Pork Chops (8)	12.5	12.5	[0.3 - 52.7]										75.0	12.5		12.5				
	Chickens (551)	0.2	1.6	[0.7 - 3.1]								15.1	61.7	21.4	0.2	0.2	1.5				
	Turkeys (121)	8.0	3.3	[0.9 - 8.2]								14.9	57.0	24.0	0.8		3.3				
	Cattle (200)	1.0	21.0	[15.6 - 27.3]								3.1	49.0	26.0	1.0	0.5	20.5				
İ	Swine (120)	1.7	15.0	[9.1 - 22.7]									20.8	62.5	1.7		15.0				

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 7d. Distribution of MICs and Occurrence of Resistance among all Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals, 2009

	Isolate Source											ution (	%) of N	MICs (µ	g/ml) <sup>4</sup>						
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R <sup>2</sup>	[95% CI] <sup>3</sup>	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Quinolones																					
Ciprofloxacin	Humans (2192)	0.1	0.0	[0.0 - 0.3]	92.9	4.5	0.2	0.7	1.0	0.4	0.1	0.1		<0.1							
	Chicken Breasts (277)	0.0	0.0	[0.0 - 1.3]	78.0	20.6	1.1		0.4												
	Ground Turkey (190)	0.0	0.0	[0.0 - 1.9]	84.7	14.7	0.5														
	Ground Beef (14)	0.0	0.0	[0.0 - 23.2]	71.4	14.3			14.3												
	Pork Chops (8)	0.0	0.0	[0.0 - 36.9]	62.5	37.5															
	Chickens (551)	0.0	0.0	[0.0 - 0.7]	90.4	9.6															
	Turkeys (121)	0.0	0.0	[0.0 - 3.0]	97.5	1.7			0.8												
	Cattle (200)	0.0	0.0	[0.0 - 1.8]	95.5	3.0	0.5		0.5	0.5											
	Swine (120)	0.0	0.0	[0.0 - 3.0]	92.5	7.5															
Nalidixic Acid	Humans (2192)	N/A	1.8	[1.3 - 2.4]							0.3	39.6	57.0	0.9	0.4	0.1	1.6				
	Chicken Breasts (277)	N/A	0.4	[0.0 - 2.0]							0.4	16.2	82.0	0.7	0.4		0.4				
	Ground Turkey (190)	N/A	0.0	[0.0 - 1.9]							0.5	15.8	81.1	2.6	0.1		0.4				
	Ground Beef (14)	N/A	14.3	[1.8 - 42.8]							0.0	21.4		2.0			14.3				
	Pork Chops (8)	N/A	0.0	[0.0 - 36.9]								21	87.5	12.5			14.0				
	Chickens (551)	N/A	0.0	[0.0 - 0.7]						0.2	2.2	62.8	34.3	0.5							
	Turkeys (121)	N/A	0.8	[0.0 - 4.5]						0.2	0.8		27.3	0.8			0.8				
	Cattle (200)	N/A	1.0	[0.1 - 3.6]							0.5	64.0		1.0			1.0				
	Swine (120)	N/A	0.0	[0.0 - 3.0]							0.0		53.3	1.7			1.0				
<b>T</b> . (																					
Tetracyclines Tetracycline	Humans (2192)	0.2	11.9	[10.6 - 13.3]									87.9	0.2	0.2						
retracycline	` '			-												2.9	8.8				
	Chicken Breasts (277)	0.4	59.9	[53.9 - 65.7]									39.7	0.4	0.4		59.6				
	Ground Turkey (190)	1.1	65.3	[58.0 - 72.0]									33.7	1.1	1.1	1.1	63.2				
	Ground Beef (14)	0.0	42.9	[17.7 - 71.1]									57.1				42.9				
	Pork Chops (8)	0.0	37.5	[8.5 - 75.5]									62.5			12.5	25.0				
	Chickens (551)	1.1	33.9	[30.0 - 38.1]									65.0	1.1		0.5	33.4				
	Turkeys (121)	0.0	63.6	[54.4 - 72.2]									36.4			8.3	55.4				
	Cattle (200)	0.0	29.0	[22.8 - 35.8]									71.0		0.5	5.5	23.0				
	Swine (120)	0.0	53.3	[44.0 - 62.5]									46.7			14.2	39.2				

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

#### Resistance by Year

Table 8a. Antimicrobial Resistance among all Non-Typhoidal Salmonella Isolates from Humans. Retail Meats, and Food Animals, by Year, 1998-2009

Table 8a. Antimicro	biai Resistance a	mong all Non-Ty												
Year	-	Llumans	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Teste	d	Humans Chicken Breasts Ground Turkey	1455	1493	1372	1410	1998 60 74	1855 83 114	1782 157 142	2034 153 183	2173 152 159	2144 99 190	2380 199 245	2192 277 190
		Ground Beef Pork Chops					9	10 5	14 11	8 9	19 8	13 18	24 23	14 8
		Chickens Turkeys	561 240	1438 713	1173 518	1307 550	1500 244	1158 262	1280 236	1989 227	1380 304	994 271	624 148	551 121
		Cattle Swine	284 793	1610 876	1388 451	893 418	1008 379	670 211	607 308	329 301	389 304	439 211	443 111	200 120
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Amikacin	Humans	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1%	0.0%	0.0%	0.0%	0.0%
	(MIC ≥ 64 μg/ml)	Chicken Breasts	0	1	0	0	0 0.0% 0	0 0.0% 0	0 0.0% 0	0.0% 0	0 0.0% 0	0 0.0% 0	0 0.0% 0	0 0.0% 0
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef					0.0% 0	0 0.0% 0	0 0.0% 0	0.0%	0 0.0% 0	0.0% 0	0 0.0% 0	0 0.0% 0
		Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%
	Gentamicin	Humans	2.8%	2.1%	2.7%	1.9%	1.4%	1.4%	1.3%	2.2%	2.0%	2.1%	1.5%	1.3%
	(MIC ≥ 16 μg/ml)	Chicken Breasts	41	32	37	27	27 10.0% 6	6.0%	3.8% 6	3.3% 5	9.2% 14	45 6.1% 6	7.0% 14	28 3.6% 10
		Ground Turkey					14.9%	22.8% 26	20.4%	26.8% 49	28.9% 46	24.7% 47	27.8% 68	18.4% 35
		Ground Beef					0.0%	0.0%	0.0%	25.0%	0.0%	7.7%	8.3%	14.3%
		Pork Chops					30.0%	0.0%	0.0%	0.0%	50.0%	5.6% 1	13.0%	0.0%
		Chickens	15.3% 86	10.4% 150	14.9% 175	7.9% 103	5.5% 83	6.3%	4.9%	4.3% 85	5.7% 79	4.5% 45	5.6% 35	5.6%
		Turkeys	18.3% 44	17.5% 125	16.2% 84	20.9%	19.3% 47	73 21.0% 55	25.4% 60	22.9% 52	16.4% 50	12.9% 35	16.9% 25	14.9% 18
		Cattle	1.8%	1.6%	2.1%	2.1%	2.6%	2.7%	1.8%	2.4%	3.9%	1.6%	1.6%	2.0%
		Swine	5 0.8% 6	25 1.1% 10	29 1.3% 6	19 1.4% 6	26 0.8% 3	0.5% 1	11 1.3% 4	2.7% 8	15 2.0% 6	7 0.9% 2	7 2.7% 3	0.0% 0
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	5.7% 83	4.4% 65	5.6% 77	4.8% 68	3.8% 76	3.5% 64	2.8%	3.4% 70	2.9%	2.8%	2.1% 50	2.5% 54
	(MIC 2 04 pg/III)	Chicken Breasts	63	05	- //	00	6.7%	4.8%	11.5% 18	4.6% 7	9.9%	5.1%	10.6%	15.2% 42
		Ground Turkey					18.9% 14	27.2% 31	18.3%	20.2%	15.1% 24	23.7% 45	18.0%	6.8%
		Ground Beef					0.0%	0.0%	0.0%	25.0% 2	5.3%	0.0%	8.3%	14.3%
		Pork Chops					10.0%	0.0%	9.1%	0.0%	25.0%	5.6%	0.0%	12.5%
		Chickens	3.2% 18	1.2% 17	4.1% 48	2.4% 31	2.0%	2.8% 32	2.7%	2.5% 49	3.6% 49	3.4% 34	3.4% 21	3.1% 17
		Turkeys	17.1% 41	21.5% 153	21.4% 111	22.9% 126	24.2% 59	16.0% 42	14.4%	19.8% 45	10.5%	16.2% 44	14.2%	10.7%
		Cattle	9.5% 27	7.1% 115	6.6% 92	6.9%	10.1% 102	13.7% 92	8.9% 54	13.1% 43	9.5%	7.7% 34	9.9%	9.0%
		Swine	7.2% 57	6.7% 59	9.3% 42	6.9% 29	4.2% 16	5.7% 12	3.9% 12	5.0% 15	8.6% 26	7.1% 15	3.6%	4.2%
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	18.7% 272	16.7% 250	16.3% 223	17.1% 241	13.2% 264	15.0% 279	12.0% 213	11.1% 225	10.7% 233	10.4%	10.0%	8.9% 196
	( = 0 · pg/iii)	Chicken Breasts					28.3%	26.5% 22	28.0% 44	30.1% 46	36.2% 55	30.3% 30	23.6%	23.1%
		Ground Turkey					37.8% 28	45.6% 52	34.5% 49	44.3% 81	40.9% 65	45.8% 87	58.8% 144	27.9% 53
		Ground Beef					22.2%	40.0%	14.3%	25.0%	10.5%	0.0%	20.8%	28.6%
		Pork Chops					70.0%	40.0%	27.3%	33.3%	25.0%	16.7%	13.0%	37.5%
		Chickens	27.8% 156	27.5% 396	28.6% 335	21.0% 275	22.9% 343	19.6% 227	22.2%	23.3% 464	21.2% 293	19.3% 192	25.2% 157	30.5% 168
		Turkeys	40.8% 98	43.6%	41.9% 217	46.7% 257	37.7% 92	29.4% 77	33.9% 80	40.1% 91	28.9% 88	34.7% 94	32.4% 48	38.8% 47
		Cattle	16.2% 46	15.4% 248	21.3% 296	20.3%	25.9% 261	28.7% 192	20.9%	24.3%	23.7%	19.8% 87	23.0%	22.0% 44
		Swine	29.4% 233	29.3% 257	39.2% 177	35.6% 149	40.1% 152	30.8% 65	36.4% 112	36.5% 110	26.3% 80	27.0% 57	29.7%	29.2% 35

Table 8b. Antimicrol	bial Resistance an	nong all Non-Ty	/phoidal	Salmone	ella Isola	tes from	Humans,	, Retail M	leats, and	Food A	nimals, b	y Year, 1	998-2009	)
Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested		Humans	1455	1493	1372	1410	1998	1855	1782	2034	2173	2144	2380	2192
		Chicken Breasts					60	83	157	153	152	99	199	277
		Ground Turkey					74	114	142	183	159	190	245	190
		Ground Beef Pork Chops					9 10	10 5	14 11	8 9	19 8	13 18	24 23	14 8
			504	4400	4470	4007								
		Chickens Turkeys	561 240	1438 713	1173 518	1307 550	1500 244	1158 262	1280 236	1989 227	1380 304	994 271	624 148	551 121
		Cattle	284	1610	1388	893	1008	670	607	329	389	439	443	200
		Swine	793	876	451	418	379	211	308	301	304	211	111	120
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase	Amoxicillin-		1.7%	2.3%	3.9%	4.7%	5.3%	4.6%	3.7%	3.2%	3.7%	3.3%	3.1%	3.4%
Inhibitor Combinations	Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans	25	34	54	66	106 10.0%	86 25.3%	66 24.8%	65 21.6%	81 19.1%	70 16.2%	73 22.6%	75 37.2%
		Chicken Breasts					6 12.2%	21 11.4%	39 7.7%	33 8.7%	29 5.0%	16 5.3%	45 5.3%	103 5.8%
		Ground Turkey					9	13	11	16	8	10	13	11
		Ground Beef					22.2% 2	40.0% 4	14.3% 2	0.0%	0.0%	0.0% 0	8.3% 2	14.3% 2
		Pork Chops					20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0% 2
		Chickens	2.0% 11	4.9% 70	7.3% 86	4.5% 59	10.2% 153	9.7% 112	12.4% 159	12.1% 241	12.9% 178	15.6% 155	8.7% 54	12.9% 71
		Turkeys	0.4%	4.3%	3.5%	6.9%	3.7%	1.5%	4.7%	3.5%	5.6%	11.1%	5.4%	13.2%
		Cattle	2.5%	31 3.9%	18 9.9%	38 11.8%	9 17.7%	21.0%	11 13.5%	8 21.0%	18.5%	30 15.5%	16.5%	16 15.0%
			7 0.4%	62 1.0%	138 1.8%	105 2.6%	178 3.7%	141 3.8%	82 1.9%	69 4.3%	72 2.3%	68 3.3%	73 4.5%	30 4.2%
Cephems	Cefoxitin	Swine	3	9	8 3.2%	11 3.4%	14 4.3%	8 4.3%	6 3.4%	13 3.0%	7 3.5%	7 2.9%	5 3.0%	5 3.2%
	(MIC ≥ 32 μg/ml)	Humans			44	48	86	79	61	62	77	63	72	71
		Chicken Breasts					10.0% 6	25.3% 21	24.8% 39	20.9% 32	18.4% 28	15.2% 15	21.6% 43	32.5% 90
		Ground Turkey					8.1% 6	2.6%	4.9% 7	7.1% 13	5.0% 8	5.3% 10	4.5% 11	5.8% 11
		Ground Beef					22.2% 2	40.0% 4	14.3% 2	0.0%	0.0%	0.0%	8.3% 2	14.3% 2
		Pork Chops					20.0%	20.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	25.0% 2
		Chickens			7.2% 85	4.1% 53	8.7% 130	8.2% 95	12.4% 159	12.0% 238	12.8% 176	13.0% 129	8.0% 50	11.4% 63
		Turkeys			3.3% 17	4.5% 25	2.5%	1.1%	5.1% 12	3.5%	5.3% 16	9.2% 25	5.4%	12.4% 15
		Cattle			9.1%	11.1%	15.9%	17.8%	13.2%	19.8%	17.7%	15.0%	14.7%	13.5%
		Swine			126	99	160 2.9%	4.3%	1.9%	65 3.7%	2.0%	2.8%	65 4.5%	4.2%
	Ceftiofur	Humans	0.8%	2.0%	6 3.2%	9 4.1%	11 4.4%	9 4.5%	6 3.4%	11 2.9%	6 3.6%	6 3.3%	5 3.0%	5 3.4%
	(MIC ≥ 8 µg/ml)		12	30	44	58	87 10.0%	83 25.3%	60 24.8%	60 20.9%	79 19.1%	70 16.2%	72 22.6%	75 36.8%
		Chicken Breasts					6	21	39	32	29	16	45	102
		Ground Turkey					8.1% 6	2.6% 3	4.9% 7	7.1% 13	5.0% 8	5.3% 10	4.5% 11	5.8% 11
		Ground Beef					22.2% 2	40.0% 4	14.3% 2	0.0%	0.0%	0.0%	8.3% 2	14.3% 2
		Pork Chops					20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0% 2
		Chickens	2.0% 11	5.2% 75	7.6% 89	4.1% 54	10.2% 153	9.8% 113	12.4% 159	12.2% 242	12.8% 177	15.4% 153	8.7% 54	12.7% 70
		Turkeys	0.4%	4.6%	3.3%	5.1%	3.3%	1.5%	4.7%	3.5%	5.3%	11.1%	5.4%	12.4%
		Cattle	2.1%	33 4.2%	17 9.8%	28 11.4%	17.4%	21.0%	11 13.3%	8 21.6%	16 18.8%	30 15.5%	8 16.3%	15 14.5%
		Swine	0.1%	1.9%	136	102 2.2%	175 3.2%	4.3%	1.9%	71 3.7%	2.0%	2.8%	72 4.5%	4.2%
	Ceftriaxone	Humans	0.8%	17 2.0%	6 3.2%	9 3.7%	12 4.4%	9 4.4%	6 3.3%	11 2.9%	6 3.7%	6 3.3%	5 3.0%	5 3.4%
	(MIC ≥ 4 μg/ml)		12	30	44	52	87 10.0%	81 26.5%	59 24.8%	59 21.6%	80 19.1%	70 16.2%	72 22.6%	75 37.5%
		Chicken Breasts					6 8.1%	22 2.6%	39 5.6%	33 7.1%	29 5.0%	16 5.8%	45 4.5%	104 5.8%
		Ground Turkey					6 22.2%	3 40.0%	8 14.3%	13	8 0.0%	11 0.0%	11 8.3%	11 14.3%
		Ground Beef					2	4	2	0	0	0	2	2
		Pork Chops					20.0% 2	20.0% 1	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	25.0% 2
		Chickens	1.8% 10	4.6% 66	7.4% 87	4.1% 54	9.9% 149	9.7% 112	12.3% 158	12.2% 242	12.8% 177	15.6% 155	8.7% 54	12.9% 71
		Turkeys	0.4% 1	4.2% 30	3.1% 16	4.7% 26	3.3% 8	1.1% 3	4.7% 11	3.5% 8	5.3% 16	11.1% 30	5.4% 8	12.4% 15
		Cattle	2.1%	3.9% 63	9.9% 137	11.3% 101	17.3% 174	21.0% 141	13.5% 82	20.7%	18.5% 72	15.9% 70	16.0% 71	14.5% 29
		Swine	0.1%	1.3%	1.3%	2.2%	2.9%	4.3%	1.6%	3.7%	1.6%	2.4%	4.5%	4.2%
		l	1	11	6	9	11	9	5	11	5	5	5	5

Table 8c. Antimicrob	oial Resistance ar	mong all Non-Ty												
Year Number of Isolates Tested		Humans	<b>1998</b> 1455	<b>1999</b> 1493	<b>2000</b> 1372	<b>2001</b> 1410	<b>2002</b> 1998	<b>2003</b> 1855	<b>2004</b> 1782	<b>2005</b> 2034	<b>2006</b> 2173	<b>2007</b> 2144	<b>2008</b> 2380	<b>2009</b> 2192
		Chicken Breasts Ground Turkey Ground Beef Pork Chops					60 74 9 10	83 114 10 5	157 142 14 11	153 183 8 9	152 159 19 8	99 190 13 18	199 245 24 23	277 190 14 8
		Chickens Turkeys	561 240	1438 713	1173 518	1307 550	1500 244	1158 262	1280 236	1989 227	1380 304	994 271	624 148	551 121
		Cattle Swine	284 793	1610 876	1388 451	893 418	1008 379	670 211	607 308	329 301	389 304	439 211	443 111	200 120
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole 1	Humans	19.5% 283	18.0% 269	17.1% 234	17.8% 251	12.9% 258	15.1% 280	13.3% 237	12.6% 256	12.1% 263	12.3% 264	10.1% 241	9.9% 217
	(MIC ≥ 512 μg/ml)	Chicken Breasts	200	200	204	201	16.7% 10	14.5% 12	28.7% 45	17.0% 26	23.0%	25.3% 25	39.2% 78	48.0% 133
		Ground Turkey					20.3%	33.3% 38	28.2%	34.4% 63	32.1% 51	34.7% 66	27.4% 67	20.0%
		Ground Beef					22.2%	40.0%	14.3%	25.0%	10.5%	7.7%	20.8%	35.7%
		Pork Chops					70.0%	40.0%	18.2%	33.3%	75.0%	16.7%	30.4%	5 37.5%
		Chickens	23.7%	15.9%	18.4%	11.8%	8.9%	10.3%	11.9%	8.5%	10.7%	10.4%	13.3%	10.0%
		Turkeys	133 32.1%	229 36.0%	216 25.1%	154 38.0%	133 30.3%	119 28.2%	152 36.4%	169 37.0%	148 27.3%	103 25.5%	83 24.3%	55 28.9%
		Cattle	77 15.5%	257 15.0%	130 19.9%	209 19.7%	74 22.3%	74 25.1%	86 22.7%	84 27.4%	83 24.2%	69 21.6%	36 24.8%	35 24.5%
		Swine	44 29.0%	242 30.7%	276 35.7%	176 34.9%	225 34.6%	168 25.1%	138 37.0%	90 32.9%	94 26.6%	95 30.8%	110 31.5%	49 30.8%
	Trimethoprim-	Humans	230	269	161 2.0%	146 2.0%	131 1.4%	53 1.9%	114 1.7%	99 1.7%	1.7%	65 1.5%	35 1.6%	37 1.7%
	Sulfamethoxazole (MIC ≥ 4 / 76 µg/ml)	Chicken Breasts	34	30	28	28	28 0.0%	36 0.0%	31 0.0%	0.0%	36 1.3%	0.0%	37 0.0%	38 0.4%
		Ground Turkey					0 1.4%	0.0%	0.0%	0 0.5%	0.0%	0.5%	0 0.4%	1.6%
		Ground Beef					0.0%	0.0%	0 7.1%	0.0%	0.0%	1 0.0%	0.0%	0.0%
							0 20.0%	0.0%	1 0.0%	0 11.1%	0 50.0%	0 5.6%	0.0%	0 25.0%
		Pork Chops	1.2%	1.1%	0.4%	0.5%	2 0.8%	0.3%	0	1 0.2%	4 0.1%	1 0.0%	0.3%	2 0.2%
		Chickens	7 2.5%	16 4.2%	5 1.5%	6 2.5%	12 2.5%	2.3%	3 0.8%	1.8%	1.0%	0 1.1%	2 1.4%	1.7%
		Turkeys	6 2.5%	30 2.4%	8 2.2%	14 2.6%	6 2.5%	6 3.3%	2 1.5%	4.9%	3 4.6%	3.0%	2 4.5%	2 1.5%
		Cattle	7 0.3%	39 1.1%	30 0.9%	23	25 1.6%	22 2.4%	9	16 2.3%	18 2.0%	13 1.9%	20 2.7%	3 2.5%
Penicillins	Ampicillin	Swine	2	10 15.5%	4	0 17.5%	6	5	5 12.1%	7	6	4 10.1%	3 9.7%	3 9.9%
	(MIC ≥ 32 μg/ml)	Humans	241	232	218	247	259 16.7%	253 33.7%	216 30.6%	232	238	217	231 29.2%	216 45.8%
		Chicken Breasts					10 16.2%	28 28.9%	48	41 26.8%	34 25.8%	18 42.6%	58 50.6%	127 57.9%
		Ground Turkey					12 22.2%	33	29 21.4%	49 25.0%	41	81 0.0%	124 12.5%	110
		Ground Beef					2	4	3 9.1%	2	2	0	3	4 37.5%
		Pork Chops	40.0%	40.4%	40.00/	0.40/	40.0%	40.0%	1	22.2%	25.0%	5.6%	13.0%	3
		Chickens	12.8% 72	12.4% 179	13.0% 152	9.4%	14.3% 215	13.7% 159	14.5% 185	14.0% 279	14.9% 205	17.0% 169	10.6%	13.8% 76
		Turkeys	10.4% 25	17.7% 126	16.2% 84	19.5% 107	18.0% 44	18.7% 49	22.0% 52	22.9% 52	25.3% 77	36.9% 100	32.4% 48	38.8% 47
		Cattle	9.2% 26	12.5% 202	18.7% 259	17.9% 160	23.9% 241	28.1% 188	19.3% 117	26.7% 88	22.4% 87	20.0% 88	21.7% 96	22.5% 45
		Swine	12.9% 102	10.8% 95	18.8% 85	11.7% 49	13.7% 52	12.8% 27	16.2% 50	13.6% 41	11.5% 35	18.0% 38	14.4% 16	19.2% 23
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	10.0% 145	9.2% 137	10.1% 138	11.6% 164	8.6% 172	10.1% 187	7.6% 136	7.8% 159	6.4% 139	7.3% 156	6.2% 147	5.7% 125
		Chicken Breasts					0.0% 0	2.4% 2	1.9% 3	0.7% 1	2.6% 4	1.0% 1	0.5% 1	0.0%
		Ground Turkey					1.4% 1	0.9% 1	2.8% 4	0.5% 1	0.6% 1	1.6% 3	1.6% 4	1.6% 3
		Ground Beef					22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	0.0% 0	12.5% 3	21.4% 3
		Pork Chops					40.0% 4	40.0% 2	18.2% 2	22.2% 2	0.0%	0.0%	0.0%	12.5% 1
		Chickens	2.9% 16	1.8% 26	4.6% 54	2.5% 33	2.4% 36	2.1%	1.3% 16	1.8%	1.7%	1.8% 18	1.8%	1.6%
					4.1%	3.8%	5.3%	4.2%	4.7%	4.8%	3.9%	5.5%	2.7%	3.3%
		Turkeys	0.8%	4.1% 29										4
		Turkeys Cattle	0.8% 2 5.6% 16	29 8.5% 137	21 15.1% 209	21 16.5% 147	13 20.6% 208	11 25.1% 168	11 17.6% 107	11 21.9% 72	12 19.8% 77	15 20.0% 88	4 19.6% 87	4 21.0% 42

<sup>1</sup> Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

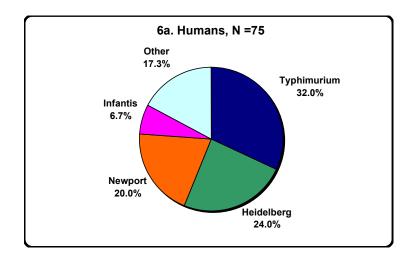
Table 8d. Antimicro	midi Nesisidiice a	mong an Non-1									1		1	1
Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Teste	d	Humans	1455	1493	1372	1410	1998	1855	1782	2034	2173	2144	2380	2192
		Chicken Breasts					60	83	157	153	152	99	199	277
		Ground Turkey					74	114	142	183	159	190	245	190
		Ground Beef					9	10	14	8	19	13	24	14
		Pork Chops					10	5	11	9	8	18	23	8
		Chickens	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551
		Turkeys	240	713	518	550	244	262	236	227	304	271	148	121
		Cattle	284	1610	1388	893	1008	670	607	329	389	439	443	200
		Swine	793	876	451	418	379	211	308	301	304	211	111	120
	Antimicrobial													
	(Resistance	Isolate												
Antimicrobial Class	Breakpoint)	Source												
Quinolones	Ciprofloxacin	Humans	0.1%	0.1%	0.4%	0.2%	<0.1%	0.2%	0.2%	<0.1%	0.1%	0.1%	<0.1%	0.0%
	(MIC ≥ 4 μg/ml)	Tamano	1	1	5	3	1	3	4	1	2	2	2	1
		Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chilokon Brodoto					0	0	0	0	0	0	0	0
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
							0	0	0	0	0	0	0	0
		Ground Beef					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
							0	0	0	0	0	0	0	0
		Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
							0	0	0	0	0	0	0	0
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	1	0	0	0	0	0	0
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0	0
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0	0	0	0	0	0	0	0	0	0	0	0
		Swine	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Natidivia Asid		1.3%	0.9%	2.3%	2.3%			2.2%	1.9%	2.4%	2.3%	2.0%	_
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	1.5%	14	32	32	1.6%	1.9%	39			49	47	1.8% 39
	(WIIC ≥ 32 μg/III)		19	14	32	32	32 0.0%	36 1.2%	0.0%	38 0.7%	52 0.7%	0.0%	0.0%	0.4%
		Chicken Breasts					0.0%	1.270	0.0%	1	1	0.0%	0.0%	1
							8.1%	4.4%	0.0%	1.1%	0.0%	2.6%	0.4%	0.0%
		Ground Turkey					6	5	0.070	2	0.070	5	1	0.078
							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%
		Ground Beef					0.070	0.070	0.070	0.070	0.070	0.070	0.070	2
							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Pork Chops					0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
			0.2%	0.2%	0.5%	0.0%	0.8%	0.4%	0.5%	0.3%	0.1%	0.1%	0.0%	0.0%
		Chickens	1	3	6	0.070	12	5	6	6	2	1	0	0.070
			2.1%	5.3%	5.4%	5.1%	5.3%	3.8%	2.1%	2.2%	0.7%	1.1%	0.7%	0.8%
		Turkeys	5	38	28	28	13	10	5	5	2	3	1	1
		Cattle	0.4%	0.1%	0.4%	0.4%	0.4%	0.4%	2.0%	1.5%	0.5%	0.7%	0.7%	1.0%
		Cattle	1	1	6	4	4	3	12	5	2	3	3	2
		Swine	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%
		Swine	0	0	1	0	1	0	0	1	0	0	0	0
Tetracyclines	Tetracycline	Humane	20.3%	19.4%	18.7%	19.9%	14.9%	16.3%	13.6%	13.9%	13.5%	14.5%	11.6%	11.9%
	(MIC ≥ 16 μg/ml)	Humans	295	289	256	280	298	303	242	282	293	310	275	261
		Chicken Breasts					33.3%	27.7%	46.5%	43.8%	46.7%	41.4%	46.7%	59.9%
		OHICKEH DIEdolS					20	23	73	67	71	41	93	166
		Ground Turkey					55.4%	39.5%	56.3%	39.9%	56.0%	67.4%	66.1%	65.3%
		Ground runkey					41	45	80	73	89	128	162	124
		Ground Beef					22.2%	40.0%	14.3%	12.5%	21.1%	0.0%	20.8%	42.9%
		Stourid Deel					2	4	2	1	4	0	5	6
		Pork Chops					70.0%	80.0%	54.5%	55.6%	25.0%	50.0%	34.8%	37.5%
		7 OIK OHOPS					7	4	6	5	2	9	8	3
		Chickens	20.5%	25.0%	26.3%	21.9%	24.9%	26.2%	27.4%	28.3%	31.8%	35.5%	30.4%	33.9%
		Offickeris	115	359	308	286	374	303	351	563	439	353	190	187
		Turkeys	45.8%	52.9%	56.2%	54.9%	54.5%	58.8%	48.3%	54.6%	61.8%	73.8%	64.2%	63.6%
		iuikeys	110	377	291	302	133	154	114	124	188	200	95	77
														00.00/
		Cattle	24.3%	20.9%	25.8%	26.3%	32.0%	36.9%	31.8%	34.0%	30.3%	27.3%	29.3%	29.0%
		Cattle	24.3% 69	20.9% 336	25.8% 358	26.3% 235	32.0% 323	36.9% 247	31.8% 193	34.0% 112	30.3% 118	27.3% 120	29.3% 130	29.0% 58
		Cattle Swine												

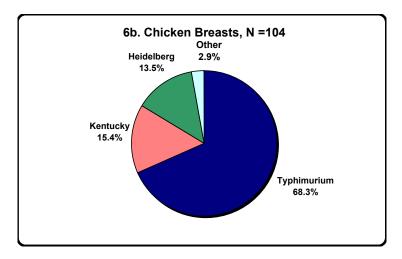
## **Ceftriaxone Resistance**

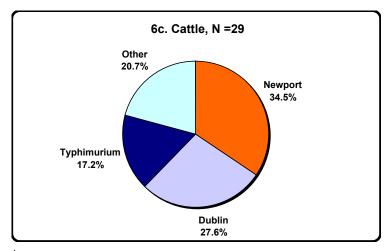
Table 9. Ceftriaxone-Resistant Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Source and Serotype, 2009

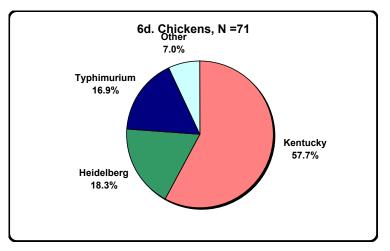
	Humans				Retail Meats	3			Food Anima	als	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans	Typhimurium	24	32.0	Chicken	Typhimurium	71	68.3	Chickens	Kentucky	41	57.7
(N=75)	Heidelberg	18	24.0	Breasts	Kentucky	16	15.4	(N=71)	Heidelberg	13	18.3
(14 10)	Newport	15	20.0	(N=104)	Heidelberg	14	13.5	(14 / 1)	Typhimurium	12	16.9
	Infantis	5	6.7	, ,	I 4,12:nonmotile	1	1.0		I 4,[5],12:i:-	2	2.8
	I 4,[5],12:i:-	2	2.7		Agona	1	1.0		Cerro	1	1.4
	Agona	2	2.7		Enteritis	1	1.0		Enteritidis	1	1.4
	Bardo	2	2.7		Littorido	•	1.0		Entertido	•	
	Dublin	2	2.7								
	Derby	1	1.3	Ground	Senftenberg	3	27.3	Turkeys	Agona	7	46.7
	Javiana	1	1.3	Turkey	Derby	2	18.2	(N=15)	Senftenberg	2	13.3
	Paratyphi B var. L(+) tartrate+	1	1.3	(N=11)	Agona	1	9.1	Ĭ ,	Anatum	1	6.7
	Schwarzengrund	1	1.3		Alachua	1	9.1		Derby	1	6.7
	Unknown serotype	1	1.3		Albany	1	9.1		Heidelberg	1	6.7
	3.				Heidelberg	1	9.1		Infantis	1	6.7
					Infantis	1	9.1		Newport	1	6.7
					Schwarzengrund	1	9.1		Typhimurium	1	6.7
				Ground	Dublin	2	100.0	Cattle	Newport	10	34.5
				Beef				(N=29)	Dublin	8	27.6
				(N=2)					Typhimurium	5	17.2
									III 61:-:1,5,7	1	3.4
									Agona	1	3.4
									Give	1	3.4
									Meleagridis	1	3.4
									Montevideo	1	3.4
									Rough O:g,p:-	1	3.4
				Pork	Heidelberg	1	50.0	Swine	Agona	2	40.0
				Chops	Infantis	1	50.0	(N=5)	Derby	1	20.0
				(N=2)					Havana	1	20.0
									Johannesburg	1	20.0

Figures 6a-d. Ceftriaxone-Resistant Non-Typhoidal Salmonella Isolates, by Source and Serotype, 2009<sup>1</sup>









<sup>&</sup>lt;sup>1</sup>Pie charts are not provided for other sources due to the small number of ceftriaxone-resistant isolates. Table 9 shows a complete listing of ceftriaxone-resistant isolates by source and serotype

Figure 7. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftriaxone, by Year, 1996-2009

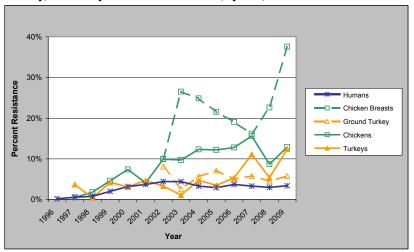
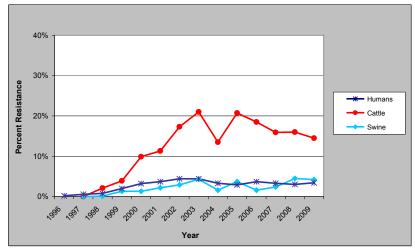


Figure 8. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Cattle, and Swine Resistant to Ceftriaxone, by Year, 1996-2009<sup>1</sup>



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

Table 10. Number of Non-Typhoidal Salmonella Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2009

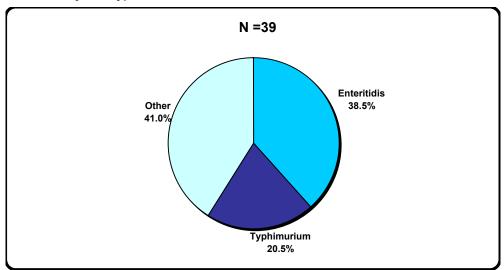
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	1318	1297	1455	1493	1372	1410	1998	1855	1782	2034	2173	2144	2380	2192
Chicken Breasts							60	83	157	153	152	99	199	277
<b>Ground Turkey</b>							74	114	142	183	159	190	245	190
Ground Beef							9	10	14	8	19	13	24	14
Pork Chops							10	5	11	9	8	18	23	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551
Turkeys		107	240	713	518	550	244	262	236	227	304	271	148	121
Cattle		24	284	1610	1388	893	1008	670	607	329	389	439	443	200
Swine		111	793	876	451	418	379	211	308	301	304	211	111	120

#### **Nalidixic Acid Resistance**

Table 11. Naldixic Acid-Resistant Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals. by Source and Serotype. 2009

	Humans				Retail Me	ats			Food Anin	nals	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=39)	Enteritidis Typhimurium Virchow Nitra Agona Derby Dublin Hadar Infantis Javiana Kentucky Saintpaul	15 8 3 2 1 1 1 1 1 1 1 1	38.5 20.5 7.7 5.1 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6	Chicken Breasts (N=1)	Enteritdis	1	100.0	Chickens (N=0)			
	Unknown serotype Partially serotyped	2	5.1 2.6	Ground Turkey (N=0)				Turkeys (N=1)	Bredeney	1	100.0
				Ground Beef (N=2)	Dublin	2	100.0	Cattle (N=2)	Dublin	2	100.0
				Pork Chops (N=0)				Swine (N=0)			

Figure 9. Nalidixic Acid-Resistant Non-Typhoidal *Salmonella* Isolates from Humans, by Serotype, 2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Pie charts are not provided for other sources due to the small number of nalidixic acid-resistant isolates. Table 11 above shows a complete listing of nalidixic acid-resistant isolates by source and serotype

Figure 10. Percent of Non-Typhoidal *Salmonella* Isolates from Humans, Retail Poultry, and Poultry Resistant to Nalidixic Acid, by Year, 1996-2009

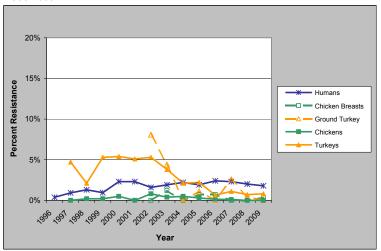
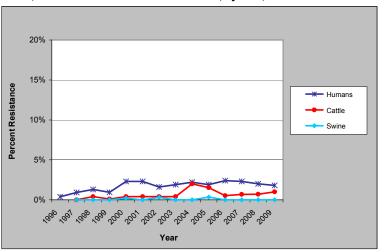


Figure 11. Percent of non-Typhoidal *Salmonella* Isolates from Humans, Cattle, and Swine Resistant to Nalidixic Acid, by Year, 1996-2009 <sup>1</sup>



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

Table 12. Number of Non-Typhoidal Salmonella Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2009

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	1318	1297	1455	1493	1372	1410	1998	1855	1782	2034	2173	2144	2380	2192
Chicken Breasts							60	83	157	153	152	99	199	277
Ground Turkey							74	114	142	183	159	190	245	190
Ground Beef							9	10	14	8	19	13	24	14
Pork Chops							10	5	11	9	8	18	23	8
Chickens		214	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551
Turkeys		107	240	713	518	550	244	262	236	227	304	271	148	121
Cattle		24	284	1610	1388	893	1008	670	607	329	389	439	443	200
Swine		111	793	876	451	418	379	211	308	301	304	211	111	120

#### Resistance among Top Salmonella Serotypes

Table 13. Number of Resistant Non-Typhoidal Salmonella Isolates from Humans, by Serotype, 2009

												Numb	er of R	esista	nt Isol	ates by	Antimi	crobial Agent	<sup>1</sup> and Class			
					n Res	Antimi istano 4-5	ce Pat	ttern	Aminogl	ocos	ides	β-Lactam/β- Lactamase Inhibitor Combinations	C	epher	ns		late iway oitors	Penicillins	Phenicols	Quine	olones	Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Nun	nber c	of Isol	ates		AMI GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Enteritidis	410	18.7%	377	23	8	2				1	5					7	3	16			15	5
Typhimurium	371	16.9%	236	12	34	75	13	1	7	18	96	23	20	24	24	111	11	104	76		8	107
Newport	236	10.8%	212	4	4	1	15		1	3	18	16	14	15	15	19	1	18	16			19
Javiana	105	4.8%	103	1		1						1	1	1	1			2			1	
Heidelberg	86	3.9%	52	4	15	13	2		2	18	20	18	17	18	18	6	3	24	4			24
I 4,[5],12:i-	72	3.3%	55	5	5	6	1		2		9	3	2	2	2	10	1	8	6			12
Oranienburg	64	2.9%	64																			
Saintpaul	57	2.6%	51	2	3	1			2		1					3	1	2	1		1	3
Montevideo	56	2.6%	52		4				4	1	3					4						1
Braenderup	46	2.1%	46																			
Infantis	44	2.0%	37		3	2	2			3	3	4	5	5	5	3	1	6	2		1	5
Others	645	29.4%	538	34	49	16	7	1	10	10	41	10	12	10	10	54	17	36	20	1	13	85
Total	2192	100.0%	1823	85	125	117	40	2	28	54	196	75	71	75	75	217	38	216	125	1	39	261

AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole

COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 14. Number of Resistant Non-Typhoidal Salmonella Isolates from Chicken Breasts, by Serotype, 2009

											Numb	er of R	esista	nt Isc	lates by	/ Antimi	crobial Agent	<sup>1</sup> and Class			
					n Res		crobial e Pattern 6-7 8	Aminogl	ocos	ides	β-Lactam/β- Lactamase Inhibitor Combinations	C	epher	ns	Pat	late hway pitors	Penicillins	Phenicols	Quine	olones	Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Nun	nber o	f Isola	ates	AMI GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Typhimurium	123	44.4%	3		45	44	31	3	34	19	71	58	70	71	119		84				118
Heidelberg	45	16.2%	28		13	4		1	7	6	14	14	14	14	1		14				7
Kentucky	44	15.9%	7	2	23	12		1		31	16	16	16	16	2		17				30
Enteritidis	27	9.7%	20	6		1					1	1	1	1	1	1	5			1	1
I 4[5],12:i:-	8	2.9%	6		2			1		1					2						2
Other	30	10.8%	17	4	5	4		4	1	7	1	1	1	2	8		7				8
Total	277	100.0%	81	12	88	65	31	10	42	64	103	90	102	104	133	1	127				166

<sup>&</sup>lt;sup>1</sup> AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 15. Number of Resistant Non-Typhoidal Salmonella Isolates from Ground Turkey, by Serotype, 2009

											Numb	er of R	esista	ant Iso	ates by	Antimi	crobial Agent	<sup>1</sup> and Class			
					n Res	intimicrobia istance Patt 4-5 6-7	ern	Aminogl	ocos	des	β-Lactam/β- Lactamase Inhibitor Combinations	C	ephei	ns	Pati	late nway pitors	Penicillins	Phenicols	Quin	olones	Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Nur	nber o	of Isolates		AMI GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Saintpaul	76	40.0%	7	5	58	6		3	1	8					6	3	65				67
Hadar	20	10.5%		1	19			2	3	15					2		11				18
IIIa 18:z4,z23:-	18	9.5%	18																		
Heidelberg	10	5.3%	1		6	3		7	2	6	1	1	1	1	5		8				6
Senftenberg	10	5.3%	3		4	1 2		3	3	3	3	3	3	3	4		6	2			1
I 4,12:d:-	9	4.7%		6	3										2		2				9
Schwarzengrund	9	4.7%	4	1	3	1		1	1	1	1	1	1	1	2		2				4
Albany	6	3.2%	3		2	1		2		3	1	1	1	1	2		2				2
Derby	5	2.6%			3	2		3		3	2	2	2	2	3		2				5
I 4,5,12:r:-	4	2.1%				4		4		4					4		4				4
Montevideo	4	2.1%		4				1	2	3											
Other	19	10.0%	6	2	8	1 2		9	1	7	3	3	3	3	8		8	1			8
Total	190	100.0%	42	19	106	18 5		35	13	53	11	11	11	11	38	3	110	3			124

AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 16. Number of Resistant Non-Typhoidal Salmonella Isolates from Ground Beef, by Serotype, 2009

										Numb	er of R	esista	ant Isol	ates by	Antimi	crobial Agent	<sup>1</sup> and Class			
				ses in Re	Antimicrob sistance Pa 4-5 6-7	attern	Aminogl	ocosi	des	β-Lactam/β- Lactamase Inhibitor Combinations	C	ephei	ms	Pati	late nway pitors	Penicillins	Phenicols	Quino	olones	Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Number	of Isolates		AMI GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Montevideo	4	28.6%	4																	
Dublin	3	21.4%			1	2		2	3	2	2	2	2	3		2	3		2	3
Saintpaul	3	21.4%		1	2		2		1					2		2				3
Newport	2	14.3%	2																	
Give	1	7.1%	1																	
Muenster	1	7.1%	1																	
Total	14	100.0%	8	1	3	2	2	2	4	2	2	2	2	5	-	4	3	-	2	6

<sup>1</sup> AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 17. Number of Resistant Non-Typhoidal Salmonella Isolates from Pork Chops, by Serotype, 2009

							Numb	er of R	esista	nt Isol	ates by	Antimi	crobial Agent	1 and Class			
				ses in Resi	ntimicrobial stance Pattern 4-5 6-7 8	Aminoglocosides	β-Lactam/β- Lactamase Inhibitor Combinations	C	epher	ns	Path	late iway oitors	Penicillins	Phenicols	Quine	olones	Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Number of	f Isolates	AMI GEN KAN STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Derby	3	37.5%	2	1		1					1						1
Infantis	2	25.0%	1	1			1	1	1	1			1				
Heidelberg	1	12.5%			1	1 1	1	1	1	1	1	1	1				1
Ohio	1	12.5%	1														
Typhimurium	1	12.5%			1	1					1	1	1	1			1
Total	8	100.0%	4	2	1 1	1 3	2	2	2	2	3	2	3	1			3

AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 18. Number of Resistant Non-Typhoidal Salmonella Isolates from Chickens, by Serotype, 2009

								Number of Resistant Isolates by Antimicrobial Agent <sup>1</sup> and Class														
				Number of Antimicrobial Classes in Resistance Pattern 0 1 2-3 4-5 6-7 8				Aminoglocosides			des	β-Lactam/β- Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Penicillins	Phenicols	Quinolones		Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Nun	nber o	f Isol	ates	AMI GEI	N KA	λN	STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Kentucky	214	38.8%	74	25	74	37	4	5	5	5	117	41	37	40	41	5		42	4			123
Enteritidis	118	21.4%	114	2	1	1						1		1	1			3				3
Heidelberg	74	13.4%	41	6	20	3	4	17	9	9	20	13	13	13	13	16		15	4			11
Typhimurium	36	6.5%	12	3	12	7	2		3	3	2	12	10	12	12	19	1	12				20
I 4,[5],12:i:-	21	3.8%	16	2	2	1		1			2	2	1	2	2	2		2				2
I 8,20:-:z6	13	2.4%		3	10						10					5						13
Other	75	13.6%	52	4	17	2		8			17	2	2	2	2	8		2	1			15
Total	551	99.9%	309	45	136	51	10	31	1	7	168	71	63	70	71	55	1	76	9		•	187

<sup>1</sup> AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 19. Number of Resistant Non-Typhoidal Salmonella Isolates from Turkeys, by Serotype, 2009

				Number of Resistant Isolat										lates by	/ Antim	crobial Agent	<sup>1</sup> and Class				
				Number of Antimicrobial Classes in Resistance Pattern 0 1 2-3 4-5 6-7 8					Aminoglocosides			Cephems			Pat	late hway pitors	Penicillins	Phenicols	Quinolones		Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Nun	nber c	of Isol	ates	AMI GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Hadar	32	26.4%		3	29			1	4	22					1		17				32
Saintpaul	18	14.9%	3	3	11	1		2	4						4	1	8				12
Agona	15	12.4%	2		8	2	3	2		5	7	7	7	7	11	1	8	3			9
Schwarzengrund	7	5.8%	3	3	1			1		1							1				4
Senftenberg	7	5.8%	3	1	2		1	2	1	1	2	2	2	2	1		3				1
IIIa 18:z4,z23:-	6	5.0%	6																		
Albany	5	4.1%	2	1	2			2		2					3						
Derby	4	3.3%		1	1	1	1	1		1	1	1	1	1	3		2	1			4
Heidelberg	3	2.5%	1		1	1		1	2	2	1	1	1	1			2				2
Muenchen	3	2.5%	1		2					2					2						2
Newport	3	2.5%			2		1	2	1	2	1	1	1	1	3		1				1
Other	18	14.9%	3	3	9	1	2	4	1	9	4	3	3	3	7		5			1	10
Total	121	100.0%	24	15	68	6	8	18	13	47	16	15	15	15	35	2	47	4		1	77

AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 20. Number of Resistant Non-Typhoidal Salmonella Isolates from Cattle, by Serotype, 2009

						Number of Resistant Isolates by Antimicrobial Agent <sup>1</sup> and Class															
				Number of Antimicrobial Classes in Resistance Pattern 0 1 2-3 4-5 6-7 8				Aminoglocosides			β-Lactam/β- Lactamase Inhibitor Combinations	Cephems		ns	Folate Pathway Inhibitors		Penicillins	Phenicols	Quino	olones	Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Num	ber c	of Isol	ates	AMI GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AMP	CHL	CIP	NAL	TET
Montevideo	59	29.5%	55	3			1			1	1	1	1	1	1		1	1			4
Dublin	21	10.5%	4	1		8	8	2	7	11	9	8	8	8	15		11	15		2	15
Typhimurium	18	9.0%	1	1	2	10	4		6	13	5	4	5	5	15	1	15	12			16
Newport	17	8.5%	5			2	10		1	12	10	9	10	10	12		11	9			12
Kentucky	10	5.0%	10																		
Cerro	9	4.5%	9																		
Meleagridis	8	4.0%	7		1						1	1	1	1			1				
Anatum	7	3.5%	5	2																	2
Muenchen	6	3.0%	5	1																	1
Agona	5	2.5%	3			1	1		1	2	1	1	1	1	2	1	1	2			2
Muenster	4	2.0%	4																		
Other	36	18.0%	29	2	1	2	2	2	3	5	3	3	3	3	4	1	5	3			6
Total	200	100.0%	137	10	4	23	26	4	18	44	30	27	29	29	49	3	45	42		2	58

AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 21. Number of Resistant Non-Typhoidal Salmonella Isolates from Swine, by Serotype, 2009

									Numb	/ Antim	nicrobial Agent <sup>1</sup> and Class								
				Number of Antimicrobial Classes in Resistance Pattern 0 1 2-3 4-5 6-7 8				Aminoglocosides	β-Lactam/β- Lactamase Inhibitor Combinations	Cephems			Pati	late hway pitors	Penicillins	Phenicols	Quinolones		Tetracyclines
Salmonella Serotype	No. of Isolates	% of Isolates		Num	nber o	of Isolates		AMI GEN KAN STR	AMC	FOX	TIO	AXO	FIS	СОТ	AMP	CHL	CIP	NAL	TET
Derby	24	20.0%	4	5	14	1		14	1	1	1	1	15	1	1	1			20
Typhimurium	20	16.7%		1	4	15		16					18	1	16	15			20
Johannesburg	11	9.2%	4	6	1				1	1	1	1			1				6
Anatum	10	8.3%	5	5															5
Infantis	10	8.3%	9		1								1		1				1
Adelaide	5	4.2%	5																
Agona	4	3.3%	2			2		2 2	2	2	2	2	2	1	2	2			2
Bredeney	4	3.3%	3		1			1											1
Heidelberg	4	3.3%		2	2			2 2											4
Saintpaul	4	3.3%	3		1								1		1				1
Other	24	20.0%	18	5	1			1	1	1	1	1			1				4
Total	120	100.0%	53	24	25	15 3	T	5 35	5	5	5	5	37	3	23	18			64

<sup>&</sup>lt;sup>1</sup> AMI= Amikacin, GEN= Gentamicin, KAN= Kanamycin, STR= Streptomycin, AMC= Amoxicillin/Clavulanic Acid, FOX= Cefoxitin, TIO= Ceftiofur, AXO= Ceftriaxone, FIS= Sulfisoxazole COT= Trimethoprim/Sulfamethoxazole, AMP= Ampicillin, CHL= Chloramphenicol, CIP= Ciprofloxacin, NAL= Nalidixic Acid, TET= Tetracycline

Table 22a. Resistance Patterns among all Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009													
Year		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	1455	1493	1372	1410	1998	1855	1782	2034	2173	2144	2380	2192
	Chicken Breasts					60	83	157	153	152	99	199	277
	Ground Turkey					74	114	142	183	159	190	245	190
	Ground Beef					9 10	10	14	8 9	19 8	13 18	24 23	14
	Pork Chops						5	11					8
	Chickens Turkeys	561 240	1438 713	1173 518	1307 550	1500 244	1158 262	1280 236	1989 227	1380 304	994 271	624 148	551 121
	Cattle	284	1610	1388	893	1008	670	607	329	389	439	443	200
	Swine	793	876	451	418	379	211	308	301	304	211	111	120
	Isolate												
Resistance Pattern	Source												
	Humans	72.9%	74.1%	74.5%	72.5%	79.1%	78.0%	80.0%	80.9%	80.5%	81.1%	84.0%	83.2%
1. No Resistance Detected		1060	1107	1022	1022	1580 51.7%	1447 45.8%	1425 40.1%	1646 46.4%	1749 38.8%	1738 47.5%	1999 45.7%	1823 29.2%
	Chicken Breasts					31.7%	38	63	71	59	47.5%	91	81
	Ground Turkey					37.8%	34.2%	28.9%	30.1%	17.6%	15.3%	20.8%	22.1%
	Glound Turkey					28	39	41	55	28	29	51	42
	Ground Beef					77.8%	60.0%	78.6%	75.0%	73.7%	92.3%	79.2%	57.1%
						7 20.0%	6 20.0%	11 45.5%	6 44.4%	14 25.0%	12 44.4%	19 65.2%	50.0%
	Pork Chops					2	1	5	4	2	8	15	4
	Chickens	58.6%	58.8%	56.9%	66.6%	62.0%	61.1%	62.7%	61.2%	57.2%	53.9%	60.4%	56.1%
	Chickens	329	846	668	871	930	708	803	1217	790	536	377	309
	Turkeys	41.3% 99	32.5% 232	33.4%	31.6% 174	29.9%	24.0%	33.5% 79	27.8%	28.0%	15.5% 42	21.6%	19.8% 24
		73.2%	74.5%	173 70.0%	69.9%	73 64.3%	63 61.0%	65.6%	63 63.2%	85 67.6%	72.0%	32 68.8%	68.5%
	Cattle	208	1200	972	624	648	409	398	208	263	316	305	137
	Swine	49.2%	48.9%	43.2%	43.5%	40.1%	53.6%	37.3%	44.5%	34.5%	43.1%	47.7%	44.2%
		390	428	195	182	152	113	115	134	105	91	53	53
2. Resistant to ≥ 3	Humans	16.3% 237	14.7% 220	15.6% 214	16.7% 236	12.3% 245	14.2% 263	11.4% 204	12.0% 244	11.8% 256	11.1% 239	9.4% 223	9.5% 209
Antimicrobial Classes		231	220	214	230	20.0%	30.1%	34.4%	25.5%	24.3%	25.3%	38.2%	48.4%
7	Chicken Breasts					12	25	54	39	37	25	76	134
	Ground Turkey					21.6%	31.6%	26.1%	29.0%	24.5%	42.6%	51.0%	26.3%
						16	36	37	53	39	81	125	50
	Ground Beef					22.2% 2	40.0% 4	14.3% 2	25.0% 2	10.5% 2	0.0%	20.8% 5	35.7% 5
	Dark Ohana					60.0%	40.0%	18.2%	22.2%	25.0%	5.6%	17.4%	50.0%
	Pork Chops					6	2	2	2	2	1	4	4
	Chickens	13.4%	12.3%	15.1%	10.2%	14.2%	13.5%	15.8%	15.1%	16.4%	17.8%	11.4%	15.6%
		75 23.8%	177 26.2%	177 21.6%	133 30.4%	213 24.2%	156 21.8%	202 27.1%	301 28.2%	226 27.3%	177 33.6%	71 29.7%	86 33.1%
	Turkeys	57	187	112	167	59	57	64	64	83	91	44	40
	Cattle	13.7%	13.3%	19.8%	18.9%	24.5%	29.6%	21.1%	27.7%	23.9%	22.1%	23.5%	26.0%
	Cattle	39	214	275	169	247	198	128	91	93	97	104	52
	Swine	24.0% 190	26.4% 231	34.6% 156	30.6% 128	34.0% 129	23.7% 50	33.4% 103	31.9% 96	22.7% 69	28.0% 59	29.7%	31.7% 38
		12.8%	11.9%	12.7%	13.5%	9.8%	11.4%	9.3%	9.1%	8.1%	8.2%	33 7.4%	7.3%
3. Resistant to ≥ 4	Humans	186	177	174	191	195	211	165	185	177	176	177	159
Antimicrobial Classes	Chicken Breasts					5.0%	16.9%	24.2%	18.3%	15.1%	13.1%	23.1%	34.7%
	Chicken breasts					3	14	38	28	23	13	46	96
	Ground Turkey					13.5% 10	24.6% 28	12.7% 18	7.7% 14	8.2% 13	14.7% 28	15.1% 37	12.1% 23
						22.2%	40.0%	14.3%	12.5%	5.3%	0.0%	12.5%	35.7%
	Ground Beef					2	4	2	1	1	0	3	5
	Pork Chops					40.0%	40.0%	18.2%	22.2%	25.0%	5.6%	13.0%	25.0%
		3.9%	4.9%	6.7%	3.6%	4 7.7%	6.8%	9.8%	2 8.7%	10.3%	1 12.3%	3 7.5%	11.1%
	Chickens	22	71	79	47	115	79	126	174	142	12.3%	47	61
	Turkovo	6.3%	10.8%	10.0%	14.7%	11.1%	9.5%	10.2%	11.5%	12.2%	15.1%	10.1%	11.6%
	Turkeys	15	77	52	81	27	25	24	26	37	41	15	14
	Cattle	9.2%	10.9%	17.4%	16.9%	22.1%	27.5%	18.8%	24.9%	22.1%	21.0%	21.9%	24.5%
		26 11.2%	175 9.8%	242 17.1%	151 9.1%	223 12.7%	184 10.9%	114 15.3%	82 13.3%	86 9.9%	92 17.5%	97 14.4%	49 15.0%
	Swine	89	86	77	38	48	23	47	40	30	37	16	18
	Humans	9.8%	8.5%	9.5%	10.3%	8.2%	9.8%	8.0%	7.2%	6.3%	6.9%	6.6%	6.3%
4. Resistant to ≥ 5		142	127	131	145	164	182	142	146	137	149	157	137
Antimicrobial Classes	Chicken Breasts					3.3% 2	13.3% 11	22.3% 35	17.7% 27	14.5% 22	12.1% 12	19.1% 38	31.4% 87
						12.2%	14.0%	4.9%	2.7%	3.1%	3.2%	2.9%	3.7%
	Ground Turkey					9	16	7	5	5	6	7	7
	Ground Beef					22.2%	40.0%	14.3%	12.5%	5.3%	0.0%	12.5%	14.3%
						2	4 40.0%	2	1	1	0	3	2 25.00/
	Pork Chops					40.0% 4	40.0% 2	9.1% 1	22.2% 2	0.0%	0.0%	0.0%	25.0% 2
	Objete	2.7%	3.0%	5.5%	3.1%	5.7%	4.9%	8.0%	5.9%	6.6%	7.4%	6.1%	7.8%
	Chickens	15	43	64	41	85	57	103	117	91	74	38	43
	Turkeys	0.8%	5.0%	4.8%	6.0%	6.6%	3.1%	5.5%	6.2%	5.9%	7.0%	4.1%	9.1%
		2	36	25	33 15.1%	16 19.3%	22.6%	13	14 23.1%	18	19 18.9%	6	11
	Cattle	4.6% 13	8.0% 128	14.0% 195	15.1% 135	19.3% 195	23.6% 158	17.8% 108	23.1% 76	20.1% 78	18.9% 83	19.0% 84	20.0% 40
	Swins	8.1%	7.3%	9.3%	7.2%	9.0%	9.5%	12.3%	10.3%	5.9%	11.4%	8.1%	14.2%
	Swine	64	64	42	30	34	20	38	31	18	24	9	17

Table 22b. Resistance Patterns among all Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009		1000				****							
Year Number of Isolates Tested	Humans	<b>1998</b> 1455	<b>1999</b> 1493	<b>2000</b> 1372	<b>2001</b> 1410	<b>2002</b> 1998	<b>2003</b> 1855	<b>2004</b> 1782	<b>2005</b> 2034	<b>2006</b> 2173	<b>2007</b> 2144	<b>2008</b> 2380	<b>2009</b> 2192
	Chicken Breasts					60	83	157	153	152	99	199	277
	Ground Turkey					74	114	142	183	159	190	245	190
	Ground Beef Pork Chops					9 10	10 5	14 11	8 9	19 8	13 18	24 23	14 8
	Chickens	561	1438	1173	1307	1500	1158	1280	1989	1380	994	624	551
	Turkeys	240	713	518	550	244	262	236	227	304	271	148	121
	Cattle Swine	284 793	1610 876	1388 451	893 418	1008 379	670 211	607 308	329 301	389 304	439 211	443 111	200 120
Resistance Pattern	Isolate Source												
5. At Least ACSSuT <sup>1</sup> Resistant	Humans	8.9%	8.4%	8.9% 122	10.1% 142	7.8% 156	9.3% 173	7.2%	6.9% 141	5.6% 121	6.3% 136	5.8%	5.1% 112
5. At Least Accourt Resistant	Chicken Breasts	130	125	122	142	0.0%	2.4%	129 1.9%	0.7%	2.6%	0.0%	138 0.5%	0.0%
	Ground Turkey					1.4%	0.9%	2.8%	0.5%	0.6%	1.6%	1.6%	0.5%
						1 22.2%	1 40.0%	4 14.3%	1 12.5%	1 5.3%	3 0.0%	4 12.5%	1 14.3%
	Ground Beef					2 40.0%	4 40.0%	2 9.1%	1 22.2%	1 0.0%	0.0%	3 0.0%	2 12.5%
	Pork Chops					4	2	1	2	0	0	0	1
	Chickens	2.7% 15	1.7% 24	4.3% 50	2.4% 32	1.9% 29	1.5% 17	0.9% 12	1.6% 31	1.6% 22	1.5% 15	1.4% 9	1.3% 7
	Turkeys	0.8% 2	3.8% 27	3.3% 17	3.6% 20	4.5% 11	2.3% 6	4.7% 11	4.0% 9	3.9% 12	4.8% 13	2.0%	3.3% 4
	Cattle	4.2%	7.6%	13.1%	14.6%	17.1%	18.1%	16.3%	20.4%	18.3%	16.2%	18.1%	15.0%
	Swine	12 7.8%	7.1%	182 8.6%	130 7.2%	172 7.7%	7.6%	99 12.0%	67 9.6%	71 5.3%	71 10.9%	80 8.1%	30 13.3%
		62 0.9%	62 0.9%	39 0.9%	30 0.5%	29 1.1%	16 1.2%	37 0.6%	29 0.9%	16 0.7%	23 0.7%	9 0.5%	16 0.7%
6. At Least ACT/S <sup>2</sup> Resistant	Humans	13	14	13	7	21 0.0%	23 0.0%	10 0.0%	18 0.0%	15 0.0%	16 0.0%	11 0.0%	15 0.0%
	Chicken Breasts					0	0	0	0	0	0	0	0
	Ground Turkey					1.4% 1	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%
	Ground Beef					0.0%	0.0%	7.1% 1	0.0%	0.0%	0.0%	0.0%	0.0%
	Pork Chops					20.0%	0.0%	0.0% 0	11.1%	0.0%	0.0%	0.0%	12.5%
	Chickens	0.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.2%	0.0%
	Turkeys	0.4%	0.4%	0.8%	0.7%	0.8%	0.0%	0.4%	0.0%	0.3%	0.0%	0.7%	0.8%
		1 2.1%	3 2.2%	4 1.7%	4 2.4%	2.4%	0 2.7%	1.2%	0 4.3%	1 4.1%	0 2.5%	1 3.8%	1.5%
	Cattle	6	35	23	21	24	18	7	14	16 0.3%	11	17	3
	Swine	0.5% 4	0.5% 4	0.0%	1.0% 4	2	0.9% 2	0.6% 2	1.7% 5	1	1.9% 4	0.9% 1	1.7% 2
7. At Least ACSSuTAuCx 3	Humans	0.3% 5	1.5% 23	2.6% 35	2.6% 36	3.4% 67	3.2% 60	2.4% 42	2.0% 41	2.0% 43	2.1% 46	1.8% 44	1.4% 30
Resistant	Chicken Breasts					0.0%	0.0%	1.9% 3	0.0% 0	2.6% 4	0.0%	0.0%	0.0% 0
	Ground Turkey					1.4%	0.9%	2.1%	0.5%	0.0%	1.1%	1.2%	0.5%
	Ground Beef					22.2%	40.0%	3 14.3%	0.0%	0.0%	0.0%	8.3%	14.3%
						20.0%	4 20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Pork Chops	0.5%	0.3%	2.7%	1.1%	0.9%	1.0%	0	0	0 1.1%	0 1.4%	0 1.1%	0 1.3%
	Chickens	3	4	32	14	13	12	5	18	15	14	7	7
	Turkeys	0.4% 1	3.4% 24	1.9% 10	2.9% 16	1.6% 4	0.8%	2.1% 5	1.8% 4	2.3% 7	4.1% 11	2.0%	3.3% 4
	Cattle	2.1% 6	3.7% 59	8.9% 124	11.0% 98	14.6% 147	15.1% 101	12.0% 73	17.3% 57	16.2% 63	13.9% 61	14.7% 65	9.5% 19
	Swine	0.1%	0.5%	1.3%	2.2%	1.8%	1.9%	1.0%	2.7%	0.7%	0.5%	0.9%	1.7%
	Humans	0.0%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	<0.1%	0.1%	0.2%	0.0%	0.2%
8. At Least Ceftriaxone and Nalidixic Acid Resistant	Chicken Breasts	0	2	1	2	0.0%	0.0%	0.0%	0.7%	0.0%	5 0.0%	0.0%	0.0%
						0.0%	0	0.0%	1 0.0%	0.0%	0 0.5%	0.0%	0.0%
	Ground Turkey					0	1	0	0	0	1	0	0
	Ground Beef					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	14.3% 2
	Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens	0.0%	0.1% 1	0.1% 1	0.0%	0.5%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
	Turkeys	0.0%	2.7%	1.2%	1.5%	1.2%	0.4%	0.8%	0.9%	0.3%	0.7%	0.0%	0.0%
	Cattle	0.0%	19 0.1%	6 0.1%	0.3%	0.2%	0.4%	1.0%	0.9%	0.3%	0.2%	0.7%	0.0%
		0.0%	1 0.0%	1 0.0%	3 0.0%	2 0.3%	3 0.0%	6 0.0%	3 0.0%	1 0.0%	1 0.0%	3 0.0%	0.0%
<sup>1</sup> ACSSuT = ampicillin, chloramphe	Swine	0	0	0	0	1	0.070	0.070	0.070	0.070	0.070	0.070	0.070

<sup>&</sup>lt;sup>1</sup> ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

<sup>&</sup>lt;sup>2</sup> ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

<sup>&</sup>lt;sup>3</sup> ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Table 23. Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals that are Resistant to≥ 3 Antimicrobial Classes, by Serotype, 2009

	Humans				Retail Meat	ts			Food Anima	als	
				Meat				Animal			
Source	Serotype	n	%	Туре	Serotype	n	%	Source	Serotype	n	%
Humans	Typhimurium	104	49.8	Chicken	Typhimurium	93	69.4	Chickens	Kentucky	42	48.8
(N=209)	Heidelberg	22	10.5	Breasts	Kentucky	17	12.7	(N=86)	Heidelberg	18	20.9
	Newport	18	8.6	(N=134)	Heidelberg	15	11.2		Typhimurium	14	16.3
	I 4,[5],12:i:-	9	4.3		I 4,[5],12:i:-	1	0.7		I 8,20:-:z6	5	5.8
	Infantis	7	3.3		I 4,12:nonmotile	1	0.7		I 4,[5],12:i:-	2	2.3
	Derby	6	2.9		I 4,5,12:r:-	1	0.7		Agona	1	1.2
	Dublin	4	1.9		Enteritidis	1	0.7		Anatum	1	1.2
	Enteritidis	4 3	1.9 1.4		Hadar	1 1	0.7		Cerro	1 1	1.2 1.2
	Agona Hadar	3	1.4		Mbandaka Montevideo	1	0.7 0.7		Enteritidis Worthington	1	1.2
	Paratyphi B Var. L(+) Tartrate	3	1.4		Saintpaul	1	0.7		worthington		1.2
	Bardo	2	1.0		Senftenberg	1	0.7				
	Saintpaul	2	1.0		centenberg		0.7				
	Virchow	2	1.0								
	Berta	1	0.5	Ground	Saintpaul	9	18.0	Turkeys	Hadar	14	35.0
	Bovismorbificans	1	0.5	Turkey	Hadar	8	16.0	(N=40)	Agona	8	20.0
	Cerro	1	0.5	(N=50)	Heidelberg	7	14.0		Derby	2	5.0
	Javiana	1	0.5		Derby	5	10.0		Heidelberg	2	5.0
	Kentucky	1	0.5		Senftenberg	5	10.0		Muenchen	2	5.0
	Kouka	1	0.5		I 4,5,12:r:-	4	8.0		Saintpaul	2	5.0
	Mississippi	1	0.5		Agona	3	6.0		Senftenberg	2	5.0
	Montevideo	1 1	0.5 0.5		Albany Schwarzengrund	2	4.0 4.0		I 4,[5],12:r:- Anatum	1 1	2.5 2.5
	Muenchen Muenster	1	0.5		I 4,12:d:-	1	2.0		Infantis	1	2.5
	Nitra	1	0.5		Alachua	1	2.0		Kentucky	1	2.5
	Schwarzengrund	1	0.5		Berta	1	2.0		Newport	1	2.5
	Stanley	1	0.5		Infantis	1	2.0		Schwarzengrund	1	2.5
	Unknown serotype	3	1.4		Kentucky	1	2.0		Typhimurium	1	2.5
	Partially serotyped Rough/Nonmotile isolates	3 1	1.4 0.5		•				Untypable	1	2.5
	Nough/Noninotile isolates	'	0.5								
				Ground	Dublin	3	60.0	Cattle	Dublin	16	30.8
				Beef (N=5)	Saintpaul	2	40.0	(N=52)	Typhimurium	15	28.8
				(N=5)					Newport Agona	12 2	23.1 3.8
									Rough O:g,p:-	2	3.8
									III 61:-:1,5,7	1	1.9
									Give	1	1.9
									Meleagridis	1	1.9
									Montevideo	1	1.9
									Senftenberg	1	1.9
				Pork	Derby	1	25.0	Swine	Typhimurium	17	44.7
				Chops	Heidelberg	1	25.0	(N=38)	Derby	15	39.5
				(N=4)	Infantis	1	25.0		Agona	2	5.3
					Typhimurium	1	25.0		Havana	1 1	2.6
									Infantis Johannesburg	1	2.6 2.6
									Saintpaul	1	2.6
1									Janipaul	'	2.0

Table 24. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are Resistant to≥ 4 Antimicrobial Classes, by Serotype, 2009

	Humans				Retail Meats				Food Anim	nals	
				Meat				Animal			
Source	Serotype	n	%	Туре	Serotype	n	%	Source	Serotype	n	%
Humans	Typhimurium	89	56.0	Chicken	Typhimurium	75	78.1	Chiekene	Kentucky	41	67.2
(N=159)	Newport	16	10.1	Breasts	Kentucky	12	12.5	(N=61)	Typhimurium	9	14.8
(14-155)	Heidelberg	15	9.4	(N=96)	Heidelberg	4	4.2	(14-01)	Heidelberg	7	11.5
	I 4,[5],12:i:-	7	4.4	(11 00)	I 4.12:nonmotile	1	1.0		I 4,[5],12:i:-	1	1.6
	Dublin	4	2.5		I 4,15,12:r:-	1	1.0		Agona	1	1.6
	Infantis	4	2.5		Enteritidis	1	1.0		Cerro	1	1.6
	Agona	2	1.3		Montevideo	1	1.0		Enteritidis	1	1.6
	Bardo	2	1.3		Saintpaul	1	1.0		Zittoriaaio		
	Enteritidis	2	1.3		oumpau.						
	Paratyphi B Var. L(+) Tartrate	2	1.3								
	Virchow	2	1.3	Ground	Saintpaul	6	26.1	Turkeys	Agona	5	35.7
	Bovismorbificans	1	0.6	Turkey	I 4,5,12:r:-	4	17.4	(N=14)	Derby	2	14.3
	Cerro	1	0.6	(N=23)	Heidelberg	3	13.0	, ,	I 4,[5],12:r:-	1	7.1
	Derby	1	0.6	l	Senftenberg	3	13.0		Heidelberg	1	7.1
	Javiana	1	0.6		Derby	2	8.7		Infantis	1	7.1
	Kentucky	1	0.6		Agona	1	4.3		Newport	1	7.1
	Kouka	1	0.6		Alachua	1	4.3		Saintpaul	1	7.1
	Mississippi	1	0.6		Albany	1	4.3		Senftenberg	1	7.1
	Muenster	1	0.6		Infantis	1	4.3		Typhimurium	1	7.1
	Saintpaul	1	0.6		Schwarzengrund	1	4.3				
	Stanley	1	0.6								
	Unknown serotype	1	0.6								
	Partially serotyped	2	1.3	Ground	Dublin	3	60.0	Cattle	Dublin	16	32.7
	Rough/Nonmotile isolates	1	0.6	Beef	Saintpaul	2	40.0	(N=49)	Typhimurium	14	28.6
				(N=5)					Newport	12	24.5
									Agona	2	4.1
									Rough O:g,p:-	2	4.1
									III 61:-:1,5,7	1	2.0
									Give	1	2.0
									Montevideo	1	2.0
				Pork	Heidelberg	1	50.0	Swine	Typhimurium	15	83.3
				Chops	Typhimurium	1	50.0	(N=18)	Agona	2	11.1
				(N=2)	. , primilariam		00.0	,	Derby	1	5.6
				I` ′					,	•	

Table 25. Non-Typhoidal *Salmonella* Isolates from Humans, Retail Meats, and Food Animals that are Resistant to≥ 5 Antimicrobial Classes, by Serotype, 2009

	Humans				Retail Meat	S			Food Anim	nals	
				Meat				Animal			
Source	Serotype	n	%	Туре	Serotype	n	%	Source	Serotype	n	%
Humans	Typhimurium	82	59.9	Chicken	Typhimurium	70	80.5	Chickens	Kentucky	27	62.8
(N=137)	Newport	15	10.9	Breasts	Kentucky	11	12.6	(N=43)	Typhimurium	9	20.9
, ,	Heidelberg	13	9.5	(N=87)	Heidelberg	4	4.6	, ,	Heidelberg	6	14.0
	I 4,[5],12:i:-	5	3.6	, ,	I 4,12:nonmotil	1	1.1		I 4,[5],12:i:-	1	2.3
	Dublin	4	2.9		Enteritidis	1	1.1		,[-], .=		
	Agona	2	1.5								
	Bardo	2	1.5								
	Infantis	2	1.5								
	Paratyphi B Var. L(+) Tartrate	2	1.5	Ground	Senftenberg	2	28.6	Turkeys	Agona	5	45.5
	Cerro	1	0.7	Turkey	Agona	1	14.3	(N=11)	Derby	1	9.1
	Derby	1	0.7	(N=7)	Alachua	1	14.3		Heidelberg	1	9.1
	Enteritidis	1	0.7		Albanby	1	14.3		Infantis	1	9.1
	Kentucky	1	0.7		Heidelberg	1	14.3		Newport	1	9.1
	Mississippi	1	0.7		Infantis	1	14.3		Senftenberg	1	9.1
	Saintpaul	1	0.7						Typhimurium	1	9.1
	Unknown serotype	1	0.7								
	Partially Serotyped	2	1.5								
	Rough/Nonmotile isolates	1	0.7	Ground	Dublin	2	100.0	Cattle	Typhimurium	13	32.5
				Beef				(N=40)	Dublin	11	27.5
				(N=2)					Newport	10	25.0
									Rough O:g,p:-	2	5.0
									III 61:-:1,5,7	1	2.5
									Agona	1	2.5
									Montevideo	1	2.5
									Give	1	2.5
				Pork	Heidelberg	1	50.0	Swine	Typhimurium	14	82.4
				Chops	Typhimurium	1	50.0	(N=17)	Agona	2	11.8
				(N=2)	i ypillillullulli	'	30.0	(.4-17)	Derby	1	5.9
				` -,					,		0.0

Table 26. Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals that are at least ACSSuT<sup>1</sup> Resistant, by Serotype, 2009

	Humans				Retail Meat	s			Food Anima	ıls	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=112)	Typhimurium Newport I 4,[5],12:i:- Heidelberg	72 15 5 3	64.3 13.4 4.5 2.7	Chicken Breasts (N=0)				Chickens (N=7)	Kentucky Heidelberg	4 3	57.1 42.9
	Agona Bardo Dublin Infantis Paratyphi B Var. L(+) Tartrate	2 2 2 2 2	1.8 1.8 1.8 1.8	Ground Turkey (N=1)	Infantis	1	100.0	Turkeys (N=4)	Agona Derby	3 1	75.0 25.0
	Cerro Mississippi Saintpaul Unknow serotype Partially Serotyped Rough/Nomotile isolates	1 1 1 1 2 1	0.9 0.9 0.9 0.9 1.8 0.9	Ground Beef (N=2)	Dublin	2	100.0	Cattle (N=30)	Typhimurium Newport Dublin Rough O:g,p:- Agona Give Montevideo	12 8 5 2 1 1	40.0 26.7 16.7 6.7 3.3 3.3 3.3
				Pork Chops (N=1)	Typhimurium	1	100.0	Swine (N=16)	Typhimurium Agona	14 2	87.5 12.5

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

Table 27. Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals that are at least ACT/S<sup>1</sup> Resistant, by Serotype, 2009

	Humans				Retail Mea	ts			Food Anim	als	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=15)	Typhimurium Heidelberg Bardo Agona	8 3 2 1	53.3 20.0 13.3 6.7	Chicken Breasts (N=0)				Chickens (N=0)			
	Newport	1	6.7	Ground Turkey (N=0)				Turkeys (N=1)	Agona	1	100.0
				Ground Beef (N=0)				Cattle (n=3)	Agona Give Typhimurium	1 1 1	33.3 33.3 33.3
				Pork Chops (N=1)	Typhimurium	1	100.0	Swine (N=2)	Agona Derby	1	50.0 50.0

<sup>&</sup>lt;sup>1</sup>ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

Table 28. Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals that are at least ACSSuTAuCx<sup>1</sup>

	Humans				Retail Mea	its			Food Anima	ıls	
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=30)	Newport Typhimurium Agona Bardo	15 6 2 2	50.0 20.0 6.7 6.7	Chicken Breasts (N=0)				Chickens (N=7)	Kentucky Heidelberg	4 3	57.1 42.9
	Infantis Dublin Heidelberg Unknown serotype	2 1 1 1	6.7 3.3 3.3 3.3	Ground Turkey (N=1)	Infantis	1	100.0	Turkeys (N=4)	Agona Derby	3 1	75.0 25.0
				Ground Beef (N=2)	Dublin	2	100.0	Cattle (N=19)	Newport Dublin Typhimurium Agona Give Montevideo Rough O:g,p:-	8 4 3 1 1 1	42.1 21.1 15.8 5.3 5.3 5.3 5.3
				Pork Chops (N=0)				Swine (N=2)	Agona	2	100.0

<sup>&</sup>lt;sup>1</sup> ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Table 29. Non-Typhoidal Salmonella Isolates from Humans, Retail Meats, and Food Animals that are at least Ceftriaxone and Nalidixic Acid Resistant, by Serotype, 2009

Hallalkic	Acid Resistant, by Serotyp	,, _,	-								
	Humans				Retail Meats				Food Animals		
Source	Serotype	n	%	Meat Type	Serotype	n	%	Animal Source	Serotype	n	%
Humans (N=4)	Typhimurium Javiana Unknown serotype	2 1 1	50.0 25.0 25.0	Chicken Breasts (N=0)				Chickens (N=0)			
				Ground Turkey (N=0)				Turkeys (N=0)			
				Ground Beef (N=2)	Dublin	2	100.0	Cattle (N=0)			
				Pork Chops (N=0)				Swine (N=0)			

### E. Antimicrobial Susceptibility among Salmonella serotype Enteritidis

Table 30a. Antimicrobial Resistance among Salmonella Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 30a. Antimicr	robial Resistance	among Salmon												
Year Number of Isolates Teste	ıd	Humans	1998 244	<b>1999</b> 269	<b>2000</b> 319	<b>2001</b> 277	<b>2002</b> 337	<b>2003</b> 257	<b>2004</b> 271	<b>2005</b> 384	<b>2006</b> 413	<b>2007</b> 385	<b>2008</b> 439	<b>2009</b> 410
Number of isolates reste	ru	Chicken Breasts Ground Turkey Ground Beef	244	209	219	211	4 5 1	3 1 1	3 0 0	12 0 0	17 0 0	13 0 0	30 1 1	27 0 0
		Pork Chops Chickens Turkeys	13	41	31 1	21	0 48 0	0 42 0	0 84 0	0 173 0	0 188 3	0 124 0	0 116 1	0 118 0
		Cattle Swine	1 0	8 2	4	4	6 1	3 1	2	2	2	4	5 0	0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Amikacin	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0% 0
	(MIC ≥ 64 μg/ml)	Chicken Breasts		0	Ü	Ü	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%
		Ground Turkey					0.0%	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops												
		Chickens	0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0 0.0%	0.0%	0.0% 0 0.0%	0.0%
		Turkeys		0	0						0		0	
		Cattle	0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0%	0.0%	0.0% 0 0.0%	0.0%	
		Swine		0	0	0	0	0	0			0		
	Gentamicin (MIC ≥ 16 μg/ml)	Humans	0.4%	0.0%	0.3%	0.0%	0.3% 1 0.0%	0.4% 1 0.0%	0.4% 1 0.0%	0.8% 3 0.0%	0.2% 1 0.0%	0.0% 0 0.0%	0.2% 1 3.3%	0.0% 0 0.0%
		Chicken Breasts					0	0	0	0	0	0	1	0.070
		Ground Turkey					0.0% 0 0.0%	0.0% 0 0.0%					0.0% 0 0.0%	
		Ground Beef					0	0					0	
		Pork Chops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens	0.0%	0	0	0.0%	0.0%	0.0%	1.2%	0.0%	0	0.0%	0	0.0%
		Turkeys		0.0% 0	0.0%						0.0% 0		0.0% 0	
		Cattle	0.0% 0	0.0%	0.0% 0	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0% 0	
		Swine		0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%			0.0% 0		
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	0.4% 1	0.4% 1	0.3% 1	0.7% 2	0.3% 1	0.0% 0	0.7% 2	0.3% 1	0.2% 1	0.5% 2	0.0% 0	0.2% 1
		Chicken Breasts					0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0
		Ground Turkey					0.0%	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.1% 1	0.0% 0						
		Turkeys		0.0%	0.0%						0.0%		0.0% 0	
		Cattle	0.0%	12.5% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0% 1	0.0% 0	0.0%	
		Swine		0.0%	0.0%	100.0% 1	0.0%	0.0%	0.0%			0.0% 0		
	Streptomycin (MIC ≥ 64 µg/ml)	Humans	1.6% 4	2.2% 6	0.0%	1.4% 4	1.5% 5	1.2% 3	2.2% 6	1.0% 4	1.2% 5	0.5% 2	0.5% 2	1.2% 5
		Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3% 1	0.0%
		Ground Turkey					0.0% 0	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%	2.1% 1	0.0%	1.2% 1	0.6% 1	0.0%	0.8% 1	0.0%	0.0% 0
		Turkeys		0.0% 0	0.0% 0						0.0% 0		0.0% 0	
		Cattle	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0% 1	0.0%	0.0%	
		Swine		0.0% 0	0.0%	100.0% 1	0.0%	0.0%	0.0%			0.0% 0		

Table 30b. Antimicro	obial Resistance	among <i>Salmon</i>												
Year Number of Isolates Tested	<u> </u>	Humans	1998 244	<b>1999</b> 269	<b>2000</b> 319	<b>2001</b> 277	<b>2002</b> 337	<b>2003</b> 257	<b>2004</b> 271	<b>2005</b> 384	<b>2006</b> 413	<b>2007</b> 385	<b>2008</b> 439	<b>2009</b> 410
Number of Isolates Tested		Chicken Breasts Ground Turkey Ground Beef	244	209	319	211	4 5 1	3 1 1	3 0 0	12 0 0	17 0 0	13 0 0	30 1 1	27 0 0
		Pork Chops					0	0	0	0	0	0	0	0
		Chickens Turkeys	13 0	41 1	31 1	21 0	48 0	42 0	84 0	173 0	188 3	124 0	116 1	118 0
		Cattle Swine	1 0	8 2	4	4	6 1	3	2	2	2	4	5	0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	0.0%	0.4% 1	0.0%	1.4% 4	0.6% 2	0.0%	0.0%	0.8%	0.5% 2	0.5% 2	0.0%	0.0%
initibility Combinations	(MIC ≥ 32 / 16 μg/ml)	Chicken Breasts	U	'	U	4	0.0% 0	33.3% 1	33.3% 1	0.0%	0.0%	0.0%	0.0% 0	3.7% 1
		Ground Turkey					0.0% 0	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops												
		Chickens	0.0% 0	2.4%	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	0.6% 1	0.0%	0.0% 0	0.9% 1	0.8% 1
		Turkeys		0.0%	0.0%						0.0%		0.0%	
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Swine		0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%		
Cephems	Cefoxitin (MIC ≥ 32 μg/ml)	Humans			0.0%	0.4% 1	0.0%	0.0%	0.0%	1.0%	0.5%	0.3%	0.0%	0.0%
		Chicken Breasts					0.0%	33.3% 1	33.3% 1	0.0%	0.0%	0.0% 0	0.0%	3.7% 1
		Ground Turkey					0.0%	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops			0.00/	0.00/	0.40/	0.00/	4.00/	0.00/	0.00/	0.00/	0.00/	0.00/
		Chickens			0.0%	0.0%	2.1% 1	0.0%	1.2% 1	0.6%	0.0%	0.0%	0.9%	0.0%
		Turkeys			0.0% 0 0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0 50.0%	0.0%	0.0% 0 0.0%	
		Cattle			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1	0.0%	0.0%	
	0.01.6	Swine	0.00/	0.40/	0	0	0	0	0	0.50/	0.50/	0	0.00/	0.00/
	Ceftiofur (MIC ≥ 8 μg/ml)	Humans	0.0%	0.4% 1	0.0%	2.2% 6	0.0%	0.0%	0.0%	0.5%	0.5%	0.3%	0.0%	0.0%
		Chicken Breasts					0.0% 0 0.0%	33.3% 1 0.0%	33.3% 1	0.0%	0.0%	0.0%	0.0% 0 0.0%	3.7% 1
		Ground Turkey					0.0%	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops	0.0%	4.9%	3.2%	0.0%	4.2%	0.0%	1.2%	1.2%	0.0%	0.0%	0.9%	0.8%
		Chickens	0.070	2 0.0%	1 0.0%	0	2	0.070	1	2	0.0%	0.070	1 0.0%	1
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0 50.0%	0.0%	0.0%	
		Cattle	0.070	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.070	1	0.0%	0.070	
	Ceftriaxone	Swine	0.0%	0.4%	0.0%	0 1.4%	0.0%	0.0%	0.0%	0.3%	0.5%	0.3%	0.0%	0.0%
	(MIC ≥ 4 μg/ml)	Humans	0.070	1	0.070	4	0.0%	0 33.3%	0 33.3%	1 0.0%	2 0.0%	1 0.0%	0.0%	0.076
		Chicken Breasts					0.0%	1 0.0%	1	0.070	0.070	0.070	0.0%	1
		Ground Turkey					0.0%	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops	0.0%	2.4%	3.2%	0.0%	4.2%	0.0%	1.2%	0.6%	0.0%	0.0%	0.9%	0.8%
		Chickens	0.0%	1 0.0%	1 0.0%	0.0%	4.2%	0.0%	1.2%	1	0.0%	0.0%	1 0.0%	1
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1	0.0%	0.0%	
		Swine		0.070	0.070	0.070	0.070	0.070	0.070			0.070		

Table 30c. Antimicr	obial Resistance	among <i>Salmon</i>	ella Ente	ritidis Isc	lates fro	m Human		Meats, ar	nd Food	Animals,	by Year, 1	1998-2009	9	
Year		L	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tester	d	Humans Chicken Breasts Ground Turkey	244	269	319	277	337 4 5	257 3 1	271 3 0	384 12 0	413 17 0	385 13 0	439 30 1	410 27 0
		Ground Beef Pork Chops					1 0	1 0	0	0	0	0	1 0	0
		Chickens	13	41	31	21	48	42	84	173	188	124	116	118
		Turkeys Cattle	0	1 8	1 4	0 4	0 6	0 3	0 2	0 2	3 2	0 4	1 5	0
	Australianskial	Swine	0	2	1	1	1	1	1	0	0	1	0	0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												•
Folate Pathway Inhibitors		Humans	2.0%	3.0%	0.9%	2.2%	1.5%	1.2%	1.8%	1.6%	1.5%	1.6%	1.1%	1.7%
	Sulfisoxazole <sup>1</sup> (MIC ≥ 512 μg/ml)	Chicken Breasts	5	8	3	6	5 0.0%	0.0%	5 33.3%	6 0.0%	0.0%	6 0.0%	5 3.3%	7 3.7%
		Ground Turkey					0.0%	0.0%	1	0	0	0	0.0%	1
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops					0	0					0	
		Chickens	0.0%	4.9%	3.2%	0.0%	4.2%	2.4%	1.2%	0.0%	0.0%	0.8%	0.9%	0.0%
		Turkeys	U	0.0%	0.0%	0	2		1	0	0.0%	-	0.0%	0
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	
		Swine	J	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		·	0.0%	Ů	
	Trimethoprim- Sulfamethoxazole	Humans	0.8% 2	0.7% 2	0.0% 0	0.7% 2	0.6%	0.8%	0.0%	0.5% 2	0.5% 2	1.0% 4	0.9% 4	0.7% 3
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts	_			_	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%
		Ground Turkey					0.0%	0.0%			-		0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0
		Turkeys		0.0% 0	0.0%						0.0% 0		0.0%	
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0	0.0%	0.0% 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		
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	6.1% 15	10.8% 29	7.5% 24	8.7% 24	6.8% 23	2.3% 6	4.1% 11	2.9% 11	4.4% 18	2.1% 8	3.6% 16	3.9% 16
		Chicken Breasts					0.0%	66.7% 2	33.3% 1	0.0%	17.6% 3	0.0%	6.7% 2	18.5% 5
		Ground Turkey					0.0% 0	0.0% 0					0.0%	
		Ground Beef					0.0% 0	0.0% 0					0.0%	
		Pork Chops												
		Chickens	30.8% 4	12.2% 5	9.7% 3	0.0% 0	4.2% 2	0.0% 0	1.2% 1	1.2% 2	1.6% 3	1.6% 2	2.6% 3	2.5% 3
		Turkeys		0.0% 0	0.0% 0						0.0% 0		0.0%	
		Cattle	100.0% 1	12.5% 1	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	50.0% 1	0.0% 0	0.0%	
		Swine		0.0% 0	0.0% 0	100.0% 1	0.0% 0	0.0% 0	0.0%			0.0% 0		
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.0%	0.4% 1	0.0% 0	0.0% 0	0.3% 1	0.4% 1	0.4% 1	0.5% 2	0.0% 0	0.5% 2	0.5% 2	0.0%
		Chicken Breasts					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey					0.0% 0	0.0% 0					0.0%	
		Ground Beef					0.0% 0	0.0% 0					0.0%	
		Pork Chops												
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.6% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Turkeys		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%	50.0% 1	0.0% 0	0.0%	
		Swine		0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0%			0.0%		
1 Sulfamethoxazole was t	1000 0000		by sulficeys	1-:- 200	4	_	_		_			_		

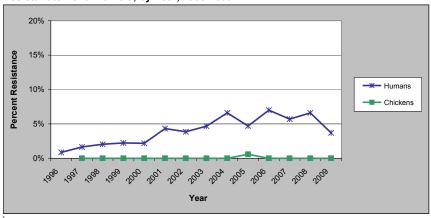
<sup>&</sup>lt;sup>1</sup> Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 30d. Antimicrobial Resistance among Salmonella Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

	Obiai Resistance	among Salmon												
Year		Lie	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tester	d	Humans Chicken Breasts Ground Turkey Ground Beef	244	269	319	277	337 4 5 1	257 3 1 1	271 3 0 0	384 12 0 0	413 17 0 0	385 13 0 0	439 30 1 1	410 27 0 0
		Pork Chops Chickens Turkeys Cattle	13 0 1	41 1 8	31 1 4	21 0 4	0 48 0 6	0 42 0 3	0 84 0 2	0 173 0 2	0 188 3 2	0 124 0 4	0 116 1 5	0 118 0 0
		Swine	0	2	1	1	1	1	1	0	0	1	0	0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source		_										
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0% 0
		Ground Turkey					0.0% 0	0.0%					0.0%	
		Ground Beef					0.0% 0	0.0% 0					0.0% 0	
		Pork Chops												
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0.0%	0.0%						0.0%		0.0%	
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		Swine		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%		
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	2.0% 5	2.2% 6	2.2% 7	4.3% 12	3.9% 13	4.7% 12	6.6% 18	4.7% 18	7.0% 29	5.7% 22	6.6% 29	3.7% 15
	( = -= Fg)	Chicken Breasts				.=	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%
		Ground Turkey					0.0%	0.0%			J	J	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%	0.6%	0.0%	0.0%	0.0%	0.0%
		Turkeys		0.0%	0.0%						0.0%		0.0%	
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	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%		
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans	6.6% 16	8.2% 22	1.9% 6	1.8% 5	4.2% 14	1.6% 4	3.3% 9	2.3% 9	1.7% 7	3.9% 15	1.6% 7	1.2% 5
		Chicken Breasts					0.0%	0.0%	33.3% 1	0.0%	11.8%	0.0%	3.3%	3.7%
		Ground Turkey					0.0%	0.0%					0.0%	
		Ground Beef					0.0%	0.0%					0.0%	
		Pork Chops												
		Chickens	0.0%	7.3% 3	0.0%	0.0%	2.1% 1	2.4%	2.4%	0.6% 1	1.6%	2.4%	0.9% 1	2.5%
		Turkeys		0.0%	0.0%						0.0%		0.0%	
		Cattle	100.0% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0% 1	25.0% 1	0.0%	
		Swine		0.0%	0.0%	100.0% 1	0.0%	0.0%	0.0%			0.0% 0		

#### **Nalidixic Acid Resistance**

Figure 12. Percent of *Salmonella* Enteritidis Isolates from Humans and Chickens Resistant to Nalidixic Acid, by Year, 1996-2009 <sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Data for other sources are not included due to the small number of *Salmonella* Enteritidis isolates from these sources. Table 30 contains resistance data for *Salmonella* Enteritidis isolates from each source, by year

Table 31. Number of Salmonella Enteritidis Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2009

Tubic of: Huili	20. O. Ou	mnomona		io iociato	0 100t0u	o	nano, rtot	an mouto	, and i oc	7 a 7 a a a a a	o, s, 100	11, 1000 =	000	
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	351	301	244	269	319	277	337	257	271	384	413	385	439	410
Chicken Breasts							4	3	3	12	17	13	30	27
Ground Turkey							5	1	0	0	0	0	1	0
Ground Beef							1	1	0	0	0	0	1	0
Pork Chops							0	0	0	0	0	0	0	0
Chickens		1	13	41	31	21	48	42	84	173	188	124	116	118
Turkeys		0	0	1	1	0	0	0	0	0	3	0	1	0
Cattle		1	1	8	4	4	6	3	2	2	2	4	5	0
Swine		0	0	2	1	1	1	1	1	0	0	1	0	0

Table 32a. Resistance Patterns among Salmonella Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 32a. Resistance P	atterns among S												
Year	Litumana	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	244	269	319	277	337	257	271	384	413	385	439	410
	Chicken Breasts Ground Turkey					4 5	3 1	3	12 0	17 0	13 0	30 1	27 0
	Ground Beef					1	1	0	0	0	0	1	0
	Pork Chops	40		0.4		0	0	0	0	0	0	0	0
	Chickens Turkeys	13 0	41 1	31 1	21 0	48 0	42 0	84 0	173 0	188 3	124 0	116 1	118 0
	Cattle	1	8	4	4	6	3	2	2	2	4	5	0
Desistence Bettern	Swine	0	2	1	1	1	1	1	0	0	1	0	0
Resistance Pattern	Isolate Source	87.7%	83.6%	89.0%	86.6%	87.5%	91.8%	87.1%	91.4%	88.6%	90.4%	87.9%	92.0%
1. No Resistance Detected	Humans	214	225	284	240	295	236	236	351	366	348	386	377
	Chicken Breasts					100.0% 4	33.3% 1	66.7% 2	100.0% 12	82.4% 14	100.0% 13	90.0% 27	74.1% 20
	Ground Turkey					100.0% 5	100.0% 1					100.0% 1	
	Ground Beef					100.0% 1	100.0% 1					100.0% 1	
	Pork Chops												
	Chickens	69.2% 9	82.9% 34	90.3% 28	100.0% 21	95.8% 46	97.6% 41	97.6% 82	97.1% 168	97.9% 184	96.0% 119	97.4% 113	96.6% 114
	Turkeys	J	100.0%	100.0%	21	40	71	UZ.	100	100.0%	110	100.0%	11-7
	Cattle	0.0%	87.5%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	50.0%	75.0%	100.0%	
		0.0%	7 100.0%	4 100.0%	4 0.0%	6 100.0%	3 100.0%	2 100.0%	2	1	3 100.0%	1	
	Swine	0	2	1	0	1	1	1			1		
2. Resistant to ≥ 3	Humans	0.4% 1	1.1% 3	0.3% 1	2.9% 8	2.1% 7	0.4% 1	1.1% 3	1.6% 6	1.7% 7	1.0% 4	0.2% 1	1.0% 4
Antimicrobial Classes	Chicken Breasts					0.0%	33.3%	33.3%	0.0%	0.0%	0.0%	33.3%	3.7%
	Ground Turkey					0.0%	0.0%	1	0	0	0	0.0%	1
	Ground Beef					0.0%	0.0%					0.0%	
	Pork Chops					0	0					0	
	<u> </u>	0.0%	2.4%	3.2%	0.0%	4.2%	0.0%	2.4%	0.6%	0.0%	0.0%	0.9%	0.8%
	Chickens	0	1	1	0.076	2	0	2	1	0	0	1	1
	Turkeys		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%	50.0%	0.0%	0.0%	
	Swine	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0	1	0.0%	0	
		0.0%	0	0.0%	1 1.1%	0.6%	0	0.7%	1.0%	0.7%	0.3%	0.0%	0.5%
3. Resistant to ≥ 4	Humans	0.076	1	0.070	3	2	1	2	4	3	1	0	2
Antimicrobial Classes	Chicken Breasts					0.0% 0	0.0%	33.3% 1	0.0% 0	0.0%	0.0% 0	0.0% 0	3.7% 1
	Ground Turkey					0.0% 0	0.0%					0.0% 0	
	Ground Beef					0.0%	0.0%					0.0% 0	
	Pork Chops												
	Chickens	0.0% 0	2.4% 1	3.2% 1	0.0% 0	4.2% 2	0.0% 0	1.2% 1	0.0% 0	0.0%	0.0% 0	0.9% 1	0.8% 1
	Turkeys		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%	50.0% 1	0.0%	0.0%	
	Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%		
4. Resistant to ≥ 5	Humans	0.0%	0.4%	0.0%	0.4%	0.0%	0.4%	0.7%	0.5% 2	0.2% 1	0.3%	0.0%	0.2%
Antimicrobial Classes	Chicken Breasts					0.0%	0.0%	33.3% 1	0.0%	0.0%	0.0%	0.0%	3.7%
	Ground Turkey					0.0%	0.0%		Ů			0.0%	
	Ground Beef					0.0%	0 0.0% 0					0 0.0% 0	
	Pork Chops					3	3					J	
	Chickens	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%
	Turkeys	J	0.0%	0.0%	U		U	U	U	0.0%	U	0.0%	U
	Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	
	Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	1	0.0%	0	
		0	0	0	0	0	0	0			0		

Table 32b. Resistance Patterns among Salmonella Enteritidis Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 32b. Resistance Pat	terns among Sa												
Year	Lucasas	<b>1998</b> 244	<b>1999</b> 269	<b>2000</b> 319	<b>2001</b> 277	<b>2002</b> 337	<b>2003</b> 257	2004	<b>2005</b> 384	<b>2006</b> 413	2007	2008	2009
Number of Isolates Tested	Humans Chicken Breasts	244	269	319	211	4	3	271 3	12	17	385 13	439 30	410 27
	Ground Turkey					5	1	0	0	0	0	1	0
	Ground Beef Pork Chops					1 0	1 0	0	0	0	0	1 0	0
	Chickens	13	41	31	21	48	42	84	173	188	124	116	118
	Turkeys	0	1	1	0	0	0	0	0	3	0	1	0
	Cattle Swine	1 0	8 2	4	4	6	3	2	2 0	2	4	5	0
Resistance Pattern	Isolate Source	Ü					·		J	Ü	·		Ü
	Humans	0.0%	0.4%	0.0%	0.0%	0.0%	0.4%	0.4%	0.5%	0.0%	0.3%	0.0%	0.0%
5. At Least ACSSuT <sup>1</sup> Resistant	Chicken Breasts	0	1	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	<u> </u>					0.0%	0.0%	0	0	0	0	0.0%	0
	Ground Turkey					0	0					0	
	Ground Beef					0.0% 0	0.0% 0					0.0%	
	Pork Chops												
	Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Turkeys	0	0.0%	0.0%	0	0	0	0	0	0.0%	0	0.0%	0
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Cattle	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%		
6. At Least ACT/S <sup>2</sup> Resistant	Humans	0.0%	0.4%	0.0% 0	0.0% 0	0.0%	0.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
6. At Least AC1/5 Resistant	Chicken Breasts	0	1	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0.0%	0.0%	0	0	0	0	0.0%	0
	Ground Turkey					0	0					0	
	Ground Beef					0.0% 0	0.0% 0					0.0%	
	Pork Chops												
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys	J	0.0%	0.0%	Ü				Ü	0.0%		0.0%	Ů
	Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0%	0	
	Swine	0	0	0	0	0	0	0			0		
7. At Least ACSSuTAuCx 3	Humans	0.0% 0	0.4% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.3% 1	0.0%	0.3%	0.0%	0.0%
Resistant	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0.0%	0.0%	0	0	0	0	0.0%	0
						0.0%	0.0%					0.0%	
	Ground Beef					0	0					0	
	Pork Chops												
	Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Turkeys		0.0%	0.0%						0.0%		0.0%	
	Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	<u> </u>	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	0.001	0.004	0	0.004	0.00/
8. At Least Ceftriaxone and	Humans	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0	0.0% 0	0.3% 1	0.0% 0	0.3% 1	0.0% 0	0.0% 0
Nalidixic Acid Resistant	Chicken Breasts					0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%
	Ground Turkey					0.0%	0.0%					0.0%	
	Ground Beef					0.0%	0.0%					0.0%	
						0	0					0	
	Pork Chops	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/
	Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Turkeys		0.0%	0.0%						0.0%		0.0%	
	Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0.0%	0	
	Swille	0	0	0	0	0	0	0			0		

<sup>&</sup>lt;sup>1</sup> ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline
<sup>2</sup> ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole
<sup>3</sup> ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

# F. Antimicrobial Susceptibility among Salmonella serotype Typhimurium

Table 33a. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009 Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tes	ted	Humans	381	363	304	325	394	408	383	438	409	404	397	371
		Chicken Breasts					9	22	49	29	21	25	68	123
		Ground Turkey					2	2	2	1	0	1	3	1
		Ground Beef					2	1	0	0	1	3	2	0
		Pork Chops					2	1	2	2	2	3	3	1
		Chickens Turkeys	66 6	154 37	145 18	130 15	150 9	156 6	171 14	183 7	105 5	83 6	70 3	36 2
		Cattle	33	189	187	87	98	78	48	34	22	26	28	18
		Swine	104	114	81	44	48	27	53	42	25	44	10	20
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Amikacin (MIC ≥ 64 µg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%
		Chicken Breasts					0.0%	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
		Ground Beef					0.0%	0.0%			0.0% 0	0.0%	0.0%	
		Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens	0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%
		Turkeys	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%
		Cattle	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0%
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.3% 1	0.0% 0	0.0%
	Gentamicin (MIC ≥ 16 μg/ml)	Humans	3.7% 14	2.2% 8	2.6% 8	1.5% 5	2.3% 9	2.0% 8	2.1% 8	1.8% 8	2.7% 11	2.5% 10	1.5% 6	1.9% 7
		Chicken Breasts					0.0% 0	0.0%	2.0% 1	0.0% 0	0.0% 0	0.0% 0	1.5% 1	2.4% 3
		Ground Turkey					0.0%	0.0%	0.0% 0	0.0% 0		0.0% 0	33.3% 1	0.0%
		Ground Beef					0.0%	0.0%			0.0%	0.0%	0.0%	
		Pork Chops	10.00		1 - 201	- 101	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%
		Chickens	18.5% 12	16.9% 26	15.2% 22	3.1%	12.7% 19	5.1% 8	4.1% 7	4.4% 8	6.7% 7	3.6%	5.7% 4	0.0%
		Turkeys	50.0%	29.7%	33.3%	53.3%	44.4%	83.3%	64.3%	14.3%	20.0%	16.7%	33.3%	50.0%
		Cattle	3.0%	2.6%	1.6%	0.0%	2.0%	1.3%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%
	Kanamusin	Swine	0.0% 0 15.7%	1.8%	0.0% 0 13.2%	2.3% 1 8.3%	2.1% 1 7.6%	0.0%	3.8% 2 5.7%	7.1% 3 5.7%	8.0% 2 5.1%	2.3% 1 5.9%	10.0% 1 2.3%	0.0%
	Kanamycin (MIC ≥ 64 μg/ml)	Humans	60	12.9% 47	40	27	30 0.0%	7.1% 29 18.2%	34.7%	25 24.1%	21 47.6%	24 12.0%	2.3% 9 25.0%	4.9% 18 27.6%
		Chicken Breasts					0.0%	4 50.0%	17 50.0%	7 0.0%	10	3	17 0.0%	34
		Ground Turkey					0.0%	1 0.0%	1	0.076	0.0%	0.0%	0.0%	0.078
		Ground Beef					0.0%	0.0%	0.0%	0.0%	0 100.0%	0.0%	0.0%	0.0%
		Pork Chops	4.6%	3.9%	3.4%	3.1%	0.076	0.0%	0 9.9%	0.0%	2	0 7.2%	0 8.6%	0.0 % 0 8.3%
		Chickens	3 66.7%	6 59.5%	5 44.4%	4 73.3%	8 55.6%	12 50.0%	17	14	19	6	6	3
		Turkeys	4 54.5%	22 36.5%	8 27.3%	11 24.1%	5 26.5%	3 16.7%	3 14.6%	0 38.2%	0	1 26.9%	0 14.3%	0 33.3%
		Cattle	18 18.3%	69 21.1%	51 14.8%	21	26 2.1%	13	7 9.4%	13 7.1%	3	7 9.1%	4 10.0%	6
	Streptomycin	Swine	19 47.8%	24 43.3%	12 39.5%	6 40.0%	1 32.0%	0 35.5%	5 31.9%	3 28.1%	4 29.3%	4 32.4%	1 28.5%	0 25.9%
	(MIC ≥ 64 μg/ml)	Humans	182	157	120	130	126 0.0%	145 18.2%	122 14.3%	123 3.4%	120 9.5%	131	113 16.2%	96 15.5%
		Chicken Breasts					0.0%	4 50.0%	7 50.0%	1 0.0%	2	7 100.0%	11 33.3%	19 0.0%
		Ground Turkey Ground Beef					0.0%	1 0.0%	1	0	100.0%	1 0.0%	1 50.0%	0
		Pork Chops					0 50.0%	0 100.0%	100.0%	100.0%	1 100.0%	0.0%	1 33.3%	100.0%
		Chickens	44.6%	40.9%	35.9%	16.9%	30.0%	16.7%	8.2%	13.7%	17.1%	10.8%	5.7%	5.6%
		Turkeys	83.3%	63 81.1%	52 72.2%	93.3%	45 77.8%	26 100.0%	14 64.3%	25 57.1%	18 60.0%	9 50.0%	33.3%	100.0%
		Cattle	5 57.6%	63.0%	13 63.1%	14 46.0%	66.3%	52.6%	9 56.3%	55.9%	3 54.5%	50.0%	50.0%	72.2%
		Swine	19 82.7%	119 80.7%	77.8%	70.5%	65 77.1%	41 59.3%	77.4%	19 69.0%	72.0%	13 59.1%	14 80.0%	13 80.0%
		10	86	92	63	31	37	16	41	29	18	26	8	16

Table 33b. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1990-2009			4000	4000	0000	0004	2000	2000	0004	2225	0000	0007	0000	0000
Year Number of Isolates Teste	d	Humans	<b>1998</b> 381	<b>1999</b> 363	<b>2000</b> 304	<b>2001</b> 325	<b>2002</b> 394	<b>2003</b> 408	<b>2004</b> 383	<b>2005</b> 438	<b>2006</b> 409	<b>2007</b> 404	<b>2008</b> 397	<b>2009</b> 371
Transcr or isolates reste	<b>-</b>	Chicken Breasts	001	000	004	020	9	22	49	29	21	25	68	123
		Ground Turkey					2	2	2	1	0	1	3	1
		Ground Beef Pork Chops					2 2	1	0 2	0 2	1 2	3	2 3	0
		Chickens	66	154	145	120								
		Turkeys	66 6	154 37	145 18	130 15	150 9	156 6	171 14	183 7	105 5	83 6	70 3	36 2
		Cattle	33	189	187	87	98	78	48	34	22	26	28	18
	Antimicrobial	Swine	104	114	81	44	48	27	53	42	25	44	10	20
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	4.5% 17	2.8% 10	6.3% 19	6.2% 20	7.6% 30	5.6% 23	4.7% 18	3.2% 14	4.4% 18	6.7% 27	3.3% 13	6.2% 23
	(MIC ≥ 32 / 16 μg/ml)	Chicken Breasts					33.3% 3	63.6% 14	49.0% 24	51.7% 15	57.1% 12	44.0% 11	50.0% 34	57.7% 71
		Ground Turkey					0.0% 0	100.0%	0.0% 0	100.0% 1		0.0% 0	33.3% 1	0.0%
		Ground Beef					0.0%	0.0%			0.0%	0.0%	0.0%	
		Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens	9.2%	29.2% 45	25.5% 37	14.6% 19	28.7% 43	25.6% 40	43.3% 74	19.7% 36	30.5%	33.7% 28	24.3% 17	33.3% 12
		Turkeys	0.0%	51.4% 19	38.9% 7	53.3% 8	22.2%	16.7% 1	14.3% 2	0.0%	0.0%	16.7% 1	0.0%	50.0% 1
		Cattle	6.1%	6.9%	12.8%	13.8%	17.3%	20.5%	25.0%	35.3%	27.3%	26.9%	21.4%	27.8%
			1.9%	13 1.8%	24	12 4.5%	17 8.3%	16 0.0%	12 0.0%	12 9.5%	6 0.0%	7 2.3%	6 0.0%	5 0.0%
		Swine	2	2	2	2	4	0	0	4	0	1	0	0
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans			3.6% 11	3.1% 10	4.3% 17	4.4% 18	4.7% 18	2.5% 11	3.9% 16	5.7% 23	3.3% 13	5.4% 20
		Chicken Breasts					33.3% 3	63.6% 14	49.0% 24	51.7% 15	52.4% 11	40.0% 10	47.1% 32	47.2% 58
		Ground Turkey					0.0%	100.0%	0.0%	100.0% 1		0.0%	33.3% 1	0.0%
		Ground Beef					0.0%	0.0%			0.0%	0.0% 0	0.0%	
		Pork Chops					0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0% 0	0.0%	0.0%
		Chickens			24.8% 36	14.6% 19	26.7% 40	23.7% 37	43.3% 74	19.7% 36	29.5% 31	24.1% 20	20.0% 14	27.8% 10
		Turkeys			38.9% 7	53.3% 8	22.2% 2	16.7% 1	14.3% 2	0.0% 0	0.0% 0	16.7% 1	0.0%	50.0% 1
		Cattle			9.1% 17	11.5% 10	11.2% 11	16.7% 13	25.0% 12	35.3% 12	27.3% 6	26.9% 7	17.9% 5	22.2% 4
		Swine			1.2% 1	0.0%	4.2%	3.7% 1	0.0%	4.8% 2	0.0%	4.5% 2	0.0%	0.0%
	Ceftiofur (MIC ≥ 8 μg/ml)	Humans	1.8% 7	1.9% 7	3.6% 11	3.1% 10	4.3% 17	4.9%	4.4% 17	2.5%	4.2% 17	6.4% 26	3.3%	6.5% 24
		Chicken Breasts					33.3%	63.6%	49.0% 24	51.7% 15	57.1% 12	44.0% 11	50.0% 34	56.9% 70
		Ground Turkey					0.0%	100.0%	0.0%	100.0% 1	0.00/	0.0%	33.3%	0.0%
		Ground Beef					0.0%	0.0%	0.00/	0.00/	0.0%	0.0%	0.0%	0.00/
		Pork Chops	9.2%	29.9%	26.2%	14.6%	0.0% 0 28.0%	0.0% 0 25.6%	0.0% 0 43.3%	0.0% 0 19.7%	0.0% 0 30.5%	0.0% 0 32.5%	0.0% 0 24.3%	0.0% 0 33.3%
		Chickens	6 0.0%	46 48.6%	38 38.9%	19 53.3%	42 22.2%	40 16.7%	74 14.3%	36 0.0%	30.5%	27 16.7%	17 0.0%	12 50.0%
		Turkeys	0 3.0%	18	7	8 11.5%	2 15.3%	1 20.5%	25.0%	0 35.3%	0 27.3%	1 26.9%	0.0 %	1 27.8%
		Cattle	1 0.0%	13	22	10	15.5 % 15 4.2%	16 0.0%	12 1.9%	12 4.8%	6	7 2.3%	6 0.0%	5 0.0%
	Ceftriaxone	Swine	1.8%	1.9%	3.3%	3.1%	4.3%	0.0%	1.9%	2.5%	0.0% 0 4.2%	1 6.4%	0.0%	0.0% 0 6.5%
	(MIC ≥ 4 μg/ml)	Humans	7	7	10	10	17 33.3%	20	17 49.0%	11 51.7%	17 57.1%	26 44.0%	13	24 57.7%
		Chicken Breasts					3 0.0%	14	24	15 100.0%	12	11 0.0%	34 33.3%	71
		Ground Turkey					0 0.0%	2 0.0%	0	1	0.0%	0	1 0.0%	0
		Ground Beef					0.0%	0	0.0%	0.0%	0.0%	0	0	0.0%
		Pork Chops Chickens	9.2%	28.6%	26.2%	14.6%	0 26.7%	0 25.6%	0 43.3%	0 19.7%	0 30.5%	0 33.7%	0 24.3%	0 33.3%
		Turkeys	6 0.0%	44 48.6%	38 38.9%	19 53.3%	40 22.2%	40 16.7%	74 14.3%	36 0.0%	32 0.0%	28 16.7%	17 0.0%	12 50.1%
		Cattle	0 3.0%	18 6.3%	7 11.8%	8 11.5%	2 15.3%	1 20.5%	2 25.0%	0 35.3%	0 27.3%	1 26.9%	0 21.4%	1 27.8%
		Swine	0.0%	12 0.9%	22 0.0%	10 0.0%	15 4.2%	16 0.0%	12 0.0%	12 4.8%	6 0.0%	7 2.3%	6 0.0%	5 0.0%
		OWING	0	1	0	0	2	0	0	2	0	1	0	0

Table 33c. Antimicrobial Resistance among *Salmonella* Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Antimicrobial Class Folate Pathway Inhibitors	Antimicrobial (Resistance	Humans Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Turkeys	381	363	304	325	394	408 22	383 49	438	409	404	397	371
Antimicrobial Class Folate Pathway Inhibitors		Ground Turkey Ground Beef Pork Chops Chickens					0	22	40	00	0.4			
Antimicrobial Class Folate Pathway Inhibitors		Ground Beef Pork Chops Chickens					9			29	21	25	68	123
Antimicrobial Class Folate Pathway Inhibitors		Pork Chops Chickens					2 2	2	2	1 0	0 1	1 3	3 2	1 0
Antimicrobial Class Folate Pathway Inhibitors							2	1	2	2	2	3	3	1
Antimicrobial Class Folate Pathway Inhibitors		Turkove	66	154	145	130	150	156	171	183	105	83	70	36
Antimicrobial Class Folate Pathway Inhibitors		Cattle	6 33	37 189	18 187	15 87	9 98	6 78	14 48	7 34	5 22	6 26	3 28	2 18
Antimicrobial Class Folate Pathway Inhibitors		Swine	104	114	81	44	48	27	53	42	25	44	10	20
Antimicrobial Class Folate Pathway Inhibitors		Isolate												
,	Breakpoint)	Source												
	Sulfamethoxazole/ Sulfisoxazole <sup>1</sup>	Humans	50.1%	45.7%	45.4%	43.1%	32.2%	38.7%	36.0%	32.0%	33.3%	37.4%	30.2%	29.9%
	(MIC ≥ 512 μg/ml)	Chicken Breasts	191	166	138	140	127 44.4%	158 31.8%	138 73.5%	140 69.0%	136 90.5%	151 68.0%	120 95.6%	96.8%
							0.0%	7 50.0%	36 100.0%	20 0.0%	19	17 100.0%	65 66.7%	119 100.0%
		Ground Turkey					0	1	2	0.070		1	2	1
		Ground Beef					0.0%	0.0%			100.0% 1	0.0%	50.0% 1	
		Pork Chops					50.0%	100.0%	100.0%	100.0%	100.0%	0.0%	33.3%	100.0%
		Chiekene	36.9%	32.5%	34.5%	18.5%	31.3%	28.2%	2 47.4%	2 37.2%	2 65.7%	0 60.2%	70.0%	52.8%
		Chickens	24	50 75.7%	50 66.7%	24 86.7%	47 77.8%	44 100.0%	81 78.6%	68 57.1%	69 80.0%	50 83.3%	49 66.7%	19 100.0%
		Turkeys	83.3% 5	28	12	13	77.8%	6	11	57.1% 4	4	5	2	2
		Cattle	60.6% 20	64.6% 122	64.2% 120	54.0% 47	58.2% 57	44.9% 35	60.4% 29	73.5% 25	59.1% 13	65.4% 17	53.6% 15	83.3% 15
		Swine	83.7%	78.9%	86.4%	75.0%	68.8%	63.0%	81.1%	69.0%	96.0%	77.3%	80.0%	90.0%
-	Trimethoprim-		87 4.5%	90 2.8%	70 3.6%	33 2.5%	33 2.3%	17 3.4%	43 2.6%	29 2.7%	24 2.2%	34 2.5%	1.8%	18 3.0%
	Sulfamethoxazole	Humans	17	10	11	8	9	14	10	12	9	10	7	11
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	J	0.0%	0.0%	0.0%
							0.0%	0.0%	0	0	0.0%	0.0%	0.0%	0
		Ground Beef					0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	100.0%
		Pork Chops					0	0	0	1	0	0	0	1
		Chickens	1.5% 1	1.3% 2	0.0%	0.8% 1	1.3%	0.6% 1	0.0%	0.0%	0.0%	0.0% 0	0.0%	2.8%
		Turkeys	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
			0 6.1%	9.0%	2.1%	2.3%	0 4.1%	2.6%	0 4.2%	0 5.9%	0 4.5%	0.0%	0.0%	5.6%
		Cattle	2	17	4	2	4	2	2	2	1	0	0	1
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.1% 1	3.7% 1	1.9% 1	9.5% 4	4.0% 1	9.1% 4	10.0% 1	5.0% 1
	Ampicillin	Humans	45.7%	41.3%	42.1%	42.5%	33.8%	36.3%	32.1%	29.0%	28.1%	31.7%	26.2%	28.0%
	(MIC ≥ 32 μg/ml)	Chicken Breasts	174	150	128	138	133 33.3%	148 72.7%	123 53.1%	127 55.2%	115 57.1%	128 48.0%	104 61.8%	104 68.3%
		Chicken bleasts					0.0%	16 100.0%	26 50.0%	16 100.0%	12	12 100.0%	42 33.3%	84 0.0%
		Ground Turkey					0	2	1	1		1	1	0.070
		Ground Beef					0.0%	0.0%			100.0% 1	0.0%	50.0% 1	
		Pork Chops					50.0%	100.0%	50.0%	100.0%	100.0%	0.0%	0.0%	100.0%
			29.2%	43.5%	42.1%	26.2%	45.3%	1 32.1%	46.8%	26.8%	2 42.9%	0 37.3%	0 28.6%	33.3%
		Chickens	19	67	61	34	68	50	80	49	45	31	20	12
		Turkeys	50.0% 3	64.9% 24	66.7% 12	80.0% 12	55.6% 5	66.7% 4	28.6% 4	57.1% 4	80.0% 4	83.3% 5	33.3% 1	50.0% 1
		Cattle	57.6% 19	66.1% 125	63.1% 118	57.5% 50	71.4% 70	59.0% 46	60.4% 29	73.5% 25	63.6% 14	61.5% 16	50.0% 14	83.3% 15
		Swine	75.0%	64.0%	82.7%	63.6%	62.5%	51.9%	71.7%	66.7%	76.0%	70.5%	70.0%	80.0%
Phenicols	Chloramphenicol		78 34.1%	73 28.9%	67 30.9%	28 31.7%	30 23.4%	14 28.2%	38 24.3%	28 24.4%	19 22.0%	31 25.5%	7 23.2%	16 20.5%
	(MIC ≥ 32 μg/ml)	Humans	130	105	94	103	92	115	93	107	90	103	92	76
		Chicken Breasts					0.0%	9.1% 2	4.1% 2	3.4% 1	0.0% 0	0.0% 0	0.0% 0	0.0%
		Ground Turkey					0.0%	50.0%	50.0%	0.0%		100.0%	33.3%	0.0%
							0.0%	0.0%	1	0	100.0%	0.0%	50.0%	0
		Ground Beef					0 50.0%	0 100.0%	100.0%	100.0%	1 0.0%	0.0%	1 0.0%	100.0%
		Pork Chops					1	1	2	2	0	0	0	1
		Chickens	18.5% 12	10.4% 16	14.5% 21	11.5% 15	16.0% 24	5.1% 8	1.8% 3	8.2% 15	7.6% 8	1.2% 1	1.4% 1	0.0%
		Turkeys	0.0%	54.1%	55.6%	73.3%	66.7%	50.0%	28.6%	57.1%	60.0%	66.7%	33.3%	0.0%
			0 27.3%	20 37.0%	10 42.8%	11 37.9%	6 49.0%	3 42.3%	4 54.2%	4 47.1%	3 50.0%	4 65.4%	1 35.7%	0 66.7%
		Cattle	9	70	80	33	48	33	26	16	11	17	10	12
		Swine	56.7% 59	49.1% 56	53.1% 43	47.7% 21	56.3% 27	48.1% 13	60.4% 32	54.8% 23	64.0% 16	65.9% 29	50.0% 5	75.0% 15

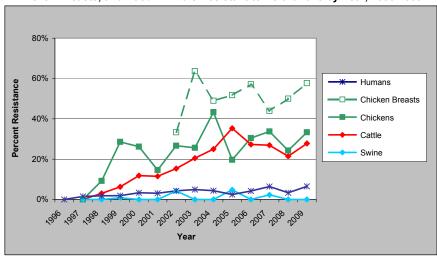
<sup>&</sup>lt;sup>1</sup> Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 33d. Antimicrobial Resistance among Salmonella Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Test	ted	Humans	381	363	304	325	394	408	383	438	409	404	397	371
		Chicken Breasts Ground Turkey Ground Beef Pork Chops					9 2 2	22 2 1	49 2 0	29 1 0	21 0 1	25 1 3	68 3 2	123 1 0
		Chickens Turkeys Cattle Swine	66 6 33 104	154 37 189 114	145 18 187 81	130 15 87 44	2 150 9 98 48	1 156 6 78 27	2 171 14 48 53	2 183 7 34 42	2 105 5 22 25	3 83 6 26 44	3 70 3 28 10	1 36 2 18 20
ntimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	0.0%	0.0%	0.0%	0.3% 1	0.0%	0.0%	0.0%	0.0%	0.2% 1	0.0% 0	0.0%	0.0%
	(MIO = 4 pg/III)	Chicken Breasts	Ü	J	Ü	•	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%
		Ground Turkey					0.0% 0	0.0% 0	0.0% 0	0.0%		0.0% 0	0.0% 0	0.0%
		Ground Beef					0.0%	0.0%			0.0%	0.0%	0.0%	
		Pork Chops					0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.09
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	0.5%	0.0%	1.3%	0.6%	1.3%	1.2%	0.5%	0.9%	0.7%	1.5%	1.3%	2.29
	`,	Chicken Breasts					0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.09
		Ground Turkey					0.0%	50.0% 1	0.0% 0	0.0% 0		0.0%	0.0% 0	0.09
		Ground Beef					0.0%	0.0%			0.0%	0.0%	0.0%	
		Pork Chops					0.0% 0	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0% 0	0.0%
		Chickens	0.0%	0.6% 1	0.7% 1	0.0% 0	2.7% 4	0.0%	0.0% 0	1.1% 2	0.0%	0.0%	0.0%	0.09
		Turkeys	0.0%	51.4% 19	33.3% 6	60.0% 9	55.6% 5	33.3% 2	14.3% 2	0.0%	0.0%	0.0%	0.0%	0.09
		Cattle	0.0%	0.5% 1	0.0% 0	0.0% 0	1.0% 1	0.0%	6.3% 3	0.0%	0.0%	0.0%	0.0% 0	0.0%
		Swine	0.0% 0	0.0% 0	1.2% 1	0.0% 0	2.1% 1	0.0% 0	0.0% 0	0.0% 0	0.0%	2.3% 1	0.0% 0	0.0%
etracyclines	Tetracycline (MIC ≥ 16 µg/ml)	Humans	46.5% 177	41.9% 152	43.4% 132	43.4% 141	32.0% 126	38.2% 156	30.3% 116	30.4% 133	31.5% 129	36.9% 149	27.5% 109	28.8 107
	( , , , , ,	Chicken Breasts					44.4% 4	31.8% 7	71.4% 35	69.0% 20	90.5% 19	72.0% 18	94.1% 64	95.9 118
		Ground Turkey					0.0%	50.0%	100.0%	0.0%	15	100.0%	66.7%	100.0
		Ground Beef					0.0%	0.0%			100.0% 1	0.0%	50.0% 1	
		Pork Chops					100.0%	100.0%	100.0% 2	100.0% 2	100.0%	66.7% 2	33.3% 1	100.0
		Chickens	30.8% 20	32.5% 50	32.4% 47	16.2% 21	28.0% 42	33.3% 52	44.4% 76	34.4% 63	61.0% 64	60.2% 50	64.3% 45	55.6 20
		Turkeys	83.3% 5	78.4% 29	83.3% 15	93.3% 14	77.8% 7	100.0%	78.6% 11	57.1% 4	100.0%	66.7% 4	66.7% 2	50.0 1
		Cattle	63.6% 21	58.7% 111	61.5% 115	44.8% 39	64.3% 63	53.8% 42	60.4% 29	67.6% 23	54.5% 12	65.4% 17	50.0% 14	88.9 16

#### **Ceftriaxone Resistance**

Figure 13. Percent of *Salmonella* Typhimurium Isolates from Humans, Retail Chicken Breasts, and Food Animals Resistant to Ceftriaxone by Year, 1996-2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Data for ground turkey, ground beef, pork chops, and turkeys are not included due to the small number of *Salmonella* Typhimurium isolates from these sources. Table 33 contains resistance data for *Salmonella* Typhimurium isolates from each source, by year

Table 34. Number of Salmonella Typhimurium Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2009

							,		<b>,</b>		· · , · <b>,</b>	,		
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	307	328	381	363	304	325	394	408	383	438	409	404	397	371
Chicken Breasts							9	22	49	29	21	25	68	123
Ground Turkey							2	2	2	1	0	1	3	1
Ground Beef							2	1	0	0	1	3	2	0
Pork Chops							2	1	2	2	2	3	3	1
Chickens		24	66	154	145	130	150	156	171	183	105	83	70	36
Turkeys		4	6	37	18	15	9	6	14	7	5	6	3	2
Cattle		1	33	189	187	87	98	78	48	34	22	26	28	18
Swine		25	104	114	81	44	48	27	53	42	25	44	10	20

Table 35a. Resistance Patterns among Salmonella Typhimurium Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 35a. Resistance Pa	itterns among 3												
Year Number of Isolates Tested	Humana	<b>1998</b> 381	<b>1999</b> 363	<b>2000</b> 304	<b>2001</b> 325	<b>2002</b> 394	<b>2003</b> 408	2004	<b>2005</b> 438	<b>2006</b> 409	<b>2007</b> 404	<b>2008</b> 397	2009 371
Number of isolates rested	Humans Chicken Breasts	381	303	304	325	394	408	383 49	438	409	404 25	68	371 123
	Ground Turkey					2	22	2	1	0	1	3	123
	Ground Beef					2	1	0	0	1	3	2	0
	Pork Chops					2	1	2	2	2	3	3	1
	Chickens	66	154	145	130	150	156	171	183	105	83	70	36
	Turkeys Cattle	6 33	37 189	18 187	15 87	9 98	6 78	14 48	7 34	5 22	6 26	3 28	2 18
	Swine	104	114	81	44	48	27	53	42	25	44	10	20
Resistance Pattern	Isolate Source												
4 No Donintono Dotonto	Humans	46.5%	50.4%	49.3%	49.2%	59.9%	54.7%	60.6%	65.1%	62.6%	57.4%	68.0%	63.6%
1. No Resistance Detected	Oli I. B. I.	177	183	150	160	236 22.2%	223 22.7%	232 14.3%	285 24.1%	256 0.0%	232 24.0%	270 4.4%	236 2.4%
	Chicken Breasts					2	5	7	7	0	6	3	3
	Ground Turkey					100.0% 2	0.0%	0.0%	0.0%		0.0%	33.3% 1	0.0%
	Ground Beef					100.0% 2	100.0% 1			0.0%	100.0% 3	50.0% 1	
	Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	66.7%	0.0%
	Chickens	40.0%	29.2%	31.7%	64.6%	37.3%	45.5%	40.9%	54.1%	30.5%	30.1%	27.1%	33.3%
		26 16.7%	45 10.8%	46 5.6%	84 6.7%	56 0.0%	71 0.0%	70 14.3%	99 42.9%	32 0.0%	25 16.7%	19 0.0%	0.0%
	Turkeys	10.7 76	4	1	1	0.070	0.070	2	3	0.070	10.770	0.070	0.070
	Cattle	36.4%	29.1%	26.7%	34.5%	19.4%	39.7%	35.4%	26.5%	31.8%	34.6%	46.4%	5.5%
		12 7.7%	55 7.9%	50 2.5%	30 13.6%	19 8.3%	31 18.5%	17 3.8%	9 16.7%	7 0.0%	9 6.8%	13 0.0%	0.0%
	Swine	8	9	2	6	4	5	2	7	0	3	0	0
2. Resistant to ≥ 3	Humans	46.7% 178	43.0% 156	43.4% 132	41.5% 135	32.5% 128	37.3% 152	31.6% 121	30.1% 132	30.3% 124	34.4% 139	27.7% 110	28.0% 104
Antimicrobial Classes	Chicken Breasts			.02	.55	33.3%	72.7%	71.4%	58.6%	81.0%	68.0%	79.4%	75.6%
						3 0.0%	16 100.0%	35 100.0%	17 100.0%	17	17 100.0%	54 33.3%	93
	Ground Turkey					0	2	2	1	100.00/	1	1	0
	Ground Beef					0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1	
	Pork Chops					50.0% 1	100.0% 1	100.0%	100.0% 2	100.0%	0.0%	33.3% 1	100.0% 1
	Chickens	31.8% 21	47.4% 73	48.3% 70	28.5% 37	46.0% 69	34.6% 54	48.5% 83	30.6% 56	55.2% 58	39.8% 33	31.4% 22	38.9% 14
	Turkeys	83.3%	73.0%	66.7%	86.7%	77.8%	100.0%	71.4%	57.1%	80.0%	83.3%	33.3%	50.0%
	0.11	5 60.6%	27 64.0%	12 64.2%	13 50.6%	7 70.4%	6 59.0%	10 60.4%	4 73.5%	4 59.1%	5 65.4%	1 50.0%	83.3%
	Cattle	20	121	120	44	69	46	29	25	13	17	14	15
	Swine	81.7% 85	78.9% 90	86.4% 70	70.5% 31	75.0% 36	55.6% 15	77.4% 41	71.4% 30	96.0% 24	72.7% 32	80.0% 8	85.0% 17
	Humans	43.3%	38.6%	39.8%	37.8%	28.4%	32.4%	27.7%	27.4%	26.9%	30.0%	24.7%	24.0%
3. Resistant to ≥ 4 Antimicrobial Classes	- Turnano	165	140	121	123	112 0.0%	132 36.4%	106 46.9%	120 48.3%	110 47.6%	121 40.0%	98 55.9%	89 61.0%
Anumiciobiai Classes	Chicken Breasts					0	8	23	14	10	10	38	75
	Ground Turkey					0.0% 0	50.0% 1	50.0% 1	0.0%		100.0% 1	33.3% 1	0.0% 0
	Ground Beef					0.0%	0.0%			100.0% 1	0.0%	50.0% 1	
	Pork Chops					50.0% 1	100.0%	100.0%	100.0% 2	100.0% 2	0.0%	0.0%	100.0%
	Chickens	18.2%	22.7%	20.7%	13.1%	25.3%	19.9%	37.4%	21.3%	38.1%	31.3%	25.7%	25.0%
	Turkerin	12 50.0%	35 62.2%	30 61.1%	17 86.7%	38 66.7%	31 66.7%	64 28.6%	39 57.1%	40 60.0%	26 66.7%	18 33.3%	9 50.0%
	Turkeys	3	23	11	13	6	4	4	4	3	4	1	1
	Cattle	60.6% 20	55.0% 104	55.6% 104	41.4% 36	58.2% 57	51.3% 40	60.4% 29	64.7% 22	54.5% 12	61.5% 16	46.4% 13	77.8% 14
	Swine	72.1%	57.0%	74.1% 60	54.5%	60.4% 29	51.9%	71.7%	66.7% 28	72.0% 18	70.5% 31	70.0%	75.0%
	Humans	75 34.1%	65 28.1%	29.6%	24 29.5%	23.1%	14 27.7%	38 24.3%	22.8%	20.8%	25.0%	7 23.7%	15 22.1%
4. Resistant to ≥ 5  Antimicrobial Classes		130	102	90	96	91 0.0%	113 27.3%	93 44.9%	100 48.3%	85 47.6%	101 40.0%	94 48.5%	82 56.9%
	Chicken Breasts					0	6	22	14	10	10	33	70
	Ground Turkey					0.0% 0	50.0% 1	50.0% 1	0.0% 0		100.0% 1	33.3% 1	0.0% 0
	Ground Beef					0.0% 0	0.0% 0			100.0% 1	0.0% 0	50.0% 1	
	Pork Chops					50.0% 1	100.0% 1	50.0% 1	100.0% 2	0.0%	0.0%	0.0%	100.0% 1
	Chickens	16.7% 11	15.6% 24	17.2% 25	12.3% 16	20.0%	17.3% 27	36.3% 62	19.7% 36	35.2% 37	30.1% 25	22.8% 16	25.9%
	Turkeys	0.0%	56.8%	55.6%	73.3%	55.6%	50.0%	28.6%	57.1%	60.0%	33.3%	33.3%	50.0%
	Cattle	24.2%	21 34.9%	10 38.0%	11 34.5%	5 35.7%	33.3%	58.3%	50.0%	3 50.0%	2 61.5%	1 35.7%	72.2%
		8 56.7%	66 46.5%	71 43.2%	30 45.5%	35 47.9%	26 48.1%	28 60.4%	17 54.8%	11 44.0%	16 47.7%	10 40.0%	13 70.0%
	Swine	59	53	35	20	23	13	32	23	11	21	4	14

Table 35b. Resistance Patterns among Salmonella Typhimurium Isolates from Humans. Retail Meats, and Food Animals, by Year, 1998-2009

Table 35b. Resistance Pa		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	381	363	304	325	394	408	383	438	409	404	397	371
	Chicken Breasts					9	22	49	29	21	25	68	123
	Ground Turkey Ground Beef					2	2	2	1	0	1 3	3	1
	Pork Chops					2 2	1	0 2	0 2	2	3	2 3	0
	Chickens	66	154	145	130	150	156	171	183	105	83	70	36
	Turkeys	6	37	18	15	9	6	14	7	5	6	3	2
	Cattle Swine	33 104	189 114	187 81	87 44	98 48	78 27	48 53	34 42	22 25	26 44	28 10	18 20
Resistance Pattern	Isolate Source												
	Humans	32.5%	27.8%	28.0%	29.5%	21.6%	26.5%	23.5%	22.4%	19.6%	22.8%	22.9%	19.4%
5. At Least ACSSuT <sup>1</sup> Resistant		124	101	85	96	85 0.0%	108 9.1%	90 4.1%	98 3.5%	80 0.0%	92 0.0%	91 0.0%	72 0.0%
	Chicken Breasts					0	2	2	1	0	0	0	0
	Ground Turkey					0.0% 0	50.0% 1	50.0% 1	0.0%		100.0%	33.3% 1	0.0%
	Ground Beef					0.0% 0	0.0%			100.0% 1	0.0%	50.0% 1	
	Pork Chops					50.0% 1	100.0% 1	50.0% 1	100.0% 2	0.0% 0	0.0%	0.0%	100.0% 1
	Chickens	16.7% 11	9.7% 15	13.1% 19	11.5% 15	12.7% 19	3.2% 5	1.8%	7.1% 13	6.7% 7	1.2%	0.0%	0.0%
	Turkeys	0.0%	51.4%	50.0%	66.7%	44.4%	50.0%	28.6%	57.1%	60.0%	33.3%	33.3%	0.0%
	Cattle	0 21.2%	19 32.8%	9 37.4%	10 31.0%	4 31.6%	28.2%	4 54.2%	41.2%	50.0%	50.0%	1 35.7%	66.7%
	Cattle	7 54.8%	62 46.5%	70 39.5%	27 45.5%	31 47.9%	22 44.4%	26 60.4%	14 50.0%	11 44.0%	13 47.7%	10 30.0%	12
	Swine	54.6%	53	39.5%	20	23	12	32	21	11	21	30.0%	70.0% 14
6. At Least ACT/S <sup>2</sup> Resistant	Humans	2.6% 10	2.2% 8	1.6% 5	0.9%	2.0% 8	3.2% 13	1.6% 6	2.1% 9	0.7% 3	2.0% 8	0.5% 2	2.2% 8
o. At Louist Ao I/O Resistant	Chicken Breasts		J			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0.0%	0.0%	0.0%	0.0%	0	0.0%	0.0%	0.0%
	Ground Beef					0.0%	0.0%	0	0	0.0%	0.0%	0.0%	0
	Pork Chops					0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	100.0%
	Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Turkeys	0.070	0.070	0.070	0	0.070	0.070	0	0	0.070	0	0.070	0.070
	Cattle	6.1% 2	8.5% 16	0.5% 1	2.3%	3.1% 3	2.6% 2	4.2% 2	2.9% 1	4.5% 1	0.0%	0.0%	5.6% 1
	Swine	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	1.9%	7.1%	4.0%	9.1%	0.0%	0.0%
	Humans	1.0%	0.6%	1.6%	1.2%	1.8%	2.2%	2.6%	1.8%	2.9%	3.7%	2.0%	1.6%
7. At Least ACSSuTAuCx 3 Resistant		4	2	5	4	7 0.0%	9	10 4.1%	0.0%	12 0.0%	15 0.0%	0.0%	6 0.0%
	Chicken Breasts					0.0%	0 50.0%	0.0%	0.0%	0	0.0%	0 33.3%	0.0%
	Ground Turkey					0	1	0.0%	0.0%	2.20	0	1	0.0%
	Ground Beef					0.0% 0	0.0% 0			0.0%	0.0%	0.0%	
	Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens	0.0%	0.0%	0.7%	0.0%	2.0%	0.6%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%
	Turkeys	0.0%	0 45.9%	33.3%	53.3%	3 11.1%	16.7%	0 14.2%	0.0%	0.0%	16.7%	0.0%	0.0%
	<u> </u>	3.0%	17 6.3%	6 11.8%	8 10.3%	1 11.2%	1 12.8%	20.8%	0 26.5%	0 22.7%	1 26.9%	0 21.4%	0 16.7%
	Cattle	1	12	22	9	11	10	10	9	5	7	6	3
	Swine	0.0% 0	0.9% 1	0.0%	0.0% 0	4.2% 2	0.0% 0	0.0% 0	2.4% 1	0.0% 0	2.3% 1	0.0%	0.0% 0
8. At Least Ceftriaxone and	Humans	0.0%	0.0%	0.3% 1	0.3% 1	0.5% 2	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.5% 2
Nalidixic Acid Resistant	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0.0%	50.0%	0.0%	0.0%		0.0%	0.0%	0.0%
	Ground Beef					0.0%	0.0%		Ť	0.0%	0.0%	0.0%	
	Pork Chops					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens	0.0%	0.6%	0.7%	0.0%	2.7%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%
	Turkeys	0.0%	48.6%	33.3%	53.3%	22.2%	16.7%	14.3%	0.0%	0.0%	16.7%	0.0%	0.0%
	Cattle	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%
		0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Swine	0	0	0	0	1	0	0	0	0	0	0	0

<sup>&</sup>lt;sup>1</sup> ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline <sup>2</sup> ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole <sup>3</sup> ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

# G. Antimicrobial Susceptibility among Salmonella serotype Newport

Table 36a. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009														
Year Number of Isolates Test		Lilimana	<b>1998</b>	<b>1999</b> 99	<b>2000</b> 121	<b>2001</b> 124	<b>2002</b> 241	<b>2003</b> 223	<b>2004</b> 191	<b>2005</b> 207	<b>2006</b> 217	<b>2007</b> 221	<b>2008</b> 253	<b>2009</b> 236
Number of Isolates Test	ea	Humans Chicken Breasts Ground Turkey Ground Beef Pork Chops	11	99	121	124	0 3 3 2	0 2 1 1	0 2 2 0	0 3 0 0	0 0 0 0	0 0 0 0	0 3 3 0	1 3 2 0
		Chickens Turkeys Cattle Swine	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1	3 15 30 1	1 8 31 2	0 3 17 0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Aminoglycosides	Amikacin (MIC ≥ 64)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	(6 = 6 1)	Chicken Breasts				J					J			0.0%
		Ground Turkey					0.0% 0	0.0%	0.0%	0.0%			0.0%	0.0%
		Ground Beef					0.0% 0	0.0% 0	0.0%				0.0%	0.0%
		Pork Chops					0.0%	0.0% 0						
		Chickens	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%		0.0% 0		0.0%	0.0% 0	
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0
		Swine	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%	
	Gentamicin (MIC ≥ 16)	Humans	0.0%	0.0%	2.5% 3	3.2% 4	3.3% 8	3.1% 7	0.5% 1	1.0% 2	0.9% 2	0.9%	0.4% 1	0.4% 1
		Chicken Breasts												0.0%
		Ground Turkey					0.0% 0	50.0% 1	0.0%	0.0%			33.3% 1	33.3% 1
		Ground Beef					0.0%	0.0% 0	0.0%				0.0%	0.0%
		Pork Chops					0.0%	0.0%						
		Chickens	100.0% 1	0.0%	20.0%	0.0%	0.0%	0.0%		16.7% 1		0.0%	0.0% 0	
		Turkeys	0.0%	0.0%	16.7% 1	6.3% 1	0.0%	52.6% 10	14.3% 1	80.0% 4	50.0% 2	0.0%	25.0% 2	66.7% 2
		Cattle	0.0%	1.9% 1	11.0% 12	6.9% 6	7.1% 8	1.3% 1	0.0%	0.0%	3.3% 1	0.0%	0.0%	0.0%
		Swine	0.0%	0.0%	0.0% 0	0.0% 0		0.0%		0.0% 0	0.0% 0	0.0%	0.0%	
	Kanamycin (MIC ≥ 64)	Humans	1.3% 1	1.0% 1	5.0% 6	7.3% 9	10.0% 24	4.5% 10	2.6% 5	1.9% 4	2.3% 5	0.9% 2	3.6% 9	1.3% 3
		Chicken Breasts												0.0%
		Ground Turkey					0.0% 0	0.0%	0.0% 0	0.0% 0			0.0%	0.0%
		Ground Beef					0.0% 0	0.0% 0	0.0% 0				33.3% 1	0.0% 0
		Pork Chops					0.0%	0.0%						
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		33.3% 2		0.0%	0.0%	
		Turkeys	0.0%	0.0%	0.0%	0.0%	10.0%	21.1%	14.3% 1	80.0%	50.0%	6.7% 1	37.5% 3	33.3% 1
		Cattle	0.0%	0.0%	9.2%	6.9%	15.9% 18	17.3% 13	25.0% 11	14.8% 4	13.3% 4	10.0%	0.0%	5.9% 1
		Swine	0.0%	0.0%	0.0%	57.1% 4		0.0%		0.0%	0.0%	0.0%	0.0%	
	Streptomycin (MIC ≥ 64)	Humans	2.6%	19.2% 19	24.0% 29	31.5% 39	25.3% 61	24.2% 54	15.7% 30	14.0% 29	13.8% 30	10.4% 23	14.2% 36	7.6% 18
		Chicken Breasts					00 ===	50.55	0.554	0.554			00.72	0.0%
		Ground Turkey					33.3%	50.0%	0.0%	0.0%			33.3%	33.3%
		Ground Beef					66.7%	100.0%	100.0%				66.7% 2	0.0%
		Pork Chops	100.00/	0.004	20.00/	27 50/	100.0%	100.0%		E0.00/		0.001	100.000	
		Chickens	100.0%	0.0%	20.0%	37.5%	0.0%	85.7% 6	44 = 21	50.0%	0.72	0.0%	100.0%	00 =1
		Turkeys	0.0%	0.0%	16.7%	12.5%	0.0%	31.6%	14.3%	80.0%	0.0%	6.7%	25.0%	66.7%
		Cattle	12.5%	37.0% 20	79.8% 87	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12
		Swine	0.0% 0	0.0%	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0%	0.0%	50.0% 1	

Table 36b. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	1	Humans	77	99	121	124	241	223	191	207	217	221	253	236
		Chicken Breasts Ground Turkey					0	0 2	0 2	0 3	0	0	0 3	1 3
		Ground Beef					3	1	2	0	0	0	3	2
		Pork Chops					2	1	0	0	0	0	0	0
		Chickens Turkeys	1 1	7 4	5 6	8 16	6 10	7 19	0 7	6 5	0 4	3 15	1 8	0 3
		Cattle	8	54	109	87	113	75	44	27	30	30	31	17
	Antimicrobial	Swine	1	5	2	7	0	3	0	1	1	1	2	0
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase	Amoxicillin-	Humans	2.6%	18.2%	22.3%	26.6%	22.8%	21.5%	15.2%	12.6%	12.4%	8.1%	13.0%	6.8%
Inhibitor Combinations	Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)		2	18	27	33	55	48	29	26	27	18	33	16 0.0%
	(	Chicken Breasts					00.00/	0.00/	0.00/	0.00/			0.00/	0
		Ground Turkey					33.3% 1	0.0%	0.0% 0	0.0% 0			0.0%	0.0% 0
		Ground Beef					66.7% 2	100.0%	100.0%				66.7% 2	0.0%
		Pork Chops					100.0% 2	100.0%						
		Chickens	0.0%	0.0%	0.0%	37.5%	0.0%	85.7%		50.0%		0.0%	100.0%	
		Turkeys	0.0%	0.0%	0.0%	3 12.5%	0.0%	6 10.5%	14.3%	0.0%	25.0%	6.7%	25.0%	33.3%
			0 12.5%	0 37.0%	0 76.1%	2 69.0%	0 78.8%	2 81.3%	77.3%	0 81.5%	1 76.7%	1 76.7%	2 64.5%	1 58.8%
		Cattle	1	20	83	60	89	61	34	22	23	23	20	10
		Swine	0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0%		0.0%	0.0%	0.0%	50.0% 1	
Cephems	Cefoxitin (MIC ≥ 32 µg/ml)	Humans			22.3% 27	25.8% 32	22.4% 54	21.5% 48	15.2% 29	12.6% 26	12.9% 28	8.1% 18	13.0% 33	5.9% 14
	, , ,	Chicken Breasts												0.0%
		Ground Turkey					33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
		-					1 66.7%	100.0%	100.0%	0			66.7%	0.0%
		Ground Beef					2 100.0%	1 100.0%	2				2	0
		Pork Chops			0.00/	07.50/	2 0.0%	1		50.00/		2 20/	100.00/	
		Chickens			0.0% 0	37.5% 3	0	71.4% 5		50.0% 3		0.0% 0	100.0% 1	
		Turkeys			0.0%	12.5% 2	0.0%	10.5% 2	14.3% 1	0.0%	25.0% 1	6.7% 1	25.0% 2	33.3% 1
		Cattle			73.4% 80	66.7% 58	77.9% 88	74.7% 56	77.3% 34	81.5% 22	70.0% 21	76.7% 23	64.5% 20	52.9% 6
		Swine			0.0%	85.7% 6	00	100.0%	34	0.0%	0.0%	0.0%	50.0%	
	Ceftiofur	Humans	1.3%	18.2%	22.3%	27.4%	22.8%	22.0%	15.2%	12.6%	12.4%	0 8.1%	13.0%	6.4%
	(MIC ≥ 8 μg/ml)		1	18	27	34	55	49	29	26	27	18	33	15 0.0%
		Chicken Breasts					00.00/	0.00/	0.00/	0.00/			0.00/	0
		Ground Turkey					33.3% 1	0.0% 0	0.0% 0	0.0% 0			0.0%	0.0% 0
		Ground Beef					66.7% 2	100.0% 1	100.0%				66.7% 2	0.0%
		Pork Chops					100.0% 2	100.0% 1						
		Chickens	0.0%	0.0%	0.0%	37.5%	0.0%	85.7%		50.0%		0.0%	100.0%	
		Turkeys	0.0%	0.0%	0.0%	3 12.5%	0.0%	10.5%	14.3%	0.0%	25.0%	6.7%	25.0%	33.3%
		•	12.5%	0 37.0%	0 76.1%	2 69.0%	0 78.8%	2 81.3%	77.3%	0 81.5%	1 76.7%	76.7%	2 64.5%	1 58.8%
		Cattle	0.0%	20 0.0%	83 0.0%	60 85.7%	89	61 100.0%	34	22 0.0%	23 0.0%	23 0.0%	20 50.0%	10
		Swine	0	0	0	6		3		0	0	0	1	
	Ceftriaxone (MIC ≥ 4 µg/mI)	Humans	1.3% 1	18.2% 18	22.3% 27	25.8% 32	22.8% 55	21.5% 48	14.7% 28	12.6% 26	12.9% 28	8.1% 18	13.0% 33	6.4% 15
		Chicken Breasts												0.0%
		Ground Turkey					33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
		Ground Beef					66.7%	100.0%	100.0%	0			66.7%	0.0%
							2 100.0%	100.0%	2				2	0
		Pork Chops	0.0%	0.0%	0.0%	37.5%	2 0.0%	1 85.7%		50.0%		0.0%	100.0%	
		Chickens	0	0	0	3	0	6	1	3	0	0	1	
		Turkeys	0.0%	0.0%	0.0%	12.5% 2	0.0%	10.5% 2	14.3% 1	0.0%	25.0% 1	6.7% 1	25.0% 2	33.3% 1
		Cattle	12.5% 1	37.0% 20	76.1% 83	69.0% 60	78.8% 89	81.3% 61	77.3% 34	81.5% 22	76.7% 23	76.7% 23	64.5% 20	58.8% 10
					UU	- 00	UU	0.1	, 0+	~~	20	20	20	10

Table 36c. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009							1	1						
Year Number of Isolates Tested		Humans	<b>1998</b>	<b>1999</b> 99	<b>2000</b> 121	<b>2001</b> 124	<b>2002</b> 241	<b>2003</b> 223	<b>2004</b> 191	<b>2005</b> 207	<b>2006</b> 217	<b>2007</b> 221	<b>2008</b> 253	<b>2009</b> 236
Number of Isolates restec		Chicken Breasts Ground Turkey Ground Beef Pork Chops	,,	33	121	124	0 3 3 2	0 2 1 1	0 2 2	0 3 0	0 0 0 0	0 0 0	0 3 3 0	1 3 2 0
		Chickens Turkeys Cattle Swine	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1	3 15 30 1	1 8 31 2	0 3 17 0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source			_								_	
Folate Pathway Inhibitors	Sulfamethoxazole/	Humans	3.9%	22.2%	23.1%	32.3%	25.7%	24.7%	16.8%	15.5%	15.2%	10.4%	13.8%	8.1%
	Sulfisoxazole₁ (MIC ≥ 512 μg/ml)	Chicken Breasts	3	22	28	40	62	55	32	32	33	23	35	0.0% 0
		Ground Turkey					33.3% 1	50.0% 1	0.0%	0.0%			33.3%	33.3% 1
		Ground Beef					66.7%	100.0%	100.0%				66.7%	0.0%
		Pork Chops					100.0%	100.0%						
		Chickens	100.0%	0.0%	0.0%	37.5% 3	0.0%	71.4%		50.0%		0.0%	100.0%	
		Turkeys	0.0%	0.0%	16.7% 1	12.5% 2	0.0%	52.6% 10	14.3% 1	80.0% 4	75.0% 3	0.0%	37.5% 3	100.0%
		Cattle	12.5% 1	35.2% 19	73.4% 80	72.4% 63	74.3% 84	73.3% 55	77.3% 34	85.2% 23	83.3% 25	83.3% 25	74.2% 23	70.6% 12
		Swine	0.0%	0.0% 0	50.0% 1	85.7% 6		100.0%		0.0%	0.0%	0.0%	50.0% 1	
	Trimethoprim- Sulfamethoxazole	Humans	1.3% 1	2.0%	4.1% 5	1.6% 2	4.1% 10	0.9% 2	2.1% 4	1.9% 4	3.2% 7	1.8% 4	3.2% 8	0.4% 1
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts												0.0%
		Ground Turkey					33.3% 1	0.0%	0.0%	0.0%			0.0%	0.0%
		Ground Beef					0.0%	0.0%	50.0% 1				0.0%	0.0%
		Pork Chops					100.0% 2	0.0%						
		Chickens	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%		16.7% 1		0.0%	100.0% 1	
		Turkeys	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0%	1.9% 1	14.7% 16	12.6% 11	7.1% 8	0.0%	11.4% 5	25.9% 7	16.7% 5	13.3% 4	12.9% 4	0.0%
		Swine	0.0% 0	0.0% 0	0.0% 0	0.0% 0		33.3% 1		0.0% 0	0.0% 0	0.0%	0.0%	
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans	2.6%	18.2% 18	23.1% 28	29.8% 37	24.9% 60	22.9% 51	15.7% 30	14.0% 29	15.2% 33	10.0% 22	15.0% 38	7.6% 18
		Chicken Breasts												0.0%
		Ground Turkey					33.3% 1	0.0%	0.0%	0.0%			0.0%	0.0% 0
		Ground Beef					66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0%
		Pork Chops					100.0% 2	100.0% 1						
		Chickens	100.0% 1	0.0% 0	0.0%	37.5% 3	16.7% 1	85.7% 6		50.0% 3		0.0%	100.0% 1	
		Turkeys	0.0%	0.0% 0	0.0%	12.5% 2	0.0%	15.8% 3	28.6% 2	20.0%	75.0% 3	6.7% 1	25.0% 2	33.3% 1
		Cattle	12.5% 1	37.0% 20	77.1% 84	70.1% 61	78.8% 89	82.7% 62	81.8% 36	85.2% 23	80.0% 24	76.7% 23	74.2% 23	64.7% 11
		Swine	0.0% 0	0.0% 0	0.0% 0	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0%	50.0% 1	
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	2.6%	18.2% 18	23.1% 28	28.2% 35	25.3% 61	22.4% 50	15.2% 29	13.5% 28	12.4% 27	9.5% 21	12.6% 32	6.8% 16
		Chicken Breasts												0.0%
		Ground Turkey					33.3% 1	0.0%	0.0% 0	0.0% 0			0.0%	0.0% 0
		Ground Beef					66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0% 0
		Pork Chops					100.0%	100.0%						
		Chickens	0.0%	0.0% 0	0.0%	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0% 0	100.0% 1	
		Turkeys	0.0%	0.0%	0.0%	12.5% 2	0.0%	21.1% 4	14.3% 1	0.0%	0.0%	0.0%	12.5% 1	0.0% 0
		Cattle	12.5% 1	37.0% 20	78.9% 86	73.6% 64	77.9% 88	78.7% 59	77.3% 34	81.5% 22	66.7% 20	76.7% 23	64.5% 20	52.9% 9
		Swine	0.0%	0.0% 0	50.0% 1	85.7% 6		100.0% 3		0.0% 0	0.0% 0	0.0%	50.0% 1	

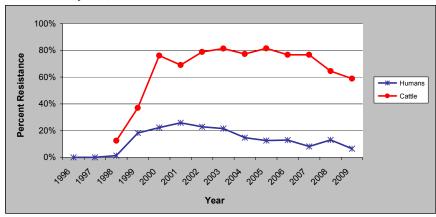
<sup>&</sup>lt;sup>1</sup> Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 36d. Antimicrobial Resistance among *Salmonella* Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009 Year			4000	4000	2000	2004	2002	2002	2004	2005	2000	2007	2008	2000
Number of Isolates Teste	nd.	Humans	<b>1998</b>	<b>1999</b> 99	<b>2000</b> 121	<b>2001</b> 124	<b>2002</b> 241	<b>2003</b> 223	<b>2004</b> 191	<b>2005</b> 207	<b>2006</b> 217	<b>2007</b> 221	253	<b>2009</b> 236
Number of Isolates Teste	ru	Chicken Breasts Ground Turkey Ground Beef Pork Chops	,,	99	121	124	0 3 3 2	0 2 1	0 2 2 0	0 3 0 0	0 0 0 0	0 0 0 0	0 3 3 0	1 3 2 0
		Chickens Turkeys Cattle Swine	1 1 8 1	7 4 54 5	5 6 109 2	8 16 87 7	6 10 113 0	7 19 75 3	0 7 44 0	6 5 27 1	0 4 30 1	3 15 30 1	1 8 31 2	0 3 17 0
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Quinolones	Ciprofloxacin (MIC ≥ 4 μg/ml)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0% 0
	(WIC 2 4 µg/III)	Chicken Breasts		U	U	U	U		U	U	U	U	J	0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%			0.0%	0.0%
		Ground Beef					0.0% 0	0.0%	0.0% 0				0.0% 0	0.0% 0
		Pork Chops	2.201				0.0%	0.0%						
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0% 0		0.0% 0	0.0%	
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0
		Swine	0.0%	0.0%	0.0%	0.0%		0.0%		0.0% 0	0.0% 0	0.0%	0.0%	
	Nalidixic Acid (MIC ≥ 32 μg/ml)	Humans	0.0%	0.0% 0	0.8% 1	0.0% 0	0.8% 2	0.4% 1	0.5% 1	0.0% 0	0.5% 1	0.0% 0	0.4% 1	0.0%
		Chicken Breasts												0.0% 0
		Ground Turkey					0.0% 0	0.0%	0.0% 0	0.0% 0			0.0% 0	0.0% 0
		Ground Beef					0.0%	0.0%	0.0% 0				0.0% 0	0.0%
		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%	2.201
		Turkeys	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 1.3%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%	0.0% 0 0.0%
		Cattle	0	0	0	0	0.0%	1	0.0%	0	0	0	0	0.0%
		Swine	0.0%	0.0% 0	0.0%	0.0% 0		0.0%		0.0% 0	0.0% 0	0.0% 0	0.0% 0	
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans	2.6%	19.2% 19	23.1% 28	30.6% 38	25.7% 62	24.2% 54	16.8% 32	14.5% 30	14.3% 31	10.0% 22	14.6% 37	8.1% 19
		Chicken Breasts												0.0% 0
		Ground Turkey					33.3% 1	0.0%	0.0%	0.0%			66.7% 2	0.0%
		Ground Beef					66.7% 2	1	100.0% 2				66.7% 2	0.0% 0
		Pork Chops	400.001	0.624	0.004	07.504	100.0%	1		E0 22/		0.004	400.000	
		Chickens	100.0%	0.0%	0.0%	37.5% 3	0.0%	85.7% 6	20.60/	50.0%	25.00/	0.0%	100.0%	22 20/
		Turkeys	0.0% 0 12.5%	0.0% 0 38.9%	0.0% 0 80.7%	12.5% 2 73.6%	40.0% 4 80.5%	36.8% 7 84.0%	28.6% 2 84.1%	60.0% 3	25.0% 1 83.3%	20.0% 3 86.7%	62.5% 5 74.2%	33.3% 1 70.6%
		Cattle	1 100.0%	21 20.0%	80.7% 88 50.0%	64 85.7%	91	63 100.0%	84.1% 37	81.5% 22 0.0%	83.3% 25 0.0%	26 0.0%	74.2% 23 50.0%	70.6% 12
		Swine	1	1	1	6		3		0.0%	0.0%	0.0%	1	

#### **Ceftriaxone Resistance**

Figure 14. Percent of *Salmonella* Newport Isolates from Humans and Cattle Resistant to Ceftriaxone, by Year, 1996-2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Data for other sources are not included due to the small number of *Salmonella* Newport isolates. Table 36 contains resistance data for *Salmonella* Newport isolates from each source, by year

Table 37. Number of Salmonella Newport Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2009

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	51	46	77	99	121	124	241	223	191	207	217	221	253	236
Chicken Breasts							0	0	0	0	0	0	0	1
Ground Turkey							3	2	2	3	0	0	3	3
Ground Beef							3	1	2	0	0	0	3	2
Pork Chops							2	1	0	0	0	0	0	0
Chickens		0	1	7	5	8	6	7	0	6	0	3	1	0
Turkeys		0	1	4	6	16	10	19	7	5	4	15	8	3
Cattle		0	8	54	109	87	113	75	44	27	30	30	31	17
Swine		0	1	5	2	7	0	3	0	1	1	1	2	0

Table 38a. Resistance I	Patterns among												
Year Number of Isolates Tested	Humans	<b>1998</b>	<b>1999</b> 99	<b>2000</b> 121	<b>2001</b> 124	<b>2002</b> 241	<b>2003</b> 223	<b>2004</b> 191	<b>2005</b> 207	<b>2006</b> 217	<b>2007</b> 221	<b>2008</b> 253	<b>2009</b> 236
Transper of isolates Testeu	Chicken Breasts	- 11	99	121	124	0	0	0	0	0	0	0	1
	Ground Turkey					3	2	2	3	0	0	3	3
	Ground Beef Pork Chops					3 2	1	0	0	0	0	3	2 0
	Chickens	1	7	5	8	6	7	0	6	0	3	1	0
	Turkeys Cattle	1 8	4 54	6 109	16 87	10 113	19 75	7 44	5 27	4 30	15 30	8 31	3 17
	Swine	1	5	2	7	0	3	0	1	1	1	2	0
Resistance Pattern	Isolate Source	94.8%	75.8%	75.2%	65.3%	72.2%	73.5%	82.2%	84.1%	82.9%	89.1%	85.0%	89.8%
1. No Resistance Detected	Humans	73	75.0%	91	81	174	164	157	174	180	197	215	212
	Chicken Breasts												100.0%
	Ground Turkey					66.7% 2	50.0% 1	100.0% 2	100.0% 3			0.0% 0	66.7% 2
	Ground Beef					33.3% 1	0.0% 0	0.0% 0				33.3% 1	100.0% 2
	Pork Chops					0.0%	0.0%						
	Chickens	0.0% 0	100.0% 7	80.0% 4	62.5% 5	83.3% 5	14.3% 1		50.0% 3		100.0% 3	0.0% 0	
	Turkeys	100.0% 1	100.0% 4	83.3% 5	87.5% 14	60.0% 6	21.1% 4	57.1% 4	20.0% 1	25.0% 1	80.0% 12	12.5% 1	0.0%
	Cattle	87.5% 7	61.1% 33	19.3% 21	25.3% 22	19.5% 22	14.7% 11	15.9% 7	14.8% 4	16.7% 5	13.3%	25.8% 8	29.4%
	Swine	0.0%	80.0% 4	50.0%	14.3%		0.0%	,	100.0%	100.0%	100.0%	50.0% 1	
2. Resistant to ≥ 3	Humans	2.6%	18.2%	23.1%	31.5%	25.3%	23.3%	16.2%	14.5%	15.2%	10.9%	13.8%	7.6%
Antimicrobial Classes	Chicken Breasts	2	18	28	39	61	52	31	30	33	24	35	0.0%
	Ground Turkey					33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
	Ground Beef					66.7%	100.0%	100.0%	0			66.7%	0.0%
	Pork Chops					100.0%	100.0%	2				2	0
	Chickens	100.0%	0.0%	0.0%	37.5%	0.0%	85.7%		50.0%		0.0%	100.0%	
	Turkeys	0.0%	0.0%	0.0%	3 12.5%	0.0%	6 26.3%	14.3%	80.0%	75.0%	6.7%	1 37.5%	33.3%
	Cattle	12.5%	0 37.0%	79.8%	74.7%	80.5%	5 84.0%	84.1%	81.5%	83.3%	83.3%	74.2%	70.6%
	Swine	0.0%	0.0%	87 50.0%	65 85.7%	91	100.0%	37	0.0%	0.0%	0.0%	50.0%	12
	Humans	2.6%	0 18.2%	23.1%	6 31.5%	25.3%	3 22.9%	15.7%	0 14.0%	13.4%	9.5%	13.8%	6.8%
3. Resistant to ≥ 4 Antimicrobial Classes	Chicken Breasts	2	18	28	39	61	51	30	29	29	21	35	16 0.0%
						33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
	Ground Turkey					1 66.7%	0 100.0%	0 100.0%	0			0 66.7%	0.0%
	Ground Beef					100.0%	1 100.0%	2				2	0
	Pork Chops	400.00/	0.00/	0.00/	27.50/	2	1		F0.00/		0.00/	400.00/	
	Chickens	100.0% 1	0.0% 0	0.0% 0	37.5% 3	0.0% 0	85.7% 6		50.0% 3		0.0%	100.0% 1	
	Turkeys	0.0%	0.0%	0.0%	12.5% 2	0.0%	21.1% 4	14.3% 1	0.0%	25.0% 1	6.7% 1	25.0% 2	33.3% 1
	Cattle	12.5% 1	37.0% 20	79.8% 87	73.6% 64	80.5% 91	84.0% 63	84.1% 37	81.5% 22	83.3% 25	83.3% 25	74.2% 23	70.6% 12
	Swine	0.0%	0.0%	50.0%	85.7% 6	31	100.0%	37	0.0%	0.0%	0.0%	50.0%	12
4. Resistant to ≥ 5	Humans	2.6%	18.2% 18	23.1%	26.6% 33	23.7% 57	22.4% 50	14.7% 28	12.6% 26	12.9% 28	8.6% 19	13.0%	6.4% 15
Antimicrobial Classes	Chicken Breasts	2	10	20	33	37	30	20	20	20	19	33	0.0%
	Ground Turkey					33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
	Ground Beef					66.7% 2	100.0%	100.0%	U			66.7%	0 0.0% 0
	Pork Chops					100.0%	100.0%	2					U
	Chickens	0.0%	0.0%	0.0%	37.5%	0.0%	85.7%		50.0%		0.0%	100.0%	
	Turkeys	0.0%	0.0%	0.0%	12.5%	0.0%	10.5%	14.3%	0.0%	25.0%	6.7%	1 12.5%	33.3%
	Cattle	12.5%	37.0%	77.1%	69.0%	78.8%	81.3%	79.5%	0 81.5%	76.7%	76.7%	64.5%	58.8%
	Swine	0.0%	0.0%	0.0%	60 85.7%	89	61 100.0%	35	0.0%	0.0%	0.0%	20 50.0%	10
	- CWIIIC	0	0	0	6		3		0	0	0	1	

Table 38b. Resistance Patterns among Salmonella Newport Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 38b. Resistance Par	terns among												
Year	Literana	<b>1998</b>	<b>1999</b> 99	<b>2000</b> 121	<b>2001</b> 124	<b>2002</b> 241	<b>2003</b> 223	2004	2005	<b>2006</b> 217	<b>2007</b> 221	2008	2009
Number of Isolates Tested	Humans	//	99	121	124			191	207			253	236
	Chicken Breasts Ground Turkey					0	0 2	0 2	0 3	0	0	0 3	1 3
	Ground Beef					3	1	2	0	0	0	3	2
	Pork Chops					2	1	0	0	0	0	0	0
	Chickens	1	7	5	8	6	7	0	6	0	3	1	0
	Turkeys Cattle	1 8	4 54	6 109	16 87	10 113	19 75	7 44	5 27	4 30	15 30	8 31	3 17
	Swine	1	5	2	7	0	3	0	1	1	1	2	0
Resistance Pattern	Isolate Source												
	Humans	1.3%	18.2%	23.1%	25.8%	23.7%	22.0%	14.7%	12.6%	12.0%	8.6%	11.9%	6.4%
5. At Least ACSSuT <sup>1</sup> Resistant		1	18	28	32	57	49	28	26	26	19	30	15 0.0%
	Chicken Breasts												0
	Ground Turkey					33.3% 1	0.0% 0	0.0% 0	0.0%			0.0% 0	0.0% 0
	Ground Beef					66.7% 2	100.0% 1	100.0% 2				66.7% 2	0.0%
	Pork Chops					100.0% 2	100.0% 1						
	Chickens	0.0% 0	0.0%	0.0%	37.5% 3	0.0%	71.4% 5		50.0% 3		0.0%	100.0% 1	
	Turkeys	0.0%	0.0%	0.0%	12.5% 2	0.0%	5.3% 1	14.3% 1	0.0%	0.0% 0	0.0%	0.0% 0	0.0%
	Cattle	12.5%	35.2%	70.6%	67.8%	70.8%	66.7%	75.0%	81.5%	63.3%	70.0%	64.5%	47.1%
	Swine	0.0%	19 0.0%	77 0.0%	59 85.7%	80	50 100.0%	33	0.0%	19 0.0%	0.0%	20 50.0%	8
	Humans	1.3%	2.0%	0 4.1%	6 0.8%	3.7%	3 0.9%	1.0%	0 1.9%	2.3%	0.5%	2.8%	0.4%
6. At Least ACT/S <sup>2</sup> Resistant		1	2	5	1	9	2	2	4	5	1	7	1 0.0%
	Chicken Breasts					33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
	Ground Turkey					1	0	0	0.070			0	0
	Ground Beef					0.0% 0	0.0% 0	50.0% 1				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		16.7% 1		0.0%	100.0% 1	
	Turkeys	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	14.3% 1	0.0%	0.0% 0	0.0%	0.0%	0.0%
	Cattle	0.0%	1.9% 1	13.8% 15	11.5% 10	7.1% 8	0.0%	2.3% 1	25.9% 7	10.0% 3	13.3% 4	12.9% 4	0.0% 0
	Swine	0.0%	0.0%	0.0%	0.0%	Ü	33.3% 1		0.0%	0.0%	0.0%	0.0%	
	Humans	1.3%	18.2%	22.3%	25.0%	22.8%	21.1%	14.7%	12.6%	10.6%	8.1%	11.9%	6.4%
7. At Least ACSSuTAuCx <sup>3</sup> Resistant	Chicken Breasts	1	18	27	31	55	47	28	26	23	18	30	15 0.0%
	Ground Turkey					33.3%	0.0%	0.0%	0.0%			0.0%	0.0%
						1 66.7%	0 100.0%	0 100.0%	0			0 66.7%	0.0%
	Ground Beef					2 100.0%	1 100.0%	2				2	0
	Pork Chops	0.0%	0.0%	0.0%	37.5%	2	1 71.4%		50.0%		0.0%	100.0%	
	Chickens	0	0	0	3	0	5	44.001	3	0.001	0	1	0.001
	Turkeys	0.0% 0	0.0% 0	0.0% 0	12.5% 2	0.0% 0	5.2% 1	14.3% 1	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Cattle	12.5% 1	35.2% 19	69.7% 76	66.7% 58	70.8% 80	66.7% 52	72.7% 32	81.5% 22	63.3% 19	70.0% 21	64.5% 20	47.1% 8
	Swine	0.0% 0	0.0%	0.0%	85.7% 6		100.0% 3		0.0% 0	0.0%	0.0% 0	50.0% 1	
8. At Least Ceftriaxone and	Humans	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Nalidixic Acid Resistant	Chicken Breasts	U	U	U	U		U	1	U	U	U	U	0.0%
	Ground Turkey					0.0%	0.0%	0.0%	0.0%			0.0%	0.0%
	Ground Beef					0.0%	0.0%	0.0%	0			0.0%	0.0%
	Pork Chops					0.0%	0.0%	0				0	0
	Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%	
	Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		0.0%	0.0%	0.0%	0.0%	0.0%	0 1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cattle	0	0.0%	0.0%	0.0%	0	1 0.0%	0	0.0%	0.0%	0.0%	0	0
	Swine	0.076	0.0 %	0.0 %	0.078		0.076		0.0%	0.0 %	0.078	0.0 %	

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

<sup>&</sup>lt;sup>2</sup> ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

<sup>&</sup>lt;sup>3</sup> ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

# H. Antimicrobial Susceptibility among Salmonella serotype Heidelberg

Table 39a. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009 Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Test	ed	Humans	1998	88	79	102	105	96	92	125	102	98	75	86
		Chicken Breasts Ground Turkey Ground Beef				.02	11 21 0	16 32 0	31 37 0	22 53 0	30 35 0	14 41 0	30 56 1	45 10 0
		Pork Chops					3	0	3	0	4	0	0	1
		Chickens Turkeys	143 39	297 139	259 125	329 142	403 60	226 57	167 46	283 25	164 43	142 23	94 8	74 3
		Cattle	11	28	6	10	8	9	1	6	4	0	3	0
	Antimicrobial	Swine	37	33	22	16	11	11	4	8	13	2	1	4
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/	0.00/
Aminoglycosides	Amikacin (MIC ≥ 64)	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0% 0
		Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey					0.0% 0	0.0%	0.0%	0.0% 0	0.0%	0.0% 0	0.0%	0.0%
		Ground Beef											0.0%	
		Pork Chops					0.0%		0.0%		0.0%			0.0%
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	U	0.0%	0
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gentamicin	Humans	0 16.8%	0 14.8%	0 8.9%	7.8%	3.8%	0 5.2%	0 4.3%	0 6.4%	0 4.9%	0 16.3%	0 14.7%	2.3%
	(MIC ≥ 16)		17	13	7	8	4 45.5%	5 18.8%	9.7%	8 13.6%	5 20.0%	16 7.1%	11 30.0%	2.2%
		Chicken Breasts					5 28.6%	3 12.5%	3 35.1%	3 37.7%	6 31.4%	1 24.4%	9 57.1%	1 70.0%
		Ground Turkey					6	4	13	20	11	10	32 100.0%	7
		Ground Beef					100.0%		0.0%		75.0%		1	0.0%
		Pork Chops	26.6%	18.5%	32.0%	12.5%	3 8.9%	7.5%	0 10.2%	9.2%	3 9.8%	11.3%	10.6%	0 23.0%
		Chickens	38	55	83	41	36	17	17	26	16	16	10	17
		Turkeys	17.9% 7	16.5% 23	12.0% 15	13.4% 19	18.3% 11	12.3% 7	17.4% 8	36.0% 9	32.6% 14	13.0% 3	50.0%	33.3% 1
		Cattle	27.3% 3	39.3% 11	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%		33.3% 1	
		Swine	0.0% 0	0.0%	9.1% 2	0.0% 0	9.1% 1	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	100.0% 1	0.0%
	Kanamycin (MIC ≥ 64)	Humans	12.9% 13	9.1% 8	15.2% 12	19.6% 20	10.5% 11	8.3% 8	8.7% 8	12.8% 16	8.8% 9	11.2% 11	26.7% 20	20.9% 18
		Chicken Breasts					36.4% 4	0.0%	0.0%	0.0%	0.0%	7.1% 1	13.3% 4	15.6% 7
		Ground Turkey					42.9% 9	34.4% 11	27.0% 10	30.2% 16	34.3% 12	56.1% 23	53.6% 30	20.0%
		Ground Beef											100.0% 1	
		Pork Chops					0.0%		33.3% 1		0.0%			100.0% 1
		Chickens	0.7%	1.3%	12.0% 31	4.3% 14	3.7% 15	5.3% 12	6.0% 10	6.7% 19	7.3% 12	6.3% 9	8.5% 8	12.2% 9
		Turkeys	5.1% 2	17.3% 24	43.2% 54	31.0% 44	30.0% 18	21.1%	19.6%	44.0% 11	27.9% 12	34.8%	50.0%	66.7%
		Cattle	63.6% 7	42.9% 12	16.7% 1	10.0% 1	37.5% 3	55.6% 5	100.0%	50.0%	0.0%		33.3%	_
		Swine	64.9% 24	60.6%	77.3% 17	75.0% 12	54.5% 6	100.0% 11	75.0% 3	75.0% 6	84.6% 11	100.0% 2	100.0%	50.0% 2
	Streptomycin (MIC ≥ 64)	Humans	30.7% 31	23.9% 21	22.8% 18	25.5% 26	17.1% 18	12.5% 12	15.2% 14	13.6% 17	11.8% 12	12.2% 12	30.7% 23	23.3% 20
	= 0.7	Chicken Breasts					63.6%	12.5%	22.6%	18.2%	23.3%	21.4%	40.0% 12	13.3%
		Ground Turkey					61.9% 13	37.5% 12	43.2% 16	47.2% 25	45.7% 16	39.0% 16	71.4%	60.0%
		Ground Beef									10	.,0	100.0%	
		Pork Chops					100.0%		33.3% 1		0.0%			100.0%
		Chickens	32.9% 47	23.9% 71	36.7% 95	20.4% 67	18.6% 75	17.7% 40	18.0% 30	15.5% 44	10.4% 17	13.4% 19	16.0% 15	27.0% 20
		Turkeys	30.8% 12	30.2% 42	52.8% 66	40.1% 57	35.0% 21	28.1% 16	21.7% 10	44.0% 11	34.9% 15	26.1%	37.5% 3	66.7%
		Cattle	72.7%	57.1% 16	16.7%	20.0%	37.5% 3	55.6% 5	100.0%	50.0%	0.0%		33.3%	
		Swine	81.1% 30	63.6%	86.4% 19	75.0% 12	45.5%	100.0%	75.0%	87.5%	69.2%	100.0%	100.0%	50.0%
			30		19	12	5	11	3	7	9	2	1	2

Table 39b. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested		Humans	101	88	79	102	105	96	92	125	102	98	75	86
		Chicken Breasts Ground Turkey					11 21	16 32	31 37	22 53	30 35	14 41	30 56	45 10
		Ground Beef Pork Chops					0 3	0	0 3	0	0 4	0 0	1 0	0
		Chickens	143	297	259	329	403	226	167	283	164	142	94	74
		Turkeys Cattle	39 11	139 28	125 6	142 10	60 8	57 9	46 1	25 6	43 4	23 0	8	3 0
	Antimicrobial	Swine	37	33	22	16	11	11	4	8	13	2	1	4
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source												
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin- Clavulanic Acid	Humans	1.0% 1	1.1% 1	3.8%	2.9%	9.5% 10	5.2% 5	9.8% 9	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18
	(MIC ≥ 32 / 16 μg/ml)	Chicken Breasts					0.0%	6.3% 1	9.7% 3	13.6% 3	10.0% 3	21.4% 3	16.7% 5	31.1% 14
		Ground Turkey					19.0% 4	9.4% 3	5.4% 2	9.4% 5	17.1% 6	9.8% 4	7.1% 4	10.0% 1
		Ground Beef											0.0% 0	
		Pork Chops					0.0% 0		0.0%		0.0% 0			100.0% 1
		Chickens	1.4% 2	1.3% 4	13.5% 35	7.0% 23	8.7% 35	9.3% 21	10.2% 17	21.9% 62	15.9% 26	17.6% 25	8.5% 8	17.6% 13
		Turkeys	2.6% 1	0.7% 1	2.4% 3	5.6% 8	5.0% 3	0.0%	6.5% 3	0.0%	9.3% 4	26.1% 6	12.5% 1	33.3% 1
		Cattle	27.3% 3	42.9% 12	0.0%	0.0%	50.0% 4	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1	
		Swine	0.0%	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0%	7.7% 1	0.0%	0.0% 0	0.0%
Cephems	Cefoxitin (MIC ≥ 32 μg/ml)	Humans			2.5% 2	2.9%	8.6% 9	5.2% 5	7.6% 7	8.8% 11	8.8% 9	7.1% 7	8.0% 6	19.8% 17
	,	Chicken Breasts					0.0%	6.3%	9.7% 3	9.1% 2	10.0% 3	21.4%	16.7% 5	31.1% 14
		Ground Turkey					19.0% 4	0.0%	5.4% 2	9.4% 5	17.1% 6	9.8%	3.6% 2	10.0% 1
		Ground Beef											0.0%	
		Pork Chops					0.0%		0.0%		0.0% 0			100.0% 1
		Chickens			13.5% 35	5.2% 17	7.4% 30	7.1% 16	10.2% 17	21.6% 61	15.2% 25	16.9% 24	8.5% 8	17.6% 13
		Turkeys			2.4% 3	4.9% 7	1.7% 1	0.0%	6.5% 3	0.0%	9.3% 4	17.4% 4	12.5% 1	33.3% 1
		Cattle			0.0% 0	0.0%	37.5% 3	44.4% 4	100.0% 1	66.7% 4	0.0% 0		33.3% 1	
		Swine			4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0%	0.0%	7.7% 1	0.0% 0	0.0% 0	0.0%
	Ceftiofur (MIC ≥ 8 μg/ml)	Humans	0.0%	0.0% 0	3.8%	2.9% 3	7.6% 8	5.2% 5	8.7% 8	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18
		Chicken Breasts					0.0%	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.1% 14
		Ground Turkey					19.0% 4	0.0%	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.6% 2	10.0% 1
		Ground Beef											0.0% 0	
		Pork Chops					0.0% 0		0.0%		0.0% 0			100.0% 1
		Chickens	1.4% 2	1.7% 5	13.9% 36	5.8% 19	8.9% 36	9.3% 21	10.2% 17	21.9% 62	15.9% 26	16.9% 24	8.5% 8	17.6% 13
		Turkeys	2.6% 1	0.7% 1	3.2% 4	5.6% 8	5.0% 3	0.0%	6.5% 3	0.0%	9.3% 4	26.1% 6	12.5% 1	33.3% 1
		Cattle	27.3% 3	42.9% 12	0.0%	0.0%	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0%		33.3% 1	
		Swine	0.0% 0	0.0% 0	4.5% 1	0.0% 0	9.1% 1	9.1% 1	0.0% 0	0.0% 0	7.7% 1	0.0% 0	0.0% 0	0.0%
	Ceftriaxone (MIC ≥ 4 μg/ml)	Humans	0.0%	0.0% 0	3.8%	2.9% 3	7.6% 8	5.2% 5	8.7% 8	8.8% 11	9.8% 10	7.1% 7	8.0% 6	20.9% 18
		Chicken Breasts					0.0% 0	6.3% 1	9.7% 3	9.1% 2	10.0% 3	21.4% 3	16.7% 5	31.1% 14
		Ground Turkey					19.1% 4	0.0%	5.4% 2	9.4% 5	17.1% 6	9.8% 4	3.6% 2	10.0% 1
		Ground Beef											0.0%	
		Pork Chops					0.0%		0.0%		0.0% 0			100.0% 1
		Chickens	0.7% 1	1.3% 4	13.5% 35	5.8% 19	8.9% 36	9.3% 21	10.2% 17	21.9% 62	15.9% 26	17.6% 25	8.5% 8	17.6% 13
		Turkeys	2.6% 1	0.7% 1	2.4% 3	5.6% 8	5.0% 3	0.0%	6.5% 3	0.0%	9.3% 4	26.1% 6	12.5% 1	33.3% 1
		Cattle	27.3% 3	42.9% 12	0.0%	0.0%	37.5% 3	55.6% 5	100.0% 1	83.3% 5	0.0% 0		33.3% 1	
		Swine	0.0%	0.0% 0	4.5% 1	0.0%	9.1% 1	9.1% 1	0.0%	0.0%	7.7% 1	0.0%	0.0% 0	0.0%

Table 39c. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009 Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested		Humans	1998	88	79	102	105	96	92	125	102	98	75	86
		Chicken Breasts Ground Turkey Ground Beef					11 21 0	16 32 0	31 37 0	22 53 0	30 35 0	14 41 0	30 56 1	45 10 0
		Pork Chops Chickens	142	207	250	320	3	0	3 167	0	4	142	0	1 74
		Chickens Turkeys	143 39	297 139	259 125	329 142	403 60	226 57	167 46	283 25	164 43	142 23	94 8	74 3
		Cattle Swine	11 37	28 33	6 22	10 16	8 11	9 11	1 4	6 8	4 13	0 2	3 1	0 4
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole <sup>1</sup>	Humans	21.8% 22	18.2% 16	11.4% 9	8.8% 9	6.7% 7	7.3% 7	7.6% 7	8.0% 10	4.9% 5	18.4% 18	12.0% 9	7.0% 6
	(MIC ≥ 512 μg/ml)	Chicken Breasts					45.5% 5	12.5%	12.9% 4	13.6%	26.7% 8	7.1%	30.0%	2.2%
		Ground Turkey					33.3% 7	15.6% 5	37.8% 14	35.8% 19	37.1% 13	26.8% 11	28.6% 16	50.0%
		Ground Beef						J		10	10		100.0%	J
		Pork Chops					100.0%		0.0%		100.0% 4			100.0%
		Chickens	33.6% 48	26.6% 79	33.2% 86	16.4% 54	9.7% 39	11.1% 25	12.6% 21	10.6% 30	7.9% 13	13.4% 19	12.8% 12	21.6% 16
		Turkeys	35.9% 14	33.8% 47	15.2% 19	27.5% 39	30.0%	19.3% 11	26.1% 12	52.0% 13	30.2% 13	34.8%	37.5% 3	0.0%
		Cattle	36.4%	57.1% 16	0.0%	10.0%	12.5%	44.4%	100.0%	50.0%	0.0%	J	33.3%	J
		Swine	21.6%	21.2%	13.6%	0.0%	0.0%	0.0%	0.0%	12.5% 1	0.0%	0.0%	100.0%	0.0%
	Trimethoprim- Sulfamethoxazole	Humans	2.0%	1.1% 1	1.3% 1	2.0%	1.0%	2.1%	0.0%	0.8%	0.0%	0.0%	2.7%	3.5%
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	6.7% 2	0.0%	0.0%	0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef						J	Ů	Ů	Ů		0.0%	J
		Pork Chops					0.0%		0.0%		100.0%			100.0%
		Chickens	0.7%	0.7% 2	0.4%	0.3%	0.7%	0.9%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%
		Turkeys	5.1% 2	4.3%	0.8%	3.5%	3.3%	3.5%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%
		Cattle	27.3%	42.9% 12	0.0%	10.0%	0.0%	55.6% 5	100.0%	50.0%	0.0%		0.0%	J
		Swine	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Penicillins	Ampicillin (MIC ≥ 32 μg/ml)	Humans	16.8% 17	6.8%	10.1% 8	9.8% 10	12.4% 13	10.4% 10	25.0% 23	20.0% 25	18.6% 19	18.4% 18	28.0% 21	27.9% 24
	= 02 pg/IIII)	Chicken Breasts					18.2%	18.8%	25.8% 8	27.3% 6	16.7%	21.4%	23.3%	31.1% 14
		Ground Turkey					19.0%	9.4%	13.5% 5	18.9% 10	31.4% 11	53.7% 22	83.9% 47	80.0%
		Ground Beef					7						0.0%	j
		Pork Chops					0.0%		0.0%		0.0%			100.0%
		Chickens	25.2% 36	16.2% 48	24.7% 64	16.7% 55	14.9% 60	19.0% 43	16.2% 27	25.1% 71	16.5% 27	20.4%	13.8% 13	20.3%
		Turkeys	12.8%	8.6% 12	4.0%	9.2% 13	13.3%	3.5%	17.4% 8	24.0%	37.2% 16	65.2% 15	50.0%	66.7%
		Cattle	27.3%	50.0% 14	0.0%	0.0%	50.0%	55.6% 5	100.0%	83.3% 5	0.0%	1.5	66.7%	
		Swine	5.4%	0.0%	9.1%	0.0%	18.2%	9.1%	0.0%	12.5% 1	7.7% 1	0.0%	100.0%	0.0%
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	1.0%	1.1%	1.3%	1.0%	1.0%	0.0%	1.1%	0.8%	0.0%	3.1%	1.3%	4.7% 4
	( = 02 µg/IIII)	Chicken Breasts	,	,		,	0.0%	0.0%	3.2%	0.0%	0.0%	7.1% 1	3.3%	0.0%
		Ground Turkey					0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef							_				0.0%	Ť
		Pork Chops					0.0%		0.0%		0.0%			0.0%
		Chickens	0.7%	1.3%	11.6% 30	3.3% 11	1.7%	3.1% 7	4.2% 7	3.2%	2.4%	4.2% 6	4.3%	5.4%
		Turkeys	2.6%	0.7%	1.6%	2.8%	1.7%	0.0%	0.0%	0.0%	4.7%	4.3%	12.5%	0.0%
		Cattle	27.3%	42.9% 12	0.0%	10.0%	25.0%	44.4% 4	100.0%	50.0%	0.0%		0.0%	J
		Swine	0.0%	3.0%	4.5% 1	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
1 Sulfamethoxazole was te		<u> </u>		l		Ü		U	U	U	U	U	_ '	U

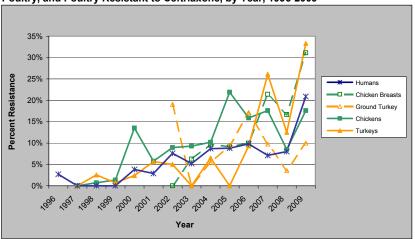
<sup>&</sup>lt;sup>1</sup> Sulfamethoxazole was tested from 1996-2003 and was replaced by sulfisoxazole in 2004

Table 39d. Antimicrobial Resistance among *Salmonella* Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	i	Humans	101	88	79	102	105	96	92	125	102	98	75	86
		Chicken Breasts Ground Turkey Ground Beef Pork Chops					11 21 0 3	16 32 0 0	31 37 0 3	22 53 0 0	30 35 0 4	14 41 0 0	30 56 1 0	45 10 0 1
		Chickens Turkeys Cattle Swine	143 39 11 37	297 139 28 33	259 125 6 22	329 142 10 16	403 60 8 11	226 57 9 11	167 46 1 4	283 25 6 8	164 43 4 13	142 23 0 2	94 8 3 1	74 3 0 4
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/mI)	Humans	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0% 0
	, , ,	Chicken Breasts					0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef											0.0%	
		Pork Chops					0.0%		0.0% 0		0.0%			0.0%
		Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0% 0
		Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	
		Swine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Nalidixic Acid (MIC ≥ 32 µg/ml)	Humans	1.0% 1	1.1% 1	1.3% 1	0.0%	0.0%	1.0% 1	0.0% 0	0.8% 1	0.0%	0.0%	0.0%	0.0% 0
	, ,,	Chicken Breasts					0.0%	0.0%	0.0%	0.0% 0	3.3% 1	0.0%	0.0%	0.0%
		Ground Turkey					4.8% 1	0.0%	0.0%	1.9% 1	0.0%	0.0%	0.0%	0.0%
		Ground Beef											0.0%	
		Pork Chops					0.0%		0.0% 0		0.0%			0.0%
		Chickens	0.0%	0.3% 1	0.0% 0	0.0% 0	0.7% 3	0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0	0.0%	0.0% 0
		Turkeys	0.0%	0.7% 1	0.8% 1	0.0% 0	1.7% 1	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0
		Cattle	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%		0.0% 0	
		Swine	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0%
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans	19.8% 20	18.2% 16	21.5% 17	24.5% 25	19.0% 20	16.7% 16	19.6% 18	18.4% 23	13.7% 14	22.4% 22	36.0% 27	27.9% 24
		Chicken Breasts					45.5% 5	0.0%	6.5% 2	4.5% 1	3.3% 1	7.1% 1	26.7% 8	15.6% 7
		Ground Turkey					57.1% 12	43.8% 14	70.3% 26	56.6% 30	68.6% 24	70.7% 29	80.4% 45	60.0% 6
		Ground Beef											100.0% 1	
		Pork Chops					66.7% 2		100.0% 3		0.0% 0			100.0% 1
		Chickens	7.7% 11	7.7% 23	20.1% 52	14.9% 49	11.7% 47	16.4% 37	15.0% 25	14.5% 41	12.2% 20	12.7% 18	13.8% 13	14.9% 11
		Turkeys	23.1% 9	38.1% 53	64.0% 80	54.2% 77	70.0% 42	84.2% 48	73.9% 34	64.0% 16	62.8% 27	65.2% 15	87.5% 7	66.7% 2
		Cattle	63.6% 7	60.7% 17	33.3% 2	40.0% 4	62.5% 5	55.6% 5	100.0% 1	66.7% 4	0.0% 0		33.3% 1	
		Swine	73.0% 27	72.7% 24	81.8% 18	93.8% 15	72.7% 8	100.0% 11	75.0% 3	87.5% 7	92.3% 12	100.0% 2	100.0% 1	100.0% 4

### **Ceftriaxone Resistance**

Figure 15. Percent of *Salmonella* Heidelberg Isolates from Humans, Retail Poultry, and Poultry Resistant to Ceftriaxone, by Year, 1996-2009 1



<sup>&</sup>lt;sup>1</sup> Data for ground beef, pork chops, cattle, and swine are not included due to the small number of *Salmonella* Heidelberg isolates from these sources. Table 39 contains resistance data for *Salmonella* Heidelberg isolates from each source, by year

Table 40. Number of Salmonella Heidelberg Isolates Tested from Humans, Food Animals, and Retail Meats, by Year, 1996-2009

								,		,		, ,	,	
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	74	75	101	88	79	102	105	96	92	125	102	98	75	86
Chicken Breasts							11	16	31	22	30	14	30	45
Ground Turkey							21	32	37	53	35	41	56	10
Ground Beef							0	0	0	0	0	0	1	0
Pork Chops							3	0	3	0	4	0	0	1
Chickens		51	143	297	259	329	403	226	167	283	164	142	94	74
Turkeys		14	39	139	125	142	60	57	46	25	43	23	8	3
Cattle		1	11	28	6	10	8	9	1	6	4	0	3	0
Swine		7	37	33	22	16	11	11	4	8	13	2	1	4

Table 41a. Resistance Patterns among Salmonella Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 41a. Resistance Pa		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	101	88	79	102	105	96	92	125	102	98	75	86
	Chicken Breasts					11	16	31	22	30	14	30	45
	Ground Turkey					21	32	37	53	35	41	56	10
	Ground Beef Pork Chops					0	0	0 3	0	0 4	0	0	0
	Chickens	143	297	259	329	403	226	167	283	164	142	94	74
	Turkeys	39	139	125	142	60	57	46	25	43	23	8	3
	Cattle	11	28	6	10	8	9	1	6	4	0	3	0
Danistana Dattana	Swine Isolate Source	37	33	22	16	11	11	4	8	13	2	1	4
Resistance Pattern		56.4%	68.2%	63.3%	64.7%	67.6%	68.8%	56.5%	62.4%	67.6%	58.2%	57.3%	60.5%
1. No Resistance Detected	Humans	57	60	50	66	71	66	52	78	69	57	43	52
	Chicken Breasts					27.3% 3	62.5% 10	58.1% 18	54.5% 12	50.0% 15	50.0% 7	50.0% 15	62.2% 28
	Ground Turkey					33.3%	50.0%	16.2%	20.8%	8.6%	9.8%	1.8%	10.0%
	Ground rurkey					7	16	6	11	3	4	1	1
	Ground Beef											0.0%	
	Pork Chops					0.0%		0.0%		0.0%			0.0%
		50.3%	61.6%	48.6%	63.5%	0 66.5%	62.8%	0 68.3%	59.4%	0 67.1%	65.5%	70.2%	0 55.4%
	Chickens	72	183	126	209	268	142	114	168	110	93	66	41
	Turkeys	46.2%	43.2%	28.8%	31.0%	15.0%	8.8%	15.2%	16.0%	23.3%	17.4%	0.0%	33.3%
		18 27.3%	60 25.0%	36 66.7%	44 60.0%	9 12.5%	5 44.4%	7 0.0%	0.0%	10 100.0%	4	0 33.3%	1
	Cattle	3	7	4	6	1	4	0	0	4		1	
	Swine	18.9% 7	27.3% 9	13.6% 3	6.3% 1	27.3% 3	0.0%	0.0%	12.5%	7.7% 1	0.0%	0.0%	0.0% 0
		13.9%	10.2%	7.6%	7.8%	12.4%	10.4%	13.0%	1 15.2%	12.7%	17.3%	28.0%	25.6%
2. Resistant to ≥ 3	Humans	14	9	6	8	13	10	12	19	13	17	21	22
Antimicrobial Classes	Chicken Breasts					45.5% 5	6.3% 1	12.9% 4	13.6% 3	13.3% 4	28.6% 4	36.7% 11	33.3% 15
	Ground Turkey					28.6%	12.5%	27.0%	34.0%	40.0%	53.7%	83.9%	70.0%
	Ground rurkey					6	4	10	18	14	22	47	7
	Ground Beef											100.0% 1	
	Pork Chops					66.7%		0.0%		0.0%			100.0%
	<u> </u>	15.4%	10.4%	19.3%	12.8%	10.9%	13.3%	0 15.6%	24.4%	0 17.1%	20.4%	12.8%	24.3%
	Chickens	22	31	50	42	44	30	26	69	28	29	12	18
	Turkeys	10.3% 4	17.3%	10.4%	16.9%	21.7%	14.0%	23.9%	36.0% 9	44.2%	69.6%	50.0% 4	66.7%
	0-#-	27.3%	24 50.0%	13 0.0%	24 10.0%	13 37.5%	55.6%	11 100.0%	83.3%	19 0.0%	16	66.7%	2
	Cattle	3	14	0	1	3	5	1	5	0	2.00/	2	2.00/
	Swine	13.5% 5	21.2% 7	13.6% 3	0.0% 0	18.2% 2	9.1% 1	0.0%	25.0% 2	7.7% 1	0.0%	100.0% 1	0.0%
	Humans	3.0%	3.4%	3.8%	2.0%	1.9%	0.0%	4.3%	4.8%	2.0%	5.1%	13.3%	17.4%
3. Resistant to ≥ 4 Antimicrobial Classes	Tidinans	3	3	3	2	9.1%	0.0%	4 6.5%	6 0.0%	0.0%	5 0.0%	10 13.3%	15 8.9%
Anumicrobial Classes	Chicken Breasts					9.1%	0.0%	2	0.0%	0.0%	0.0%	13.5%	6.9%
	Ground Turkey					19.1%	9.4%	10.8%	7.6%	17.1%	14.6%	19.6%	30.0%
						4	3	4	4	6	6	0.0%	3
	Ground Beef											0	
	Pork Chops					0.0%		0.0%		0.0%			100.0% 1
	Chickens	1.4%	3.7%	13.5%	4.0%	3.7%	5.3%	7.8%	6.7%	4.3%	6.3%	4.2%	9.5%
	Chickens	2	11	35	13	15	12	13	19	7	9	4	7
	Turkeys	2.6% 1	2.2%	4.0% 5	5.6% 8	6.7% 4	1.8% 1	6.5% 3	12.0% 3	14.0% 6	21.7% 5	25.0% 2	33.3% 1
	Cattle	27.3%	42.9%	0.0%	10.0%	25.0%	55.6%	100.0%	50.0%	0.0%		33.0%	
	Oditio	3 5.4%	12 3.0%	0 4.5%	0.0%	9.1%	5 9.1%	0.0%	0.0%	7.7%	0.0%	1 100.0%	0.0%
	Swine	2	3.0%	4.5%	0.0%	9.1%	9.1%	0.0%	0.0%	1.7%	0.0%	100.0%	0.0%
	Humans	0.0%	0.0%	2.5%	1.0%	1.9%	0.0%	3.3%	1.6%	2.0%	4.1%	6.7%	15.1%
4. Resistant to ≥ 5  Antimicrobial Classes		0	0	2	1	0.0%	0.0%	3.2%	0.0%	0.0%	0.0%	5 6.7%	13 8.9%
	Chicken Breasts					0	0	1	0	0	0	2	4
	Ground Turkey					19.1% 4	9.4%	5.4% 2	0.0%	8.6%	2.4% 1	1.8%	10.0%
	Ground Beef						3		0	3		0.0%	1
	Ground Beer					0.007		0.00/		0.00/		0	400.00/
	Pork Chops					0.0%		0.0%		0.0%			100.0%
	Chickens	0.7%	1.3%	12.4%	3.6%	2.7%	4.4%	3.6%	4.9%	4.3%	5.6%	4.2%	8.1%
		1 2.6%	4 0.7%	32 3.2%	12 4.2%	11 3.3%	10 0.0%	6 2.2%	14 0.0%	7 9.3%	8 8.7%	4 25.0%	6 33.3%
	Turkeys	2.6%	0.7%	3.2%	4.2% 6	3.3%	0.0%	1	0.0%	9.3%	8.7%	25.0%	33.3%
	Cattle	27.3%	42.9%	0.0%	0.0%	25.0%	55.6%	100.0%	50.0%	0.0%		0.0%	
		0.0%	12 0.0%	0 4.5%	0.0%	9.1%	5 9.1%	0.0%	0.0%	7.7%	0.0%	100.0%	0.0%
	Swine	0.070	0.070	1	0.070	1	1	0.070	0.070	1	0.070	1	0.070

Table 41b. Resistance Patterns among Salmonella Heidelberg Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 41b. Resistance Pa Year		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	101	88	79	102	105	96	92	125	102	98	75	86
	Chicken Breasts					11	16	31	22	30	14	30	45
	Ground Turkey					21	32	37	53	35	41	56	10
	Ground Beef Pork Chops					0	0	0 3	0	0 4	0	1 0	0
	Chickens	143	297	259	329	403	226	167	283	164	142	94	74
	Turkeys	39	139	125	142	60	57	46	25	43	23	8	3
	Cattle	11	28	6	10	8	9	1	6	4	0	3	0
Resistance Pattern	Swine Isolate Source	37	33	22	16	11	11	4	8	13	2	1	4
Resistance Fattern		0.0%	0.0%	1.3%	1.0%	1.0%	0.0%	1.1%	0.0%	0.0%	3.1%	1.3%	3.5%
5. At Least ACSSuT <sup>1</sup> Resistant	Humans	0	0	1	1	1	0	1	0	0	3	1	3
	Chicken Breasts					0.0%	0.0%	3.2% 1	0.0%	0.0%	0.0%	3.3% 1	0.0%
	Ground Turkey					0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%
	<u> </u>					0	0	2	0	0	0	0.0%	0
	Ground Beef											0.070	
	Pork Chops					0.0%		0.0%		0.0%			0.0%
	01:1	0.7%	1.3%	11.2%	3.0%	0 1.5%	2.2%	0 2.4%	2.8%	1.8%	4.2%	4.2%	0 4.1%
	Chickens	1	4	29	10	6	5	4	8	3	6	4	3
	Turkeys	2.6%	0.7% 1	1.6% 2	2.8%	1.7% 1	0.0%	0.0%	0.0%	4.7% 2	4.3% 1	12.5% 1	0.0%
	Cattle	27.3%	42.9%	0.0%	0.0%	12.5%	33.3%	100.0%	50.0%	0.0%		0.0%	,
		3 0.0%	12 0.0%	0 4.5%	0.0%	0.0%	0.0%	0.0%	3 0.0%	0.0%	0.0%	100.0%	0.0%
	Swine	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	Humans	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%
6. At Least ACT/S <sup>2</sup> Resistant	Oli L. B I	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chicken Breasts					0	0	0	0	0	0	0	0
	Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Beef								-			0.0%	
						0.0%		0.0%		0.0%		0	0.0%
	Pork Chops	2.20/	2.20/		2.20/	0	2.20/	0		0	2.20/	2.20/	0
	Chickens	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Turkeys	0.0%	0.0%	0.0%	1.4%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	-	0 27.3%	0 42.9%	0.0%	0.0%	0.0%	0 44.4%	100.0%	0 50.0%	0.0%	0	0.0%	0
	Cattle	3	12	0	0	0	4	1	3	0		0	
	Swine	0.0%	0.0% 0	0.0% 0	0.0%	9.1% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
7. At Least ACSSuTAuCx <sup>3</sup> Resistant	Humans	0.0%	0.0%	1.3%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
	Tumans	0	0	1	1	0.0%	0.0%	0 3.2%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chicken Breasts					0.0%	0.0%	1	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%
	Carried Daref					0	0	2	0	0	0	0.0%	0
	Ground Beef											0	
	Pork Chops					0.0% 0		0.0%		0.0%			0.0%
	Chickens	0.7%	0.7%	11.2%	2.7%	1.5%	2.2%	2.4%	2.8%	1.8%	4.2%	2.1%	4.1%
		2.6%	0.7%	29 0.8%	9 2.8%	6 1.7%	5 0.0%	0.0%	0.0%	3 4.7%	6 4.3%	0.0%	0.0%
	Turkeys	1	1	1	4	1	0	0	0	2	1	0	0
	Cattle	27.3% 3	42.9% 12	0.0%	0.0%	12.5% 1	33.3% 3	100.0% 1	50.0% 3	0.0%		0.0%	
	Swine	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8. At Least Ceftriaxone and	Humans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	0	0	0	0.0%
Nalidixic Acid Resistant	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turker					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0	0	0	0	0	0	0	0
	Ground Beef											0.0%	
	Pork Chops					0.0%		0.0%		0.0%			0.0%
	-	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens	0	0	0	0	4	0	0	0	0	0	0	0
	Turkeys	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Cattle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0.0%	0
	Cattle	0	0	0	0	0	0	0	0	0		0	
	Swine	0.0% 0	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%

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

 $<sup>^2</sup>$  ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

 $<sup>^{\</sup>rm 3}$  ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

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

Table 42a. Antimicrobial Resistance among Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009 Year		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Number of Isolates Teste	ed	Humans	0	8	13	14	35	37	36	33	105	73	83	72
Ground Tu Ground Be Pork Chop		Chicken Breasts Ground Turkey Ground Beef					5 2 0	2 0 0	4 0 0	9 0 0	9 2 0	2 0 2	4 0 0	8 0 0
		Pork Chops					0	0	0	0	0	0	0	0
		Chickens Turkeys	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	44 1	102 2	79 1	49 1	29 0	21 0
		Cattle Swine	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	4 0	2 1	3 2	6 1	1	1
Authorizantial Olasa	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Antimicrobial Class Aminoglycosides	1 /	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chicken Breasts		0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey					0.0%	0	0	0	0.0%	0	0	0
		Ground Beef					0				0	0.0%		
		Pork Chops										0		
		Chickens							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Turkeys							0.0%	0.0%	0.0%	0.0%	0	0
		Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
									0	0.0%	0.0%	0.0%	0.0%	0.0%
	Gentamicin	Swine		0.0%	0.0%	7.1%	0.0%	5.4%	5.6%	0.0%	0 4.8%	0 1.4%	0 3.6%	0 2.8%
	(MIC ≥ 16 μg/ml)	Humans		0	0	1	0.0%	0.0%	2 0.0%	0	5 22.2%	1 50.0%	3	2 12.5%
		Chicken Breasts					0.0%	0	0	1	2 50.0%	1	0	1
		Ground Turkey					0				1	50.0%		
		Ground Beef										1		
		Pork Chops							11.4%	9.8%	11.4%	0.0%	6.9%	4.8%
		Chickens							5 100.0%	10	9 100.0%	0.0%	2	1
		Turkeys							1	0	1	1	0.00/	0.00/
		Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine								0.0%	0.0%	0.0%	0.0%	0.0%
	Kanamycin (MIC ≥ 64 μg/ml)	Humans		0.0% 0	0.0% 0	7.1% 1	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	1.4% 1	1.2% 1	0.0% 0
		Chicken Breasts					0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%
		Ground Turkey					0.0%				0.0% 0			
		Ground Beef										0.0% 0		
		Pork Chops												
		Chickens							4.5% 2	0.0% 0	0.0%	4.1% 2	0.0%	0.0%
		Turkeys							0.0%	0.0% 0	0.0%	0.0%		
		Cattle							0.0%	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%
		Swine								0.0%	0.0%	0.0% 0	0.0% 0	0.0%
	Streptomycin (MIC ≥ 64 µg/ml)	Humans		0.0%	7.7% 1	14.3% 2	2.9% 1	8.1% 3	5.6% 2	3.0% 1	3.8%	8.2% 6	10.8% 9	12.5% 9
		Chicken Breasts		-		_	0.0%	0.0%	0.0%	11.1%	22.2%	0.0%	0.0%	12.5% 1
		Ground Turkey					0.0%				50.0%			
		Ground Beef					Ľ					0.0%		
		Pork Chops												
		Chickens							15.9%	9.8%	6.3%	8.2%	10.3%	9.5%
		Turkeys							100.0%	10 50.0%	100.0%	100.0%	3	2
		Cattle							25.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine							1	0 100.0%	0.0%	0.0%	100.0%	0.0%
		for monophasic Salr								1	0	0	1	0

<sup>&</sup>lt;sup>1</sup> N/A = data not available. Antigenic formulas for monophasic *Salmonella* were not determined for food animal isolates prior to 2004

Table 42b. Antimicrobial Resistance among *Salmonella* I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Year  Number of Isolates Tested			1998	1999	2000	2001	2002	2003	2004	2005	2006	7007		
		Humans	0	8	13	14	35	37	36	33	105	<b>2007</b> 73	<b>2008</b> 83	<b>2009</b> 72
			Ü	0	13	14	5 2 0	2 0 0	4 0 0	9 0 0	9 2 0	2 0 2 0	4 0 0	8 0 0
		Pork Chops Chickens Turkeys Cattle	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	44 1 4	102 2 2	79 1 3	49 1 6	29 0 1	21 0 1
		Swine	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1
	Antimicrobial Resistance	Isolate												
	Breakpoint) Amoxicillin-	Source		0.0%	0.0%	0.0%	2.9%	5.4%	2.8%	3.0%	3.8%	1.4%	3.6%	4.2%
Inhibitor Combinations C	Clavulanic Acid (MIC ≥ 32 / 16 µg/ml)	Humans		0	0	0	1 0.0%	2 0.0%	1 0.0%	1 0.0%	4	1 0.0%	3	3
· ·	міо <u>– од</u> 7 го руміі)	Chicken Breasts					0.0%	0	0	0	1 0.0%	0	0	0
		Ground Turkey					0.076				0	0.0%		
		Ground Beef										0.0%		
		Pork Chops												
		Chickens							4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	9.2% 2
		Turkeys							0.0% 0	50.0% 1	0.0% 0	0.0% 0		
		Cattle							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%
	Cefoxitin MIC ≥ 32 µg/ml)	Humans				0.0% 0	2.9% 1	5.4% 2	2.8% 1	3.0% 1	3.8% 4	1.4% 1	3.6% 3	2.8%
`		Chicken Breasts					0.0% 0	0.0% 0	0.0%	0.0%	11.1% 1	0.0%	0.0%	0.0%
		Ground Turkey					0.0%				0.0%			
		Ground Beef										0.0%		
		Pork Chops										3		
		Chickens							4.5% 2	5.9% 6	16.5% 13	16.3% 8	3.4% 1	4.8% 1
		Turkeys							0.0%	50.0%	0.0%	0.0%	-	1
		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 0.0% 0
	Ceftiofur (MIC ≥ 8 µg/ml)	Humans		0.0%	0.0%	7.1% 1	2.9%	5.4% 2	2.8%	3.0%	3.8%	2.7%	3.6%	2.8%
(P		Chicken Breasts		0	U		0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%
		Ground Turkey					0.0%	U	U	0	0.0%	0	0	U
		Ground Beef					0				0	0.0%		
		Pork Chops										0		
		Chickens							4.5%	5.9%	16.5%	16.3%	3.4%	9.5%
		Turkeys							0.0%	6 50.0%	0.0%	0.0%	1	2
		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%
	Ceftriaxone (MIC ≥ 4 μg/ml)	Humans		0.0%	0.0%	0.0%	2.9*%	5.4%	2.8%	3.0%	3.8%	0 2.7%	0 3.6%	2.8%
(N		Chicken Breasts		0	0	0	0.0%	0.0%	0.0%	0.0%	4 11.1%	0.0%	0.0%	0.0%
		Ground Turkey					0.0%	0	0	0	1 0.0%	0	0	0
							0				0	0.0%		
		Ground Beef										0		
		Pork Chops							4.5%	5.9%	16.5%	16.3%	3.4%	9.5%
		Chickens							2 0.0%	6 50.0%	13	8	1	2
		Turkeys							0.0%	1 0.0%	0.0%	0.0%	0.0%	0.0%
		Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<sup>1</sup> N/A = data not available. Ar		Swine								0	0.0%	0.0%	0.0%	0.0%

Table 42c. Antimicrobial Resistance among Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

1998-2009			4000	1000	2000	2004	2002	2002	2004	2005	2000	2007	2000	2000
Year Number of Isolates Tested		Humans	<b>1998</b>	<b>1999</b> 8	<b>2000</b>	<b>2001</b>	<b>2002</b> 35	<b>2003</b> 37	<b>2004</b> 36	<b>2005</b> 33	<b>2006</b> 105	<b>2007</b> 73	<b>2008</b> 83	<b>2009</b> 72
realiser of isolates rested		Chicken Breasts Ground Turkey Ground Beef Pork Chops	J	3	13	14	5 2 0	2 0 0	4 0 0	9 0 0	9 2 0	2 0 2 0	4 0 0 0	8 0 0
		Chickens Turkeys Cattle	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	44 1 4	102 2 2	79 1 3	49 1 6	29 0 1	21 0 1
		Swine	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Folate Pathway Inhibitors	Sulfamethoxazole/ Sulfisoxazole <sup>2</sup>	Humans		12.5% 1	0.0% 0	14.3% 2	2.9% 1	5.4% 2	11.1% 4	0.0% 0	8.6% 9	4.1% 3	13.3% 11	13.9% 10
	(MIC ≥ 512 μg/ml)	Chicken Breasts				_	0.0% 0	0.0%	0.0%	11.1%	22.2%	50.0%	0.0%	25.0% 2
		Ground Turkey					0.0%				50.0% 1			
		Ground Beef										50.0% 1		
		Pork Chops												
		Chickens							13.6% 6	9.8% 10	13.9% 11	6.1% 3	6.9% 2	9.5% 2
		Turkeys							100.0% 1	50.0% 1	100.0% 1	100.0% 1		
		Cattle							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%
		Swine								100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0%
	Trimethoprim- Sulfamethoxazole	Humans		0.0% 0	0.0% 0	7.1% 1	2.9% 1	0.0%	2.8% 1	0.0%	0.0%	1.4% 1	4.8% 4	1.4% 1
	(MIC ≥ 4 / 76 μg/ml)	Chicken Breasts					0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey					0.0% 0				0.0%			
		Ground Beef										0.0%		
	F	Pork Chops												
		Chickens							4.5% 2	0.0%	0.0%	0.0%	0.0% 0	0.0%
		Turkeys							0.0%	0.0%	0.0%	0.0%		
		Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine								0.0%	0.0%	0.0%	0.0%	0.0%
Penicillins	Ampicillin (MIC ≥ 32 µg/ml)	Humans		0.0% 0	7.7% 1	7.1% 1	8.6% 3	8.1% 3	5.6% 2	6.1% 2	6.7% 7	5.5% 4	8.4% 7	11.1% 8
		Chicken Breasts					0.0% 0	0.0%	0.0%	0.0%	11.1% 1	0.0%	0.0%	0.0%
		Ground Turkey					0.0% 0				0.0%			
		Ground Beef										0.0%		
		Pork Chops												
		Chickens							6.8% 3	8.8% 9	17.7% 14	20.4% 10	6.9% 2	9.5% 2
		Turkeys							0.0%	50.0% 1	0.0%	0.0%		
		Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine								100.0%	50.0%	0.0%	100.0%	0.0%
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans		0.0% 0	0.0%	7.1% 1	2.9% 1	0.0%	2.8% 1	0.0%	1.9% 2	1.4% 1	6.0% 5	8.3% 6
	( , , ,	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1						0.0%				0.0%			
		Ground Turkey												
		Ground Turkey Ground Beef										0.0%		
		Ground Beef							0.0%	0.0%	0.0%		0.0%	0.0%
		Ground Beef Pork Chops										0.0%		
		Ground Beef Pork Chops Chickens							0.0%	0.0%	0.0%	0 0.0% 0 0.0%		

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

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

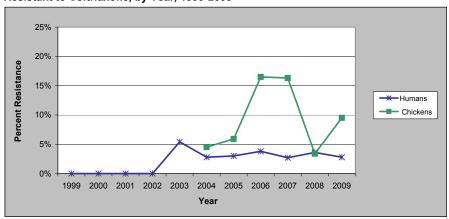
Table 42d. Antimicrobial Resistance among Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested		Humans	0	8	13	14	35	37	36	33	105	73	83	72
		Chicken Breasts					5	2	4	9	9	2	4	8
		Ground Turkey Ground Beef					2	0	0	0	2	0 2	0	0
		Pork Chops					0	0	0	0	0	0	0	0
		Chickens	N/A	N/A	N/A	N/A	N/A	N/A	44	102	79	49	29	21
		Turkeys Cattle	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	1 4	2 2	3	1 6	0 1	0
		Swine	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1
Antimicrobial Class	Antimicrobial (Resistance Breakpoint)	Isolate Source												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans		0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%
	(MIC 2 4 µg/IIII)	Chicken Breasts		U	U	U	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey					0.0% 0				0.0% 0			
		Ground Beef										0.0%		
		Pork Chops												
		Chickens							0.0%	0.0% 0	0.0%	0.0%	0.0% 0	0.0%
		Turkeys							0.0% 0	0.0% 0	0.0%	0.0%		
		Cattle							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%
	Nalidixic Acid (MIC ≥ 32 μg/ml)	Humans		0.0% 0	0.0% 0	0.0% 0	0.0% 0	2.7% 1	2.8% 1	0.0% 0	1.0% 1	1.4% 1	1.2% 1	0.0%
		Chicken Breasts					0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
		Ground Turkey					0.0% 0				0.0% 0			
		Ground Beef										0.0% 0		
		Pork Chops												
		Chickens							2.3% 1	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		
		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	0.0% 0
Tetracyclines	Tetracycline (MIC ≥ 16 μg/ml)	Humans		0.0% 0	7.7% 1	7.1% 1	5.7% 2	0.0% 0	11.1% 4	3.0% 1	8.6% 9	9.6% 7	16.9% 14	16.7% 12
		Chicken Breasts					0.0% 0	0.0%	0.0% 0	11.1% 1	11.1% 1	0.0% 0	0.0% 0	25.0% 2
		Ground Turkey					0.0% 0				0.0% 0			
		Ground Beef										0.0% 0		
		Pork Chops												
		Chickens							11.4%	4.9% 5	3.8%	14.3% 7	3.4% 1	9.5% 2
		Turkeys							0.0%	50.0%	0.0%	0.0%		
		Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Swine								100.0% 1	50.0% 1	0.0% 0	100.0% 1	0.0%

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

#### **Ceftriaxone Resistance**

Figure 16. Percent of *Salmonella* I 4,[5],12:i:- Isolates from Humans and Chickens Resistant to Ceftriaxone, by Year,  $1999-2009^{1}$ 



<sup>&</sup>lt;sup>1</sup> Data for other sources and data for humans for 1996-1998 are not included due to the small number of *Salmonella* I 4,[5],12:i:- isolates. Data for food animals are not available for this serotype prior to 2004. Table 42 contains all resistance data available for *Salmonella* I 4,[5],12:i:- isolates

Table 43. Number of Salmonella I 4,[5],12:i:- Isolates Tested from Humans, Retail Meats, and Food Animals, by Year, 1996-2009

			/6 4/											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	3	3	0	8	13	14	35	37	36	33	105	73	83	72
Chicken Breasts							5	2	4	9	9	2	4	8
Ground Turkey							2	0	0	0	2	0	0	0
Ground Beef							0	0	0	0	0	2	0	0
Pork Chops							0	0	0	0	0	0	0	0
Chickens		N/A <sup>1</sup>	N/A	N/A	N/A	N/A	N/A	N/A	44	102	79	49	29	21
Turkeys		N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	2	1	1	0	0
Cattle		N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	2	3	6	1	1
Swine		N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1

<sup>&</sup>lt;sup>1</sup> N/A = data not available. Antigenic formulas for monophasic Salmonella were not determined for food animal isolates prior to 2004

## **Multidrug Resistance**

Table 44a. Resistance Patterns among Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Table 44a. Resistance Pa Year		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	0	8	13	14	35	37	36	33	105	73	83	72
	Chicken Breasts					5	2	4	9	9	2	4	8
	Ground Turkey Ground Beef					2 0	0	0	0	2 0	0 2	0	0
	Pork Chops					0	0	0	0	0	0	0	0
	Chickens	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	44 1	102 2	79 1	49 1	29 0	21 0
	Turkeys Cattle	N/A	N/A N/A	N/A	N/A	N/A	N/A	4	2	3	6	1	1
	Swine	N/A	N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1
Resistance Pattern	Isolate Source												
1. No Resistance Detected	Humans		87.5% 7	92.3% 12	78.6% 11	91.4% 32	78.4% 29	80.6% 29	87.9% 29	85.7% 90	82.2% 60	77.1% 64	76.4%
1. No Resistance Detected	Chicken Breasts		,	12	11	100.0%	100.0%	100.0%	88.9%	55.6%	50.0%	100.0%	55 75.0%
	Ground Turkey					5 100.0%	2	4	8	5 50.0%	1	4	6
						2				1	50.0%		
	Ground Beef										1		
	Pork Chops												
	Chickens							77.3% 34	76.5% 78	68.4% 54	65.3% 32	82.8% 24	76.2% 16
	Turkeys							0.0%	50.0% 1	0.0%	0.0%		
	Cattle							75.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Swine							3	0.0%	50.0%	6 100.0%	0.0%	100.0%
			0.0%	7.7%	7.1%	5.7%	5.4%	8.3%	0 3.0%	1 9.5%	1 5.5%	0 9.6%	1 12.5%
2. Resistant to ≥ 3	Humans		0	1	1	2	2	3	1	10	4	8	9
Antimicrobial Classes	Chicken Breasts					0.0%	0.0%	0.0%	11.1% 1	22.2% 2	0.0%	0.0% 0	12.5% 1
	Ground Turkey					0.0%				0.0%			
	Ground Beef										0.0%		
	Pork Chops										0		
	Chickens							13.6%	9.8%	19.0%	20.4%	6.9%	9.5%
	<u> </u>							6 0.0%	10 50.0%	15 0.0%	10 0.0%	2	2
	Turkeys							0	1	0	0	0.00/	0.00/
	Cattle							0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0% 0
	Swine								100.0% 1	50.0% 1	0.0%	100.0% 1	0.0%
3. Resistant to ≥ 4	Humans		0.0%	0.0%	7.1%	2.9%	0.0%	2.8%	0.0%	3.8%	2.7%	7.2%	9.7%
Antimicrobial Classes	Chicken Breasts		0	0	1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0.0%	0	0	0	0.0%	0	0	0
	Ground Turkey					0				0	0.0%		
	Ground Beef										0.070		
	Pork Chops												
	Chickens							2.3%	0.0%	1.3% 1	0.0%	0.0%	4.8% 1
	Turkeys							0.0%	50.0%	0.0%	0.0%	J	
	Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
								0	0 100.0%	0 50.0%	0.0%	0 100.0%	0.0%
	Swine		0.0%	0.0%	7.1%	2.9%	0.0%	2.8%	1 0.0%	1 2.9%	0 1.4%	1 4.8%	0 6.9%
4. Resistant to ≥ 5	Humans		0.076	0.078	1	1	0	1	0	3	1	4	5
Antimicrobial Classes	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0.0%				0.0% 0			
	Ground Beef										0.0%		
	Pork Chops										0		
								2.3%	0.0%	1.3%	0.0%	0.0%	4.8%
	Chickens							1	0	1	0	0.078	1
	Turkeys							0.0% 0	50.0% 1	0.0% 0	0.0% 0		
	Cattle							0.0% 0	0.0% 0	0.0%	0.0% 0	0.0%	0.0% 0

Table 44b. Resistance Patterns among Salmonella I 4,[5],12:i:- Isolates from Humans, Retail Meats, and Food Animals, by Year, 1998-2009

Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Humans Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Turkeys Cattle Swine Isolate Source	0 N/A N/A N/A N/A	8 N/A N/A	13	<b>2001</b> 14	35 5 2	2003 37 2 0	36 4 0	33 9	2006 105 9	73 2	<b>2008</b> 83 4	<b>2009</b> 72 8
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Turkeys Cattle Swine Isolate Source	N/A N/A N/A	N/A	.5	.4	5	2	4	9	9	2	4	
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Ground Turkey Ground Beef Pork Chops Chickens Turkeys Cattle Swine Isolate Source	N/A N/A											
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Pork Chops Chickens Turkeys Cattle Swine Isolate Source	N/A N/A							0	2	0	0	0
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Chickens Turkeys Cattle Swine Isolate Source	N/A N/A				0	0	0	0	0	2 0	0	0
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Cattle Swine Isolate Source	N/A	N/A	N/A	N/A	N/A	N/A	44	102	79	49	29	21
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Swine Isolate Source		N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	1 4	2 2	1 3	1 6	0	0
Resistance Pattern  5. At Least ACSSuT <sup>2</sup> Resistant	Source		N/A	N/A	N/A	N/A	N/A	0	1	2	1	1	1
5. At Least ACSSuT* Resistant													
	Humans		0.0% 0	0.0% 0	7.1% 1	2.9% 1	0.0% 0	2.8% 1	0.0% 0	1.9% 2	1.4% 1	3.6% 3	6.9% 5
	Chicken Breasts					0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0% 0
	Ground Turkey					0.0%				0.0%	0.00/		
_	Ground Beef										0.0% 0		
	Pork Chops							2.20/		2.20/		2.20/	
_	Chickens							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<u>-</u>	Turkeys							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	100.0% 1	0.0% 0
6. At Least ACT/S <sup>3</sup> Resistant	Humans		0.0% 0	0.0% 0	7.1% 1	2.9% 1	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%
	Chicken Breasts					0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%
	Ground Turkey					0.0%				0.0%			
	Ground Beef										0.0%		
	Pork Chops												
	Chickens							0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0% 0
	Turkeys							0.0% 0	0.0%	0.0%	0.0%		
	Cattle							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
7. At Least ACSSuTAuCx 4	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	2.4%	0.0%
Resistant	Chicken Breasts					0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0%	0.0%
	Ground Turkey					0.0%				0.0% 0			
	Ground Beef										0.0%		
	Pork Chops												
	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		
	Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Swine								0.0%	0.0%	0.0%	0.0%	0.0%
8. At Least Ceftriaxone and	Humans		0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%	0.0%	0.0%
Nalidixic Acid Resistant	Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Ground Turkey					0.0%				0.0%			
	Ground Beef										0.0%		
	Pork Chops												
	Chickens							2.3% 1	0.0%	0.0%	0.0%	0.0% 0	0.0% 0
	Turkeys							0.0% 0	0.0%	0.0%	0.0%		
	Cattle							0.0%	0.0%	0.0%	0.0%	0.0%	0.0% 0
	Swine								0.0%	0.0%	0.0%	0.0%	0.0%

<sup>&</sup>lt;sup>1</sup> N/A = data not available. Antigenic formulas for monophasic Salmonella were not determined for food animal isolates prior to 2004

<sup>&</sup>lt;sup>2</sup> ACSSuT = ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline

<sup>&</sup>lt;sup>3</sup>ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

<sup>&</sup>lt;sup>4</sup>ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

## IV. Campylobacter Data

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

Table 45. Number of Campylobacter jejuni Isolates Tested, by Source and Year, 1998-2009<sup>1</sup>

							Year						
Source	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	209	297	293	306	365	329	303	320	791	709	992	1046	1355
Chicken Breasts						198	325	510	403	426	332	329	403
<b>Ground Turkey</b>						2	4	7	10	12	20	10	9
Chickens					64 <sup>2</sup>	526	374	508	567	228	166	78	117

<sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

Table 46. Number of Campylobacter coli Isolates Tested, by Source and Year, 1998-2009<sup>1</sup>

							Year						
Source	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	6	8	20	12	17	25	22	26	98	97	105	110	143
Chicken Breasts						90	142	196	151	145	143	181	179
Ground Turkey						2	1	5	9	10	14	19	15
Chickens					52 <sup>2</sup>	288	247	186	380	123	76	28	81

<sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

<sup>&</sup>lt;sup>2</sup> These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

<sup>&</sup>lt;sup>2</sup> These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

# B. Isolation of Campylobacter from Retail Meats

Table 47. Number and Percent of Retail Meat Samples Culture Positive for Campylobacter . 20091

Cumpyiosacter, 2003	Chicken Breasts	Ground Turkey
Number of Meat Samples Tested	1320	1320
Number Positive for Campylobacter	582	24
Percent Positive for Campylobacter	44.1%	1.8%

<sup>&</sup>lt;sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports

Figure 17. Percent of Retail Meat Samples Culture Positive for Campylobacter, 2009

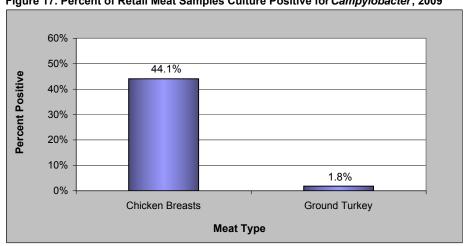
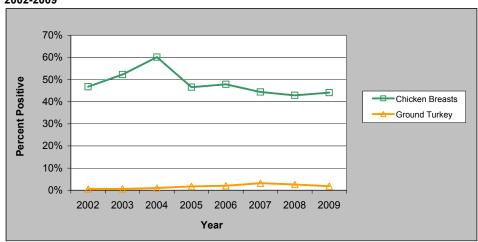


Figure 18. Percent of Retail Meat Samples Culture Positive for Campylobacter, 2002-2009



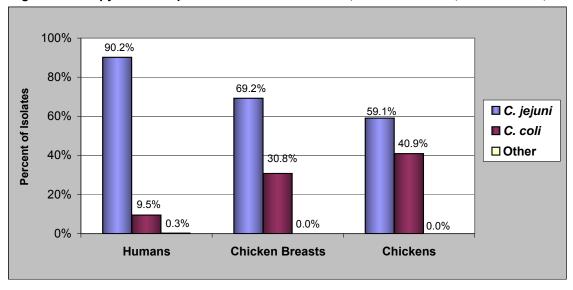
# C. Campylobacter Species

Table 48. Campylobacter Species Isolated from Humans, Retail Meats, and Chickens, 2009

	Humans	Retail	Meats <sup>1</sup>	Food Animals
	Humans (N=1502)	Chicken Breasts (N=582)	Ground Turkey (N=24)	Chickens (N=198)
Campylobacter Species				
C. jejuni	90.2%	69.2%	37.5%	59.1%
o. jejum	1355	403	9	117
C. coli	9.5%	30.8%	62.5%	40.9%
0. 0011	143	179	15	81
Other	0.3%	0.0%	0.0%	0.0%
Other	4	0	0	0

<sup>&</sup>lt;sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports

Figure 19. Campylobacter Species Isolated from Humans, Chicken Breasts, and Chickens, 2009



### D. Antimicrobial Susceptibility among Campylobacter jejuni

#### **MIC Distributions**

Table 49a. Distribution of MICs and Occurrence of Resistance among Campylobacter jejuni Isolates from Humans, Retail Meats, and Chickens, 2009

	ribution of MICs a						- Jan 19	0.00.000	<i>j</i> eju						uu				
Antimicrobial	Isolate Source (# of Isolates) <sup>1</sup>	%l <sup>2</sup>	<b>%R</b> <sup>3</sup>	[95% CI] <sup>4</sup>	0.015	0.03	0.06	0.125	0.25	0.50	Distribution 1	n (%) of M 2	ICs (µg/ml 4	)° 8	16	32	64	128	256
	(# of Isolates)	%I	%R	[95% CI]	0.015	0.03	0.06	0.125	0.25	0.50			-	•	10	32	04	120	250
Aminoglycosides													ı	II					
Gentamicin	Humans (1355)	0.0	0.7	[0.3 - 1.3]				1.1	23.0	63.2	11.7	0.3					0.7		
	Chicken Breasts (403)	0.0	0.0	[0.0 - 0.9]					1.0	49.4	49.6								
	Ground Turkey (9)	0.0	0.0	[0.0 - 33.6]						33.3	66.7								
	Chickens (117)	0.0	0.9	[0.0 - 4.7]				17.9	50.4	30.8							0.9		
Ketolides																			
Telithromycin	Humans (1355)	0.5	1.4	[0.8 - 2.2]			<0.1	0.1	8.0	33.6	38.4	16.2	1.8	0.5	1.4				
	Chicken Breasts (403)	0.5	0.2	[0.0 - 1.4]				0.2	7.7	36.2	41.7	12.4	1.0	0.5	0.2				
	Ground Turkey (9)	0.0	0.0	[0.0 - 33.6]						22.2	55.6	22.2							
	Chickens (117)	0.0	0.0	[0.0 - 3.1]				1.7	20.5	51.3	22.2	4.3							
Lincosamides																			
Clindamycin	Humans (1355)	0.2	1.3	[0.8 - 2.1]		1.5	17.3	45.4	27.8	5.0	1.3	0.1	0.2	0.3	0.4	0.7			
	Chicken Breasts (403)	0.2	0.5	[0.1 - 1.8]			3.7	42.4	46.2	6.2	0.5	0.2	0.2	0.5					
	Ground Turkey (9)	11.1	0.0	[0.0 - 33.6]				22.2	66.7				11.1						
	Chickens (117)	0.0	0.0	[0.0 - 3.1]		2.6	42.7	41.0	12.0	1.7									
Macrolides																			
Azithromycin	Humans (1355)	0.0	1.5	[1.0 - 2.4]	0.7	16.8	48.0	26.7	5.8	0.4	<0.1							1.5	
	Chicken Breasts (403)	0.0	1.0	[0.3 - 2.5]	1.2	22.3	64.5	9.9	1.0									1.0	
	Ground Turkey (9)	0.0	0.0	[0.0 - 33.6]		11.1	44.4	44.4											
	Chickens (117)	0.0	0.0	[0.0 - 3.1]	3.4	57.3	36.8	2.6											
Erythromycin	Humans (1355)	0.0	1.5	[1.0 - 2.4]				1.7	25.2	48.7	18.7	3.6	0.4					1.5	
	Chicken Breasts (403)	0.0	1.0	[0.3 - 2.5]				1.7	34.5	45.2	17.6						0.2	0.7	
	Ground Turkey (9)	0.0	0.0	[0.0 - 33.6]				•••	33.3	44.4		22.2					V		
	Chickens (117)	0.0	0.0	[0.0 - 3.1]				8.5	41.0	41.9	6.8	1.7							
	CHICKEHS (117)	0.0	0.0	[0.0 - 3.1]				0.5	41.0	41.9	0.0	1./							

<sup>&</sup>lt;sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

<sup>&</sup>lt;sup>2</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>3</sup> Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>4</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>5</sup> 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 areas 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 greater than the lowest tested concentration

Table 49b. Distribution of MICs and Occurrence of Resistance among Campylobacter jejuni Isolates from Humans, Retail Meats, and Chickens, 2009

	Isolate Source										Distributio	n (%) of M	ICs (µg/ml)	5					
Antimicrobial	(# of Isolates) 1	%l <sup>2</sup>	%R <sup>3</sup>	[95% CI] <sup>4</sup>	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Phenicols																			
Florfenicol <sup>6</sup>	Humans (1355)	N/A	0.6	[0.3 - 1.2]					<0.1	14.8	70.3	12.2	2.0	0.5	<0.1				
	Chicken Breasts (403) Ground Turkey (9)	N/A N/A	0.0 0.0	[0.0 - 0.9] [0.0 - 33.6]					0.2	6.7	80.4 88.9	12.7 11.1							
	Chickens (117)	N/A	0.0	[0.0 - 3.1]					0.9	63.2	35.0	0.9							
Quinolones																			
Ciprofloxacin	Humans (1355)	<0.1	23.0	[20.8 - 25.4]		1.1	27.8	40.3	5.9	1.7	0.2	<0.1	1.5	9.1	7.4	3.1	1.4	0.4	
	Chicken Breasts (403) Ground Turkey (9)	0.0 0.0	21.1 44.4	[17.2 - 25.4] [13.7 - 78.8]		0.5	8.4 33.3	58.3 22.2	11.7					5.0 22.2	7.9 11.1	8.2 11.1			
	Chickens (117)	0.0	19.7	[12.9 - 28.0]		4.3	47.9	26.5	1.7				1.7	12.0	5.1	0.9			
Nalidixic acid	Humans (1355)	0.0	23.2	[21.0 - 25.5]									64.1	11.1	1.6		2.6	20.6	
	Chicken Breasts (403)	0.0	21.1	[17.2 - 25.4]									59.6	19.4			0.5	20.6	
	Ground Turkey (9)	0.0	44.4	[13.7 - 78.8]									55.6				33.3	11.1	
	Chickens (117)	0.0	19.7	[12.9 - 28.0]									76.9	3.4			8.5	11.1	
Tetracyclines																			
Tetracycline	Humans (1355)	0.1	43.4	[40.7 - 46.1]			4.3	26.3	16.5	6.0	2.7	0.5	<0.1	0.1	0.4	2.5	9.9	30.6	
	Chicken Breasts (403) Ground Turkey (9)	0.0	46.2 100.0	[41.2 - 51.2] [66.4 - 100.0]				16.4	23.8	10.7	2.2	0.7			1.0	5.5	13.6 22.2	26.1 77.8	
	Chickens (117)	0.9	49.6	[40.2 - 59.0]			3.4	23.1	13.7	6.0	2.6		0.9	0.9	1.7	8.5	22.2	17.1	

<sup>&</sup>lt;sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

<sup>&</sup>lt;sup>2</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>3</sup> Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>4</sup>95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>5</sup> 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 areas 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

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

# Resistance by Year

Table 50a. Antimicrobial Resistance among Campylobacter jejuni Isolates from Humans, Retail Meats, and Chickens, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates T	ested	Humans	297	293	306	365	329	303	320	791	709	992	1046	1355
		Chicken Breasts Ground Turkey					198	325 4	510 7	403 10	426 12	332 20	329 10	403
						64 <sup>1</sup>	526	374	508	567	228	166	78	
	Antimicrobial	Chickens				04	520	3/4	506	567	220	100	70	117
Antimicrobial Class	(Resistance Breakpoint) <sup>2</sup>	Isolate Source <sup>3</sup>												
Aminoglycosides	Gentamicin (MIC ≥ 8 µg/ml)	Humans	0.3% 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.3% 1	0.5% 4	0.0%	0.7% 7	1.1% 12	0.7% 9
		Chicken Breasts					0.0%	0.3% 1	0.0%	0.0%	0.0% 0	0.0% 0	0.0%	0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0% 0	0.0%	0.0%	0.0%
		Chickens				0.0% 0	0.0% 0	0.0% 0	0.2% 1	0.0% 0	0.0% 0	0.0%	1.3% 1	0.9% 1
Ketolides	Telithromycin (MIC ≥ 16 μg/ml)	Humans								0.6% 5	0.8% 6	1.0% 10	2.2% 23	1.4% 19
	, ,,	Chicken Breasts							0.4% 2	0.5% 2	0.7% 3	0.6%	0.3%	0.2% 1
		Ground Turkey							0.0%	0.0%	0.0%	5.0% 1	10.0%	0.0%
		Chickens								0.4%	0.0%	0.0%	0.0%	0.0%
Lincosamides	Clindamycin (MIC ≥ 8 µg/ml)	Humans	1.0%	0.7%	0.7%	1.9% 7	1.8%	0.0%	2.2% 7	1.1% 9	1.0% 7	1.3% 13	2.1% 22	1.3% 18
	(о _ о ру)	Chicken Breasts		_	_				0.4%	0.5%	0.7%	0.6%	0.9%	0.5%
		Ground Turkey							0.0%	0.0%	0.0%	5.0%	10.0%	0.0%
		Chickens				0.0%	0.4%	0.8%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
Macrolides	Azithromycin (MIC ≥ 8 µg/ml)	Humans	0.3%	1.4% 4	1.6% 5	1.9% 7	1.8% 6	0.3%	0.6% 2	1.8% 14	0.8%	1.6% 16	2.3% 24	1.5% 21
	( 3 3 7 3 7	Chicken Breasts							0.8% 4	0.5% 2	0.9% 4	0.6%	1.2% 4	1.0% 4
		Ground Turkey							0.0%	0.0%	0.0%	5.0% 1	10.0% 1	0.0%
		Chickens				3.1% 2	0.6%	1.3% 5	1.6% 8	1.4%	0.4%	0.0%	1.3%	0.0%
	Erythromycin (MIC ≥ 32 µg/ml)	Humans	0.7%	1.4% 4	1.0%	1.9% 7	1.2%	0.3%	0.3%	1.6% 13	0.8%	1.6% 16	2.3%	1.5%
	(σ = σ= μg/)	Chicken Breasts	_	·			0.0%	0.0%	0.8%	0.5%	0.9%	0.6%	1.2%	1.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	10.0%	0.0%
		Chickens				3.1%	0.6%	1.6%	1.2% 6	1.1% 6	0.4%	0.0%	1.3%	0.0%
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Humans	0.7%	0.3%	0.0%	0.3%	0.3%	0.0%	1.6%					
	= 32 pg)	Chickens	_			0.0%	0.0%	0.0%	0.0%					
	Florfenicol (MIC ≥ 8) <sup>4</sup>	Humans								0.5% 4	0.0%	0.0%	0.6% 6	0.6%
	= = 5/	Chicken Breasts							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Chickens								0.0%	0.0%	0.0%	0.0%	0.0%

<sup>&</sup>lt;sup>1</sup>These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

<sup>&</sup>lt;sup>2</sup> Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

<sup>&</sup>lt;sup>3</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

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

Table 50b. Antimicrobial Resistance among Campylobacter jejuni Isolates from Humans, Retail Meats, and Chickens, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Te	ested	Humans	297	293	306	365	329	303	320	791	709	992	1046	1355
		Chicken Breasts Ground Turkey					198 2	325 4	510 7	403 10	426 12	332 20	329 10	403 9
		Chickens				64 <sup>1</sup>	526	374	508	567	228	166	78	117
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) <sup>2</sup>	Isolate Source <sup>3</sup>												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	13.8% 41	17.7% 52	14.7% 45	18.4% 67	20.7% 68	17.2% 52	18.1% 58	21.5% 170	19.5% 138	25.8% 256	22.4% 234	23.0% 312
		Chicken Breasts					15.2% 30	14.5% 47	15.1% 77	15.1% 61	16.7% 71	17.2% 57	14.6% 48	21.1% 85
		Ground Turkey					50.0% 1	0.0%	28.6%	10.0% 1	50.0% 6	30.0% 6	60.0% 6	44.4% 4
		Chickens				20.3% 13	18.6% 98	14.7% 55	21.3% 108	15.0% 85	8.8% 20	21.7% 36	32.1% 25	19.7% 23
	Nalidixic acid (MIC ≥ 64 μg/ml)	Humans	15.5% 46	19.5% 57	16.0% 49	18.9% 69	21.3% 70	17.8% 54	18.4% 59	21.9% 173	19.0% 135	26.1% 259	22.8% 239	23.2% 314
		Chicken Breasts							15.1% 77	14.9% 60	16.7% 71	17.2% 57	14.6% 48	21.1% 85
		Ground Turkey							28.6% 2	10.0% 1	50.0% 6	30.0% 6	60.0% 6	44.4% 4
		Chickens				20.3% 13	22.1% 116	15.5% 58	21.7% 110	15.3% 87	8.8% 20	21.7% 36	33.3% 26	19.7% 23
Tetracyclines	Doxycycline (MIC ≥ 8 μg/ml)	Chicken Breasts					38.4% 76	40.6% 132						
		Ground Turkey					100.0% 2	75.0% 3						
	Tetracycline (MIC ≥ 16 μg/ml)	Humans	46.1% 137	45.4% 133	39.2% 120	40.3% 147	41.3% 136	38.3% 116	46.9% 150	41.8% 331	47.4% 336	44.8% 444	44.3% 463	43.4% 588
		Chicken Breasts							50.2% 256	46.4% 187	47.2% 201	48.5% 161	49.8% 164	46.2% 186
		Ground Turkey							42.9% 3	70.0% 7	75.0% 9	90.0% 18	100.0% 10	100.0% 9
		Chickens				35.9% 23	45.1% 237	47.6% 178	42.3% 215	44.1% 250	56.1% 128	56.6% 94	53.8% 42	49.6% 58

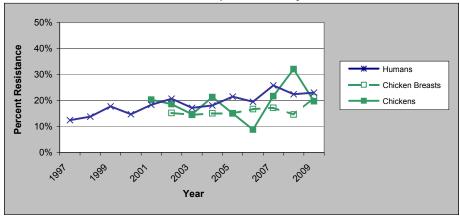
<sup>&</sup>lt;sup>1</sup> These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

<sup>&</sup>lt;sup>2</sup> Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

<sup>&</sup>lt;sup>3</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

#### Ciprofloxacin Resistance

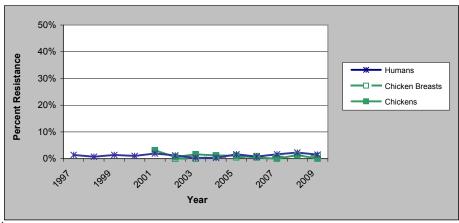
Figure 20. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Data for ground turkey, ground beef, and pork chops are not included due to the small number of *C. jejuni* isolates from these sources. Table 50 contains resistance data for *C. jejuni* isolates from each source, by year

## **Erythromycin Resistance**

Figure 21. Percent of *Campylobacter jejuni* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Erythromycin by Year, 1997-2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup>Data for ground turkey, ground beef, and pork chops are not included due to the small number of *C. jejuni* isolates from these sources. Table 50 contains resistance data for *C. jejuni* isolates from each source, by year

Table 51. Number of *Campylobacter jejuni* Isolates Tested from Humans, Retail Meats<sup>2</sup>, and Chickens by Year, 1997-2009

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	209	297	293	306	365	329	303	320	791	709	992	1046	1355
Chicken Breasts						198	325	510	403	426	332	329	403
Ground Turkey						2	4	7	10	12	20	10	9
Chickens					64 <sup>1</sup>	526	374	508	567	228	166	78	117

<sup>&</sup>lt;sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports.

<sup>&</sup>lt;sup>2</sup> These isolates were recovered from July through December 2001, when the new ARS isolation method was used

Table 52. Resistance Patterns among *Campylobacter jejuni* Isolates from Humans, Retail Meats and Food Animals. by Year. 2004-2009 <sup>1</sup>

Animals, by Year, 2004-2009 Year		2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	N/A <sup>1</sup>	791	709	992	1046	1355
	Chicken Breasts	510	403	426	332	329	403
	Ground Turkey	7	10	12	20	10	9
	Chickens	N/A <sup>1</sup>	567	228	166	78	117
	Onlocons	1071	001	LLO	100	70	117
Basistanas Battarna	Isolate Source <sup>2</sup>						
Resistance Patterns	isolate Source		48.0%	43.7%	45.5%	46.1%	46.6%
1. No Resistance Detected	Humans		380	310	45.576	482	632
	Chicken Breasts	41.0%	43.4%	43.9%	40.4%	40.4%	41.9%
	Chicken breasts	209	175	187	134	133	169
	Ground Turkey	42.9%	30.0%	16.7%	10.0%	0.0%	0.0%
		3	3	2	2	0	0
	Chickens		46.9% 266	39.9% 91	34.3% 57	33.3% 26	41.9% 49
			13.8%	11.4%	17.4%	14.7%	13.9%
2. Resistance to ≥ 2	Humans		109	81	173	154	189
Antimicrobial Classes	Chicken Breasts	7.1%	6.0%	8.7%	7.2%	7.0%	10.7%
	Chicken bleasts	36	24	37	24	23	43
	Ground Turkey	14.3%	10.0%	41.7%	30.0%	70.0%	44.4%
		1	1 8.3%	5	6 12.7%	7 23.1%	4
	Chickens		8.3% 47	5.3% 12	21	18	12.0% 14
			1.3%	0.7%	1.3%	2.2%	1.5%
3. Resistance to ≥ 3	Humans		10	5	13	23	21
Antimicrobial Classes	Chicken Breasts	0.4%	0.5%	0.7%	0.6%	0.3%	0.2%
	Officient breasts	2	2	3	2	1	1
	Ground Turkey	0.0%	0.0%	0.0%	5.0%	10.0%	0.0%
		0	0 0.5%	0.0%	0.0%	0.0%	0.0%
	Chickens		3	0.0%	0.0%	0.0%	0.0%
	I la companya		0.3%	0.3%	0.9%	1.1%	0.9%
4. Resistance to ≥ 4	Humans		2	2	9	11	12
Antimicrobial Classes	Chicken Breasts	0.4%	0.3%	0.7%	0.0%	0.0%	0.0%
	Omenen Bredete	2	1	3	0	0	0
	Ground Turkey	0.0%	0.0% 0	0.0%	5.0% 1	10.0% 1	0.0%
		U	0.0%	0.0%	0.0%	0.0%	0.0%
	Chickens		0	0	0	0	0
	Humans		1.0%	0.6%	1.3%	1.5%	1.1%
5. At Least Quinolone and	Tiulilaiis		8	4	13	16	15
Macrolide Resistant	Chicken Breasts	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		0 00/	0	0	0 5 00/	0	0
	Ground Turkey	0.0%	0.0% 0	0.0%	5.0% 1	0.0% 0	0.0% 0
	Objetere		0.2%	0.4%	0.0%	1.3%	0.0%
	Chickens		1	1	0	1	0
	Humans		12.4%	10.7%	17.0%	13.7%	13.3%
6. At Least Quinolone and	Tamans		98	76	169	143	180
Tetracycline Resistant	Chicken Breasts	6.3%	5.5%	8.0%	6.6%	6.1%	10.2%
		32 14.3%	22 10.0%	34 41.7%	22 30.0%	20 60.0%	41 44.4%
	Ground Turkey	14.576	10.076	5	6	6	4
	Chickons		7.2%	4.8%	12.7%	20.5%	11.1%
	Chickens		41	11	21	16	13

<sup>&</sup>lt;sup>1</sup> Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth microdilution method was first used

<sup>&</sup>lt;sup>2</sup> Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports

#### E. Antimicrobial Susceptibility among Campylobacter coli

#### **MIC Distributions**

Table 53a. Distribution of MICs and Occurrence of Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, 2009

	Isolate Source										Distributio	n (%) of M	ICs (µg/ml	) <sup>5</sup>					
Antimicrobial	(# of Isolates) <sup>1</sup>	<b>%l</b> <sup>2</sup>	%R <sup>3</sup>	[95% CI]⁴	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Aminoglycosides																			
Gentamicin	Humans (143)	0.0	2.8	[0.8 - 7.0]				0.7	5.6	48.3	39.9	2.8					2.8		
	Chicken Breasts (179)	0.0	5.6	[2.7 - 10.0]						56.4	38.0						5.6		
	Ground Turkey (15)	0.0	0.0	[0.0 - 21.8]						53.3	46.7								
	Chickens (81)	0.0	2.5	[0.3 - 8.6]					32.1	65.4							2.5		
Ketolides																			
Telithromycin	Humans (143)	4.9	2.1	[0.4 - 6.0]			0.7	0.7	11.2	18.9	21.0	21.0	19.6	4.9	2.1				
	Chicken Breasts (179)	0.6	4.5	[1.9 - 8.6]				0.6	17.3	8.9	15.6	39.1	13.4	0.6	4.5				
	Ground Turkey (15)	0.0	0.0	[0.0 - 21.8]					13.3	6.7	33.3	40.0	6.7						
	Chickens (81)	0.0	6.2	[2.0 - 13.8]				4.9	12.3	8.6	40.7	25.9	1.2		6.2				
Lincosamides																			
Clindamycin	Humans (143)	1.4	2.1	[0.4 - 6.0]		0.7	5.6	16.8	28.7	29.4	11.9	3.5	1.4		1.4	0.7			
	Chicken Breasts (179)	1.7	3.4	[1.2 - 7.2]			0.6	7.8	61.5	19.0	3.4	2.8	1.7	0.6	1.7	1.1			
	Ground Turkey (15)	0.0	0.0	[0.0 - 21.8]				6.7	53.3	33.3	6.7								
	Chickens (81)	6.2	0.0	[0.0 - 4.5]			1.2	48.1	37.0	3.7	2.5	1.2	6.2						
Macrolides																			
Azithromycin	Humans (143)	0.0	2.8	[0.8 - 7.0]	0.7	2.1	18.2	47.6	25.2	3.5								2.8	
	Chicken Breasts (179)	0.0	4.5	[1.9 - 8.6]		3.4	46.9	40.8	4.5									4.5	
	Ground Turkey (15)	0.0	0.0	[0.0 - 21.8]		6.7	46.7	33.3	13.3										
	Chickens (81)	0.0	6.2	[2.0 - 13.8]		9.9	65.4	18.5										6.2	
Erythromycin	Humans (143)	0.0	2.8	[0.8 - 7.0]			0.7	0.7	5.6	34.3	29.4	16.8	9.1	0.7		1	0.7	2.1	
	Chicken Breasts (179)	0.0	4.5	[1.9 - 8.6]				0.6	17.3	25.7	40.2	10.6	1.1					4.5	
	Ground Turkey (15)	0.0	0.0	[0.0 - 21.8]					13.3	33.3	46.7	6.7							
	Chickens (81)	0.0	6.2	[2.0 - 13.8]				1.2	16.0	37.0	33.3	6.2						6.2	

<sup>&</sup>lt;sup>1</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

<sup>&</sup>lt;sup>2</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>3</sup> Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>4</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>5</sup> 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 areas 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 greater than the lowest tested concentration

Table 53b. Distribution of MICs and Occurrence of Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, 2009

	Isolate Source										Distributio	n (%) of M	ICs (µg/ml)	5					
Antimicrobial	(# of Isolates) <sup>1</sup>	%l <sup>2</sup>	%R <sup>3</sup>	[95% CI] <sup>4</sup>	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256
Phenicols																			
Florfenicol 6	Humans (143)	N/A	0.0	[0.0 - 2.5]						7.0	56.6	29.4	7.0						
	Chicken Breasts (179) Ground Turkey (15)	N/A N/A	0.0 0.0	[0.0 - 2.0] [0.0 - 21.8]						1.7	58.1 66.7	38.5 33.3	1.7						
	Chickens (81)	N/A	0.0	[0.0 - 4.5]						7.4	86.4	6.2							
Quinolones																			
Ciprofloxacin	Humans (143)	0.7	21.7	[15.2 - 29.3]			15.4	37.8	15.4	8.4	0.7	0.7	3.5	5.6	9.8	1.4	1.4		
	Chicken Breasts (179) Ground Turkey (15)	0.0	18.4 46.7	[13.0 - 24.9] [21.3 - 73.4]			5.0	45.8 40.0	30.7 13.3				0.6 6.7	3.4 33.3	5.6	8.4	0.6	6.7	
	Chickens (81)	0.0	22.2	[13.7 - 32.8]			18.5	50.6	8.6					8.6	13.6				
Nalidixic acid	Humans (143)	0.7	23.1	[16.4 - 30.9]									43.4	28.0	4.9	0.7	7.0	16.1	
	Chicken Breasts (179) Ground Turkey (15)	0.0 0.0	18.4 46.7	[13.0 - 24.9] [21.3 - 73.4]									40.8 40.0	36.9 13.3	3.9		4.5 13.3	14.0 33.3	
	Chickens (81)	0.0	22.2	[13.7 - 32.8]									72.8	4.9			17.3	4.9	
Tetracyclines																			
Tetracycline	Humans (143)	0.0	44.8	[36.4 - 53.3]			1.4	14.7	17.5	12.6	8.4	0.7					3.5	41.3	
	Chicken Breasts (179) Ground Turkey (15)	0.6 0.0	38.0 73.3	[30.9 - 45.5] [44.9 - 92.2]				2.2	19.0 13.3	24.0 13.3	9.5	6.7		0.6			1.7	36.3 73.3	
	Chickens (81)	0.0	44.4	[33.4 - 55.9]				3.7	32.1	9.9	8.6		1.2			4.9	13.6	25.9	

Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

<sup>&</sup>lt;sup>2</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>3</sup> Percent resistant; for florfenicol, percent non-susceptible. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>4</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>5</sup> 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 areas 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

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

## Resistance by Year

Table 54a. Antimicrobial Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, by Year, 1998-2009

	norobiai ittoolott	ance among Camp						tan wea						
Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Te	ested	Humans	8	20	12	17	25	22	26	98	97	105	110	143
		Chicken Breasts					90	142	196	151	145	143	181	179
		Ground Turkey					2	1	5	9	10	14	19	15
		Chickens				52 <sup>1</sup>	288	247	100	380	100	76	20	0.1
	Audiologable	Chickens				52	200	247	186	360	123	76	28	81
	Antimicrobial (Resistance													
	Breakpoint) <sup>2</sup>	Isolate Source 3												
Antimicrobial Class	<u> </u>	Isolate Source	0.00/	0.00/	0.00/	0.00/	0.00/	4.50/	2.22/	0.00/	4.00/	2.22/	0.00/	0.00/
Aminoglycosides	Gentamicin	Humans	0.0%	0.0%	8.3%	0.0%	0.0%	4.5%	0.0%	2.0%	1.0%	0.0%	0.9%	2.8%
	(MIC ≥ 8 μg/ml)		0	0	1	0	0	1	0	2	1	0	1 70/	4
		Chicken Breasts					0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.7%	5.6%
							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10 0.0%
		Ground Turkey					0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	1.3%	3.6%	2.5%
		Chickens				0.070	0.070	0.070	0.070	1	0.070	1.570	1	2.370
Ketolides	Telithromycin									4.1%	7.2%	5.7%	5.5%	2.1%
rtotonidos	(MIC ≥ 16 μg/ml)	Humans								4	7	6	6	3
	(o = 10 µg)								8.2%	7.9%	4.8%	7.0%	7.7%	4.5%
		Chicken Breasts							16	12	7	10	14	8
		0 17 1							0.0%	22.2%	0.0%	0.0%	5.3%	0.0%
		Ground Turkey							0	2	0	0	1	0
		Chielena								5.5%	6.5%	13.2%	3.6%	6.2%
		Chickens								21	8	10	1	5
Lincosamides	Clindamycin	Humans	12.5%	10.0%	8.3%	5.9%	4.0%	9.1%	0.0%	4.1%	9.3%	5.7%	9.1%	2.1%
	(MIC ≥ 8 μg/ml)	Hullialis	1	2	1	1	1	2	0	4	9	6	10	3
		Chicken Breasts							7.1%	8.6%	4.8%	4.9%	5.0%	3.4%
		Chicken breasts							14	13	7	7	9	6
		Ground Turkey							0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground runkey							0	0	0	0	0	0
		Chickens				1.9%	4.9%	4.5%	1.1%	2.4%	1.6%	9.2%	3.6%	0.0%
						1	14	11	2	9	2	7	1	0
Macrolides	Azithromycin	Humans	12.5%	10.0%	8.3%	5.9%	4.0%	9.1%	0.0%	3.1%	8.2%	5.7%	10.0%	2.8%
	(MIC ≥ 8 μg/ml)		1	2	1	1	1	2	0	3	8	6	11	4
		Chicken Breasts							9.2%	9.9%	5.5%	6.3%	9.9%	4.5%
									18	15	8	9	18	8
		Ground Turkey							0.0%	22.2%	0.0%	0.0%	5.3%	0.0%
						44.50/	40.40/	00.00/	0	2	0	0	1 10 70/	0
		Chickens				11.5% 6	19.4% 56	20.2% 50	9.1% 17	8.4% 32	8.9% 11	14.5% 11	10.7% 3	6.2% 5
	Erythromycin		12.5%	10.0%	8.3%	5.9%	4.0%	9.1%	0.0%	3.1%	8.2%	5.7%	10.0%	2.8%
	(MIC ≥ 32 μg/ml)	Humans	12.5%	2	1	1	1	2	0.0%	3.1%	8	6	10.0%	4
	(WIC = 32 µg/III)		-		'	'	7.8%	7.0%	9.2%	9.9%	5.5%	6.3%	9.9%	4.5%
							l .		18	15	8	9	18	8
		Chicken Breasts					7	10						
							7 0.0%	0.0%			0.0%	0.0%		0.0%
		Chicken Breasts  Ground Turkey					0.0% 0	0.0%	0.0%	22.2% 2	0.0% 0	0.0% 0	5.3% 1	0.0%
		Ground Turkey				9.6%	0.0%	0.0%	0.0%	22.2%			5.3%	
						9.6%	0.0% 0	0.0% 0	0.0%	22.2% 2	0	0	5.3% 1	0
Phenicols	Chloramphenicol	Ground Turkey Chickens	25.0%	0.0%	0.0%		0.0% 0 18.8%	0.0% 0 20.2%	0.0% 0 9.1%	22.2% 2 8.4%	0 8.9%	0 14.5%	5.3% 1 10.7%	0 6.2%
Phenicols	Chloramphenicol (MIC ≥ 32 µg/ml)	Ground Turkey	25.0%	0.0%	0.0%	5 0.0% 0	0.0% 0 18.8% 54 0.0% 0	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0	22.2% 2 8.4%	0 8.9%	0 14.5%	5.3% 1 10.7%	0 6.2%
Phenicols		Ground Turkey Chickens Humans				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0%	22.2% 2 8.4%	0 8.9%	0 14.5%	5.3% 1 10.7%	0 6.2%
Phenicols	(MIC ≥ 32 μg/ml)	Ground Turkey Chickens				5 0.0% 0	0.0% 0 18.8% 54 0.0% 0	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0	22.2% 2 8.4% 32	0 8.9% 11	0 14.5% 11	5.3% 1 10.7% 3	0 6.2% 5
Phenicols	(MIC ≥ 32 μg/ml)  Florfenicol	Ground Turkey Chickens Humans Chickens				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0%	22.2% 2 8.4% 32	0 8.9% 11	0 14.5% 11	5.3% 1 10.7% 3	0 6.2% 5
Phenicols	(MIC ≥ 32 μg/ml)	Ground Turkey Chickens Humans				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0% 0	22.2% 2 8.4% 32 1.0%	0 8.9% 11 0.0% 0	0 14.5% 11 0.0% 0	5.3% 1 10.7% 3	0 6.2% 5
Phenicols	(MIC ≥ 32 μg/ml)  Florfenicol	Ground Turkey Chickens Humans Chickens				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0% 0	22.2% 2 8.4% 32 1.0% 1 0.0%	0 8.9% 11 0.0% 0 0.0%	0 14.5% 11 0.0% 0 0.0%	5.3% 1 10.7% 3 0.0% 0	0 6.2% 5
Phenicols	(MIC ≥ 32 μg/ml)  Florfenicol	Ground Turkey Chickens Humans Chickens Humans				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0% 0	22.2% 2 8.4% 32 1.0% 1 0.0%	0 8.9% 11 0.0% 0 0.0% 0	0 14.5% 11 0.0% 0 0.0% 0	5.3% 1 10.7% 3 0.0% 0 0.0%	0 6.2% 5 0.0% 0 0.0%
Phenicols	(MIC ≥ 32 μg/ml)  Florfenicol	Ground Turkey Chickens Humans Chickens Humans				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0% 0	22.2% 2 8.4% 32 1.0% 1 0.0% 0	0 8.9% 11 0.0% 0 0.0% 0	0 14.5% 11 0.0% 0 0.0% 0 0.0%	5.3% 1 10.7% 3 0.0% 0 0.0% 0 0.0%	0 6.2% 5 0.0% 0 0.0% 0 0.0%
Phenicols	(MIC ≥ 32 μg/ml)  Florfenicol	Ground Turkey Chickens Humans Chickens Humans Chicken Breasts				5 0.0% 0 0.0%	0.0% 0 18.8% 54 0.0% 0 0.0%	0.0% 0 20.2% 50 0.0% 0	0.0% 0 9.1% 17 0.0% 0 0.0% 0	22.2% 2 8.4% 32 1.0% 1 0.0%	0 8.9% 11 0.0% 0 0.0% 0	0 14.5% 11 0.0% 0 0.0% 0	5.3% 1 10.7% 3 0.0% 0 0.0%	0 6.2% 5 0.0% 0 0.0%

<sup>&</sup>lt;sup>1</sup>These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

<sup>&</sup>lt;sup>2</sup> Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

<sup>&</sup>lt;sup>3</sup> Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for these retail meats can be found in prior reports

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

Table 54b. Antimicrobial Resistance among Campylobacter coli Isolates from Humans, Retail Meats, and Chickens, by Year, 1998-2009

Year			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Te	ested	Humans	8	20	12	17	25	22	26	98	97	105	110	143
		Chicken Breasts Ground Turkey					90 2	142 1	196 5	151 9	145 10	143 14	181 19	179 15
		Chickens				52¹	288	247	186	380	123	76	28	81
Antimicrobial Class	Antimicrobial (Resistance Breakpoint) <sup>2</sup>	Isolate Source <sup>3</sup>												
Quinolones	Ciprofloxacin (MIC ≥ 4 µg/ml)	Humans	0.0%	30.0% 6	25.0% 3	47.1% 8	12.0% 3	22.7% 5	30.8% 8	23.5% 23	21.6% 21	28.6% 30	30.0% 33	21.7% 31
		Chicken Breasts					10.0% 9	13.4% 19	16.3% 32	29.1% 44	22.1% 32	25.9% 37	20.4% 37	18.4% 33
		Ground Turkey					50.0% 1	100.0% 1	0.0% 0	55.6% 5	30.0% 3	50.0% 7	47.4% 9	46.7% 7
		Chickens				19.2% 10	16.0% 46	20.2% 50	26.9% 50	22.1% 84	15.4% 19	15.8% 12	14.3% 4	22.2% 18
	Nalidixic acid (MIC ≥ 64 µg/ml)	Humans	50.0% 4	30.0% 6	25.0% 3	47.1% 8	12.0% 3	22.7% 5	34.6% 9	26.5% 26	23.7% 23	30.5% 32	30.0% 33	23.1% 33
		Chicken Breasts							16.3% 32	29.1% 44	20.7% 30	25.9% 37	20.4% 37	18.4% 33
		Ground Turkey							0.0% 0	55.6% 5	30.0% 3	50.0% 7	47.4% 9	46.7% 7
		Chickens				19.2% 10	17.7% 51	21.5% 53	27.4% 51	22.1% 84	15.4% 19	15.8% 12	14.3% 4	22.2% 18
Tetracyclines	Doxycycline (MIC ≥ 8 μg/ml)	Chicken Breasts					44.4% 40	50.7% 72						
		Ground Turkey					50.0% 1	100.0% 1						
	Tetracycline (MIC ≥ 16 μg/ml)	Humans	50.0% 4	30.0% 6	25.0% 3	58.8% 10	40.0% 10	45.5% 10	38.5% 10	30.6% 30	39.2% 38	41.9% 44	40.0% 44	44.8% 64
		Chicken Breasts							46.4% 91	42.4% 64	46.9% 68	39.9% 57	46.4% 84	38.0% 68
		Ground Turkey							0.0% 0	88.9% 8	80.0% 8	64.3% 9	94.7% 18	73.3% 11
		Chickens				57.7% 30	49.0% 141	51.0% 126	48.4% 90	42.1% 160	53.7% 66	42.1% 32	60.7% 17	44.4% 36

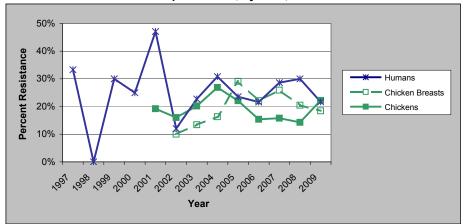
<sup>&</sup>lt;sup>1</sup>These isolates were recovered from July through December, 2001, when the new ARS isolation method was used

<sup>&</sup>lt;sup>2</sup> Resistance figures for gentamicin, clindamycin, azithromycin, erythromycin, nalidixic acid, and doxycycline in this report may differ from previously published figures because breakpoints have been revised for these antimicrobials

<sup>&</sup>lt;sup>3</sup> Beginning in 2008, ground beef and pork chops were no longer tested for Campylobacter due to low isolation in previous years. Data for these retail meats can be found in prior reports

## Ciprofloxacin Resistance

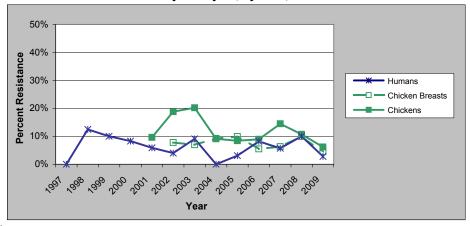
Figure 22. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Ciprofloxacin, by Year, 1997-2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Data for ground turkey, ground beef, and pork chops are not included due to the small number of *C. coli* isolates from these sources. There were no *C. coli* isolates from ground beef. Table 54 contains resistance data for *C. coli* isolates from each source, by year

#### **Erythromycin Resistance**

Figure 23. Percent of *Campylobacter coli* Isolates from Humans, Chicken Breasts, and Chickens Resistant to Erythromycin, by Year, 1997-2009<sup>1</sup>



<sup>&</sup>lt;sup>1</sup> Data for ground turkey, ground beef, and pork chops are not included due to the small number of *C. coli* isolates from these sources. There were no *C. coli* isolates from ground beef. Table 54 contains resistance data for *C. coli* isolates from each source, by year

Table 55. Number of *Campylobacter coli* Isolates Tested from Humans, Retail Meats<sup>1</sup>, and Chickens, by Year, 1997-2009

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Humans	6	8	20	12	17	25	22	26	98	97	105	110	143
Chicken Breasts						90	142	196	151	145	143	181	179
Ground Turkey						2	1	5	9	10	14	19	15
Chickens					52 <sup>2</sup>	288	247	186	380	123	76	28	81

Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years. Data for the retail meats can be found in prior reports

<sup>&</sup>lt;sup>2</sup>These isolates were recovered from July through December 2001, when the new ARS isolation method was used

Table 56. Resistance Patterns among Campylobacter coli Isolates from Humans, Retail Meats and Food Animals, by Year, 2004-2009<sup>1</sup>

Year, 2004-2009' Year		2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Humans	N/A <sup>1</sup>	98	97	105	110	143
	Chicken Breasts	196	151	145	143	181	179
	Ground Turkey	5	9	10	14	19	15
	Chickens	N/A <sup>1</sup>	380	123	76	28	81
	Chickens	IN/A	360	123	70	20	01
Resistance Patterns	Isolate Source <sup>2</sup>						
toolotanoo i attorno			51.0%	45.4%	40.0%	42.7%	44.1%
1. No Resistance Detected	Humans		50	44	42	47	63
	Chicken Breasts	38.3%	36.4%	38.6%	45.5%	41.4%	48.6%
	Chicken bleasts	75	55	56	65	75	87
	Ground Turkey	100.0%	11.1%	20.0%	28.6%	5.3%	20.0%
	,	5	1 47.00/	20.00/	4	1	3
	Chickens		47.6% 181	39.0% 48	43.4% 33	28.6% 8	49.4% 40
			12.2%	16.5%	18.1%	24.5%	12.6%
2. Resistance to ≥ 2	Humans		12.270	16	19	27.370	18
Antimicrobial Classes	Chieken Dresete	15.3%	19.9%	15.2%	19.6%	24.3%	15.6%
	Chicken Breasts	30	30	22	28	44	28
	Ground Turkey	0.0%	55.6%	30.0%	42.9%	52.6%	40.0%
	Ground rankey	0	5	3	6	10	6
	Chickens		21.6%	17.9%	21.1%	17.9%	19.8%
			82	22	16	5	16
Decistance to > 2	Humans		3.1%	7.2%	5.7%	5.5%	2.1%
3. Resistance to ≥ 3  Antimicrobial Classes		8.2%	3 9.3%	7 5.5%	6 7.0%	6 6.1%	3 4.5%
Antimicropial Classes	Chicken Breasts	16	14	8	10	11	8
	0 17 1	0.0%	22.2%	0.0%	0.0%	5.3%	0.0%
	Ground Turkey	0	2	0	0	1	0
	Chickens		5.8%	6.5%	13.2%	7.1%	6.2%
	Official		22	8	10	2	5
	Humans		1.0%	2.1%	1.0%	1.8%	2.1%
4. Resistance to ≥ 4		4.50/	1	2	1	2	3
Antimicrobial Classes	Chicken Breasts	1.5% 3	4.6% 7	2.1% 3	2.8%	2.2% 4	1.7%
		0.0%	22.2%	0.0%	0.0%	0.0%	3 0.0%
	Ground Turkey	0.070	2	0.070	0.070	0.070	0.070
	Ohishana		1.3%	0.8%	3.9%	0.0%	4.9%
	Chickens		5	1	3	0	4
	Humans		1.0%	3.1%	1.9%	3.6%	2.1%
5. At Least Quinolone and	Tramano		1	3	2	4	3
Macrolide Resistant	Chicken Breasts	0.5%	1.3%	0.0%	1.4%	1.1%	1.7%
		0.0%	22.2%	0.0%	0.0%	0.0%	3 0.0%
	Ground Turkey	0.070	2	0.070	0.070	0.070	0.0 %
	0111	J	1.6%	1.6%	5.3%	0.0%	4.9%
	Chickens		6	2	4	0	4
	Humans		9.2%	10.3%	13.3%	17.3%	12.6%
6. At Least Quinolone and	Tullians		9	10	14	19	18
Tetracycline Resistant	Chicken Breasts	7.1%	11.3%	10.3%	14.7%	13.3%	7.3%
		14	17	15	21	24	13
	Ground Turkey	0.0%	55.6%	30.0%	42.9%	47.4%	40.0%
		0	5 13.9%	9.8%	6 10.5%	9 14.3%	6 16.0%
	Chickens		13.9%	9.8%	8	14.3%	13
				14			10

<sup>&</sup>lt;sup>1</sup> Data are reported for retail meats beginning in 2004 and for humans and chickens beginning in 2005 when the broth <sup>2</sup> Beginning in 2008, ground beef and pork chops were no longer tested for *Campylobacter* due to low isolation in previous years Data for these retail meats can be found in prior reports

# V. Escherichia coli Data

# A. E. coli Isolates Tested

Table 57. Number of *E. coli* Isolates Tested, by Source and Year, 2000-2009

					Υe	ear				
Source	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Chicken Breasts			282	396	400	393	418	299	306	315
<b>Ground Turkey</b>			304	333	376	396	388	315	300	306
<b>Ground Beef</b>			295	311	338	316	295	256	250	247
Pork Chops			184	218	232	205	182	152	146	147
Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877

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

Table 58. Number and Percent of Retail Meat Samples Culture Positive for E. coli, 2009

	Chicken Breasts	Ground Turkey	Ground Beef	Pork Chops
Number of Meat Samples Tested	360	360	360	360
Number Positive for <i>E. coli</i>	315	306	247	147
Percent Positive for <i>E. coli</i>	87.5%	85.0%	68.6%	40.8%

Figure 24. Percent of Retail Meat Samples Culture Positive for E. coli, 2009

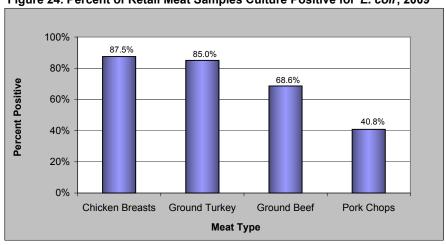
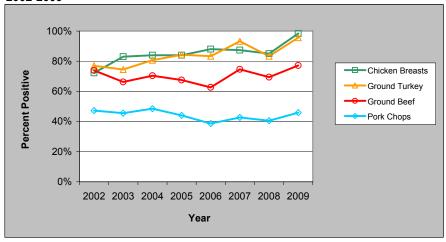


Figure 25. Percent of Retail Meat Samples Culture Positive for  $\it E. coli$ , 2002-2009



# C. Antimicrobial Susceptibility among E. coli

#### **MIC Distributions**

Table 59a. Distribution of MICs and Occurrence of Resistance among E. coli Isolates from Retail Meats and Chickens, 2009

	Isolate Source									0	istribu	ition (%	%) of M	ICs (µg	/ml) <sup>4</sup>						
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R²	[95% CI] <sup>3</sup>	0.015	0.03	0.06	0.125	0.25	0.50	1	2 `	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Chicken Breasts (315)	0.0	0.0	[0.0 - 1.2]						0.3	10.8	58.1	30.5	0.3							
	Ground Turkey (306)	0.0	0.0	[0.0 - 1.2]						0.3	8.5	65.7	23.2	2.0	0.3						
	Ground Beef (247)	0.0	0.0	[0.0 - 1.5]							11.3	64.4	22.7	1.6							
	Pork Chops (147)	0.0	0.0	[0.0 - 2.5]							9.5	59.9	26.5	4.1							
	1 ' ' '									۸.				٥.							
	Chickens (877)	0.0	0.0	[0.0 - 0.4]						0.5	10.8	67.0	15.3	0.5			J				
Gentamicin	Chicken Breasts (315)	2.2	34.3	[29.1 - 39.8]					2.9	32.4	26.3	1.9		2.2	8.6	25.7					
	Ground Turkey (306)	2.0	37.9	[32.4 - 43.6]					1.6	27.1	29.1	1.6	0.7	2.0	12.8	25.2					
	Ground Beef (247)	0.4	8.0	[0.1 - 2.9]					3.2	47.8	45.3	2.4		0.4	0.4	0.4					
	Pork Chops (147)	0.0	4.1	[1.5 - 8.7]					2.7	47.6	42.9	2.7				4.1					
	Chickens (877)	3.6	43.3	[40.0 - 46.7]					4.4	36.5	11.1	0.3	0.7	3.6	16.0	27.4					
Kananinin	Objetes Deserte (245)	0.3	- 4											83.2	11.1	0.3	0.6	4.8			
Kanamycin	Chicken Breasts (315)		5.4	[3.2 - 8.5]												0.3	0.6				
	Ground Turkey (306)	0.0	20.6	[16.2 - 25.6]										76.1	3.3			20.6			
	Ground Beef (247)	0.0	2.0	[0.7 - 4.7]										97.6	0.4		0.8	1.2			
	Pork Chops (147)	0.0	6.1	[2.8 - 11.3]										91.8	2.0			6.1			
	Chickens (877)	1.0	7.9	[6.2 - 9.9]										87.1	4.0	1.0	0.6	7.3			
Streptomycin	Chicken Breasts (315)	N/A	38.1	[32.7 - 43.7]												61.9	16.5	21.6			
	Ground Turkey (306)	N/A	57.5	[51.8 - 63.1]												42.5	18.0	39.5			
	Ground Beef (247)	N/A	8.1	[5.0 - 12.2]												91.9	2.4	5.7			
	Pork Chops (147)	N/A	19.7	[13.6 - 27.1]												80.3	7.5	12.2			
	Chickens (877)	N/A	49.8	[46.5 - 53.2]												50.2	17.1	32.6			
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Chicken Breasts (315)	1.0	13.3	[9.8 - 17.6]							2.5	23.5	46.0	13.7	1.0	9.2	4.1				
	Ground Turkey (306)	14.4	9.8	[6.7 - 13.7]							1.6	10.5	31.1	32.7	14.4	6.5	3.3				
	Ground Beef (247)	0.0	1.6	[0.4 - 4.1]							5.7	26.7	59.5	6.5		1.6					
	Pork Chops (147)	0.0	6.8	[3.3 - 12.2]							5.4	32.0	46.9	8.8		5.4	1.4				
	Chickens (877)	0.5	12.4	[10.3 - 14.8]							4.7	30.7	43.0	8.8	0.5	8.9	3.5				
Cephems		0.0		[								00	.0.0	0.0	0.0	1 0.0	0.0				
Cefoxitin	Chicken Breasts (315)	0.0	13.3	[9.8 - 17.6]							1.0	14.9	61.0	9.8		3.5	9.8				
	Ground Turkey (306)	1.6	7.8	[5.1 - 11.4]							1.0	18.6	59.5	11.4	1.6	3.3	4.6				
	Ground Beef (247)	0.0	1.6	[0.4 - 4.1]							2.0	30.4	57.1	8.9		0.8	0.8				
	Pork Chops (147)	0.7	6.8	[3.3 - 12.2]							2.0	28.6	55.1	6.8	0.7	3.4	3.4				
	Chickens (877)	1.1	11.4	[9.4 - 13.7]						0.1	1.8	28.7	49 N	7.8	1.1	6.0	5.4				

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 59b. Distribution of MICs and Occurrence of Resistance among E. coli Isolates from Retail Meats and Chickens, 2009

	Isolate Source				Distribution (%) of MICs (μg/ml) <sup>4</sup>																
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R²	[95% CI] <sup>3</sup>	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Cephems																					
Ceftiofur	Chicken Breasts (315)	0.6	11.7	[8.4 - 15.8]				2.5	28.3	54.6	1.3	1.0	0.6	6.4	5.4						
	Ground Turkey (306)	0.7	6.2	[3.8 - 9.5]				2.0	29.1	57.8	3.6	0.7	0.7	3.6	2.6						
	Ground Beef (247)	0.0	0.8	[0.1 - 2.9]				7.3	39.3	51.8	0.4	0.4			0.8						
	Pork Chops (147)	0.0	6.8	[3.3 - 12.2]				10.2	42.2	39.5	1.4			3.4	3.4						
	Chickens (877)	2.1	9.5	[7.6 - 11.6]				5.0	43.9	37.2	2.3	0.1	2.1	6.5	3.0						
Ceftriaxone	Chicken Breasts (315)	0.0	12.4	[9.0 - 16.5]					86.3	0.6	0.6		0.3	5.7	4.4	1.9					
	Ground Turkey (306)	0.0	6.9	[4.3 - 10.3]					91.2	0.7	1.3			3.6	2.9	0.3					
	Ground Beef (247)	0.0	0.8	[0.1 - 2.9]					98.4		8.0				0.4	0.4					
	Pork Chops (147)	0.0	6.8	[3.3 - 12.2]					93.2					3.4	2.7	0.7					
	Chickens (877)	0.1	11.5	[9.5 - 13.8]					87.6	0.7	0.1	0.1	1.4	6.4	3.5	0.2					
Folate Pathway Inhibitors																					
Sulfisoxazole	Chicken Breasts (315)	N/A	40.6	[35.2 - 46.3]											41.0	16.5	1.9			40.6	
	Ground Turkey (306)	N/A	53.9	[48.2 - 59.6]											29.4	15.0	1.6			53.9	
	Ground Beef (247)	N/A	7.7	[4.7 - 11.8]											70.4	19.0	2.8			7.7	
	Pork Chops (147)	N/A	14.3	[9.1 - 21.0]											53.7	27.2	4.8			14.3	
	Chickens (877)	N/A	52.6	[49.2 - 55.9]											43.8	3.1	0.2	0.1	0.2	52.6	
	Chicken Breasts (315)	N/A	2.2	[0.0 4.5]				78.1	13.0	4.1	1.6	1.0	I	22							
Trimethoprim-Sulfamethoxazole	Ground Turkey (306)			[0.9 - 4.5]				69.3	16.3	6.2	1.6			2.2							
	• , ,	N/A	5.9	[3.5 - 9.1]							1.0	1.3		5.9							
	Ground Beef (247) Pork Chops (147)	N/A N/A	2.0 2.7	[0.7 - 4.7] [0.7 - 6.8]				93.9 88.4	3.6 6.1	0.4 2.7				2.0							
	1 , , ,																				
Penicillins	Chickens (877)	N/A	7.0	[5.4 - 8.8]				68.4	14.6	6.2	2.7	1.1	0.2	6.7							
Ampicillin	Chicken Breasts (315)	0.0	22.2	[17.8 - 27.2]							9.2	41.9	25.7	1.0	1	ĺ	22.2				
Ampionin	Ground Turkey (306)	0.3	56.2	[50.4 - 61.8]							2.6	26.8	13.4	0.7	0.3		56.2				
	Ground Beef (247)	0.0	4.9	[2.5 - 8.3]								51.4	27.9	0.7	0.0		4.9				
	Pork Chops (147)	0.0	11.6	[6.9 - 17.9]								52.4	21.8	1.4			11.6				
	Chickens (877)	0.0	19.8	[17.2 - 22.6]									17.8	0.5		0.2	19.6				
Phonicale																					
Phenicols	Objeties Deserte (245)	4.0	0.0	10.4 0.03								7.0	F7.F	22.7	1 40	I	0.0				
Chloramphenicol	Chicken Breasts (315)	1.0	0.6	[0.1 - 2.3]								7.3	57.5	33.7	1.0		0.6				
	Ground Turkey (306)	0.3	3.3	[1.6 - 5.9]								4.6	52.0	39.9	0.3	0.3	2.9				
	Ground Beef (247)	0.4	2.4	[0.9 - 5.2]								6.5	50.2	40.5	0.4		2.4				
	Pork Chops (147)	1.4	4.8	[1.9 - 9.6]								6.8	55.8	31.3	1.4	1.4	3.4				
	Chickens (877)	0.2	1.1	[0.5 - 2.1]								15.4	65.1	18.1	0.2	0.3	0.8				

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

Table 59c. Distribution of MICs and Occurrence of Resistance among E. coli Isolates from Retail Meats and Chickens, 2009

	Isolate Source									D	Distribu	ition (%	6) of M	ICs (µg	ı/ml) <sup>4</sup>						
Antimicrobial	(# of Isolates)	%l <sup>1</sup>	%R²	[95% CI] 3	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Quinolones																					
Ciprofloxacin	Chicken Breasts (315)	0.0	0.3	[0.0 - 1.8]	96.5	0.3	0.3	0.3	2.2					0.3							
	Ground Turkey (306)	0.0	0.7	[0.1 - 2.3]	93.8	3.6		0.3	1.6				0.3	0.3							
	Ground Beef (247)	0.0	0.0	[0.0 - 1.5]	97.6	1.6			0.4	0.4											
	Pork Chops (147)	0.0	0.0	[0.0 - 2.5]	99.3	0.7															
	Chickens (877)	0.0	0.5	[0.1 - 1.2]	95.3	1.3	0.5	1.4	0.9	0.2				0.5							
Nalidixic Acid	Chicken Breasts (315)	N/A	2.9	[1.3 - 5.4]						1.0	17.5	74.0	4.4		0.3	0.3	2.5				
	Ground Turkey (306)	N/A	2.6	[1.1 - 5.1]						0.7	16.7	71.2	8.8				2.6				
	Ground Beef (247)	N/A	0.4	[0.0 - 2.2]						1.2	10.9	80.6	6.5	0.4			0.4				
	Pork Chops (147)	N/A	0.0	[0.0 - 2.5]						4.8	16.3	68.7	10.2								
	Chickens (877)	N/A	3.2	[2.1 - 4.6]						1.7	31.4	60.2	3.0	0.1	0.5	0.9	2.3				
Tetracyclines																					
Tetracycline	Chicken Breasts (315)	1.3	41.6	[36.1 - 47.2]									57.1	1.3	1.0	2.2	38.4				
	Ground Turkey (306)	0.0	82.0	[77.3 - 86.2]									18.0			3.9	78.1				
	Ground Beef (247)	4.9	18.6	[14.0 - 24.0]									76.5	4.9	1.2	0.8	16.6				
	Pork Chops (147)	2.7	46.9	[38.7 - 55.3]									50.3	2.7		4.1	42.9				
	Chickens (877)	0.8	49.1	[45.8 - 52.5]									50.1	0.8	1.5	11.3	36.4				

<sup>&</sup>lt;sup>1</sup> Percent of isolates with intermediate susceptibility

<sup>&</sup>lt;sup>2</sup> Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s, to the right of the double vertical bars, are due to rounding

<sup>&</sup>lt;sup>3</sup> 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method

<sup>&</sup>lt;sup>4</sup> The unshaded areas indicatethe 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 areas indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration

# Resistance by Year

Table 60a. Antimicrobial Resistance among *E. coli* Isolates from Retail Meats and Chickens, by Year, 2000-2009

Table 60a. Antimicro	biai itesistance a	nong L. con is							·	_		
Year Number of Isolates Tested		Chickon Process	2000	2001	<b>2002</b> 282	<b>2003</b> 396	<b>2004</b> 400	<b>2005</b> 393	<b>2006</b> 418	<b>2007</b> 299	<b>2008</b> 306	<b>2009</b> 315
Number of Isolates Tested		Chicken Breasts Ground Turkey			282 304	396	376	393 396	418 388	315	306	315 306
		Ground Beef			295	311	338	316	295	256	250	247
		Pork Chops	205	1000	184	218	232	205	182	152	146	147
	Antimicrobial	Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877
Antimicrobial Class	(Resistance Breakpoint)	Isolate Source										
Aminoglycosides	Amikacin	Chicken Breasts			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	(MIC ≥ 64 μg/ml)				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Turkey			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
		Ground Beef			0	0	0	0	0	0	0	0
		Pork Chops			0.0% 0	0.0%	0.0% 0	0.0% 0	0.0%	0.0%	0.0%	0.0%
		Chickens	0.0%	0.0% 0	0.0% 0	0.0%	0.0% 0	0.0% 0	0.0% 0	0.0% 0	0.0%	0.0% 0
	Gentamicin	Chicken Breasts	, and the second	Ů	23.1%	29.3%	30.0%	37.7%	37.3%	34.4%	34.0%	34.3%
	(MIC ≥ 16 μg/ml)	Ground Turkey			65 27.0%	116 29.7%	120 29.3%	148 27.5%	156 29.6%	103 27.0%	104 37.0%	108 37.9%
					82 0.3%	99 1.0%	110 0.6%	109 0.0%	115 4.1%	85 0.0%	111 2.0%	116 0.8%
		Ground Beef			1 1.1%	3 1.4%	2 1.3%	0.0%	12 1.1%	0 1.3%	5 1.4%	2 4.1%
		Pork Chops			2	3	3	0	2	2	2	6
		Chickens	40.0% 114	33.4% 664	38.0% 799	38.8% 530	39.1% 663	36.7% 819	33.1% 449	38.0% 574	44.5% 439	43.3% 380
	Kanamycin (MIC ≥ 64 μg/ml)	Chicken Breasts			6.0% 17	6.8% 27	6.8% 27	7.1% 28	11.5% 48	9.0% 27	6.9% 21	5.4% 17
	(o = o : pg)	Ground Turkey			13.2%	16.8%	16.0%	11.4%	14.7%	15.6%	19.0%	20.6%
		Ground Beef			40 2.4%	56 2.9%	60 2.4%	45 0.6%	57 4.7%	49 1.6%	57 4.0%	63 2.0%
					7 5.4%	9 8.7%	8 8.2%	7.3%	14 6.0%	4.6%	10 6.2%	5 6.1%
		Pork Chops	40.40/	44.50/	10 11.6%	19 10.3%	19 11.5%	15 10.3%	11	7	9	9 7.9%
		Chickens	16.1% 46	14.5% 288	243	140	196	231	9.1% 123	7.7% 117	101	69
	Streptomycin (MIC ≥ 64 µg/ml)	Chicken Breasts			49.3% 139	56.1% 222	56.8% 227	50.6% 199	48.1% 201	46.8% 140	43.8% 134	38.1% 120
		Ground Turkey			57.6% 175	54.7% 182	49.2% 185	43.4% 172	43.8% 170	44.8% 141	57.3% 172	57.5% 176
		Ground Beef			9.5%	9.0%	11.8%	5.4%	14.2%	6.3%	10.4%	8.1%
		Pork Chops			28 22.3%	28 19.7%	40 21.1%	17 13.2%	42 13.7%	16 13.8%	26 19.9%	20 19.7%
			77.5%	65.8%	41 65.1%	43 64.2%	49 64.1%	27 58.0%	25 49.5%	21 47.0%	29 54.6%	29 49.8%
Q Laston/Q Lastones	Amoxicillin-	Chickens	221	1308	1368	877	1088	1295	672	710	538	437
β-Lactam/β-Lactamase Inhibitor Combinations	Clavulanic Acid	Chicken Breasts			12.1% 34	13.6% 54	10.0% 40	12.2% 48	11.5% 48	7.4% 22	11.8% 36	13.3% 42
	(MIC ≥ 32 / 16 μg/ml)	Ground Turkey			5.6% 17	3.0% 10	5.3% 20	3.8% 15	6.7% 26	6.3% 20	8.3% 25	9.8% 30
		Ground Beef			2.0% 6	2.3% 7	3.9% 13	1.3% 4	2.4% 7	0.8% 2	2.4% 6	1.6% 4
		Pork Chops			5.4%	5.1%	5.6%	2.9%	2.2%	0.7%	3.4%	6.8%
			8.1%	10.0%	10 10.9%	11 11.1%	13 8.8%	6 10.6%	4 16.0%	1 11.2%	5 13.7%	10 12.4%
Cephems	Cefoxitin	Chickens	23	199	229 11.0%	151 9.3%	149 8.3%	236 11.2%	217 11.2%	169 7.4%	135 11.8%	109 13.3%
- Copiliania	(MIC ≥ 32 μg/ml)	Chicken Breasts			31	37	33	44	47	22	36	42
		Ground Turkey			3.3% 10	1.2% 4	4.5% 17	3.3% 13	6.2% 24	6.3% 20	6.3% 19	7.8% 24
		Ground Beef			1.4% 4	0.3% 1	1.2% 4	1.0% 3	2.0% 6	0.8% 2	2.4% 6	1.6% 4
		Pork Chops			3.3% 6	2.3% 5	2.2% 5	1.5% 3	1.6% 3	0.7% 1	3.4% 5	6.8% 10
		Chickens	7.4%	8.7%	8.5%	8.3%	8.2%	9.9%	15.0%	10.3%	13.8%	11.4%
	Ceftiofur	Chicken Breasts	21	173	178 7.1%	113 7.6%	139 5.8%	221 8.7%	204 8.6%	155 6.0%	136 10.8%	100 11.8%
	(MIC ≥ 8 μg/ml)				20 1.0%	30 0.3%	23 1.1%	34 1.8%	36 3.1%	18 6.0%	33 3.7%	37 6.2%
		Ground Turkey			3	1 0.3%	4 0.9%	7	12	19	11	19
		Ground Beef			0	1	3	2	3	2	4	2
		Pork Chops			0.5% 1	0.9% 2	0.4% 1	0.0% 0	0.0% 0	0.7% 1	3.4% 5	6.8% 10
		Chickens	6.3% 18	4.4% 88	5.5% 115	7.1% 97	4.9% 83	6.5% 145	10.2% 139	7.0% 106	10.5% 103	9.5% 83
	Ceftriaxone	Chicken Breasts			7.8%	9.1%	6.5%	10.2%	9.1%	6.4%	11.1%	12.4%
	(MIC ≥ 4 μg/ml)	Ground Turkey			1.3%	36 0.3%	1.3%	2.3%	38 3.1%	19 6.0%	3.7%	39 6.9%
					4 0.0%	0.3%	5 1.5%	9 1.9%	12 1.7%	19 0.8%	11 1.6%	21 0.8%
		Ground Beef			0	1 0.9%	5	6	5	0.7%	4	2
		Pork Chops			0.5% 1	2	0.4% 1	0.5% 1	1	1	3.4% 5	6.8% 10
		Chickens	6.3%	7.6%	8.6%	9.4%	7.2% 122	9.0% 200	14.7% 199	10.3% 155	13.5%	11.5%

Table 60b. Antimicrobial Resistance among E. coli Isolates from Retail Meats and Chickens, by Year, 2000-2009

Year							nickens,					
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested		Chicken Breasts			282	396	400	393	418	299	306	315
		Ground Turkey			304	333	376	396	388	315	300	306
		Ground Beef Pork Chops			295 184	311 218	338 232	316 205	295 182	256 152	250 146	247 147
	Austinatonobiol	Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877
	Antimicrobial (Resistance	Isolate										
Antimicrobial Class	Breakpoint)	Source										
Folate Pathway Inhibitors	Sulfamethoxazole/	Chicken Breasts			32.3%	38.4%	41.3%	48.1%	46.9%	42.1%	39.2%	40.6%
	Sulfisoxazole 1	Chicken Breasts			91	152	165	189	196	126	120	128
	(MIC ≥ 512 μg/ml)	Ground Turkey			48.0% 146	51.7% 172	48.4% 182	48.0% 190	48.5% 188	48.9% 154	51.0% 153	53.9% 165
					9.8%	10.3%	13.0%	7.0%	12.5%	9.4%	11.6%	7.7%
		Ground Beef			29	32	44	22	37	24	29	19
		Pork Chops			12.5%	15.1%	19.4%	14.1%	20.3%	11.8%	16.4%	14.3%
		·	57.9%	58.2%	23 46.1%	33 43.9%	45 53.2%	29 51.9%	37 48.6%	18 53.2%	24 52.7%	21 52.6%
		Chickens	165	1157	969	599	903	1159	660	804	520	461
	Trimethoprim-	Chicken Breasts			3.6%	7.1%	4.3%	7.4%	8.9%	5.0%	3.6%	2.2%
	Sulfamethoxazole	- Chicken Bredete			10	28 6.9%	17	29	37	15	11	7 5.9%
	(MIC ≥ 4 / 76 μg/ml)	Ground Turkey			4.0% 12	23	3.7% 14	5.1% 20	8.0% 31	7.9% 25	5.3% 16	18
		Ground Beef			0.7%	0.3%	0.6%	0.6%	1.4%	1.2%	2.0%	2.0%
		Glound Beel			2	1	2	2	4	3	5	5
		Pork Chops			1.1%	2.8%	3.9% 9	1.5% 3	2.2%	1.3%	6.2% 9	2.7%
			17.2%	12.6%	10.4%	6 10.5%	10.7%	10.4%	4 8.4%	7.9%	9.1%	7.0%
		Chickens	49	251	218	144	181	232	114	120	90	61
Penicillins	Ampicillin	Chicken Breasts			21.6%	25.3%	17.0%	24.7%	20.1%	18.1%	23.5%	22.2%
	(MIC ≥ 32 μg/ml)				61 31.3%	100 35.7%	68 33.2%	97 38.1%	84 42.0%	54 48.3%	72 58.0%	70 56.2%
		Ground Turkey			95	119	125	151	163	152	174	172
		Ground Beef			6.1%	5.1%	5.3%	3.5%	9.2%	6.6%	6.4%	4.9%
		Ground Beer			18	16	18	11	27	17	16 15.1%	12 11.6%
		Pork Chops			13.6% 25	13.3% 29	15.1% 35	16.1% 33	15.9% 29	15.8% 24	15.1%	11.6%
		Chickens	20.0%	19.5%	19.0%	18.6%	17.6%	22.0%	25.6%	18.7%	23.5%	19.8%
		Chickens	57	388	399	254	298	492	347	282	232	174
Phenicols	Chloramphenicol	Chicken Breasts			0.7%	0.0%	1.8%	0.5%	2.6%	2.0%	1.0% 3	0.6%
	(MIC ≥ 32 μg/ml)				0.3%	0 3.6%	7 0.8%	2 4.0%	11 2.3%	6 2.9%	3.7%	3.3%
		Ground Turkey			1	12	3	16	9	9	11	10
		Ground Beef			1.0%	2.3%	3.6%	1.6%	1.4%	3.9%	0.8%	2.4%
						_						
		Glound Beel			1.6%	7	12 4 3%	5 3.4%	6.6%	10 3.9%	2 3 4%	6
		Pork Chops			3 1.6% 3	7 4.1% 9	12 4.3% 10	3.4% 7	6.6% 12	3.9% 6	2 3.4% 5	
		Pork Chops	4.6%	2.4%	1.6% 3 1.8%	4.1% 9 1.3%	4.3% 10 1.0%	3.4% 7 1.0%	6.6% 12 1.9%	3.9% 6 2.3%	3.4% 5 1.0%	6 4.8% 7 1.1%
Ouinelana	Cigroflavagia		4.6%	2.4% 47	1.6% 3 1.8% 38	4.1% 9 1.3% 18	4.3% 10 1.0% 17	3.4% 7 1.0% 22	6.6% 12 1.9% 26	3.9% 6 2.3% 34	3.4% 5 1.0% 10	6 4.8% 7 1.1% 10
Quinolones	Ciprofloxacin (MIC ≥ 4 ua/ml)	Pork Chops			1.6% 3 1.8% 38 0.0%	4.1% 9 1.3% 18 0.0%	4.3% 10 1.0% 17 0.0%	3.4% 7 1.0% 22 0.0%	6.6% 12 1.9% 26 0.0%	3.9% 6 2.3% 34 0.0%	3.4% 5 1.0% 10 0.0%	6 4.8% 7 1.1%
Quinolones	Ciprofloxacin (MIC ≥ 4 μg/ml)	Pork Chops Chickens Chicken Breasts			1.6% 3 1.8% 38	4.1% 9 1.3% 18	4.3% 10 1.0% 17	3.4% 7 1.0% 22	6.6% 12 1.9% 26	3.9% 6 2.3% 34	3.4% 5 1.0% 10	6 4.8% 7 1.1% 10 0.3%
Quinolones		Pork Chops Chickens			1.6% 3 1.8% 38 0.0% 0 0.0%	4.1% 9 1.3% 18 0.0% 0 0.3% 1	4.3% 10 1.0% 17 0.0% 0 0.8% 3	3.4% 7 1.0% 22 0.0% 0 0.0%	6.6% 12 1.9% 26 0.0% 0 0.5% 2	3.9% 6 2.3% 34 0.0% 0 0.3%	3.4% 5 1.0% 10 0.0% 0 0.0% 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2
Quinolones		Pork Chops Chickens Chicken Breasts			1.6% 3 1.8% 38 0.0% 0 0.0% 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0%	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0%	6.6% 12 1.9% 26 0.0% 0 0.5% 2	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0%	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2
Quinolones		Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef			1.6% 3 1.8% 38 0.0% 0 0.0%	4.1% 9 1.3% 18 0.0% 0 0.3% 1	4.3% 10 1.0% 17 0.0% 0 0.8% 3	3.4% 7 1.0% 22 0.0% 0 0.0%	6.6% 12 1.9% 26 0.0% 0 0.5% 2	3.9% 6 2.3% 34 0.0% 0 0.3%	3.4% 5 1.0% 10 0.0% 0 0.0% 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2
Quinolones		Pork Chops Chickens Chicken Breasts Ground Turkey			1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0
Quinolones		Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.0%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.0% 0	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0%	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0%	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens	13	47	1.6% 3 1.8% 38 0.0% 0 0 0.0% 0 0.0% 0 0.0% 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.0% 1	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.0% 0 0.2% 3	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0
Quinolones		Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.0%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.0% 0	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0%	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0%	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 4.3%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 1 1 4.0%	4.3% 10 1.0% 17 0.0% 0 0 8 3 0.0% 0 0 0.0% 0 0.2% 3 7.0% 28	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0	3.9% 6 2.3% 34 0.0% 0 0 0.3% 1 0.0% 0 0.1% 1 1 3.0% 9 2.2%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0 0.5% 4 2.9% 9
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 4.3%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.0% 0 0.2% 3 7.0% 28	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 1.5.0% 21 5.2% 20	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.1% 1 3.0% 9 2.2% 7	3.4% 5 1.0% 0 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0 0.5% 4 2.9% 9 9
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 4.3%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 1 1 4.0%	4.3% 10 1.0% 17 0.0% 0 0 8 3 0.0% 0 0 0.2% 3 7.0% 28	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0 1.0% 0	3.9% 6 2.3% 34 0.0% 0 0 0.3% 1 0.0% 0 0.1% 1 1 3.0% 9 2.2%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0 0.5% 4 2.9% 9
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5%	4.3% 10 1.0% 17 0.0% 0 0 8 3 0.0% 0 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 4 1.5%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 2 0.0% 2 0.0% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0 0.0% 0 0 0.0% 0 0 0 0	3.9% 6 2.3% 34 0.0% 0 0 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.4% 1	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.5% 4 2.9% 9 2.6% 8 0.4% 1
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 4 1.5% 3	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 2 0.0% 0 0.0% 21 5.2% 20 0.7% 2 0.5% 1	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.0% 1 0.	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0 0.0% 0 0 2.9% 9 2.6% 8 0.4% 1 0.0%
Quinolones	(MIC ≥ 4 μg/mI)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef	0.0%	0.2%	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5%	4.3% 10 1.0% 17 0.0% 0 0 8 3 0.0% 0 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 4 1.5%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 2 0.0% 2 0.0% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0 0.0% 0 0 0.0% 0 0 0 0	3.9% 6 2.3% 34 0.0% 0 0 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.4% 1	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.5% 4 2.9% 9 2.6% 8 0.4% 1
Quinolones	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)  Tetracycline	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chickens Chickens	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5% 1 1.0%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5 0.0% 0	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.5% 3 7.5%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 21 5.2% 20 0.7% 2 1 5.5% 1	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 1 3.0% 9 2.2% 7 0.4% 1 0.0% 0	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.4% 1 0.0% 0	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0 0.0% 0 0 2.5% 4 2.9% 9 2.6% 8 8 0.4% 1 0.0% 0 0
	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 1 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5% 1 4.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5 0.0% 0 6.8% 115 48.0% 192	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 4.4% 8 6.6% 26 10.4% 4 1.5% 3 7.5% 168 46.6% 183	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 2 0.7% 21 5.2% 2 0.5% 1 5.4% 73 50.5% 211	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0% 0 4.2% 64 40.5%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.4% 1 0.0% 0 43.8% 134	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0 0.0% 0 0 2.9% 9 2.6% 8 0.4% 1 0.0% 0 3.2% 2.84 1.86 1.86 1.86 1.86 1.86 1.86 1.86 1.86
	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)  Tetracycline	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chickens Chickens	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 2.8% 8 4.3% 13 13 0.0% 0 0.5% 142 46.1% 130 77.0%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5% 1 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.2% 3 7.0% 28 10.6% 40 40 1.5% 5 0.0% 0 6.8% 115 48.0% 192 74.2%	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.5% 3 7.5% 188 46.6% 183 78.0%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 21 5.2% 20 0.7% 2 1 5.4% 73 50.5% 211 76.5%	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0% 0 4.2% 64 40.5%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.0% 0 6.0% 59 43.8%	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0 0.0% 0 0 2.5% 4 2.9% 9 2.6% 8 0 4 1 0.0% 0 4 2.9% 1 3.2% 2.9% 1 3.2% 2.9% 1 3.2% 1 4.0% 1 4.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5.0% 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1
	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)  Tetracycline	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chickens	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 2.8% 8 4.3% 13 0.0% 0 0.5% 1 6.8% 142 46.1% 130 77.0% 234	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5% 1 6.2% 84 42.9% 17.8% 259	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5 0.0% 0 6.8% 115 48.0% 192 74.2% 279	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 3 7.5% 168 46.6% 183 78.0% 309	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 15.2% 20 0.7% 2 15.2% 20 0.5% 1 5.4% 73 50.5% 211 76.5% 297	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0% 0 4.2% 64 40.5% 121 80.0%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.4% 1 0.0% 0 6.0% 59 43.8% 134 85.7%	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.5% 4 2.9% 9 2.6% 8 0.4% 1 0.0% 0 3.2% 28 41.6% 131.82.0% 251
	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)  Tetracycline	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chicken Breasts Chicken Breasts Chickens Chickens	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 1 0.0% 0 0.0% 1 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5% 1 6.2% 84 42.9% 170 77.8% 259 25.1%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5 0.0% 0 40 1.5% 5 28 1.5% 5 2.6% 40 1.5% 5 2.6% 40 1.7% 40 1.7% 40 1.7% 40 1.7% 40 1.7% 40 1.7% 40 40 40 40 40 40 40 40 40 40	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 4 1.5% 3 7.5% 168 46.6% 309 16.5% 309	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 2 1 5.2% 2 0.7% 2 1 5.4% 73 50.5% 211 76.5% 297 25.4% 75	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0% 0 4.2% 64 40.5% 121 80.0% 252 21.9%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 6 2.9% 9 3.7% 11 0.4% 1 0.0% 0 43.8% 134 85.7% 257 24.0% 60 60	6 4.8% 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0 0.5% 4 2.9% 9 2.6% 8 0.4% 1 0.0% 0 3.2% 28 41.6% 131 82.0% 251 18.6% 62
	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)  Tetracycline	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chickens	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 2.8% 8 4.3% 13 0.0% 0 0 0.5% 1 6.8% 142 46.1% 130 77.0% 234 30.9% 91 52.7%	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.09% 0 0.09% 0 0.19% 1 4.09% 16 11.7% 3 0.5% 1 6.2% 84 42.9% 170 77.8% 259 25.1% 78 46.3%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5 0.0% 0 6.8% 115 48.0% 192 74.2% 279 22.8% 77 56.0%	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 4 1.5% 37.5% 188 46.6% 183 78.0% 309 16.5% 52 45.9%	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 21 5.2% 20 0.7% 2 1 5.4% 73 50.5% 297 25.4% 75 52.7%	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0% 64 40.5% 121 80.0% 252 21.9% 56	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.6% 6 2.9% 9 3.7% 11 0.4% 1 0.0% 0 6.0% 59 43.8% 257 24.0% 60 54.8%	6 4.8% 7 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0 0.5% 4 2.9% 9 2.6% 8 0.4% 1 0.0% 0 3.2% 28 41.6% 131 82.0% 251 18.6% 62 46.9%
	(MIC ≥ 4 μg/ml)  Nalidixic Acid (MIC ≥ 32 μg/ml)  Tetracycline	Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey Ground Beef Pork Chops Chicken Breasts Ground Turkey Ground Beef Pork Chops Chickens Chicken Breasts Ground Turkey	0.0%	0.2% 3	1.6% 3 1.8% 38 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 1 0.0% 0 0.0% 1 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0 0 0 0 0 0 0 0 0 0 0 0	4.1% 9 1.3% 18 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 4.0% 16 11.7% 39 1.0% 3 0.5% 1 4.2% 84 42.9% 170 77.8% 259 25.1%	4.3% 10 1.0% 17 0.0% 0 0.8% 3 0.0% 0 0.2% 3 7.0% 28 10.6% 40 1.5% 5 0.0% 0 40 1.5% 5 28 1.5% 5 2.6% 40 1.5% 5 2.6% 40 1.7% 40 1.7% 40 1.7% 40 1.7% 40 1.7% 40 1.7% 40 40 40 40 40 40 40 40 40 40	3.4% 7 1.0% 22 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.4% 8 6.6% 26 10.4% 41 1.3% 4 1.5% 3 7.5% 168 46.6% 309 16.5% 309	6.6% 12 1.9% 26 0.0% 0 0.5% 2 0.0% 0 0.0% 0 0.0% 0 0.0% 2 1 5.2% 2 0.7% 2 1 5.4% 73 50.5% 211 76.5% 297 25.4% 75	3.9% 6 2.3% 34 0.0% 0 0.3% 1 0.0% 0 0.0% 0 0.1% 1 3.0% 9 2.2% 7 0.4% 1 0.0% 0 4.2% 64 40.5% 121 80.0% 252 21.9%	3.4% 5 1.0% 10 0.0% 0 0.0% 0 0.0% 0 0.0% 0 0.0% 6 2.9% 9 3.7% 11 0.4% 1 0.0% 0 43.8% 134 85.7% 257 24.0% 60 60	6 4.8% 7 7 1.1% 10 0.3% 1 0.7% 2 0.0% 0 0.0% 0 0.5% 4 2.9% 9 2.6% 8 0.4% 1 0.0% 0 3.2% 28 41.6% 131 82.0% 251 18.6% 62

<sup>&</sup>lt;sup>1</sup> Sulfamethoxazole was tested from 1996 through 2003 and was replaced by sulfisoxazole in 2004

# **Multidrug Resistance**

Table 61a. Resistance Patterns among E. coli Isolates from Retail Meats and Chickens, by Year, 2000-2009

Table 61a. Resistance Pat		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Isolates Tested	Chicken Breasts	1 2000	2001	282	396	400	393	418	299	306	315
Number of isolates rested	Ground Turkey			304	333	376	396	388	315	300	306
	Ground Beef			295	311	338	316	295	256	250	247
	Pork Chops			184	218	232	205	182	152	146	147
	·										
	Chickens	285	1989	2100	1365	1697	2232	1357	1510	986	877
Resistance Pattern	Isolate Source										
1. No Resistance Detected	Chicken Breasts			27.0%	20.5%	20.8% 83	20.6% 81	23.7% 99	29.1%	33.3% 102	34.3% 108
1. NO Resistance Detected				76 16.8%	81 14.7%	19.1%	16.2%	16.0%	87 13.0%	8.3%	11.8%
	Ground Turkey			51	49	72	64	62	41	25	36
	Ground Beef			63.1%	66.9%	73.1%	80.4%	71.5%	77.0%	73.2%	78.1%
				186	208	247	254	211	197	183	193
	Pork Chops			41.3% 76	44.5% 97	37.9% 88	48.8% 100	42.9% 78	48.0% 73	43.8% 64	51.0% 75
		10.2%	12.9%	15.9%	16.0%	17.0%	17.7%	18.6%	24.3%	20.9%	21.9%
	Chickens	29	257	333	219	288	395	252	367	206	192
	01:1 5 1			36.2%	42.2%	35.3%	45.0%	43.3%	33.8%	36.6%	37.5%
2. Resistant to ≥ 3	Chicken Breasts			102	167	141	177	181	101	112	118
Antimicrobial Classes	Ground Turkey			55.6%	55.6%	51.9%	52.6%	55.2%	57.5%	63.7%	66.3%
	Glound Turkey			169	185	195	209	214	181	191	203
	Ground Beef			10.2%	7.4%	10.4%	5.4%	11.5%	9.0%	11.2%	6.9%
	5.64.14 266.			30	23	35	17	34	23	28	17
	Pork Chops			17.4%	17.9%	21.1%	16.1%	15.9%	15.1%	17.8%	15.0%
	· ·	FF 40/	50.00/	32	39	49	33	29	23	26	22
	Chickens	55.1%	50.3% 1000	43.9% 921	39.2%	43.0% 729	41.5% 926	43.7% 593	36.7%	44.1%	41.4%
		157	1000	13.8%	535 13.6%	12.5%	12.2%	14.6%	554 10.4%	435 13.7%	363 13.7%
3. Resistant to ≥ 4	Chicken Breasts			39	54	50	48	61	31	42	43
Antimicrobial Classes				23.0%	30.0%	24.5%	24.2%	25.8%	27.0%	32.3%	38.9%
Antimioropiai Glacoco	Ground Turkey			70	100	92	96	100	85	97	119
	0 15 (			1.7%	4.2%	4.7%	1.9%	5.8%	4.7%	4.4%	3.6%
	Ground Beef			5	13	16	6	17	12	11	9
	Pork Chops			5.4%	6.9%	7.8%	4.9%	7.7%	3.3%	7.5%	10.9%
	1 OIK CHOPS			10	15	18	10	14	5	11	16
	Chickens	19.3%	16.1%	14.3%	13.8%	11.8%	14.9%	17.5%	13.6%	16.6%	14.5%
		55	320	300	188	200	333	137	206	164	127
	Chicken Breasts			6.0%	7.3%	6.0%	5.9%	7.4%	5.7%	7.8%	6.4%
4. Resistant to ≥ 5				17	29	24	23	31	17	24	20
Antimicrobial Classes	Ground Turkey			9.2% 28	14.7% 49	6.9% 26	6.3% 25	5.7% 22	4.1% 13	6.3% 19	7.8% 24
				0.3%	2.6%	2.7%	1.0%	2.4%	0.4%	2.0%	1.2%
	Ground Beef			1	8	9	3	7	1	5	3
	Pork Chops			3.3%	2.8%	2.2%	1.5%	3.3%	1.3%	4.1%	5.4%
	i ork chops			6	6	5	3	6	2	6	8
	Chickens	8.1%	8.1%	7.4%	7.2%	5.8%	7.6%	8.9%	7.1%	9.0%	7.5%
	·	23	162	155	98	98	170	121	107	89	66
	Chicken Breasts			0.4%	0.0%	1.3%	0.3%	1.4%	2.0%	1.0%	0.6%
5. At Least ACSSuT <sup>1</sup> Resistant				1	0	5	1	6	6	3	2
	Ground Turkey			0.0%	2.7%	0.5%	1.8%	0.8%	1.9%	2.0%	2.3%
				0.3%	9 1.0%	2 1.5%	7 0.6%	0.3%	6 0.4%	6 0.0%	7 0.0%
	Ground Beef			1	3	1.5%	2	1	1	0.0%	0.0%
	Pork Chops			0.5%	1.4%	1.3%	1.0%	1.1%	0.7%	1.4%	2.0%
	i ork chops			1	3	3	2	2	1	2	3
	Chickens	3.5%	2.0%	1.3%	1.0%	0.8%	0.6%	1.3%	1.7%	0.5%	0.2%
	3	10	40	27	14	14	14	18	26	5	2

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

Table 61b. Resistance Patterns among E. coli Isolates from Retail Meats and Chickens, by Year, 2000-2009

Number of Isolates Tested	Table 61b. Resistance P	atterns among L										
Ground Turkey Ground Beef Pork Chops	Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Ground Beef   Pork Chops   295   311   338   316   295   256   250   2   2   2   2   2   2   2   2   2	Number of Isolates Tested				_							315
Pork Chops												306
Chickens   285   1989   2100   1365   1697   2232   1357   1510   986   8		Ground Beef			295	311	338	316	295	256	250	247
Chicken Breasts   Chicken Br		Pork Chops			184	218	232	205	182	152	146	147
Chicken Breasts   Chicken Br												
Chicken Breasts  Chickens  Chickens  Chickens  Chickens  Chicken Breasts  Chicken Breasts  Chickens		285	1989	2100	1365	1697	2232	1357	1510	986	877	
Chicken Breasts   0   0   1   0   0   1   0   0   1   0   0	Resistance Pattern	Isolate Source										
Chicken Breasts   Chicken Breasts   Chicken Breasts   Chickens		Chicken Broads			0.0%	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%
Ground Furkey	6. At Least ACT/S 1 Resistant	Chicken bleasis			0	0	1	0	0	1	0	0
Chickens		Cround Turkey			0.0%	0.9%	0.0%	0.8%	0.3%	0.3%	0.0%	0.3%
Pork Chops		Ground Turkey			0	3	0	3	1	1	0	1
Pork Chops Pork Chops Chickens Pork Chops Chickens Pork Chops Pork Chops Chickens Pork Chops Pork Chops Chickens Pork Chops Chickens Pork Chops Pork Cho		One and Dearf			0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%
Pork Chops		Ground Beef			0	0	0	1	1	0	0	0
Chickens 1.4% 0.6% 0.3% 0.2% 0.3% 0.3% 0.2% 0.3% 0.3% 0.3% 0.2% 0.3% 0.3% 0.3% 0.2% 0.3% 0.3% 0.2% 0.3% 0.3% 0.2% 0.3% 0.3% 0.2% 0.3% 0.3% 0.2% 0.3% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.2% 0.3% 0.0% 0.3% 0.0% 0.3% 0.0% 0.3% 0.0% 0.3% 0.0% 0.0		Davida Obrasia			0.5%	0.0%	0.4%	0.5%	0.0%	0.0%	0.0%	0.7%
Chicken Breasts   4		Pork Chops			1	0	1	1	0	0	0	1
7. At Least ACSSuTAuCx 2 Resistant  Chicken Breasts  A 11 7 3 5 7 3 4 3 3 5 7 3 4 3 3 7 7 8 3 4 3 3 7 7 8 3 7 7 8 7 8 7 8 7 8 7 8 7 8 7		Chielena	1.4%	0.6%	0.3%	0.2%	0.3%	0.3%	0.2%	0.3%	0.3%	0.2%
7. At Least ACSSuTAuCx 2 Resistant  Ground Turkey  Ground Beef  O.0%  O.		Chickens	4	11	7	3	5	7	3	4	3	2
Table   Tabl		01:1 0 1			0.4%	0.0%	1.0%	0.3%	1.0%	0.7%	0.7%	0.6%
Ground Furkey  O 1 0 1 0 4 4  Ground Beef  O 0,0% O,0% O,9% O,3% O,0% O,0% O,0% O,0% O,0% O,0% O,0% O,0	7. At Least ACSSuTAuCx 2	Chicken Breasts			1	0	4	1	4	2	2	2
Ground Beef 0.0% 0.0% 0.9% 0.3% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0	Resistant	One of Total and			0.0%	0.3%	0.0%	0.3%	0.0%	1.3%	1.3%	1.0%
Pork Chops  2.8% 1.1% 0.8% 0.8% 0.6% 0.5% 1.0% 0.9% 0.9% 0.4% 0.  Chickens 2.8% 1.1% 0.8% 0.8% 0.6% 0.5% 1.0% 0.9% 0.4% 0.  Chicken Breasts 0.7% 0.5% 1.5% 0.3% 0.2% 0.0% 1.0% 1.		Ground Turkey			0	1	0	1	0	4	4	3
Pork Chops    Description   De		Cround Doof			0.0%	0.0%	0.9%	0.3%	0.0%	0.0%	0.0%	0.0%
Pork Chops  0 1 1 0 0 1 1  Chickens 2.8% 1.1% 0.8% 0.8% 0.6% 0.5% 1.0% 0.9% 0.4% 0.8% 0.6% 0.5% 1.0% 0.9% 0.4% 0.1% 0.1% 0.5% 0.5% 0.5% 0.5% 0.5% 0.0% 0.5% 0.4% 0.5% 0.5% 0.5% 0.5% 0.5% 0.5% 0.5% 0.5		Ground Beer			0	0	3	1	0	0	0	0
Chicken Breasts    0		Davida Obrasia			0.0%	0.5%	0.4%	0.0%	0.0%	0.7%	0.7%	2.0%
Chicken Breasts 8 22 17 11 10 11 13 14 4 Chicken Breasts 0.7% 0.5% 1.5% 0.3% 0.2% 0.0% 1.0% 1.		Pork Chops			0	1	1	0	0	1	1	3
8 22 17 11 10 11 13 14 4  Chicken Breasts 0.7% 0.5% 1.5% 0.3% 0.2% 0.0% 1.0% 1.		Chielena	2.8%	1.1%	0.8%	0.8%	0.6%	0.5%	1.0%	0.9%	0.4%	0.2%
Chicken Breasts		Chickens	8	22	17	11	10	11	13	14	4	2
8. At Least Ceftriaxone and Chicken Breasts 2 2 6 1 1 0 3		Objeten Breeste			0.7%	0.5%	1.5%	0.3%	0.2%	0.0%	1.0%	1.0%
	8. At Least Ceftriaxone and	Chicken Breasts			2	2	6	1	1	0	3	3
Nalidixic Acid Resistant 0.3%   0.3%   0.3%   0.3%   0.0%   0.6%   0.0%   0.	Nalidixic Acid Resistant	0 17 1			0.3%	0.3%	0.3%	0.3%	0.0%	0.6%	0.0%	0.0%
Ground Turkey 1 1 1 1 0 2 0		Ground Turkey			1	1	1	1	0	2	0	0
0.0% 0.0% 0.3% 0.3% 0.3% 0.0% 0.0% 0.		Outsid Doof			0.0%	0.0%	0.3%	0.3%	0.3%	0.0%	0.0%	0.4%
Ground Beet		Ground Beet			0			1			0	1
0.5% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0%		D 1 01			0.5%		0.0%	0.0%	0.0%	0.0%		0.0%
Pork Chops		Pork Chops										0
14% 0.3% 0.4% 0.0% 0.4% 0.7% 0.4% 0.6% 0.4% 0		Ohistore	1.4%	0.3%	0.4%		0.4%			0.6%	0.4%	0.6%
Chickens		Chickens										5

 $<sup>^{\</sup>rm 1}$  ACT/S = ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole

 $<sup>^2\,\</sup>mbox{ACSSuTAuCx}$  = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

# Appendix A

Table A1. Concentration Ranges Used for Susceptibility Testing of *Salmonella* and *E. coli*, 2009

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)
Aminoglycosides	Amikacin	0.5 - 64
	Gentamicin	0.25 - 16
	Kanamycin	8 - 64
	Streptomycin	32 - 64
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	1 / 0.5 - 32 / 16
Cephems	Cefoxitin	0.5 - 32
	Ceftiofur	0.12 - 8
	Ceftriaxone	0.25 - 64
Folate Pathway Inhibitors	Sulfisoxazole	16 - 256
	Trimethoprim-Sulfamethoxazole	0.12 / 2.4 - 4 / 76
Penicillins	Ampicillin	1 - 32
Phenicols	Chloramphenicol	2 - 32
Quinolones	Ciprofloxacin	0.015 - 4
	Nalidixic acid	0.5 - 32
Tetracyclines	Tetracycline	4 - 32

Table A2. Concentration Ranges Used for Susceptibility Testing of Campylobacter, 2009

Antimicrobial Class	Antimicrobial Agent	Concentration Range (μg/ml)
Aminoglycosides	Gentamicin	0.12 - 32
Ketolides	Telithromycin	0.015 - 8
Lincosamides	Clindamycin	0.03 - 16
Macrolides	Azithromycin	0.015 - 64
	Erythromycin	0.03 - 64
Phenicols	Florfenicol	0.03 - 64
Quinolones	Ciprofloxacin	0.015 - 64
	Nalidixic acid	4 - 64
Tetracyclines	Tetracycline	0.06 - 64

# Appendix B

Table B1. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for Salmonella and E. coli Isolates, 1996-2009 1,2

	Method		<u> </u>	-				Broth Mic		-					
	Sensititre® Plate Name	CMV1CCDC <sup>3</sup> CMV3CNCD	CMV3	SCNCD	CMV4CNCD	CMV5CNCD	CMV6CNCD	CMV7	CNCD			CMV1	AGNF		
	Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Antimicrobial Class	Antimicrobial Agent														
Aminocyclitols	Apramycin	V	<b>V</b>	√	√	√	√								
Aminoglycosides	Amikacin	<b>√</b>	V	√	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	√	√	<b>V</b>	<b>V</b>	<b>√</b>	<b>√</b>
	Gentamicin	$\checkmark$	$\checkmark$	√	√	√	<b>V</b>	√	√	√	√	√	√	√	<b>V</b>
	Kanamycin	$\checkmark$	<b>V</b>	√	√	√	<b>V</b>	√	√	√	√	√	√	√	<b>V</b>
	Streptomycin	$\checkmark$	<b>V</b>	√	√	√	<b>V</b>	√	√	√	√	√	√	√	<b>V</b>
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Cephems	Cefoxitin					√	√	√	√	√	√	√	√	√	√
	Ceftiofur	<b>V</b>	√	√	√	√	√	√	√	√	<b>√</b>	√	√	√	√
	Ceftriaxone	<b>V</b>	√	√	√	√	<b>V</b>	√	√	√	√	√	√	√	√
	Cephalothin	<b>√</b>	√	√	√	√	<b>V</b>	√	√						
Coumarins	Novobiocin	√ 													
Folate Pathway Inhibitors	Sulfamethoxazole	<b>√</b>	$\sqrt{}$	√	√	√	<b>V</b>	<b>V</b>	√						
	Sulfisoxazole									√	√	√	√	√	√
	Trimethoprim-Sulfamethoxazole	<b>√</b>	<b>V</b>	√	√	√	√	√	√	√	√	√	√	√	√
Penems	Imipenem						√								
Penicillins	Ampicillin	$\checkmark$	<b>V</b>	√	√	√	<b>V</b>	√	√	√	√	√	√	√	<b>V</b>
	Ticarcillin	√	$\checkmark$	<b>√</b>											
Phenicols	Chloramphenicol	√	<b>V</b>	√	√	√	<b>V</b>	<b>V</b>	√	√	√	<b>V</b>	√	√	√
	Florfenicol				√										
Quinolones	Ciprofloxacin	√	<b>V</b>	√	√	√	<b>√</b>	<b>√</b>	√	√	√	√	√	<b>V</b>	√
	Nalidixic acid	<b>√</b>	√	1	<b>V</b>	√	<b>√</b>	√	√	<b>V</b>	√	<b>V</b>	√	1	<b>V</b>
Tetracyclines	Tetracycline	√	<b>V</b>	√	√	√	√	<b>√</b>	<b>√</b>	√	<b>√</b>	√	√	√	<b>V</b>

<sup>&</sup>lt;sup>1</sup> Testing of Salmonella isolates from humans, food animals, and retail meats began in 1996, 1997, and 2002, respectively

<sup>&</sup>lt;sup>2</sup> Testing of *E. coli* isolates from chickens and retail meats began in 2000 and 2002, respectively. Testing of *E. coli* O157 isolates from humans began in 1996. A study of *E. coli* isolates from humans in the community began in 2004

<sup>&</sup>lt;sup>3</sup> In 1996, most isolates were tested using Sensititre<sup>®</sup> plate CMV1CCDC, but a few isolates were tested using Sensititre<sup>®</sup> plate CMV3CNCD

Table B2. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for Campylobacter Isolates from Humans and Chickens, 1997-2009 <sup>1</sup>

	Method				E-	Γest <sup>®</sup>						oth Microdilution		
	Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Antimicrobial Class	Antimicrobial Agent													
Aminoglycosides	Gentamicin		√	√	√	√	√	√	√	√	√	√	√	√
Ketolides	Telithromycin									√	√	√	√	√
Lincosamides	Clindamycin	<b>V</b>	√	√	√	√	√	√	√	√	√	√	√	√
Macrolides	Azithromycin		√	√	√	√	√	√	√	<b>√</b>	√	√	√	√
	Erythromycin	<b>√</b>	√	√	√	√	√	√	√	<b>√</b>	√	√	√	√
Penems	Meropenem													
Phenicols	Chloramphenicol	<b>V</b>	√	√	√	√	√	√	√					
	Florfenicol									<b>√</b>	√	√	√	√
Quinolones	Ciprofloxacin	<b>√</b>	√	√	√	√	√	√	√	<b>√</b>	√	√	√	√
	Nalidixic acid	<b>V</b>	√	√	√	√	√	√	√	<b>√</b>	√	√	√	√
Tetracyclines	Doxycycline													
	Tetracycline	<b>V</b>	<b>V</b>	√	√	√	√	<b>V</b>	√	<b>√</b>	√	<b>V</b>	√	<b>V</b>

<sup>&</sup>lt;sup>1</sup>Testing of *Campylobacter* isolates from humans and chickens began in 1997 and 1998, respectively. For chickens, this report contains data on isolates recovered during the period of July 2001 through December 2007, when the new isolation method was used by USDA's Agricultural Research Service

Table B3. Antimicrobial Agents and Antimicrobial Susceptibility Testing Methods for Campylobacter Isolates from Retail Meats, 2002-2009

	Method				Agar E	Dilution	Broth Microdilution Sensititre® Plate: CAMPY					
	Year				2002	2003	2004	2005	2006	2007	2008	2009
Antimicrobial Class	Antimicrobial Agent											
Aminoglycosides	Gentamicin				√	√	√	√	√	√	√	√
Ketolides	Telithromycin						√	√	√	√	√	√
Lincosamides	Clindamycin						√	√	√	√	√	√
Macrolides	Azithromycin						√	√	√	√	<b>V</b>	√
	Erythromycin				√	√	√	√	√	√	<b>√</b>	√
Penems	Meropenem				<b>V</b>	√						
Phenicols	Chloramphenicol											
	Florfenicol						√	√	√	√	<b>V</b>	√
Quinolones	Ciprofloxacin				√	√	√	√	√	√	<b>V</b>	√
	Nalidixic acid						√	√	√	√	<b>V</b>	√
Tetracyclines	Doxycycline				<b>V</b>	√						
	Tetracycline						<b>V</b>	√	√	√	<b>V</b>	√