2012 Retail Meat Report

National Antimicrobial Resistance Monitoring System

NARMS

TABLE OF CONTENTS

Abbreviations..... 4-5
Acknowledgements..... 6
Introduction & Highlights..... 7-11
Surveillance and Laboratory Testing Methods..... 12-14
Interpretive Criteria..... 15-16

PREVALENCE DATA

Percent Positive Samples
Site and Bacterium, 2002-2012..... 17-20
Bacterium and Meat Type, 2002-2012..... 21
Salmonella & *Campylobacter* by Meat Type, 2002-2012..... 22

***SALMONELLA* DATA**

Salmonella by Serotype and Meat Type, 2012..... 23

Trends in Resistance
Salmonella by Meat Type, 2002-2012..... 24-26
Distribution of Resistant *Salmonella b*y Top Serotypes, 2012..... 27

Resistance to Multiple Antimicrobial Agents
Multidrug Resistance Patterns, 2002-2012..... 28
Resistance to Multiple Classes by Meat Type, 2002-2012..... 29

MIC Distributions
Retail Chicken, 2002-2012..... 30-31
Ground Turkey, 2002-2012..... 32-33
Ground Beef, 2002-2012..... 34-35
Pork Chop, 2002-2012..... 36-37

Other Beta Lactam Resistance..... 38

***CAMPYLOBACTER* DATA**

Campylobacter Species by Meat Type, 2002-2012..... 39
Campylobacter jejuni and *C. coli* Isolated by Month from Retail Chicken, 2002-2012..... 40

Trends in Resistance
Campylobacter Species by Meat Type, 2002-2012..... 41
Campylobacter jejuni and *C. coli* from Chicken Breast, 2002-2012..... 42-43

Resistance to Multiple Antimicrobial Agents
Campylobacter jejuni and *C. coli* Resistant to Multiple Classes by Meat Type, 2002-2012..... 44

MIC Distributions in Retail Chicken
Campylobacter jejuni, 2002-2012..... 45
Campylobacter coli, 2002-2012..... 46

ENTEROCOCCUS DATA

Enterococcus Species by Meat Type, 2002-2012..... 47

Trends in Resistance

Enterococcus by Meat Type, 2002-2012..... 48-50
Enterococcus faecalis by Meat Type, 2002-2012..... 51
Enterococcus faecium by Meat Type, 2002-2012..... 52
Enterococcus hirae by Meat Type, 2002-2012..... 53

Resistance to Multiple Antimicrobial Agents

Enterococcus faecalis Resistant to Multiple Classes by Meat Type, 2002-2012..... 54
Enterococcus faecium Resistant to Multiple Classes by Meat Type, 2002-2012..... 55

MIC Distributions by Species

Retail Chicken, 2012..... 56
Ground Turkey, 2012..... 57
Ground Beef, 2012..... 58
Pork Chop, 2012..... 59

ESCHERICHIA COLI DATA

Escherichia coli Prevalence by Meat Type, 2002-2012..... 60

Trends in Resistance

Escherichia coli by Meat Type, 2002-2012..... 61-63

Resistance to Multiple Antimicrobial Agents

Multidrug Resistance Patterns, 2002-2012..... 64
Resistance to Multiple Classes by Meat Type, 2002-2012..... 65

MIC Distributions

Retail Chicken, 2012..... 66-67
Ground Turkey, 2012..... 68-69
Ground Beef, 2012..... 70-71
Pork Chop, 2012..... 72-73

Other Beta Lactam Resistance..... 74

APPENDICES

PFGE Profiles For *Salmonella* Isolates..... 75-84
Log Sheet Example..... 85
Trend Analysis Description..... 86
Epidemiological Cut-off Values Description..... 87-88

List of Abbreviations and Acronyms

ACSSuT	Resistance to ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, and tetracycline
ACT/S	Resistance to at least ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole
ACSSuTAuCx	Resistance to ampicillin, chloramphenicol, streptomycin, sulfamethoxazole/sulfisoxazole, tetracycline, amoxicillin-clavulanic acid, and ceftriaxone
AMC	Amoxicillin/clavulanic Acid
AMP	Ampicillin
AXO	Ceftriaxone
AZI	Azithromycin
BAP	Blood Agar Plate
CA	California
CCA	Campy Cefex Agar
CDC	Centers for Disease Control and Prevention
CI	Confidence interval
CIP	Ciprofloxacin
CHL	Chloramphenicol
CLI	Clindamycin
CLSI	Clinical and Laboratory Standards Institute
CO	Colorado
COT	Trimethoprim/sulfamethoxazole
CT	Connecticut
CVM	Center for Veterinary Medicine
DAP	Daptomycin
EAP	Enterococcosel Agar Plate
ECOFF	Epidemiological cut-off values
EMB	Eosin Methylene Blue
ERY	Erythromycin
ESBL	Extended-spectrum beta-lactamase
FDA	U.S. Food and Drug Administration
FDA/CVM	U.S. Food and Drug Administration/Center for Veterinary Medicine
FFN	Florfenicol
FIS	Sulfisoxazole
FOX	Cefoxitin
GA	Georgia
GEN	Gentamicin
KAN	Kanamycin
LIN	Lincomycin
LZD	Linezolid
MD	Maryland
MIC	Minimum Inhibitory Concentration
MN	Minnesota
NAL	Nalidixic acid
NARMS	National Antimicrobial Resistance Monitoring System
NM	New Mexico
NY	New York
NIT	Nitrofurantoin

OR	Oregon
PA	Pennsylvania
PCR	Polymerase chain reaction
PEN	Penicillin
PFGE	Pulse-field gel electrophoresis
QDA	Quinupristin/dalfopristin
RVR10	Rappaport-Vassiliadis Medium
SDD	Susceptible-dose dependent
STR	Streptomycin
TEL	Telithromycin
TET	Tetracycline
TGC	Tigecycline
TIO	Ceftiofur
TN	Tennessee
TYL	Tylosin
VAN	Vancomycin
XLD	Xylose Lysine Deoxycholate

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Special thanks to Denise Benton, Mary Bartholomew, and Junshan Qiu for providing outstanding web support and statistical consultation.

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INTRODUCTION

The primary purpose of the National Antimicrobial Resistance Monitoring System (NARMS) retail meat surveillance program at the U.S. Food and Drug Administration's Center for Veterinary Medicine (FDA/CVM) is to monitor the prevalence and trends of antimicrobial resistance among foodborne isolates of *Salmonella, Campylobacter, Enterococcus* and *Escherichia coli.*

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

1) Assist the FDA in making decisions related to the approval of safe and effective antimicrobial drugs for animals;
2) Monitor trends in antimicrobial resistance among foodborne bacteria from humans, retail meats, and animals;
3) Disseminate timely information on antimicrobial resistance to promote interventions that reduce resistance among foodborne bacteria;
4) Conduct research to better understand the emergence, persistence, and spread of antimicrobial resistance.

NARMS retail meat surveillance is a collaborative project between the FDA/CVM, the Centers for Disease Control and Prevention (CDC), and state and local public health departments in California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, Pennsylvania, and Tennessee. Each site purchases approximately 40 food samples per month, comprising of 10 samples each of chicken, ground turkey, ground beef, and pork chops. All sites culture the meat and poultry samples for *Salmonella* while only poultry samples are cultured for *Campylobacter*. In 2012, 4 of the 11 participating laboratories (Georgia, Oregon, Maryland and Tennessee) also cultured meat and poultry samples for *E. coli* and *Enterococcus*. Bacterial isolates are sent to FDA/CVM for serotyping, antimicrobial susceptibility testing, and genetic analysis.

This annual report includes FDA/CVM's surveillance data for 2012 for *Salmonella*, *Campylobacter*, *Enterococcus*, and *Escherichia coli*. Surveillance data include the number of isolates of each pathogen tested by NARMS and the number and percentage of isolates that were resistant to each of the antimicrobial agents tested. Data from earlier years are presented in tables and graphs where appropriate. Additional NARMS data and more information about NARMS activities are available at www.fda.gov/narms .

WHAT'S NEW IN THE NARMS RETAIL MEAT REPORT

Unlike the other bacteria tested in NARMS, there are no formal clinical breakpoints established for *Campylobacter*. Beginning in this 2012 report, NARMS will use a different approach to interpret susceptible (S) and resistant (R) categories for *Campylobacter*, based on epidemiological cut-off values (ECOFFs). ECOFFs are used to distinguish isolates with any acquired resistance trait (non-wild type) from those without any acquired traits (wild type). For the purposes of this report, non-wild-type *Campylobacter* isolates will be termed resistant. It is important to emphasize that ECOFFs are distinct from clinical breakpoints where resistance is defined using pharmacological parameters and data from clinical trial outcomes. This change to *Campylobacter* reporting facilitates detection of emerging resistance and is a step toward globally harmonized methods for *Campylobacter* surveillance. ECOFF interpretations were applied to all *Campylobacter* analyses in this report and a more detailed description of how they differ from clinical breakpoints can be found in Appendix 4.

In the 2014 M100-S24 document, the Clinical Laboratory and Standards Institute (CLSI) revised cefepime breakpoints, an antimicrobial that is used for screening for the presence of extended-spectrum beta-lactamase (ESBL) production. The cefepime resistance breakpoint lowered from ≥ 32 µg/mL to ≥ 16 µg/mL. CLSI revised cefepime breakpoints to better correlate with dosages used by clinicians and to optimize its activity against multidrug resistant Gram-negative bacteria. Also included in the cefepime revision was the introduction of the susceptible-dose dependent (SDD)[1] category. When reporting cefepime results, CLSI recommends using SDD instead of "intermediate" because there are multiple approved dosing options for cefepime and SDD highlights the option of using higher doses to treat infections caused by isolates when the cefepime minimum inhibitory concentration is 4 or 8 µg/mL. The revised cefepime breakpoints and SDD categories were applied to Table 13 and Table 30 of this report.

In the 2011 NARMS retail meat report, revised ciprofloxacin breakpoints from the 2012 CLSI M100-S22 document were applied to only *Salmonella* analyses. Beginning with this report, the revised ciprofloxacin breakpoints will also be applied to all *Escherichia coli* analyses. Since *E. coli* is used in part to detect emerging trends in *Salmonella* resistance, the application of the revised ciprofloxacin breakpoints to *E. coli* will ensure results are comparable.

[1] Additional information on the definition and use of susceptible-dose dependent (SDD) category can be found at the following location http://community.clsi.org/micro/wp-content/uploads/sites/15/2013/07/Cefepime-BP-Change-for-Enterobacteriaceae_-Intro-of-SDD-For-Labs.pdf

Highlights of the 2012 NARMS Retail Meat Report

Salmonella[1]

In *Salmonella*, antibiotic resistance varies by serotype. Overall changes in resistance among *Salmonella* isolated from each food source may reflect changes in resistance within serotypes, changes in serotype distribution, or both. Please note, the retail meat report does not describe antibiotic resistance trends by serotype.

- Prevalence – In 2012, a total of 345 *Salmonella* isolates were tested. *Salmonella* was isolated from 18% of retail chicken, 7% of ground turkey, 1% of ground beef, and 1% of pork chop samples (Figure 1).
- *Salmonella* serotypes Typhimurium and Kentucky accounted for 49% of retail meat isolates (Table 7).
- This is the first year that *Salmonella* serotype IIIa 18:z4,z23:- became the top serotype in ground turkey (Table 7).
- *S.* Heidelberg prevalence among all retail meat continued to decrease, comprising only 7% of *Salmonella* isolates in 2012 (Table 7).
- Quinolones – In 2012, all *Salmonella* isolates were susceptible to nalidixic acid and ciprofloxacin (Table 8).
- Cephalosporins – Between 2002 and 2012, third-generation cephalosporin resistance in retail chicken rose from 10% to 28% and in ground turkey rose from 8% to 18% ($p < 0.05$, Table 8).
- Ampicillin – Between 2002 and 2012, ampicillin resistance in retail chicken rose significantly from 17% to 29% ($p < 0.05$) and in ground turkey isolates rose from 16% to 41% ($p < 0.001$, Table 8).
- Multidrug Resistance – The proportion of *Salmonella* with no detected resistance increased in 2012 compared to 2011. In 2012, 33% of retail chicken isolates were resistant to ≥ 3 antibiotic classes compared to 40% of ground turkey isolates. More than 24% of retail chicken isolates showed resistance to ≥ 5 classes (Table 11) with 2/3rd from serotype Typhimurium (Table 9).

Campylobacter[2]

C. jejuni and *C. coli* cause most campylobacteriosis. Many of these infections are foodborne and poultry is a major source of human *C. jejuni* infections. More than 90% of *Campylobacter* isolates are recovered from retail chicken each year and *C. jejuni* accounts for 2/3rd of them (Table 14).

Macrolides and fluoroquinolones are used in the treatment of human *Campylobacter* infections. Both drugs are also authorized for use in food-producing animals (Animal Drugs @ FDA).

[1] Nearly all salmonellae were recovered from poultry. Due to the low recovery from ground beef and pork chops (< 2%), statistical analysis of trends in resistance from these sources should be considered with caution.
[2] Ground beef and pork chop samples are no longer cultured for *Campylobacter*, due to their low recovery (<0.5%) from 2002–2007.

- Prevalence – In 2012, a total of 944 *Campylobacter* isolates were tested. *Campylobacter* was isolated from 47% of retail chicken and < 1% of ground turkey samples (Figure 2).
- Macrolide resistance in retail chicken isolates remained at 1% for *C. jejuni*, while macrolide resistance in *C. coli* rose to 12% compared to 5% in 2011 (Table 17).
- There have been no consistent changes in ciprofloxacin resistance among *C. jejuni* and *C. coli* from retail chicken since 2005 when fluoroquinolone use stopped in poultry production (Table 17).
- In 2012, nearly 50% of *C. jejuni* and *C. coli* from retail chicken were tetracycline resistant. Tetracycline resistance is the most common resistance among *Campylobacter* (Table 17).
- In 2012, gentamicin resistance in *C. coli* markedly decreased to 4% following a significantly steady increase from <1% when it first appeared in 2007 to 18% in 2011 ($p < 0.001$, Table 17).
- Multidrug resistance is rare in *Campylobacter*. There were 26 (of 620) *Campylobacter* isolates from poultry resistant to ≥ 3 antibiotic classes in 2012 (Table 18).

Enterococcus

Enterococcus is used as a sentinel for antibiotic selection pressures by compounds with Gram-positive activity. This spectrum of activity is exhibited by many antibiotics used in food animal production and the same classes of antibiotics are also used to treat human infections.

- Prevalence – In 2012, a total of 1,785 *Enterococcus* isolates were tested. *Enterococcus* was isolated from 95% of retail chicken, 97% of ground turkey, 94% of ground beef, and 87% of pork chop samples (Table 6).
- No isolates were resistant to vancomycin or linezolid (Table 21). These classes of compounds are important in human medicine but are not used in food animal production.
- Streptogramin resistance has significantly decreased ($p < 0.05$) in all retail meat since 2002, however it remains above 50% in ground turkey isolates (Table 21).
- *E. faecalis* from poultry showed markedly higher aminoglycoside and macrolide resistance than *E. faecium*, with the exception of streptomycin. *E. faecium* from all sources had much higher resistance to nitrofurantoin, penicillin and ciprofloxacin compared to *E. faecalis* (Table 22.1-2).
- The proportion of poultry isolates from 2002 through 2012 that were multidrug resistant was higher for *E. faecium* than *E. faecalis* (Table 23.1-2).

Escherichia coli

E. coli is used by NARMS as an indicator organism to detect both emerging resistance patterns and specific resistance genes that could potentially be transferred to other pathogenic gram negative bacteria (e.g. *Salmonella*).

- Prevalence – In 2012, a total of 1,209 *E. coli* isolates were tested. *E. coli* was isolated from 80% of retail chicken, 82% of ground turkey, 56% of ground beef, and 34% of pork chop samples (Table 6).

- Quinolones – All *E. coli* isolates in 2012 continued showing little to no resistance to nalidixic acid (< 2%) and ciprofloxacin (< 1%, Table 26).
- Cephalosporins – Between 2002 to 2012 third-generation cephalosporin resistance rose in ground turkey isolates from 1% to 10% ($p < 0.001$, Table 26).
- Ampicillin – Between 2002 to 2012 ampicillin resistance increased significantly in ground turkey isolates from 31% to 56% ($p < 0.001$, Table 26).
- Multidrug Resistance – Among *E. coli* isolates from ground turkey, 68% were resistant to ≥ 3 antibiotic classes in 2012 (Table 28).

Surveillance and Laboratory Testing Methods

Sample Collection and Isolate Submission

For 2012, retail meat samples were collected from 11 sites including California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, Pennsylvania, and Tennessee. Each site collected samples from a randomized list of area grocery stores derived from the Chain Store Guide ® (Tampa, FL). All 11 sites cultured the meat samples for non-typhoidal *Salmonella* and *Campylobacter*. In 2012, Georgia, Maryland, Oregon and Tennessee cultured the same samples for *E. coli* and *Enterococcus*. A single isolate from each culture-positive meat sample was submitted by the 11 sites to the FDA/CVM for serotype or species confirmation and antimicrobial susceptibility testing.

Microbiological Analysis and Testing Methods at the NARMS Sites

Retail meat samples were stored at 4°C and processed within 96 hours of purchase. Meat packages were kept intact until they were aseptically opened in the laboratory. A sample is defined as a single retail chicken part (breast, wing, or thigh) or pork chop, or a 25 gram (g) aliquot of ground product (beef and turkey). Samples were placed in separate sterile plastic bags with 225 mL of buffered peptone water, and the bags were vigorously shaken. Fifty milliliters of the rinsate from each sample were transferred to individual sterile containers for bacterial isolation as outlined below.

Salmonella Isolation

Fifty milliliters of double strength lactose broth were added to the flasks containing 50 mL of rinsate. The contents were mixed thoroughly and incubated at 35°C for 24 hours. From each flask, 0.1 mL was transferred to 9.9 mL of RVR10 medium and incubated at 42°C for 16-20 hours. One milliliter of this enrichment was transferred to pre-warmed (35-37°C) 10 mL tubes of M Broth and incubated 35-37°C for 6-8 hours. From each M Broth culture, 1 mL was heated at 100°C for 15 minutes, and the remaining portion was refrigerated. The heated portion from each culture was screened using the TECRA *Salmonella* Visual Immunoassay kit (International BioProducts, Bothell, WA) or the VIDAS® *Salmonella* Immunoassay kit (bioMerieux, Hazelwood, MO) according to the manufacturers' instructions. If the TECRA or VIDAS assay was negative, the sample was considered negative for *Salmonella*. If the TECRA or VIDAS assay was positive, a loopful of the corresponding unheated M Broth culture was streaked for isolation onto a Xylose Lysine Deoxycholate (XLD) agar plate and incubated at 35°C for 24 hours. Each XLD agar plate was examined for typical *Salmonella* colonies (pink colonies with or without black centers). If no *Salmonella*-like growth was observed on XLD agar, the sample was considered negative. A typical *Salmonella* colony was streaked for purity onto a trypticase soy agar plate supplemented with 5% defibrinated sheep blood (BAP). The BAP(s) were incubated at 35°C for 18-24 hours before sub-culturing an isolated colony for further biochemical identification and serotyping using the laboratory's standard procedures. *Salmonella* isolates were subsequently frozen at -70 to -80°C in Brucella broth with 20% glycerol and shipped on dry ice to FDA/CVM. Upon arrival at FDA/CVM, each isolate was streaked for purity on a BAP before being confirmed as *Salmonella* using the Vitek 2 Compact microbial identification system (bioMérieux, Hazelwood, MO). These isolates were further serotyped for O and H antigens using either commercially available antisera (Difco-Becton Dickinson, Sparks, MD; Miravista Diagnostics, Indianapolis, IN) or antisera from the CDC.

***Campylobacter* Isolation**

Fifty milliliters of double-strength Bolton broth was added to the flasks containing 50 mL of rinsate, mixed gently to avoid aeration, and incubated at 42°C for 24 hours in a reduced oxygen atmosphere containing 85% nitrogen, 10% carbon dioxide, and 5% oxygen. The Bolton broth enrichment was inoculated onto Campy Cefex Agar (CCA) to obtain isolated colonies, and incubated at 42°C in the above atmosphere for 24 to 48 hours. If no *Campylobacter*-like growth was observed on a CCA plate, the sample was considered negative. When *Campylobacter*-like growth was observed, one typical well-isolated colony from each CCA plate was sub-cultured to a BAP and incubated as described above. Following incubation, the purified culture was gram stained and tested for its reaction to catalase, oxidase, hippurate and/or motility. All isolates presumptively identified as *Campylobacter* were frozen at -70 to -80°C in Brucella broth with 20% glycerol and shipped in cryo-vials on dry ice to FDA/CVM. Upon arrival at FDA/CVM, isolates were streaked for purity on a BAP before being identified to the species level using PCR assays previously described (2, 6).

***Escherichia coli* Isolation (Georgia, Oregon, Maryland and Tennessee in 2012)**

Fifty milliliters of double strength MacConkey broth was added to flasks containing 50 mL of rinsate, mixed thoroughly and incubated at 35°C for 16-20 hours. One loopful from each flask was streaked onto an Eosin Methylene Blue (EMB) agar plate and incubated at 35°C for 16-20 hours. If no typical *E. coli* colonies were observed on an EMB agar plate, the sample was considered negative. When *E. coli*-like growth was present, one typical, well-isolated colony was subcultured onto a BAP. Indole positive and oxidase negative isolates were presumptively identified as *E. coli*. These isolates were frozen at -70 to -80°C in Brucella broth with 20% glycerol and shipped in cryo-vials on dry ice to FDA/CVM. Upon arrival at FDA/CVM, every isolate was streaked for purity on a BAP before being confirmed as *E. coli* using the Vitek 2 Compact microbial identification system (bioMérieux, Hazelwood, MO).

***Enterococcus* Isolation (Georgia, Oregon, Maryland and Tennessee in 2012)**

Fifty milliliters of double-strength Enterococcosel broth was added 50 mL of rinsate, mixed thoroughly and incubated at 45°C for 18-24 hours. If no typical growth or blackening was observed in the flask, the sample was considered negative. If blackening of the broth was observed, a loopful was streaked for isolation onto an Enterococcosel Agar plate (EAP) and incubated at 35°C for 18-24 hours. If no typical growth was observed on the EA plate, the sample was considered negative. If *Enterococcus*-like growth was present, one well-isolated colony was streaked for isolation onto a BAP, and incubated at 35°C for 18-24 hours in ambient air. Presumptive *Enterococcus* isolates were subsequently frozen at -70 to -80°C in Brucella broth with 20% glycerol and shipped in cryo-vials on dry ice to FDA/CVM. Upon arrival at FDA/CVM, every isolate was streaked for purity on a BAP before being confirmed as *Enterococcus* using the Vitek 2 Compact microbial identification system (bioMérieux, Hazelwood, MO).

Antimicrobial Susceptibility Testing

Antimicrobial minimal inhibitory concentrations (MICs) were determined by broth microdilution according to the Clinical and Laboratory Standards Institute (CLSI) standards (3, 4, 5) using a 96-well microtiter plate (Sensititre, Trek Diagnostic Systems, Thermo Fisher Scientific Inc., Cleveland, OH). *Salmonella* and *E. coli* isolates were tested using a custom plate developed for

Gram-negative bacteria (catalog # CMV2AGNF) and suspect Extended Spectrum Beta-Lactamases (ESBL) that were resistant to ceftriaxone (AXO) and/or ceftiofur (TIO) were tested using a custom plate developed for ESBL testing (CMV2DW); *Enterococcus* isolates were tested using a custom plate developed for Gram-positive bacteria (catalog # CMV3AGPF); and *Campylobacter* isolates were tested using a custom plate developed for *Campylobacter* testing (catalog # CAMPY). The quality control organisms included *Escherichia coli* ATCC 25922, *Enterococcus faecalis* ATCC 29212, *Enterococcus faecalis* ATCC 51299 *Staphylococcus aureus* ATCC 29213, *Pseudomonas aeruginosa* ATCC 27853, and *Campylobacter jejuni* ATCC 33560 (3, 4, 5). CLSI approved interpretive criteria were used when available for all organisms except *Campylobacter* where established epidemiological cut off values were used. Provisional NARMS breakpoints were used when no CLSI approved interpretive criteria was available (Tables 1- 4).

Pulsed-Field Gel Electrophoresis (PFGE)

Pulsed-field gel electrophoresis (PFGE) was used to assess genetic relatedness among all *Salmonella* and select *Campylobacter* isolates using protocols developed by CDC (1). All *Campylobacter* isolated from 2002 to 2005 were tested by PFGE. Since 2012, only those resistant to gentamycin have been examined by PFGE. Agarose-embedded DNA was digested with *Xba*I and *Bln*I for *Salmonella* isolates and *Sma*I and *Kpn*I for *Campylobacter* isolates. DNA restriction fragments were separated by pulsed electrophoresis using the CHEF Mapper ® system (Bio-Rad, Hercules, CA). Genomic-DNA profiles were analyzed using BioNumerics software (Applied-Maths, Kortrijk, Belgium), and banding patterns were compared using Dice coefficients with a 1.5% band position tolerance.

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Table 1. Interpretive Criteria used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli*, NARMS Retail Meat, 2012[1]

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)	Breakpoints (µg/ml)		
			Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin	0.25 - 16	≤ 4	8	≥ 16
	Kanamycin	8 - 64	≤ 16	32	≥ 64
	Streptomycin*	32 - 64	≤ 32	N/A	≥ 64
β-Lactam/β-Lactamase Inhibitor Combinations	Amoxicillin–Clavulanic Acid	1 / 0.5 - 32 / 16	≤ 8 / 4	16 / 8	≥ 32 / 16
Cephems	Cefoxitin	0.5 - 32	≤ 8	16	≥ 32
	Ceftiofur	0.12 - 8	≤ 2	4	≥ 8
	Ceftriaxone	0.25 - 64	≤ 1	2	≥ 4
Folate Pathway Inhibitors	Sulfisoxazole[2]	16 - 256	≤ 256	N/A	≥ 512
	Trimethoprim–Sulfamethoxazole	0.12 / 2.4 - 4 / 76	≤ 2 / 38	N/A	≥ 4 / 76
Macrolides	Azithromycin*	0.12 - 16	≤ 16	N/A	≥ 32
Penicillins	Ampicillin	1 - 32	≤ 8	16	≥ 32
Phenicols	Chloramphenicol	2 - 32	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin[3]	0.015 - 4	≤ 0.06	0.12-0.5	≥ 1
	Nalidixic acid	0.5 - 32	≤ 16	N/A	≥ 32
Tetracyclines	Tetracycline	4 - 32	≤ 4	8	≥ 16

Table 2. Interpretive Criteria used for Antimicrobial Susceptibility Testing of *Campylobacter*, NARMS Retail Meat, 2012[4]

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)	Breakpoints (µg/ml)			
			jejuni		*coli*	
			Susceptible	Resistant	Susceptible	Resistant
Aminoglycosides	Gentamicin	0.12 - 32	≤ 2	≥ 4	≤ 2	≥ 4
Ketolides	Telithromycin	0.015 - 8	≤ 4	≥ 8	≤ 4	≥ 8
Lincosamides	Clindamycin	0.03 - 16	≤ 0.5	≥ 1	≤ 1	≥ 2
Macrolides	Azithromycin	0.015 - 64	≤ 0.25	≥ 0.5	≤ 0.5	≥ 1
	Erythromycin	0.03 - 64	≤ 4	≥ 8	≤ 8	≥ 16
Phenicols	Florfenicol	0.03 - 64	≤ 4	≥ 8	≤ 4	≥ 8
Quinolones	Ciprofloxacin	0.015 - 64	≤ 0.5	≥ 1	≤ 0.5	≥ 1
	Nalidixic acid	4 - 64	≤ 16	≥ 32	≤ 16	≥ 32
Tetracyclines	Tetracycline	0.06 - 64	≤ 1	≥ 2	≤ 2	≥ 4

*No CLSI interpretative criteria for this bacterium/antimicrobial combination currently available. NARMS established breakpoints were used for resistance monitoring.
[1] Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute, M100-S22), except for streptomycin and azithromycin where no CLSI breakpoint is established
[2] Sulfamethoxazole was replaced by sulfisoxazole in 2004
[3] Revised ciprofloxacin breakpoints for invasive *Salmonella* serotypes from the CLSI M100-S22 document, were used for all *Salmonella* and *E. coli* analyses
[4] Breakpoints were adopted from epidemiological cut off values

Table 3. Interpretive Criteria used for Antimicrobial Susceptibility Testing of *Enterococcus* , NARMS Retail Meat, 2012[1]

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)	Breakpoints (µg/ml)		
			Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamicin	128 - 1024	≤ 500	N/A	> 500
	Kanamycin*	128 - 1024	≤ 512	N/A	≥ 1024
	Streptomycin	512 - 2048	≤ 512	N/A	≥ 1024
Glycopeptides	Vancomycin	0.25 - 32	≤ 4	8 - 16	≥ 32
Glycylcyclines	Tigecycline*[2]	0.015 - 0.5	≤ 0.25	N/A	N/A
Lincosamides	Lincomycin*	1 - 8	≤ 2	4	≥ 8
Lipopeptides	Daptomycin[3]	0.25 - 16	≤ 4	N/A	N/A
Macrolides	Erythromycin	0.25 - 8	≤ 0.5	1 - 4	≥ 8
	Tylosin*	0.25 - 32	≤ 8	16	≥ 32
Nitrofurans	Nitrofurantoin	2 - 64	≤ 32	64	≥ 128
Oxazolidinones	Linezolid	0.5 - 8	≤ 2	4	≥ 8
Penicillins	Penicillin	0.25 - 16	≤ 8	N/A	≥ 16
Phenicols	Chloramphenicol	2 - 32	≤ 8	16	≥ 32
Quinolones	Ciprofloxacin	0.12 - 4	≤ 1	2	≥ 4
Streptogramins	Quinupristin/Dalfopristin	0.5 - 32	≤ 1	2	≥ 4
Tetracyclines	Tetracycline	1 - 32	≤ 4	8	≥ 16

Table 4. Interpretive Criteria used for Antimicrobial Susceptibility Testing of *Salmonella* and *E. coli* Resistant to Ceftriaxone or Ceftiofur, NARMS Retail Meat, 2012

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)	Breakpoints (µg/ml)		
			Susceptible	Intermediate	Resistant
β-Lactam/β-Lactamase Inhibitor Combinations	Piperacillin-tazobactam	0.5 - 128	≤ 16	32 - 64	≥ 128
Penems	Imipenem	0.125 - 16	≤ 1	2	≥ 4
Cephems	Cefepime[4]	0.125 - 32	≤ 2	N/A	≥ 16
	Cefotaxime	0.125 - 128	≤ 1	2	≥ 4
	Ceftazidime	0.125 - 128	≤ 4	8	≥ 16
Monobactams	Aztreonam	0.125 - 32	≤ 4	8	≥ 16

*No CLSI interpretative criteria for this bacterium/antimicrobial combination currently available. NARMS established breakpoints were used for resistance monitoring.

[1] Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute, M100-S22) where available

[2] Only a susceptible breakpoint (≤ 0.25 µg/ml) has been established. Isolates with an MIC ≥ 0.5 µg/ml are reported as nonsusceptible.

[3] Only a susceptible breakpoint (≤ 4 µg/ml) has been established for *E.faecalis* . Isolates with an MIC ≥ 8 µg/ml are reported as nonsusceptible. There are no established CLSI breakpoints for *E. faecium* and *E. hirae* .

[4] Cefepime MICs above the susceptible range and below the resisatant range are Susceptible Dose Dependent (SDD) according to CLSI guidelines (M100-S24)

Table 5.1 Percent Positive Samples for Retail Chicken by Bacterium and Site, 2002-2012

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	**Year**	**N**[2]	**# Isolates**	**% Positive**[3]	**N**	**# Isolates**	**% Positive**	**N**	**# Isolates**	**% Positive**	**N**	**# Isolates**	**% Positive**
CA	2003-2005	358	243	67.9%	358	42	11.7%						
	2006	118	96	81.4%	118	16	13.6%						
	2007	119	97	81.5%	120	12	10.0%						
	2008	120	78	65.0%	120	19	15.8%						
	2009	120	90	75.0%	120	34	28.3%						
	2010	120	79	65.8%	120	9	7.5%						
	2011	120	86	71.7%	120	19	15.8%						
	2012	110	69	62.7%	110	13	11.8%						
	Total	**1185**	**838**	**70.7%**	**1186**	**164**	**13.8%**						
CO	2004-2005	213	59	27.7%	213	13	6.1%						
	2006	120	74	61.7%	120	7	5.8%						
	2007	120	62	51.7%	120	2	1.7%						
	2008	120	63	52.5%	120	4	3.3%						
	2009	120	57	47.5%	120	10	8.3%						
	2010	120	67	55.8%	120	9	7.5%						
	2011	120	56	46.7%	120	10	8.3%						
	2012	120	62	51.7%	120	12	10.0%						
	Total	**1053**	**500**	**47.5%**	**1053**	**67**	**6.4%**						
CT	2002-2005	420	295	70.2%	420	75	17.9%						
	2006	120	79	65.8%	120	20	16.7%						
	2007	119	66	55.5%	120	15	12.5%						
	2008	120	41	34.2%	120	7	5.8%						
	2009	120	47	39.2%	120	20	16.7%						
	2010	120	29	24.2%	120	17	14.2%						
	2011	120	40	33.3%	120	10	8.3%						
	2012	120	34	28.3%	120	21	17.5%						
	Total	**1259**	**631**	**50.1%**	**1260**	**185**	**14.7%**						
GA	2002-2005	480	283	59.0%	480	38	7.9%	480	479	99.8%	480	458	95.4%
	2006	120	63	52.5%	120	15	12.5%	120	120	100.0%	120	117	97.5%
	2007	120	57	47.5%	120	8	6.7%	120	117	97.5%	120	114	95.0%
	2008	120	66	55.0%	120	11	9.2%	120	119	99.2%	120	115	95.8%
	2009	120	48	40.0%	120	12	10.0%	120	119	99.2%	120	115	95.8%
	2010	120	55	45.8%	120	4	3.3%	120	118	98.3%	120	110	91.7%
	2011	120	56	46.7%	120	7	5.8%	120	120	100.0%	120	112	93.3%
	2012	120	72	60.0%	120	14	11.7%	120	118	98.3%	120	110	91.7%
	Total	**1320**	**700**	**53.0%**	**1320**	**109**	**8.3%**	**1320**	**1310**	**99.2%**	**1320**	**1251**	**94.8%**
MD	2002-2005	480	229	47.7%	480	72	15.0%	480	454	94.6%	480	430	89.6%
	2006	120	68	56.7%	120	18	15.0%	120	115	95.8%	120	102	85.0%
	2008	110	34	30.9%	110	43	39.1%						
	2009	120	50	41.7%	120	37	30.8%						
	2010	120	40	33.3%	120	28	23.3%	100	93	93.0%	100	70	70.0%
	2011	120	45	37.5%	120	13	10.8%	120	82	68.3%	120	50	41.7%
	2012	120	57	47.5%	120	26	21.7%	120	114	95.0%	120	92	76.7%
	Total	**1190**	**523**	**43.9%**	**1190**	**237**	**19.9%**	**940**	**858**	**91.3%**	**940**	**744**	**79.1%**
MN	2002-2005	466	192	41.2%	466	61	13.1%						
	2006	120	43	35.8%	120	16	13.3%						
	2007	120	28	23.3%	120	11	9.2%						
	2008	120	24	20.0%	120	5	4.2%						
	2009	120	25	20.8%	120	9	7.5%						
	2010	120	15	12.5%	120	8	6.7%						
	2011	120	36	30.0%	120	7	5.8%						
	2012	120	40	33.3%	120	8	6.7%						
	Total	**1306**	**403**	**30.9%**	**1306**	**125**	**9.6%**						
NM	2004-2005	239	84	35.1%	239	8	3.3%						
	2006	119	15	12.6%	120	18	15.0%						
	2007	120	52	43.3%	120	30	25.0%						
	2008	120	61	50.8%	120	36	30.0%						
	2009	120	48	40.0%	120	28	23.3%						
	2010	120	43	35.8%	120	20	16.7%						
	2011	120	56	46.7%	120	29	24.2%						
	2012	120	55	45.8%	120	36	30.0%						
	Total	**1078**	**414**	**38.4%**	**1079**	**205**	**19.0%**						
NY	2003-2005	356	221	62.1%	356	44	12.4%						
	2006	119	48	40.3%	120	15	12.5%						
	2007	120	33	27.5%	120	12	10.0%						
	2008	120	53	44.2%	120	30	25.0%						
	2009	120	50	41.7%	120	68	56.7%						
	2010	120	52	43.3%	120	43	35.8%						
	2011	120	72	60.0%	120	42	35.0%						
	2012	110	50	45.5%	110	29	26.4%						
	Total	**1185**	**579**	**48.9%**	**1186**	**283**	**23.9%**						
OR	2002-2005	400	156	39.0%	400	62	15.5%	390	386	99.0%	400	236	59.0%
	2006	119	50	42.0%	120	7	5.8%	120	119	99.2%	118	94	79.7%
	2007	120	52	43.3%	120	2	1.7%	120	119	99.2%	120	98	81.7%
	2008	120	39	32.5%	120	1	0.8%	120	119	99.2%	120	92	76.7%
	2009	120	45	37.5%	120	9	7.5%	120	115	95.8%	120	98	81.7%
	2010	120	47	39.2%	120	12	10.0%	120	113	94.2%	120	96	80.0%
	2011	120	40	33.3%	120	10	8.3%	120	118	98.3%	120	89	74.2%
	2012	120	45	37.5%	120	13	10.8%	120	113	94.2%	120	98	81.7%
	Total	**1239**	**474**	**38.3%**	**1240**	**116**	**9.4%**	**1230**	**1202**	**97.7%**	**1238**	**901**	**72.8%**
PA	2008				120	25	20.8%						
	2009	120	80	66.7%	120	41	34.2%						
	2010	120	23	19.2%	120	13	10.8%						
	2011	120	51	42.5%	120	8	6.7%						
	2012	120	74	61.7%	120	43	35.8%						
	Total	**480**	**228**	**47.5%**	**600**	**130**	**21.7%**						
TN	2002-2005	463	255	55.1%	463	38	8.2%	463	451	97.4%	451	347	76.9%
	2006	118	36	30.5%	118	20	16.9%	118	115	97.5%	117	105	89.7%
	2007	112	28	25.0%	112	7	6.3%	111	103	92.8%	102	87	85.3%
	2008	120	51	42.5%	120	17	14.2%	120	110	91.7%	120	99	82.5%
	2009	120	40	33.3%	120	4	3.3%	120	115	95.8%	120	102	85.0%
	2010	120	55	45.8%	120	8	6.7%	120	115	95.8%	120	81	67.5%
	2011	120	65	54.2%	120	3	2.5%	120	113	94.2%	120	90	75.0%
	2012	120	65	54.2%	120	14	11.7%	120	111	92.5%	120	86	71.7%
	Total	**1293**	**595**	**46.0%**	**1293**	**111**	**8.6%**	**1292**	**1233**	**95.4%**	**1270**	**997**	**78.5%**
Grand Total		**12588**	**5885**	**46.8%**	**12713**	**1732**	**13.6%**	**3490**	**3370**	**96.6%**	**4768**	**3893**	**81.6%**

[1] CT, GA, MD, OR, MN, TN joined surveillance in 2002; NY, CA in 2003; CO, NM in 2004; PA in 2008. MD did not collect samples for NARMS retail meat testing in 2007. As of 2011 retail chicken sampling may include any chicken part with skin on and bone in.

[2] N = Number of samples tested

[3] % Positive = Number of Isolates / (N) Number of samples tested

Table 5.2 Percent Positive Samples for Ground Turkey by Bacterium and Site, 2002-2012

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	**Year**	**N**[2]	**# Isolates**	**% Positive**[3]	**N**	**# Isolates**	**% Positive**	**N**	**# Isolates**	**% Positive**	**N**	**# Isolates**	**% Positive**
CA	2003-2005	359	1	0.3%	359	30	8.4%						
	2006	120	0	0.0%	120	5	4.2%						
	2007	120	1	0.8%	120	8	6.7%						
	2008	119	0	0.0%	119	12	10.1%						
	2009	120	1	0.8%	120	12	10.0%						
	2010	120	0	0.0%	120	17	14.2%						
	2011	120	0	0.0%	120	11	9.2%						
	2012	110	1	0.9%	110	9	8.2%						
	Total	**1188**	**4**	**0.3%**	**1188**	**104**	**8.8%**						
CO	2004-2005	217	0	0.0%	217	25	11.5%						
	2006	120	10	8.3%	120	17	14.2%						
	2007	120	10	8.3%	120	20	16.7%						
	2008	120	14	11.7%	120	30	25.0%						
	2009	120	3	2.5%	120	19	15.8%						
	2010	120	1	0.8%	120	15	12.5%						
	2011	120	11	9.2%	120	20	16.7%						
	2012	119	2	1.7%	119	9	7.6%						
	Total	**1056**	**51**	**4.8%**	**1056**	**155**	**14.7%**						
CT	2002-2005	420	7	1.7%	420	67	16.0%						
	2006	120	2	1.7%	120	8	6.7%						
	2007	120	1	0.8%	120	14	11.7%						
	2008	120	1	0.8%	120	9	7.5%						
	2009	120	2	1.7%	120	13	10.8%						
	2010	120	0	0.0%	120	7	5.8%						
	2011	120	0	0.0%	120	11	9.2%						
	2012	120	1	0.8%	120	12	10.0%						
	Total	**1260**	**14**	**1.1%**	**1260**	**141**	**11.2%**						
GA	2002-2005	480	8	1.7%	480	116	24.2%	480	480	100.0%	480	456	95.0%
	2006	120	6	5.0%	120	28	23.3%	120	117	97.5%	120	116	96.7%
	2007	120	7	5.8%	120	48	40.0%	120	120	100.0%	120	120	100.0%
	2008	120	3	2.5%	120	47	39.2%	120	120	100.0%	120	120	100.0%
	2009	120	4	3.3%	120	43	35.8%	120	120	100.0%	120	119	99.2%
	2010	120	0	0.0%	120	20	16.7%	120	117	97.5%	120	120	100.0%
	2011	120	3	2.5%	120	22	18.3%	120	115	95.8%	120	118	98.3%
	2012	120	1	0.8%	120	13	10.8%	120	119	99.2%	120	118	98.3%
	Total	**1320**	**32**	**2.4%**	**1320**	**337**	**25.5%**	**1320**	**1308**	**99.1%**	**1320**	**1287**	**97.5%**
MD	2002-2005	480	5	1.0%	480	59	12.3%	480	433	90.2%	480	427	89.0%
	2006	120	0	0.0%	120	12	10.0%	120	99	82.5%	120	95	79.2%
	2008	110	1	0.9%	110	30	27.3%						
	2009	120	2	1.7%	120	13	10.8%						
	2010	120	2	1.7%	120	18	15.0%	100	93	93.0%	100	78	78.0%
	2011	120	2	1.7%	120	18	15.0%	120	96	80.0%	120	87	72.5%
	2012	120	0	0.0%	120	7	5.8%	120	118	98.3%	120	105	87.5%
	Total	**1190**	**12**	**1.0%**	**1190**	**157**	**13.2%**	**940**	**839**	**89.3%**	**940**	**792**	**84.3%**
MN	2002-2005	477	14	2.9%	477	60	12.6%						
	2006	120	4	3.3%	120	25	20.8%						
	2007	119	6	5.0%	120	27	22.5%						
	2008	120	3	2.5%	120	17	14.2%						
	2009	120	4	3.3%	120	21	17.5%						
	2010	120	3	2.5%	120	14	11.7%						
	2011	120	1	0.8%	120	13	10.8%						
	2012	120	1	0.8%	120	5	4.2%						
	Total	**1316**	**36**	**2.7%**	**1317**	**182**	**13.8%**						
NM	2004-2005	238	2	0.8%	238	29	12.2%						
	2006	120	0	0.0%	120	19	15.8%						
	2007	118	5	4.2%	118	42	35.6%						
	2008	120	4	3.3%	120	53	44.2%						
	2009	120	2	1.7%	120	30	25.0%						
	2010	120	4	3.3%	120	43	35.8%						
	2011	120	6	5.0%	120	35	29.2%						
	2012	120	0	0.0%	120	13	10.8%						
	Total	**1076**	**23**	**2.1%**	**1076**	**264**	**24.5%**						
NY	2003-2005	360	1	0.3%	360	43	11.9%						
	2006	120	2	1.7%	120	15	12.5%						
	2007	120	2	1.7%	120	10	8.3%						
	2008	120	0	0.0%	120	18	15.0%						
	2009	120	0	0.0%	120	12	10.0%						
	2010	120	0	0.0%	120	18	15.0%						
	2011	120	1	0.8%	120	13	10.8%						
	2012	110	0	0.0%	110	9	8.2%						
	Total	**1190**	**6**	**0.5%**	**1190**	**138**	**11.6%**						
OR	2002-2005	400	0	0.0%	400	29	7.3%	390	356	91.3%	400	191	47.8%
	2006	120	0	0.0%	120	8	6.7%	120	115	95.8%	120	76	63.3%
	2007	120	0	0.0%	120	2	1.7%	120	104	86.7%	120	104	86.7%
	2008	120	1	0.8%	120	4	3.3%	120	113	94.2%	120	89	74.2%
	2009	120	2	1.7%	120	10	8.3%	120	103	85.8%	120	84	70.0%
	2010	120	0	0.0%	120	14	11.7%	120	89	74.2%	120	86	71.7%
	2011	120	0	0.0%	120	6	5.0%	120	107	89.2%	120	75	62.5%
	2012	120	0	0.0%	120	5	4.2%	120	117	97.5%	120	84	70.0%
	Total	**1240**	**3**	**0.2%**	**1240**	**78**	**6.3%**	**1230**	**1104**	**89.8%**	**1240**	**789**	**63.6%**
PA	2008				120	11	9.2%						
	2009	120	4	3.3%	120	8	6.7%						
	2010	120	1	0.8%	120	19	15.8%						
	2011	120	3	2.5%	120	4	3.3%						
	2012	120	1	0.8%	120	5	4.2%						
	Total	**480**	**9**	**1.9%**	**600**	**47**	**7.8%**						
TN	2002-2005	428	3	0.7%	428	55	12.9%	428	425	99.3%	418	335	80.1%
	2006	106	0	0.0%	106	22	20.8%	105	104	99.0%	106	101	95.3%
	2007	108	2	1.9%	108	19	17.6%	108	105	97.2%	98	91	92.9%
	2008	120	4	3.3%	120	15	12.5%	120	110	91.7%	120	91	75.8%
	2009	120	1	0.8%	120	12	10.0%	120	105	87.5%	120	103	85.8%
	2010	120	2	1.7%	120	17	14.2%	120	118	98.3%	120	85	70.8%
	2011	120	4	3.3%	120	9	7.5%	120	117	97.5%	120	88	73.3%
	2012	116	0	0.0%	116	4	3.4%	116	106	91.4%	116	84	72.4%
	Total	**1238**	**16**	**1.3%**	**1238**	**153**	**12.4%**	**1237**	**1190**	**96.2%**	**1218**	**978**	**80.3%**
Grand Total		**12554**	**206**	**1.6%**	**12675**	**1756**	**13.9%**	**3490**	**3251**	**93.2%**	**4718**	**3846**	**81.5%**

[1] CT, GA, MD, OR, MN, TN joined surveillance in 2002; NY, CA in 2003; CO, NM in 2004; PA in 2008. MD did not collect samples for NARMS retail meat testing in 2007.

[2] N = Number of samples tested

[3] % Positive = Number of Isolates / (N) Number of samples tested

Table 5.3 Percent Positive Samples for Ground Beef by Bacterium and Site, 2002-2012

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	Year	N[2]	# Isolates	% Positive[3]	N	# Isolates	% Positive	N	# Isolates	% Positive	N	# Isolates	% Positive
CA	2003-2005	360	0	0.0%	360	3	0.8%						
	2006	120	0	0.0%	120	1	0.8%						
	2007	119	0	0.0%	119	2	1.7%						
	2008				120	2	1.7%						
	2009				120	0	0.0%						
	2010				120	1	0.8%						
	2011				120	0	0.0%						
	2012				110	1	0.9%						
	Total	**599**	**0**	**0.0%**	**1189**	**10**	**0.8%**						
CO	2004-2005	222	0	0.0%	222	0	0.0%						
	2006	120	0	0.0%	120	2	1.7%						
	2007	120	0	0.0%	120	1	0.8%						
	2008				120	0	0.0%						
	2009				120	0	0.0%						
	2010				120	1	0.8%						
	2011				120	0	0.0%						
	2012				120	0	0.0%						
	Total	**462**	**0**	**0.0%**	**1062**	**4**	**0.4%**						
CT	2002-2005	420	0	0.0%	420	13	3.1%						
	2006	116	0	0.0%	116	2	1.7%						
	2007	120	0	0.0%	120	0	0.0%						
	2008				120	0	0.0%						
	2009				120	2	1.7%						
	2010				120	0	0.0%						
	2011				120	0	0.0%						
	2012				120	2	1.7%						
	Total	**656**	**0**	**0.0%**	**1256**	**19**	**1.5%**						
GA	2002-2005	480	0	0.0%	480	5	1.0%	480	472	98.3%	480	376	78.3%
	2006	120	0	0.0%	120	4	3.3%	120	118	98.3%	119	94	79.0%
	2007	120	0	0.0%	120	0	0.0%	120	120	100.0%	120	100	83.3%
	2008				120	0	0.0%	120	117	97.5%	120	100	83.3%
	2009				120	1	0.8%	120	119	99.2%	120	101	84.2%
	2010				120	0	0.0%	120	119	99.2%	120	88	73.3%
	2011				120	5	4.2%	120	114	95.0%	120	61	50.8%
	2012				120	1	0.8%	120	117	97.5%	120	80	66.7%
	Total	**720**	**0**	**0.0%**	**1320**	**16**	**1.2%**	**1320**	**1296**	**98.2%**	**1319**	**1000**	**75.8%**
MD	2002-2005	480	1	0.2%	480	6	1.3%	480	412	85.8%	480	353	73.5%
	2006	120	0	0.0%	120	0	0.0%	120	100	83.3%	120	47	39.2%
	2008				110	3	2.7%						
	2009				120	0	0.0%						
	2010				120	0	0.0%	100	86	86.0%	100	52	52.0%
	2011				120	3	2.5%	120	85	70.8%	120	34	28.3%
	2012				120	2	1.7%	120	116	96.7%	120	54	45.0%
	Total	**600**	**1**	**0.2%**	**1190**	**14**	**1.2%**	**940**	**799**	**85.0%**	**940**	**540**	**57.4%**
MN	2002-2005	473	0	0.0%	473	2	0.4%						
	2006	120	0	0.0%	120	1	0.8%						
	2007	120	0	0.0%	120	3	2.5%						
	2008				120	0	0.0%						
	2009				120	1	0.8%						
	2010				120	0	0.0%						
	2011				120	0	0.0%						
	2012				120	1	0.8%						
	Total	**713**	**0**	**0.0%**	**1313**	**8**	**0.6%**						
NM	2004-2005	240	0	0.0%	240	1	0.4%						
	2006	120	0	0.0%	120	2	1.7%						
	2007	120	0	0.0%	120	3	2.5%						
	2008				120	4	3.3%						
	2009				120	5	4.2%						
	2010				120	1	0.8%						
	2011				120	0	0.0%						
	2012				120	2	1.7%						
	Total	**480**	**0**	**0.0%**	**1080**	**18**	**1.7%**						
NY	2003-2005	360	0	0.0%	360	0	0.0%						
	2006	120	0	0.0%	120	0	0.0%						
	2007	120	0	0.0%	120	0	0.0%						
	2008				120	0	0.0%						
	2009				120	0	0.0%						
	2010				120	2	1.7%						
	2011				120	0	0.0%						
	2012				110	3	2.7%						
	Total	**600**	**0**	**0.0%**	**1190**	**5**	**0.4%**						
OR	2002-2005	400	0	0.0%	400	9	0.0%	400	365	91.3%	400	239	59.8%
	2006	120	0	0.0%	120	2	1.7%	120	108	90.0%	119	69	58.0%
	2007	120	0	0.0%	120	1	0.8%	120	113	94.2%	120	82	68.3%
	2008				120	0	0.0%	120	107	89.2%	120	61	50.8%
	2009				120	0	0.0%	120	94	78.3%	120	60	50.0%
	2010				120	0	0.0%	120	97	80.8%	120	51	42.5%
	2011				120	0	0.0%	120	116	96.7%	120	57	47.5%
	2012				120	0	0.0%	120	114	95.0%	120	63	52.5%
	Total	**640**	**0**	**0.0%**	**1240**	**12**	**1.0%**	**1240**	**1114**	**89.8%**	**1239**	**682**	**55.0%**
PA	2008				120	2	1.7%						
	2009				120	1	0.8%						
	2010				120	1	0.8%						
	2011				120	0	0.0%						
	2012				120	1	0.8%						
	Total				**600**	**5**	**0.8%**						
TN	2002-2005	469	0	0.0%	469	2	0.4%	469	461	98.3%	457	292	63.9%
	2006	120	0	0.0%	120	5	4.2%	120	112	93.3%	120	85	70.8%
	2007	112	5	4.5%	112	3	2.7%	112	101	90.2%	103	74	71.8%
	2008				120	13	10.8%	120	113	94.2%	120	89	74.2%
	2009				120	4	3.3%	120	114	95.0%	120	86	71.7%
	2010				120	1	0.8%	120	113	94.2%	120	78	65.0%
	2011				120	1	0.8%	120	108	90.0%	120	63	52.5%
	2012				120	0	0.0%	120	106	88.3%	120	74	61.7%
	Total	**701**	**5**	**0.7%**	**1301**	**29**	**2.2%**	**1301**	**1228**	**94.4%**	**1280**	**841**	**65.7%**
Grand Total		**6171**	**6**	**0.1%**	**12741**	**140**	**1.1%**	**4801**	**4437**	**92.4%**	**4778**	**3063**	**64.1%**

[1] CT, GA, MD, OR, MN, TN joined surveillance in 2002; NY, CA in 2003; CO, NM in 2004; PA in 2008. MD did not collect samples for NARMS retail meat testing in 2007.

[2] N = Number of samples tested

[3] % Positive = Number of Isolates / (N) Number of samples tested

Table 5.4 Percent Positive Samples for Pork Chop by Bacterium and Site, 2002-2012

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	Year	N[2]	# Isolates	% Positive[3]	N	# Isolates	% Positive	N	# Isolates	% Positive	N	# Isolates	% Positive
CA	2003-2005	360	3	0.8%	360	4	1.1%						
	2006	120	0	0.0%	120	0	0.0%						
	2007	117	0	0.0%	117	1	0.9%						
	2008				117	0	0.0%						
	2009				120	3	2.5%						
	2010				120	0	0.0%						
	2011				120	0	0.0%						
	2012				110	0	0.0%						
	Total	**597**	**3**	**0.5%**	**1184**	**8**	**0.7%**						
CO	2004-2005	215	0	0.0%	215	0	0.0%						
	2006	116	0	0.0%	116	0	0.0%						
	2007	120	2	1.7%	120	2	1.7%						
	2008				120	1	0.8%						
	2009				120	0	0.0%						
	2010				120	0	0.0%						
	2011				120	0	0.0%						
	2012				120	0	0.0%						
	Total	**451**	**2**	**0.4%**	**1051**	**3**	**0.3%**						
CT	2002-2005	420	3	0.7%	420	7	1.7%						
	2006	120	0	0.0%	120	1	0.8%						
	2007	120	0	0.0%	120	0	0.0%						
	2008				120	0	0.0%						
	2009				120	2	1.7%						
	2010				120	1	0.8%						
	2011				120	0	0.0%						
	2012				120	0	0.0%						
	Total	**660**	**3**	**0.5%**	**1260**	**11**	**0.9%**						
GA	2002-2005	480	0	0.0%	480	4	0.8%	480	468	97.5%	480	258	45.8%
	2006	120	0	0.0%	120	0	0.0%	120	115	95.8%	120	65	54.2%
	2007	120	0	0.0%	120	3	2.5%	120	118	98.3%	120	71	59.2%
	2008				120	2	1.7%	120	114	95.0%	120	61	50.8%
	2009				120	2	1.7%	120	117	97.5%	120	69	57.5%
	2010				120	3	2.5%	120	115	95.8%	120	60	50.0%
	2011				120	1	0.8%	120	112	93.3%	120	49	40.8%
	2012				120	1	0.8%	120	119	99.2%	120	56	46.7%
	Total	**720**	**0**	**0.0%**	**1320**	**16**	**1.2%**	**1320**	**1278**	**96.8%**	**1320**	**689**	**52.2%**
MD	2002-2005	480	2	0.4%	480	10	2.1%	480	354	73.8%	480	257	53.5%
	2006	120	0	0.0%	120	0	0.0%	120	78	65.0%	120	36	30.0%
	2008				110	2	1.8%						
	2009				120	0	0.0%						
	2010				120	4	3.3%	100	81	81.0%	100	29	29.0%
	2011				120	3	2.5%	120	65	54.2%	120	23	19.2%
	2012				120	2	1.7%	120	101	84.2%	120	41	34.2%
	Total	**600**	**2**	**0.3%**	**1190**	**21**	**1.8%**	**940**	**679**	**72.2%**	**940**	**386**	**41.1%**
MN	2002-2005	463	1	0.2%	463	0	0.0%						
	2006	120	0	0.0%	120	0	0.0%						
	2007	119	0	0.0%	120	0	0.0%						
	2008				120	2	1.7%						
	2009				120	0	0.0%						
	2010				120	0	0.0%						
	2011				120	0	0.0%						
	2012				120	0	0.0%						
	Total	**702**	**1**	**0.1%**	**1303**	**2**	**0.2%**						
NM	2004-2005	239	1	0.4%	239	0	0.0%						
	2006	120	1	0.8%	120	2	1.7%						
	2007	120	0	0.0%	120	6	5.0%						
	2008				120	3	2.5%						
	2009				120	0	0.0%						
	2010				120	6	5.0%						
	2011				120	9	7.5%						
	2012				120	2	1.7%						
	Total	**479**	**2**	**0.4%**	**1079**	**28**	**2.6%**						
NY	2003-2005	360	0	0.0%	360	6	1.7%						
	2006	120	0	0.0%	120	1	0.8%						
	2007	120	1	0.8%	120	0	0.0%						
	2008				120	0	0.0%						
	2009				120	0	0.0%						
	2010				120	2	1.7%						
	2011				120	3	2.5%						
	2012				110	2	1.8%						
	Total	**600**	**1**	**0.2%**	**1190**	**14**	**1.2%**						
OR	2002-2005	400	1	0.3%	400	3	0.8%	390	345	88.5%	400	119	29.8%
	2006	120	2	1.7%	120	4	3.3%	120	93	77.5%	118	36	30.5%
	2007	120	1	0.8%	120	0	0.0%	120	101	84.2%	120	35	29.2%
	2008				120	3	2.5%	120	107	89.2%	119	48	40.3%
	2009				120	0	0.0%	120	89	74.2%	120	29	24.2%
	2010				120	0	0.0%	120	98	81.7%	120	44	36.7%
	2011				120	4	3.3%	120	101	84.2%	120	38	31.7%
	2012				120	4	3.3%	120	94	78.3%	120	36	30.0%
	Total	**640**	**4**	**0.6%**	**1240**	**18**	**1.5%**	**1230**	**1028**	**83.6%**	**1237**	**385**	**31.1%**
PA	2008				120	0	0.0%						
	2009				120	1	0.8%						
	2010				120	3	2.5%						
	2011				120	1	0.8%						
	2012				120	1	0.8%						
	Total				**600**	**6**	**1.0%**						
TN	2002-2005	467	3	0.6%	467	1	0.2%	467	441	94.4%	452	205	45.4%
	2006	116	0	0.0%	116	0	0.0%	112	103	92.0%	114	45	39.5%
	2007	116	0	0.0%	116	6	5.2%	116	91	78.4%	116	46	39.7%
	2008				120	10	8.3%	120	88	73.3%	120	37	30.8%
	2009				120	0	0.0%	120	97	80.8%	120	49	40.8%
	2010				120	1	0.8%	120	112	93.3%	120	50	41.7%
	2011				120	7	5.8%	120	105	87.5%	120	36	30.0%
	2012				120	0	0.0%	120	102	85.0%	120	28	23.3%
	Total	**699**	**3**	**0.4%**	**1299**	**25**	**1.9%**	**1295**	**1139**	**88.0%**	**1282**	**496**	**38.7%**
Grand Total		**6148**	**21**	**0.3%**	**12716**	**152**	**1.2%**	**4785**	**4124**	**86.2%**	**4779**	**1956**	**40.9%**

[1] CT, GA, MD, OR, MN, TN joined surveillance in 2002; NY, CA in 2003; CO, NM in 2004; PA in 2008. MD did not collect samples for NARMS retail meat testing in 2007.

[2] N = Number of samples tested

[3] % Positive = Number of Isolates / (N) Number of samples tested

Table 6. Percent Positive Samples by Bacterium and Meat Type, 2002-2012[1, 2]

2002	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (2513)	616	288	(46.8)	642	4	(1.0)	642	-	-	613	5	(0.8)
Salmonella (2513)	616	60	(9.7)	642	74	(11.5)	642	9	(1.4)	613	10	(1.6)
Enterococcus (1574)	390	381	(97.7)	395	387	(98.0)	399	383	(96.0)	390	369	(94.6)
Escherichia coli (1574)	390	282	(72.3)	395	304	(77.0)	399	295	(73.9)	390	184	(47.2)

2003	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (3533)	897	469	(52.3)	857	5	(0.6)	880	1	(0.1)	899	4	(0.4)
Salmonella (3533)	897	83	(9.3)	857	114	(13.3)	880	10	(1.1)	899	5	(0.6)
Enterococcus (1873)	477	466	(97.7)	447	418	(93.5)	470	432	(91.9)	479	426	(88.9)
Escherichia coli (1873)	477	396	(83.0)	447	333	(74.5)	470	311	(66.2)	479	218	(45.5)

2004	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (4699)	1172	706	(60.2)	1165	12	(1.0)	1186	-	-	1176	3	(0.3)
Salmonella (4699)	1172	157	(13.4)	1165	142	(12.2)	1186	14	(1.2)	1176	11	(0.9)
Enterococcus (1900)	476	466	(97.9)	466	437	(93.8)	480	448	(93.3)	478	404	(84.5)
Escherichia coli (1900)	476	400	(84.0)	466	376	(80.7)	480	338	(70.4)	478	232	(48.5)

2005	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (4777)	1190	554	(46.6)	1195	20	(1.7)	1196	-	-	1196	2	(0.2)
Salmonella (4781)	1194	153	(12.8)	1195	183	(15.3)	1196	8	(0.7)	1196	9	(0.8)
Enterococcus (1880)	470	457	(97.2)	470	452	(96.2)	470	447	(95.1)	470	409	(87.0)
Escherichia coli (1871)	468	393	(84.0)	470	396	(84.3)	468	316	(67.5)	465	205	(44.1)

2006	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (4766)	1193	572	(47.9)	1185	24	(2.0)	1196	-	-	1192	3	(0.3)
Salmonella (4769)	1196	152	(12.7)	1185	159	(13.4)	1196	19	(1.6)	1192	8	(0.7)
Enterococcus (1893)	478	469	(98.1)	465	435	(93.5)	478	438	(91.6)	472	389	(82.4)
Escherichia coli (1884)	475	418	(88.0)	466	388	(83.3)	478	295	(61.7)	472	182	(38.6)

2007	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (4278)	1070	475	(44.4)	1065	34	(3.2)	1071	5	(0.5)	1072	4	(0.4)
Salmonella (4282)	1072	99	(9.2)	1066	190	(17.8)	1071	13	(1.2)	1073	18	(1.7)
Enterococcus (1407)	351	339	(96.6)	348	329	(94.5)	352	334	(94.9)	356	310	(87.1)
Escherichia coli (1379)	342	299	(87.4)	338	315	(93.2)	343	256	(74.6)	356	152	(42.7)

2008	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (2379)	1190	510	(42.9)	1189	31	(2.6)						
Salmonella (5236)	1310	198	(15.1)	1309	246	(18.8)	1310	24	(1.8)	1307	23	(1.8)
Enterococcus (1440)	360	348	(96.7)	360	343	(95.3)	360	337	(93.6)	360	309	(85.8)
Escherichia coli (1440)	360	306	(85.0)	360	300	(83.3)	360	250	(69.4)	359	146	(40.7)

2009	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (2640)	1320	580	(43.9)	1320	25	(1.9)						
Salmonella (5280)	1320	272	(20.6)	1320	193	(14.6)	1320	14	(1.1)	1320	8	(0.6)
Enterococcus (1440)	360	349	(96.9)	360	328	(91.1)	360	327	(90.8)	360	303	(84.2)
Escherichia coli (1440)	360	315	(87.5)	360	306	(85.0)	360	247	(68.6)	360	147	(40.8)

2010	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (2640)	1320	505	(38.3)	1320	13	(1.0)						
Salmonella (5280)	1320	171	(13.0)	1320	202	(15.3)	1320	7	(0.5)	1320	20	(1.5)
Enterococcus (1840)	460	439	(95.4)	460	417	(90.7)	460	415	(90.2)	460	406	(88.3)
Escherichia coli (1840)	460	357	(77.6)	460	369	(80.2)	460	269	(58.5)	460	183	(39.8)

2011	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (2640)	1320	603	(45.7)	1320	31	(2.3)						
Salmonella (5280)	1320	158	(12.0)	1320	162	(12.3)	1320	9	(0.7)	1320	28	(2.1)
Enterococcus (1920)	480	433	(90.2)	480	435	(90.6)	480	423	(88.1)	480	383	(79.8)
Escherichia coli (1920)	480	341	(71.0)	480	368	(76.7)	480	215	(44.8)	480	146	(30.4)

2012	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
Bacterium (A)	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Campylobacter (2595)	1300	617	(47.5)	1295	7	(0.5)						
Salmonella (5195)	1300	229	(17.6)	1295	91	(7.0)	1300	13	(1.0)	1300	12	(0.9)
Enterococcus (1916)	480	456	(95.0)	476	460	(96.6)	480	453	(94.4)	480	416	(86.7)
Escherichia coli (1916)	480	386	(80.4)	476	391	(82.1)	480	271	(56.5)	480	161	(33.5)

[1] As of 2011 retail chicken sampling may include any chicken part with skin on and bone in.

[2] Gray areas indicate not tested; A = Total number of meat sampled; N = Number of samples tested per meat type; n = Number of isolates; % = (n) Number of isolates / (N) Number of samples per meat type

Figure 1. Percent Positive Samples for *Salmonella* by Meat Type, 2002-2012

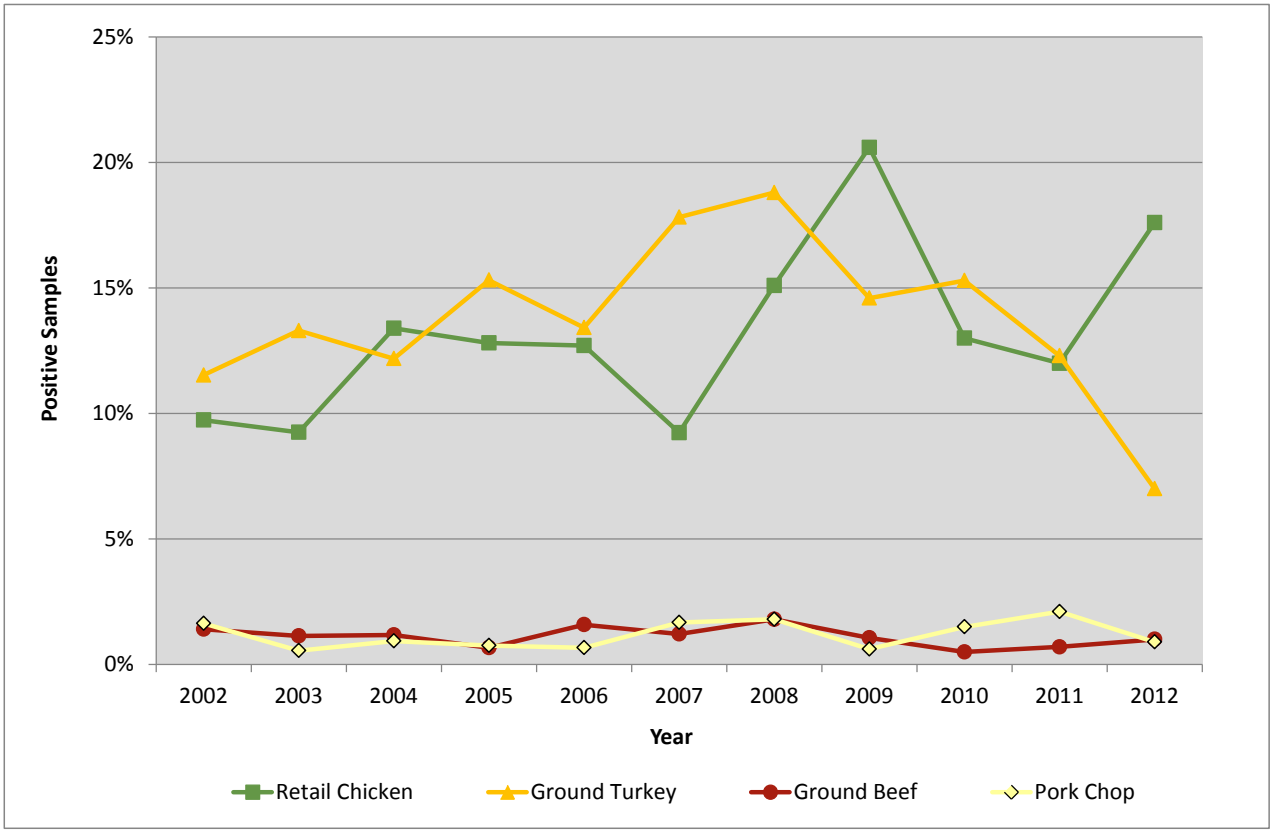
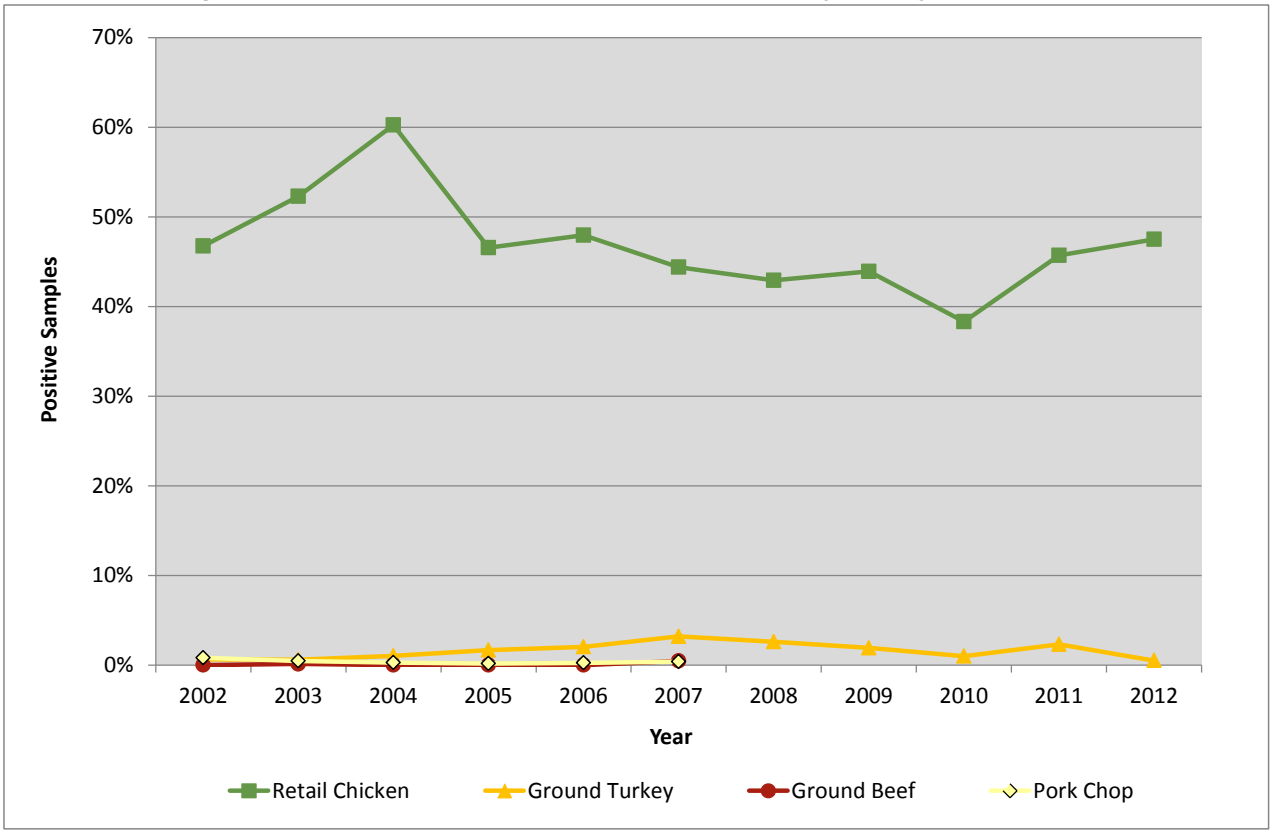


Figure 2. Percent Positive Samples for *Campylobacter* by Meat Type, 2002-2012[1]



[1] Due to low isolation, Ground Beef and Pork Chop were no longer tested for *Campylobacter* after 2007.

Table 7. Distribution of *Salmonella* Serotype among Meat Types, 2012

Serotype (N)[1]	Retail Chicken		Ground Turkey		Ground Beef		Pork Chop	
	n[2]	%[3]	n	%	n	%	n	%
1. Typhimurium (104)	88	84.6%	9	8.6%	1	1.0%	6	5.8%
2. Kentucky (65)	62	95.4%	1	1.5%	1	1.5%	1	1.5%
3. Enteritidis (30)	26	86.7%	4	13.3%				
4. Heidelberg (23)	17	73.9%	5	21.7%			1	4.3%
5. IIIa 18:z4,z23:- (16)			16	100.0%				
6. Thompson (11)	11	100.0%						
7. Saintpaul (9)			9	100.0%				
8. Agona (8)			7	87.5%	1	12.5%		
9. Hadar (8)			8	100.0%				
10. Infantis (8)	3	37.5%	3	37.5%	1	12.5%	1	12.5%
11. Schwarzengrund (8)	1	12.5%	7	87.5%				
12. I 4,5,12:i:- (6)	6	100.0%						
13. Montevideo (6)	4	66.7%	1	16.7%	1	16.7%		
14. Reading (5)			4	80.0%			1	20.0%
15. Anatum (4)	1	25.0%	2	50.0%	1	25.0%		
16. Dublin (4)					4	100.0%		
17. Mbandaka (4)	4	100.0%						
18. Newport (4)	1	25.0%	2	50.0%	1	25.0%		
19. Senftenberg (3)	1	33.3%	2	66.7%				
20. Albany (2)			2	100.0%				
21. Braenderup (2)	2	100.0%						
22. Brandenburg (2)			2	100.0%				
23. Cerro (2)					2	100.0%		
24. Derby (2)			1	100.0%			1	100.0%
25. Gaminara (2)	1	100.0%	1	50.0%				
26. Berta (1)			1	50.0%				
27. I 4,12:d:- (1)			1	100.0%				
28. I 9,12:nonmotile (1)	1	100.0%						
29. Javiana (1)			1	100.0%				
30. London (1)							1	100.0%
31. Muenchen (1)			1	100.0%				
32. Worthington (1)			1	100.0%				
Total (345)	**229**	**66.4%**	**91**	**26.4%**	**13**	**3.8%**	**12**	**3.5%**

[1] N = Total number of *Salmonella* isolates for a particular serotype

[2] n = number of # of isolates with a given serotype per meat

[3] % = (n) # of isolates per serotype per meat / (N) total # of isolates per serotype

Table 8. Resistance to Antimicrobials in *Salmonella* Isolates by Meat Type, 2002-2012[1]

Meat Type	Year (N)	Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetra-cyclines
		GEN (MIC ≥ 16)	KAN (MIC ≥ 64)	STR (MIC ≥ 64)	AMC (MIC ≥ 32)	TIO (MIC ≥ 32)	AXO (MIC ≥ 4)	FOX (MIC ≥ 32)	FIS[2] (MIC ≥	COT (MIC ≥ 4)	AZI[3] (MIC > 16)	AMP (MIC ≥ 32)	CHL (MIC ≥ 512)	CIP (MIC ≥ 1)	NAL (MIC ≥ 32)	TET (MIC ≥ 16)
Retail Chicken	2002 (60)	10.0%	6.7%	28.3%	10.0%	10.0%	10.0%	10.0%	16.7%	–		16.7%	–	–	–	33.3%
	2003 (83)	6.0%	4.8%	26.5%	25.3%	25.3%	26.5%	25.3%	14.5%	–		33.7%	2.4%	–	1.2%	27.7%
	2004 (157)	3.8%	11.5%	28.0%	24.8%	24.8%	24.8%	24.8%	28.7%	–		30.6%	1.9%	–	–	46.5%
	2005 (153)	3.3%	4.6%	30.1%	21.6%	20.9%	21.6%	20.9%	17.0%	–		26.8%	0.7%	–	0.7%	43.8%
	2006 (152)	9.2%	9.9%	36.2%	19.1%	19.1%	19.1%	18.4%	23.0%	1.3%		22.4%	2.6%	–	0.7%	46.7%
	2007 (99)	6.1%	5.1%	30.3%	16.2%	16.2%	16.2%	15.2%	25.3%	–		18.2%	1.0%	–	–	41.4%
	2008 (198)	7.1%	10.6%	23.7%	22.2%	22.2%	22.2%	21.2%	38.9%	–		28.3%	0.5%	–	–	46.5%
	2009 (272)	3.3%	15.4%	23.2%	37.5%	37.1%	37.9%	33.1%	48.2%	0.4%		45.6%	–	–	0.4%	60.3%
	2010 (171)	5.8%	8.2%	25.1%	33.3%	33.3%	34.5%	28.7%	44.4%	–		38.0%	2.3%	–	–	56.7%
	2011 (158)	3.8%	11.4%	38.6%	33.5%	34.2%	33.5%	25.9%	44.9%	1.3%	0.6%	40.5%	0.6%	–	–	65.8%
	2012 (229)	5.2%	4.8%	30.6%	27.9%	27.5%	27.9%	22.7%	37.1%	–	–	29.3%	–	–	–	48.5%
	P-value[4]	0.3340	0.9637	0.7085	0.0038	0.0041	0.0039	0.4466	<0.0001	0.5537	N/A	0.0331	0.0940	N/A	0.1833	<0.0001
Ground Turkey	2002 (74)	14.9%	18.9%	37.8%	12.2%	8.1%	8.1%	8.1%	20.3%	1.4%		16.2%	1.4%	2.7%	8.1%	55.4%
	2003 (114)	22.8%	27.2%	45.6%	11.4%	2.6%	2.6%	2.6%	33.3%	–		28.9%	0.9%	–	4.4%	39.5%
	2004 (142)	20.4%	18.3%	34.5%	7.7%	4.9%	5.6%	4.9%	28.2%	–		20.4%	2.8%	–	–	56.3%
	2005 (183)	26.8%	20.2%	44.3%	8.7%	7.1%	7.1%	7.1%	34.4%	0.5%		26.8%	0.5%	–	1.1%	39.9%
	2006 (159)	28.9%	15.1%	40.9%	5.0%	5.0%	5.0%	5.0%	32.1%	–		25.8%	0.6%	–	–	56.0%
	2007 (190)	24.7%	23.7%	45.8%	5.3%	5.3%	5.8%	5.3%	34.7%	0.5%		42.6%	1.6%	–	2.6%	67.4%
	2008 (246)	27.6%	17.9%	58.5%	5.7%	4.9%	4.9%	4.9%	27.6%	0.4%		51.2%	1.6%	–	0.4%	66.3%
	2009 (193)	18.7%	6.7%	28.0%	5.7%	5.7%	5.7%	5.7%	20.2%	1.6%		58.0%	1.6%	–	–	64.8%
	2010 (202)	16.3%	15.3%	31.7%	16.3%	15.8%	16.3%	15.3%	24.8%	–		48.0%	2.5%	–	0.5%	54.0%
	2011 (162)	32.1%	14.8%	56.5%	21.0%	20.4%	22.4%	17.9%	26.5%	3.7%	–	58.0%	3.7%	–	–	64.8%
	2012 (91)	26.4%	13.2%	44.0%	17.6%	16.5%	17.6%	15.4%	27.5%	–	–	40.7%	3.3%	–	–	45.1%
	P-value	0.4158	0.0003	0.4164	0.0021	<0.0001	<0.0001	<0.0001	0.0995	0.0562	N/A	<0.0001	0.3434	N/A	<0.0001	0.0004
Ground Beef	2002 (9)	–	–	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	–		22.2%	22.2%	–	–	22.2%
	2003 (10)	–	–	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	–		40.0%	40.0%	–	–	40.0%
	2004 (14)	–	–	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	7.1%		21.4%	14.3%	–	–	14.3%
	2005 (8)	25.0%	25.0%	25.0%	–	–	–	–	25.0%	–		25.0%	12.5%	–	–	12.5%
	2006 (19)	–	5.3%	10.5%	–	–	–	–	10.5%	–		10.5%	5.3%	–	–	21.1%
	2007 (13)	7.7%	–	–	–	–	–	–	7.7%	–		–	–	–	–	–
	2008 (24)	8.3%	8.3%	20.8%	8.3%	8.3%	8.3%	8.3%	20.8%	–		12.5%	12.5%	–	–	20.8%
	2009 (14)	14.3%	14.3%	28.6%	14.3%	14.3%	14.3%	14.3%	35.7%	–		28.6%	21.4%	–	14.3%	42.9%
	2010 (7)	–	14.3%	42.9%	28.6%	28.6%	28.6%	28.6%	42.9%	–		28.6%	42.9%	–	–	42.9%
	2011 (9)	–	11.1%	33.3%	11.1%	11.1%	11.1%	–	–	–	–	11.1%	–	–	–	44.4%
	2012 (13)	–	23.1%	23.1%	15.4%	15.4%	15.4%	15.4%	23.1%	–	–	23.1%	23.1%	–	–	23.1%
	P-value	0.9810	0.0327	0.5479	0.5570	0.5570	0.5570	0.3381	0.9093	N/A	N/A	0.5895	0.8605	N/A	N/A	0.2773
Pork Chop	2002 (10)	30.0%	10.0%	70.0%	20.0%	20.0%	20.0%	20.0%	70.0%	20.0%		40.0%	40.0%	–	–	70.0%
	2003 (5)	–	–	40.0%	20.0%	20.0%	20.0%	20.0%	40.0%	–		40.0%	40.0%	–	–	80.0%
	2004 (11)	–	9.1%	27.3%	–	–	–	–	18.2%	–		9.1%	18.2%	–	–	54.5%
	2005 (9)	–	–	33.3%	–	–	–	–	33.3%	11.1%		22.2%	22.2%	–	–	55.6%
	2006 (8)	50.0%	25.0%	25.0%	–	–	–	–	75.0%	50.0%		25.0%	–	–	–	25.0%
	2007 (18)	5.6%	5.6%	16.7%	–	–	–	–	16.7%	5.6%		5.6%	–	–	–	50.0%
	2008 (23)	13.0%	–	13.0%	–	–	–	–	30.4%	–		13.0%	–	–	–	34.8%
	2009 (8)	–	12.5%	37.5%	25.0%	25.0%	25.0%	25.0%	37.5%	25.0%		37.5%	12.5%	–	–	37.5%
	2010 (20)	10.0%	10.0%	45.0%	–	–	–	–	50.0%	–		15.0%	15.0%	–	–	45.0%
	2011 (28)	3.6%	7.1%	57.1%	3.6%	7.1%	7.1%	10.7%	25.0%	–	–	46.4%	17.9%	–	–	39.3%
	2012 (12)	8.3%	–	41.7%	–	–	–	–	33.3%	–	–	16.7%	–	–	–	41.7%
	P-value	0.3114	0.7173	0.4515	0.2478	0.3995	0.3995	0.5923	0.2417	0.0527	N/A	0.4899	0.0458	N/A	N/A	0.1338

[1] Dashes indicate 0.0% resistance to antimicrobial. Where % resistance = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type).

[2] Sulfisoxazole replaced Sulfamethoxazole on NARMS panel in 2004

[3] Data for Azithromycin available beginning in 2011

[4] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

Figure 3. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Retail Chicken and Ground Turkey, 2002-2012

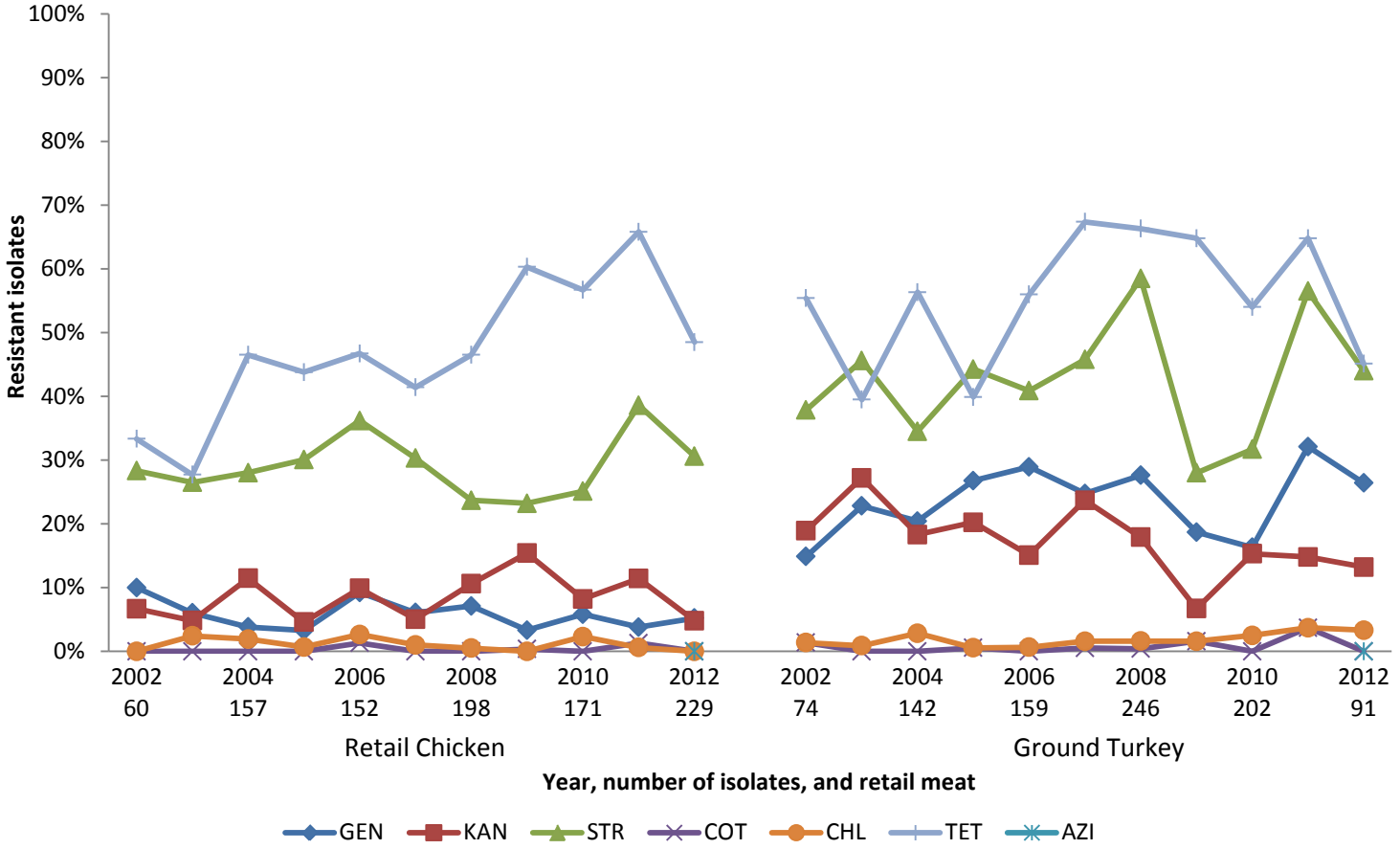


Figure 4. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Ground Beef and Pork Chop, 2002-2012

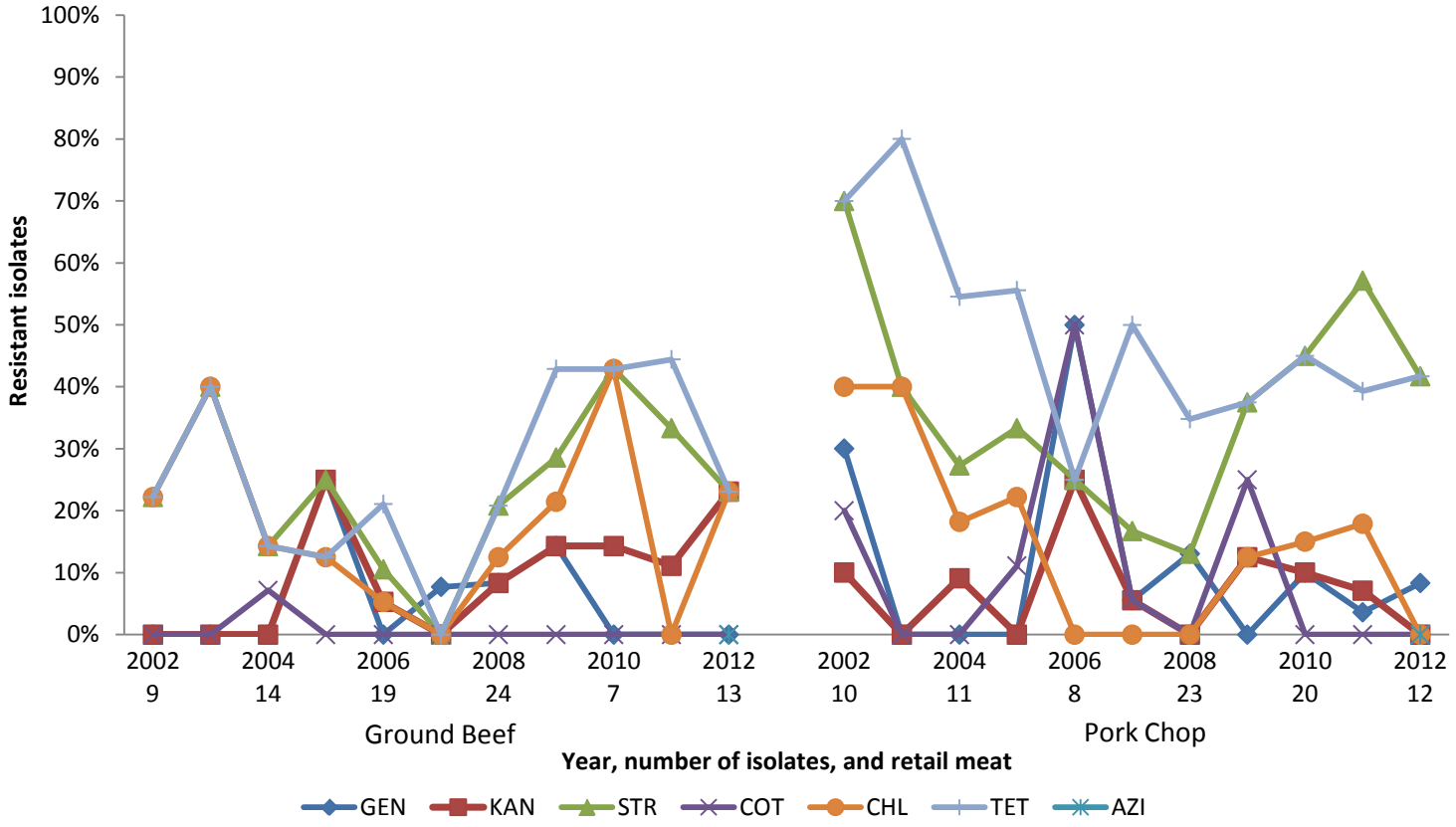


Figure 5. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Retail Chicken and Ground Turkey, 2002-2012

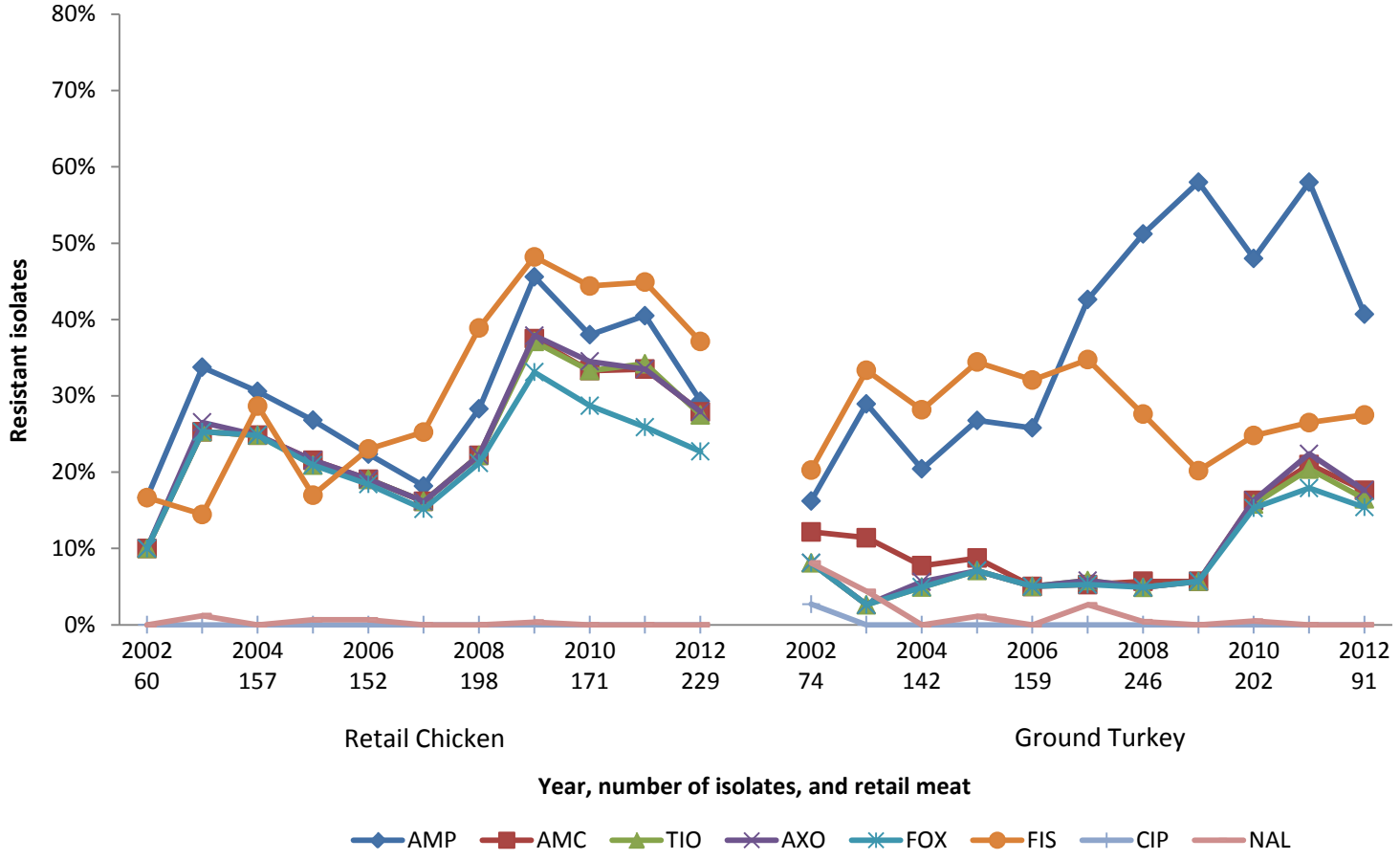


Figure 6. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Ground Beef and Pork Chop, 2002-2012

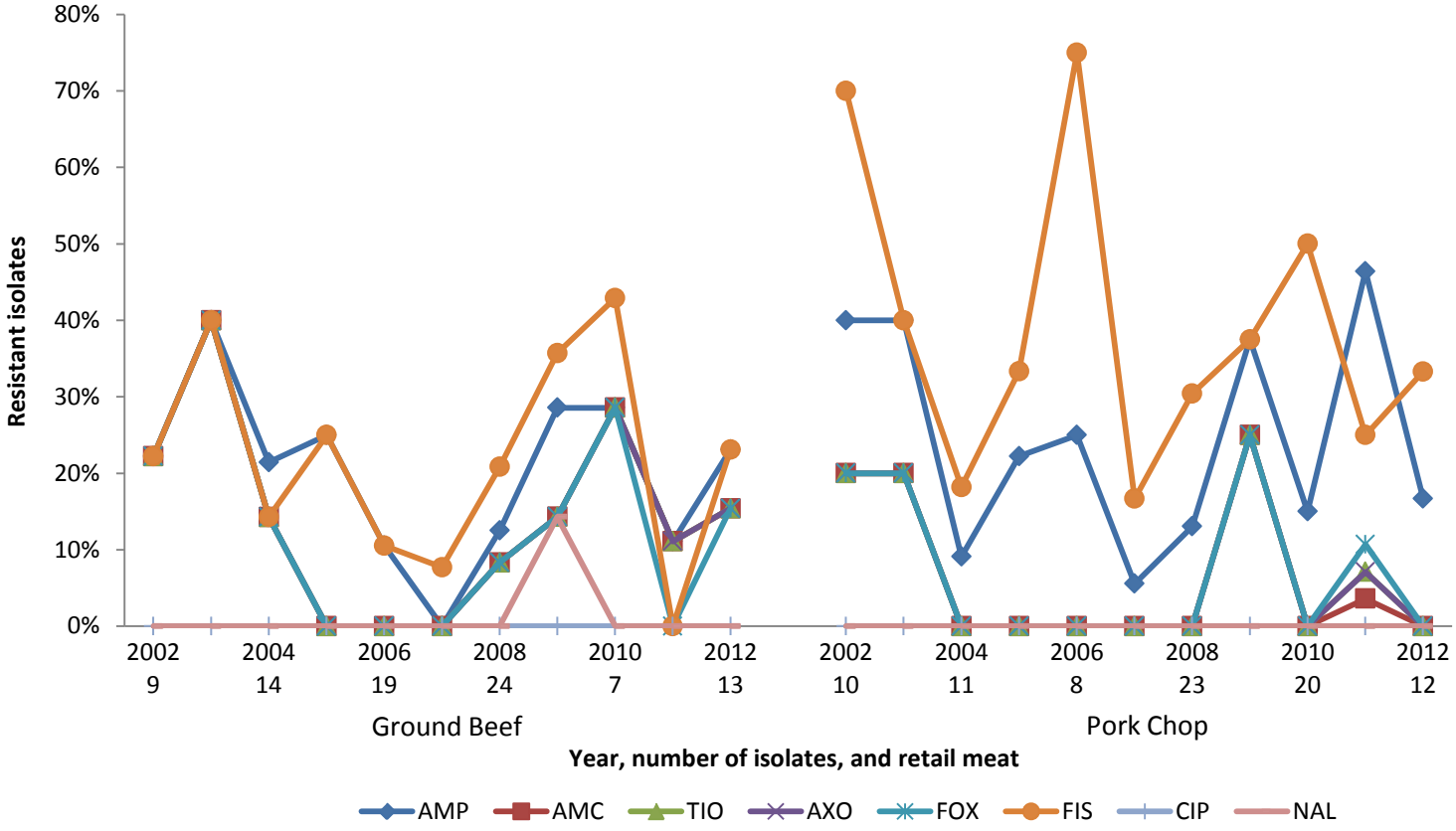


Table 9. Distribution of Resistant *Salmonella* Isolates by Meat Type and Serotype, 2012

Source	Serotype	No. of Isolates	% of Isolates	Number of Antimicrobial Classes in Resistance Pattern						Number of Resistant Isolates by Antimicrobial Agent and Class												
				0	1	2-3	4-5	6-7	8-9	Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combination	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetracyclines
				Number of Isolates						GEN	KAN	STR	AMC	FOX	TIO	AXO	FIS	COT	AZI	AMP	CHL	CIP	NAL	TET
Retail Chicken	Typhimurium	88	38.4%	8	1	30	37	12		6	9	15	49	30	49	49	79			50				78
	Kentucky	62	27.1%	7	23	18	13	1		4		54	13	10	12	13	3			14				25
	Enteritidis	26	11.4%	26																				
	Heidelberg	17	7.4%	17																				
	Thompson	11	4.8%	11																				
	I 4,5,12:i:-	6	2.6%	3	1			2			2		2	2	2	2	2			2				3
	Mbandaka	4	1.7%	1	2	1				1		1					1							3
	Montevideo	4	1.7%	4																				
	Infantis	3	1.3%	3																				
	Braenderup	2	0.9%	1	1																			1
	Anatum	1	0.4%			1				1		1								1				1
	Gaminara	1	0.4%	1																				
	I 9,12:nonmotile	1	0.4%	1																				
	Newport	1	0.4%	1																				
	Other	2	0.9%	1	1							1												
	Total	229	100.0%	85	29	50	50	15	0	12	11	72	64	42	63	64	85	0	0	67	0	0	0	111
Ground Turkey	IIIa 18:z4,z23:-	16	17.6%	16																				
	Saintpaul	9	9.9%	1		8				4		4	1	1	1	1	1			8				6
	Typhimurium	9	9.9%	4		1	2	2		1	1	5	2	1	2	2	5			4				4
	Hadar	8	8.8%			6	2			3		8					3			2				7
	Agona	7	7.7%			6		1		5	1	5	2	2	2	2	6			3				1
	Schwarzengrund	7	7.7%	2	1	2	2				2	2	2	2	2	2				2				3
	Heidelberg	5	5.5%			4	1			5		4					1			5				5
	Enteritidis	4	4.4%	3		1						1												1
	Reading	4	4.4%	3		1					1	1								1				1
	Infantis	3	3.3%					3		3	3	3	3	3	3	3	3			3	3			3
	Albany	2	2.2%			2							2	2	2	2				2				
	Anatum	2	2.2%			2				2		2								2				2
	Brandenburg	2	2.2%	1		1					1	1					1							1
	Newport	2	2.2%	1				1		1	1	1	1	1	1	1	1			1				1
	Senftenberg	2	2.2%			2					1	1					1			1				1
	Berta	1	1.1%				1				1		1	1	1	1				1				
	Derby	1	1.1%		1																			1
	Gaminara	1	1.1%	1																				
	I 4,12:d:-	1	1.1%		1																			1
	Other	5	5.5%			5						2	2	1	1	2	3			2				3
	Total	91	100.0%	32	3	41	8	7	0	24	12	40	16	14	15	16	25	0	0	37	3	0	0	41
Ground Beef	Dublin	4	30.8%	1			1	2			2	3	2	2	2	2	3			3	3			3
	Cerro	2	15.4%	2																				
	Agona	1	7.7%		1						1													
	Other	6	46.2%	6																				
	Total	13	100.0%	9	1	0	1	2	0	0	3	3	2	2	2	2	3	0	0	3	3	0	0	3
Pork Chop	Typhimurium	6	50.0%	3		2	1					3					3			1				1
	Derby	1	8.3%			1						1					1							1
	Heidelberg	1	8.3%			1				1										1				1
	Other	4	33.3%	1	3							1												2
	Total	12	100.0%	4	3	4	1	0	0	1	0	5	0	0	0	0	4	0	0	2	0	0	0	5

Table 10. Multidrug Resistance Patterns among *Salmonella* Isolates, 2002-2012[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of Isolates Tested by Source	Retail Chicken	60	83	157	153	152	99	198	272	171	158	229
	Ground Turkey	74	114	142	183	159	190	246	193	202	162	91
	Ground Beef	9	10	14	8	19	13	24	14	7	9	13
	Pork Chop	10	5	11	9	8	18	23	8	20	28	12
Resistance Pattern	**Isolate Source**											
1. At Least ACSSuT[2] Resistant	**Retail Chicken**	–	2.4% 2	1.9% 3	0.7% 1	2.6% 4	–	0.5% 1	–	1.8% 3	–	–
	Ground Turkey	1.4% 1	0.9% 1	2.8% 4	0.5% 1	0.6% 1	1.6% 3	1.6% 4	0.5% 1	2.5% 5	3.1% 5	3.3% 3
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	–	12.5% 3	14.3% 2	28.6% 2	–	23.1% 3
	Pork Chop	40.0% 4	40.0% 2	9.1% 1	22.2% 2	–	–	–	12.5% 1	5.0% 1	10.7% 3	–
2. At Least ACT/S[3] Resistant	**Retail Chicken**	–	–	–	–	–	–	–	–	–	–	–
	Ground Turkey	1.4% 1	–	–	–	–	–	–	–	–	2.5% 4	–
	Ground Beef	–	–	7.1% 1	–	–	–	–	–	–	–	–
	Pork Chop	20.0% 2	–	–	11.1% 1	–	–	–	12.5% 1	–	–	–
3. At Least ACSSuTAuCx[4] Resistant	**Retail Chicken**	–	–	1.9% 3	–	2.6% 4	–	–	–	0.6% 1	–	–
	Ground Turkey	1.4% 1	0.9% 1	2.1% 3	0.5% 1	–	1.1% 2	1.2% 3	0.5% 1	2.0% 4	3.1% 5	3.3% 3
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	–	–	–	8.3% 2	14.3% 2	28.6% 2	–	15.4% 2
	Pork Chop	20.0% 2	20.0% 1	–	–	–	–	–	–	–	3.6% 1	–
4. At Least Ceftriaxone and Nalidixic Acid Resistant	**Retail Chicken**	–	–	–	0.7% 1	–	–	–	–	–	–	–
	Ground Turkey	–	0.9% 1	–	–	–	0.5% 1	–	–	0.5% 1	–	–
	Ground Beef	–	–	–	–	–	–	–	14.3% 2	–	–	–
	Pork Chop	–	–	–	–	–	–	–	–	–	–	–

[1] Dashes indicate 0.0% resistance

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

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

[4] ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone

Table 11. Multidrug Resistance among *Salmonella* Isolates by Antimicrobial Class, 2002-2012[1,2]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of Isolates Tested by Source	Retail Chicken	60	83	157	153	152	99	198	272	171	158	229
	Ground Turkey	74	114	142	183	159	190	246	193	202	162	91
	Ground Beef	9	10	14	8	19	13	24	14	7	9	13
	Pork Chop	10	5	11	9	8	18	23	8	20	28	12
Resistance Pattern	**Isolate Source**											
1. No Resistance Detected	Retail Chicken	51.7% 31	45.8% 38	40.1% 63	46.4% 71	38.8% 59	47.5% 47	46.0% 91	29.0% 79	36.3% 62	25.9% 41	37.1% 85
	Ground Turkey	37.8% 28	34.2% 39	28.9% 41	30.1% 55	17.6% 28	15.3% 29	20.7% 51	22.3% 43	31.7% 64	22.2% 36	35.2% 32
	Ground Beef	77.8% 7	60.0% 6	78.6% 11	75.0% 6	73.7% 14	92.3% 12	79.2% 19	57.1% 8	57.1% 4	55.6% 5	69.2% 9
	Pork Chop	20.0% 2	20.0% 1	45.5% 5	44.4% 4	25.0% 2	44.4% 8	65.2% 15	50.0% 4	35.0% 7	25.0% 7	33.3% 4
2. Resistant to ≥ 3 Antimicrobial Classes	Retail Chicken	20.0% 12	30.1% 25	34.4% 54	25.5% 39	24.3% 37	25.3% 25	37.4% 74	48.5% 132	41.5% 71	44.9% 71	33.2% 76
	Ground Turkey	20.3% 15	28.9% 33	26.1% 37	29.0% 53	24.5% 39	42.6% 81	51.6% 127	26.4% 51	33.2% 67	50.0% 81	39.6% 36
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	25.0% 2	10.5% 2	–	20.8% 5	35.7% 5	42.9% 3	11.1% 1	23.1% 3
	Pork Chop	60.0% 6	40.0% 2	18.2% 2	22.2% 2	25.0% 2	5.6% 1	17.4% 4	50.0% 4	50.0% 10	28.6% 8	25.0% 3
3. Resistant to ≥ 4 Antimicrobial Classes	Retail Chicken	3.3% 2	16.9% 14	24.2% 38	18.3% 28	15.1% 23	13.1% 13	22.7% 45	34.6% 94	32.7% 56	32.9% 52	28.4% 65
	Ground Turkey	13.5% 10	14.9% 17	12.7% 18	7.7% 14	8.2% 13	14.7% 28	15.4% 38	12.4% 24	17.8% 36	24.7% 40	16.5% 15
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	–	12.5% 3	35.7% 5	42.9% 3	11.1% 1	23.1% 3
	Pork Chop	40.0% 4	40.0% 2	18.2% 2	22.2% 2	25.0% 2	5.6% 1	13.0% 3	25.0% 2	5.0% 1	14.3% 4	8.3% 1
4. Resistant to ≥ 5 Antimicrobial Classes	Retail Chicken	3.3% 2	12.0% 10	22.3% 35	17.6% 27	14.5% 22	12.1% 12	18.7% 37	31.6% 86	30.4% 52	27.8% 44	24.5% 56
	Ground Turkey	10.8% 8	4.4% 5	4.9% 7	2.7% 5	3.1% 5	3.2% 6	3.3% 8	3.6% 7	11.4% 23	19.1% 31	7.7% 7
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	12.5% 1	5.3% 1	–	12.5% 3	14.3% 2	28.6% 2	11.1% 1	23.1% 3
	Pork Chop	40.0% 4	40.0% 2	9.1% 1	22.2% 2	–	–	–	25.0% 2	5.0% 1	10.7% 3	0.0% 0
5. Resistant to ≥ 6 Antimicrobial Classes	Retail Chicken	–	4.8% 4	5.7% 9	3.9% 6	5.9% 9	4.0% 4	4.0% 8	11.4% 31	10.5% 18	13.3% 21	6.6% 15
	Ground Turkey	10.8% 8	0.9% 1	2.8% 4	2.2% 4	1.9% 3	2.1% 4	2.0% 5	2.6% 5	7.9% 16	13.0% 21	7.7% 7
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	–	–	–	8.3% 2	14.3% 2	28.6% 2	–	15.4% 2
	Pork Chop	20.0% 2	20.0% 1	–	–	–	–	–	12.5% 1	–	3.6% 1	–

[1] Dashes indicate 0.0% resistance.

[2] NARMS Retail Meat Reports 2002-2010 included amikacin in the multidrug resistance patterns. Begining in 2011, multidrug resistance patterns contain azithromycin. Because resistance to azithromycin and amikacin are less than 1%, the multidrug resistance patterns are comparable across years.

Table 12.1 MIC Distribution among *Salmonella* from Retail Chicken, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (60)	0.0	**10.0**	[3.8 - 20.5]					36.7	48.3	5.0				**1.7**	**8.3**					
	2003 (83)	1.2	**6.0**	[2.0 - 13.5]					33.7	54.2	4.8			1.2	**2.4**	**3.6**					
	2004 (157)	0.6	**3.8**	[1.4 - 8.1]					46.5	45.2	3.8			0.6	**1.9**	**1.9**					
	2005 (153)	0.0	**3.3**	[1.1 - 7.5]					64.7	30.1	2.0				**0.7**	**2.6**					
	2006 (152)	1.3	**9.2**	[5.1 - 15.0]					42.1	46.1	1.3			1.3		**9.2**					
	2007 (99)	1.0	**6.1**	[2.3 - 12.7]					52.5	35.4	4.0	1.0		1.0	**2.0**	**4.0**					
	2008 (198)	0.0	**7.1**	[3.9 - 11.6]					28.3	56.6	8.1					**7.1**					
	2009 (272)	0.7	**3.3**	[1.5 - 6.2]					52.6	39.7	3.3		0.4	0.7	**1.5**	**1.8**					
	2010 (171)	0.0	**5.8**	[2.8 - 10.5]					71.3	21.6	0.6				**1.7**	**4.1**					
	2011 (158)	1.3	**3.8**	[1.4 - 8.1]					25.3	64.6	4.4	0.6		1.3	**0.6**	**3.2**					
	2012 (229)	0.0	**5.2**	[2.7 - 9.0]					24.9	62.9	6.6	0.4			**2.2**	**3.1**					
Kanamycin	2002 (60)	0.0	**6.7**	[1.8 - 16.2]										91.7	1.7			**6.7**			
	2003 (83)	1.2	**4.8**	[1.3 - 11.9]										94.0		1.2		**4.8**			
	2004 (157)	0.6	**11.5**	[6.9 - 17.5]										84.7	3.2	0.6		**11.5**			
	2005 (153)	0.0	**4.6**	[1.9 - 9.2]										95.4				**4.6**			
	2006 (152)	0.0	**9.9**	[5.6 - 15.8]										88.8	1.3			**9.9**			
	2007 (99)	0.0	**5.1**	[1.7 - 11.4]										91.9	3.0			**5.1**			
	2008 (198)	0.5	**10.6**	[6.7 - 15.8]										86.9	2.0	0.5	**0.5**	**10.1**			
	2009 (272)	0.0	**15.4**	[11.4 - 20.3]										84.2	0.4			**15.4**			
	2010 (171)	0.0	**8.2**	[4.5 - 13.4]										91.8				**8.2**			
	2011 (158)	0.0	**11.4**	[6.9 - 17.4]										88.6				**11.4**			
	2012 (229)	0.0	**4.8**	[2.4 - 8.4]										94.8	0.4			**4.8**			
Streptomycin	2002 (60)	N/A	**28.3**	[17.5 - 41.4]												71.7	**10.0**	**18.3**			
	2003 (83)	N/A	**26.5**	[17.4 - 37.3]												73.5	**14.5**	**12.0**			
	2004 (157)	N/A	**28.0**	[21.2 - 35.7]												72.0	**16.6**	**11.5**			
	2005 (153)	N/A	**30.1**	[22.9 - 38.0]												69.9	**21.6**	**8.5**			
	2006 (152)	N/A	**36.2**	[28.6 - 44.4]												63.8	**23.0**	**13.2**			
	2007 (99)	N/A	**30.3**	[21.5 - 40.4]												69.7	**21.2**	**9.1**			
	2008 (198)	N/A	**23.7**	[18.0 - 30.3]												76.3	**9.6**	**14.1**			
	2009 (272)	N/A	**23.2**	[18.3 - 28.6]												76.8	**15.8**	**7.4**			
	2010 (171)	N/A	**25.1**	[18.8 - 32.3]												74.9	**16.4**	**8.8**			
	2011 (158)	N/A	**38.6**	[31.0 - 46.7]												61.4	**17.1**	**21.5**			
	2012 (229)	N/A	**31.4**	[25.5 - 37.9]												69.4	**12.2**	**18.3**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (60)	1.7	**10.0**	[3.8 - 20.5]							76.7	6.7		5.0	1.7		**10.0**				
	2003 (83)	6.0	**25.3**	[16.4 - 36.0]							65.1	1.2		2.4	6.0		**25.3**				
	2004 (157)	1.3	**24.8**	[18.3 - 32.4]							61.8	7.6		4.5	1.3		**24.8**				
	2005 (153)	3.9	**21.6**	[15.3 - 28.9]							70.6	2.0		2.0	3.9	**2.0**	**19.6**				
	2006 (152)	0.7	**19.1**	[13.2 - 26.2]							75.7	1.3	0.7	2.6	0.7	**0.7**	**18.4**				
	2007 (99)	1.0	**16.2**	[9.5 - 24.9]							77.8	3.0	1.0	1.0	1.0	**1.0**	**15.2**				
	2008 (198)	3.0	**22.2**	[16.6 - 28.7]							66.7	5.1		3.0	3.0	**1.5**	**20.7**				
	2009 (272)	3.7	**37.5**	[31.7 - 43.5]							50.4	3.7	0.4	4.4	3.7	**6.6**	**30.9**				
	2010 (171)	2.3	**33.3**	[26.3 - 40.9]							60.8	0.6	0.6	2.3	2.3	**4.1**	**29.2**				
	2011 (158)	3.2	**33.5**	[26.2 - 41.5]							55.7	2.5	1.3	3.8	3.2	**11.4**	**22.2**				
	2012 (229)	0.0	**27.9**	[22.2 - 34.2]							68.6	2.2	0.4	0.9		**7.9**	**20.1**				
Cephems																					
Ceftiofur	2002 (60)	0.0	**10.0**	[3.8 - 20.5]					1.7	71.7	16.7	0.0			**10.0**						
	2003 (83)	0.0	**25.3**	[16.4 - 36.0]						51.8	21.7	1.2			**25.3**						
	2004 (157)	0.0	**24.8**	[18.3 - 32.4]					0.6	47.1	27.4				**24.8**						
	2005 (153)	0.0	**20.9**	[14.8 - 28.2]					2.6	61.4	15.0	0.0			**20.9**						
	2006 (152)	0.0	**19.1**	[13.2 - 26.2]						17.8	62.5	0.7		**0.7**	**18.4**						
	2007 (99)	0.0	**16.2**	[9.5 - 24.9]						22.2	58.6	3.0		**1.0**	**15.2**						
	2008 (198)	0.0	**22.2**	[16.6 - 28.7]						11.6	64.8	1.0		**1.5**	**21.1**						
	2009 (272)	0.4	**37.1**	[31.4 - 43.2]						14.3	46.3	1.8	0.4	**9.9**	**27.2**						
	2010 (171)	0.0	**33.3**	[26.3 - 40.9]					0.6	21.1	43.9	1.2		**8.2**	**25.2**						
	2011 (158)	0.0	**34.2**	[26.8 - 42.1]						19.6	43.0	3.2		**10.1**	**24.1**						
	2012 (229)	0.4	**27.5**	[21.8 - 33.8]						37.1	34.1	0.9	0.4	**10.5**	**17.0**						
Ceftriaxone	2002 (60)	0.0	**10.0**	[3.8 - 20.5]					90.0					**5.0**	**3.3**	**1.7**					
	2003 (83)	0.0	**26.5**	[17.4 - 37.3]					73.5				**1.2**	**1.2**	**16.9**	**7.2**					
	2004 (157)	0.0	**24.8**	[18.3 - 32.4]					75.2					**1.9**	**18.5**	**4.5**					
	2005 (153)	0.0	**21.6**	[15.3 - 28.9]					77.8	0.7				**2.0**	**17.0**	**2.6**					
	2006 (152)	0.0	**19.1**	[13.2 - 26.2]					80.9				**0.7**	**0.7**	**13.8**	**3.3**	**0.7**				
	2007 (99)	0.0	**16.2**	[9.5 - 24.9]					83.8					**2.0**	**10.1**	**4.0**					
	2008 (198)	0.0	**22.2**	[16.6 - 28.7]					77.4					**3.0**	**15.1**	**4.5**					
	2009 (272)	0.0	**37.9**	[32.1 - 43.9]					62.3				**0.4**	**9.6**	**18.8**	**8.8**	**0.4**				
	2010 (171)	0.0	**34.5**	[27.4 - 42.1]					65.5				**3.5**	**9.4**	**17.5**	**3.5**	**0.6**				
	2011 (158)	1.3	**33.5**	[26.2 - 41.5]					65.2			1.3	**0.6**	**13.9**	**12.7**	**4.4**	**1.9**				
	2012 (229)	0.0	**27.9**	[22.2 - 34.2]					71.6	0.4			**1.3**	**9.6**	**13.1**	**3.5**	**0.4**				
Cefoxitin	2002 (60)	0.0	**10.0**	[3.8 - 20.5]							1.7	61.7	20.0	6.7		**10.0**					
	2003 (83)	0.0	**25.3**	[16.4 - 36.0]								60.2	13.3	1.2		**25.3**					
	2004 (157)	0.0	**24.8**	[18.3 - 32.4]							2.5	56.7	14.6	1.3		**5.7**	**19.1**				
	2005 (153)	0.7	**20.9**	[14.8 - 28.2]							25.5	48.4	4.6	0.0	0.7	**11.1**	**9.8**				
	2006 (152)	0.7	**18.4**	[12.6 - 25.5]								58.6	21.1	1.3	0.7	**6.6**	**11.8**				
	2007 (99)	2.0	**15.2**	[8.7 - 23.8]							3.0	55.6	22.2	2.0	2.0	**3.0**	**12.1**				
	2008 (198)	1.0	**21.2**	[15.7 - 27.6]							2.5	53.0	21.7	0.5	1.0	**6.6**	**14.6**				
	2009 (272)	4.8	**33.1**	[27.5 - 39.0]							0.7	42.6	16.2	2.6	4.8	**16.5**	**16.5**				
	2010 (171)	5.3	**28.7**	[22.0 - 36.1]							10.5	42.1	12.9	0.6	5.3	**15.8**	**12.9**				
	2011 (158)	8.9	**25.9**	[19.3 - 33.5]							0.6	43.0	20.3	1.3	8.9	**17.1**	**8.9**				
	2012 (229)	4.4	**22.7**	[17.4 - 28.7]							3.5	56.8	11.4	1.3	4.4	**14.0**	**8.7**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding. [3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 12.1 MIC Distribution among *Salmonella* from Retail Chicken, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (60)	N/A	**16.7**	[8.3 - 28.5]											38.3	31.7	13.3				**16.7**
	2003 (83)	N/A	**14.5**	[7.7 - 23.9]											32.5	33.7	15.7	3.6			**14.5**
Sulfisoxazole	2004 (157)	N/A	**28.7**	[21.7 - 36.4]											12.1	14.6	43.3	1.3		**28.7**	
	2005 (153)	N/A	**17.0**	[11.4 - 23.9]											11.1	28.1	41.8	2.0		**17.0**	
	2006 (152)	N/A	**23.0**	[16.6 - 30.5]											5.3	16.4	53.9	1.3		**23.0**	
	2007 (99)	N/A	**25.3**	[17.1 - 35.0]											13.1	20.2	31.3	10.1		**25.3**	
	2008 (198)	N/A	**38.9**	[32.1 - 46.1]											3.5	18.7	37.4	1.0	0.5	**38.9**	
	2009 (272)	N/A	**48.2**	[42.1 - 54.3]											4.4	15.4	29.4	2.2	0.4	**48.2**	
	2010 (171)	N/A	**44.4**	[36.9 - 52.2]											1.8	31.0	22.2	0.6		**44.4**	
	2011 (158)	N/A	**44.9**	[37.0 - 53.0]											16.5	17.7	20.3	0.6		**44.9**	
	2012 (229)	N/A	**37.1**	[30.8 - 43.7]											30.6	22.3	10.0			**37.1**	
Trimethoprim-	2002 (60)	N/A	**0.0**	[0.0 - 6.0]				98.3	1.7												
Sulfamethoxazole	2003 (83)	N/A	**0.0**	[0.0 - 4.3]				97.6	2.4												
	2004 (157)	N/A	**0.0**	[0.0 - 2.3]				96.8	3.2												
	2005 (153)	N/A	**0.0**	[0.0 - 2.4]				98.7	1.3												
	2006 (152)	N/A	**1.3**	[0.2 - 4.7]				94.7	3.3	0.7				**1.3**							
	2007 (99)	N/A	**0.0**	[0.0 - 3.7]				84.8	15.2												
	2008 (198)	N/A	**0.0**	[0.0 - 1.8]				90.9	6.6	2.5											
	2009 (272)	N/A	**0.4**	[0.0 - 2.0]				97.8	1.5	0.4			**0.4**								
	2010 (171)	N/A	**0.0**	[0.0 - 2.1]				99.4	0.6												
	2011 (158)	N/A	**1.3**	[0.2 - 4.5]				95.6	2.5	0.6				**1.3**							
	2012 (229)	N/A	**0.0**	[0.0 - 1.6]				99.6	0.4												
Macrolides																					
Azithromycin	2011 (158)	N/A	**0.6**	[0.0 - 3.5]								4.4	91.8	3.2		**0.6**					
	2012 (229)	N/A	**0.0**	[0.0 - 1.6]							2.2	18.3	79.5								
Penicillins																					
Ampicillin	2002 (60)	0.0	**16.7**	[8.3 - 28.5]							53.3	30.0					**16.7**				
	2003 (83)	0.0	**33.7**	[23.7 - 44.9]							43.4	22.9					**33.7**				
	2004 (157)	0.0	**30.6**	[23.5 - 38.4]							60.5	8.9					**30.6**				
	2005 (153)	0.0	**26.8**	[20.0 - 34.5]							69.3	3.3	0.7				**26.8**				
	2006 (152)	0.0	**22.4**	[16.0 - 29.8]							74.3	2.6	0.7				**22.4**				
	2007 (99)	0.0	**18.2**	[11.1 - 27.2]							68.7	12.1	1.0				**18.2**				
	2008 (198)	0.0	**28.3**	[22.1 - 35.1]							61.6	9.6	0.5				**28.3**				
	2009 (272)	0.0	**45.6**	[39.6 - 51.7]							44.9	9.2	0.4				**45.6**				
	2010 (171)	0.0	**38.0**	[30.7 - 45.7]							55.6	5.3		1.2			**38.0**				
	2011 (158)	0.0	**40.5**	[32.8 - 48.6]							50.0	8.9	0.6				**40.5**				
	2012 (229)	0.0	**29.3**	[23.5 - 35.6]							62.0	8.7					**29.3**				
Phenicols																					
Chloramphenicol	2002 (60)	0.0	**0.0**	[0.0 - 6.0]								1.7	68.3	30.0							
	2003 (83)	0.0	**2.4**	[0.3 - 8.4]									32.5	65.1			**2.4**				
	2004 (157)	0.6	**1.9**	[0.4 - 5.5]								2.5	14.6	80.3	0.6		**1.9**				
	2005 (153)	0.0	**0.7**	[0.0 - 3.6]								1.3	65.4	32.7			**0.7**				
	2006 (152)	0.7	**2.6**	[0.7 - 6.6]								0.7	32.9	63.2	0.7		**2.6**				
	2007 (99)	5.1	**1.0**	[0.0 - 5.5]									28.3	65.7	5.1	**1.0**					
	2008 (198)	0.0	**0.5**	[0.0 - 2.8]								1.0	27.8	70.7			**0.5**				
	2009 (272)	0.4	**0.0**	[0.0 - 1.3]									23.2	76.5	0.4						
	2010 (171)	0.0	**2.3**	[0.6 - 5.9]								3.5	64.3	29.8		**0.6**	**1.8**				
	2011 (158)	0.6	**0.6**	[0.0 - 3.5]								0.6	53.8	44.3	0.6	**0.6**					
	2012 (229)	0.0	**0.0**	[0.0 - 1.6]								4.4	53.7	41.9							
Quinolones																					
Ciprofloxacin	2002 (60)	0.0	**0.0**	[0.0 - 6.0]	90.0	10.0															
	2003 (83)	1.2	**0.0**	[0.0 - 4.3]	83.1	14.5	1.2		1.2												
	2004 (157)	0.0	**0.0**	[0.0 - 2.3]	96.2	3.8															
	2005 (153)	0.7	**0.0**	[0.0 - 2.4]	88.2	11.1		0.7													
	2006 (152)	0.7	**0.0**	[0.0 - 2.4]	68.4	30.9			0.7												
	2007 (99)	0.0	**0.0**	[0.0 - 3.7]	85.9	14.1															
	2008 (198)	0.0	**0.0**	[0.0 - 1.8]	81.8	17.2	1.0														
	2009 (272)	0.4	**0.0**	[0.0 - 1.3]	77.6	21.0	1.1		0.4												
	2010 (171)	0.0	**0.0**	[0.0 - 2.1]	92.4	7.6															
	2011 (158)	0.0	**0.0**	[0.0 - 2.3]	84.8	14.6	0.6														
	2012 (229)	0.0	**0.0**	[0.0 - 1.6]	86.9	13.1															
Nalidixic Acid	2002 (60)	N/A	**0.0**	[0.0 - 6.0]									68.3	31.7							
	2003 (83)	N/A	**1.2**	[0.0 - 6.5]							1.2	1.2	84.3	12.0			**1.2**				
	2004 (157)	N/A	**0.0**	[0.0 - 2.3]								12.1	82.8	5.1							
	2005 (153)	N/A	**0.7**	[0.0 - 3.6]							0.7	27.5	69.3	1.3	0.7	**0.7**					
	2006 (152)	N/A	**0.7**	[0.0 - 3.6]								25.0	71.1	3.3			**0.7**				
	2007 (99)	N/A	**0.0**	[0.0 - 3.7]								33.3	62.6	4.0							
	2008 (198)	N/A	**0.0**	[0.0 - 1.8]								26.8	69.7	3.5							
	2009 (272)	N/A	**0.4**	[0.0 - 2.0]							0.4	16.2	82.0	0.7	0.4		**0.4**				
	2010 (171)	N/A	**0.0**	[0.0 - 2.1]							2.3	46.2	50.3	1.2							
	2011 (158)	N/A	**0.0**	[0.0 - 2.3]							1.3	33.5	63.3	1.3	0.6						
	2012 (229)	N/A	**0.0**	[0.0 - 1.6]								30.1	69.0	0.9							
Tetracyclines																					
Tetracycline	2002 (60)	1.7	**33.3**	[21.7 - 46.7]									65.0	1.7			**33.3**				
	2003 (83)	0.0	**27.7**	[18.4 - 38.6]									72.3			**1.2**	**26.5**				
	2004 (157)	0.6	**46.5**	[38.5 - 54.6]									52.9	0.6			**46.5**				
	2005 (153)	0.0	**43.8**	[35.8 - 52.0]									56.2			**0.7**	**43.1**				
	2006 (152)	0.0	**46.7**	[38.6 - 55.0]									53.3			**1.3**	**45.4**				
	2007 (99)	0.0	**41.4**	[31.6 - 51.8]									58.6				**41.4**				
	2008 (198)	0.5	**46.5**	[39.4 - 53.7]									53.0	0.5	**1.5**	**0.5**	**44.4**				
	2009 (272)	0.4	**60.3**	[54.2 - 66.2]									39.3	0.4	**0.4**		**59.9**				
	2010 (171)	1.8	**56.7**	[48.9 - 64.3]									41.5	1.8	**0.6**	**1.2**	**55.0**				
	2011 (158)	0.0	**65.8**	[57.9 - 73.2]									34.2		**1.9**		**63.9**				
	2012 (229)	0.0	**48.5**	[41.8 - 55.1]									51.5		**0.4**	**1.3**	**46.7**				

Table 12.2 MIC Distribution among *Salmonella* from Ground Turkey, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (74)	2.7	**14.9**	[7.7 - 25.0]					40.5	39.2	2.7			2.7	**5.4**	**9.5**					
	2003 (114)	5.3	**22.8**	[15.5 - 31.6]					25.4	37.7	5.3	3.5		5.3	**14.9**	**7.9**					
	2004 (142)	2.8	**20.4**	[14.1 - 28.0]					33.8	37.3	4.9	0.7		2.8	**9.2**	**11.3**					
	2005 (183)	5.5	**26.8**	[20.5 - 33.8]					36.6	29.0	1.1		1.1	5.5	**14.2**	**12.6**					
	2006 (159)	1.3	**28.9**	[22.0 - 36.6]					18.9	45.3	4.4	1.3		1.3	**6.9**	**22.0**					
	2007 (190)	2.1	**24.7**	[18.8 - 31.5]					27.9	41.1	3.7	0.5		2.1	**5.8**	**18.9**					
	2008 (246)	0.4	**27.6**	[22.2 - 33.7]					8.5	50.8	11.0	1.2	0.4	0.4	**4.9**	**22.8**					
	2009 (193)	1.6	**18.7**	[13.4 - 24.9]					25.4	46.6	6.7	0.5	0.5	1.6	**2.6**	**16.1**					
	2010 (202)	2.0	**16.3**	[11.5 - 22.2]					44.1	35.6	1.0	0.5	0.5	2.0	**7.4**	**8.9**					
	2011 (162)	1.2	**32.1**	[25.0 - 39.9]					8.6	49.4	6.8	1.2	0.6	1.2	**2.5**	**29.6**					
	2012 (91)	1.1	**26.4**	[17.7 - 36.7]					9.9	44.0	18.7			1.1	**6.6**	**19.8**					
Kanamycin	2002 (74)	2.7	**18.9**	[10.7 - 29.7]										74.3	4.1	2.7	**2.7**	**16.2**			
	2003 (114)	2.6	**27.2**	[19.3 - 36.3]										70.2		2.6	**14.0**	**13.2**			
	2004 (142)	1.4	**18.3**	[12.3 - 25.7]										78.9	1.4	1.4	**7.0**	**11.3**			
	2005 (183)	0.0	**20.2**	[14.7 - 26.8]										77.6	2.2		**3.3**	**16.9**			
	2006 (159)	1.3	**15.1**	[9.9 - 21.6]										81.1	2.5	1.3	**3.1**	**11.9**			
	2007 (190)	1.6	**23.7**	[17.8 - 30.4]										69.5	5.3	1.6	**2.1**	**21.6**			
	2008 (246)	2.0	**17.9**	[13.3 - 23.3]										72.8	7.3	2.0	**0.4**	**17.5**			
	2009 (193)	0.0	**6.7**	[3.6 - 11.2]										91.7	1.6			**6.7**			
	2010 (202)	0.5	**15.3**	[10.7 - 21.1]										84.2		0.5	**0.5**	**14.9**			
	2011 (162)	0.6	**14.8**	[9.7 - 21.2]										80.9	3.7	0.6	**1.2**	**13.6**			
	2012 (91)	0.0	**13.2**	[7.0 - 21.9]										81.3	5.5			**13.2**			
Streptomycin	2002 (74)	N/A	**37.8**	[26.8 - 49.9]												62.2	**8.1**	**29.7**			
	2003 (114)	N/A	**45.6**	[36.3 - 55.2]												54.4	**20.2**	**25.4**			
	2004 (142)	N/A	**34.5**	[26.7 - 42.9]												65.5	**21.1**	**13.4**			
	2005 (183)	N/A	**44.3**	[36.9 - 51.8]												55.7	**23.5**	**20.8**			
	2006 (159)	N/A	**40.9**	[33.2 - 48.9]												59.1	**20.1**	**20.8**			
	2007 (190)	N/A	**45.8**	[38.6 - 53.2]												54.2	**27.9**	**17.9**			
	2008 (246)	N/A	**58.5**	[52.1 - 64.8]												41.5	**25.6**	**32.9**			
	2009 (193)	N/A	**28.0**	[21.8 - 34.9]												72.0	**18.1**	**9.8**			
	2010 (202)	N/A	**31.7**	[25.3 - 38.6]												68.3	**15.3**	**16.3**			
	2011 (162)	N/A	**56.2**	[48.2 - 63.9]												43.8	**25.9**	**30.3**			
	2012 (91)	N/A	**44.0**	[33.6 - 54.8]												56.0	**24.2**	**19.8**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (74)	1.4	**12.2**	[5.7 - 21.8]							73.0	9.5	2.7	1.4	1.4	**5.4**	6.8				
	2003 (114)	15.8	**11.4**	[6.2 - 18.7]							58.8	11.4	0.9	10.8	15.8	**8.8**	**2.6**				
	2004 (142)	8.5	**7.7**	[3.9 - 13.4]							71.8	8.5		3.5	8.5	**2.8**	**4.9**				
	2005 (183)	10.4	**8.7**	[5.1 - 13.8]							69.4	3.8		7.7	10.4	**2.7**	**6.0**				
	2006 (159)	11.3	**0.6**	[0.0 - 3.5]							71.7	2.5		9.4	11.3		**5.0**				
	2007 (190)	22.6	**5.3**	[2.6 - 9.5]							53.2	3.7	0.5	14.7	22.6	**1.1**	**4.2**				
	2008 (246)	27.2	**5.7**	[3.1 - 9.4]							43.1	5.7		18.3	27.2	**0.8**	**4.9**				
	2009 (193)	19.2	**5.7**	[2.9 - 10.0]							37.8	4.1		33.2	19.2	**2.1**	**3.6**				
	2010 (202)	8.4	**16.3**	[11.5 - 22.2]							49.0	3.0	0.5	22.8	8.4	**4.0**	**12.4**				
	2011 (162)	12.3	**21.0**	[15.0 - 28.1]							38.9	2.5	1.9	23.5	12.3	**8.0**	**13.0**				
	2012 (91)	5.5	**17.6**	[10.4 - 27.0]							58.2	1.1	2.2	15.4	5.5	**2.2**	**15.4**				
Cephems																					
Ceftiofur	2002 (74)	0.0	**8.1**	[3.0 - 16.8]						51.4	35.1	5.4		**1.4**	**6.8**						
	2003 (114)	0.0	**2.6**	[0.5 - 7.5]						41.2	54.4	1.8			**2.6**						
	2004 (142)	0.0	**4.9**	[2.0 - 9.9]						43.0	47.9	4.2			**4.9**						
	2005 (183)	0.0	**7.1**	[3.8 - 11.8]						44.8	46.4	1.6			**7.1**						
	2006 (159)	0.0	**5.0**	[2.2 - 9.7]						4.4	87.4	3.1			**5.0**						
	2007 (190)	0.0	**5.3**	[2.6 - 9.5]						9.5	82.6	2.6			**5.3**						
	2008 (246)	0.0	**4.9**	[2.5 - 8.4]						7.3	82.1	5.7			**4.9**						
	2009 (193)	0.0	**5.7**	[2.9 - 10.0]					0.5	10.4	80.8	2.6		**1.0**	**4.7**						
	2010 (202)	0.0	**15.8**	[11.1 - 21.6]						26.2	56.4	1.5		**1.5**	**14.4**						
	2011 (162)	0.6	**20.4**	[14.5 - 27.4]						16.1	59.3	3.7	0.6	**3.1**	**17.3**						
	2012 (91)	1.1	**16.5**	[9.5 - 25.7]						29.7	49.5	3.3	1.1	**1.1**	**15.4**						
Ceftriaxone	2002 (74)	0.0	**8.1**	[3.0 - 16.8]					91.9				**1.4**	**5.4**	**1.4**						
	2003 (114)	0.0	**2.6**	[0.5 - 7.5]					97.4					**0.9**		**1.8**					
	2004 (142)	0.0	**5.6**	[2.5 - 10.8]					94.4						**2.1**	**3.5**					
	2005 (183)	0.0	**7.1**	[3.8 - 11.8]					92.9						**3.3**	**1.1**	**1.6**	**1.1**			
	2006 (159)	0.0	**5.0**	[2.2 - 9.7]					95.0					**0.6**	**3.1**	**0.6**	**0.6**				
	2007 (190)	0.0	**5.8**	[2.9 - 10.1]					93.7	0.5					**1.1**	**2.6**	**1.6**	**0.5**			
	2008 (246)	0.0	**4.9**	[2.5 - 8.4]					95.1						**3.3**	**1.2**		**0.4**			
	2009 (193)	0.0	**5.7**	[2.9 - 10.0]					94.3					**0.5**	**2.6**	**2.1**	**0.5**				
	2010 (202)	0.0	**16.3**	[11.5 - 22.2]					82.7	1.0			**0.5**	**1.5**	**7.9**	**6.4**					
	2011 (162)	0.0	**22.2**	[16.1 - 29.4]					75.9	1.9			**1.2**	**4.9**	**6.8**	**6.2**	**3.1**				
	2012 (91)	0.0	**17.6**	[10.4 - 27.0]					82.4				**1.1**	**1.1**	**4.4**	**8.8**	**2.2**				
Cefoxitin	2002 (74)	1.3	**8.1**	[3.0 - 16.8]							2.7	47.3	31.1	9.5	1.3	**8.1**					
	2003 (114)	1.8	**2.6**	[0.5 - 7.5]							1.8	55.3	31.6	7.0	1.8	**2.6**					
	2004 (142)	1.4	**4.9**	[2.0 - 9.9]							1.4	60.6	28.2	3.5	1.4	**0.7**	**4.2**				
	2005 (183)	0.0	**7.1**	[3.8 - 11.8]							23.5	46.4	20.8	2.2		**3.8**	**3.3**				
	2006 (159)	0.0	**0.6**	[0.0 - 3.5]								54.7	38.4	1.9		**3.1**	**1.9**				
	2007 (190)	0.5	**5.3**	[2.6 - 9.5]							2.6	65.3	24.7	1.6	0.5	**0.5**	**4.7**				
	2008 (246)	0.0	**4.9**	[2.5 - 8.4]							0.8	65.4	24.8	4.1		**0.4**	**4.5**				
	2009 (193)	0.0	**5.7**	[2.9 - 10.0]							1.6	63.7	26.4	2.6		**2.1**	**3.6**				
	2010 (202)	0.5	**15.3**	[10.7 - 21.1]							10.9	53.5	18.8	1.0	0.5	**4.0**	**11.4**				
	2011 (162)	3.7	**17.9**	[12.3 - 24.7]							2.5	53.1	19.8	3.1	3.7	**4.3**	**13.6**				
	2012 (91)	1.1	**15.4**	[8.7 - 24.5]							1.1	58.2	22.0	2.2	1.1	**1.1**	**14.3**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding. [3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 12.2 MIC Distribution among *Salmonella* from Ground Turkey, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (74)	N/A	**20.3**	[11.8 - 31.2]											20.3	51.4	6.8	1.4			**20.3**
	2003 (114)	N/A	**33.3**	[24.8 - 42.8]											18.4	33.3	13.2	1.8		**0.9**	**32.5**
Sulfisoxazole	2004 (142)	N/A	**28.2**	[20.9 - 36.3]											4.9	17.6	49.3			**28.2**	
	2005 (183)	N/A	**34.4**	[27.6 - 41.8]											3.3	23.0	39.3			**34.4**	
	2006 (159)	N/A	**32.1**	[24.9 - 39.9]											1.9	10.7	51.6	3.1	0.6	**32.1**	
	2007 (190)	N/A	**34.7**	[28.0 - 42.0]											4.2	23.7	27.9	7.9	1.6	**34.7**	
	2008 (246)	N/A	**27.6**	[22.2 - 33.7]											1.6	32.2	35.9	1.6	1.2	**27.4**	
	2009 (193)	N/A	**20.2**	[14.8 - 26.6]											4.7	13.5	59.6	2.1		**20.2**	
	2010 (202)	N/A	**24.8**	[19.0 - 31.3]											6.9	29.7	38.6			**24.8**	
	2011 (162)	N/A	**26.5**	[19.9 - 34.0]											13.0	32.1	27.8	0.6		**26.5**	
	2012 (91)	N/A	**27.5**	[18.6 - 37.8]											31.9	26.4	14.3			**27.5**	
Trimethoprim-	2002 (74)	N/A	**1.4**	[0.0 - 7.3]				89.2	8.1	1.4				**1.4**							
Sulfamethoxazole	2003 (114)	N/A	**0.0**	[0.0 - 3.2]				86.0	13.2	0.9											
	2004 (142)	N/A	**0.0**	[0.0 - 2.6]				89.4	6.3	4.2											
	2005 (183)	N/A	**0.5**	[0.0 - 3.0]				96.2	2.7	0.5				**0.5**							
	2006 (159)	N/A	**0.0**	[0.0 - 2.3]				93.1	5.7	1.3											
	2007 (190)	N/A	**0.5**	[0.0 - 2.9]				78.4	20.5	0.5				**0.5**							
	2008 (246)	N/A	**0.4**	[0.0 - 2.2]				83.7	13.1	2.9				**0.4**							
	2009 (193)	N/A	**1.6**	[0.3 - 4.5]				96.9	1.6					**1.6**							
	2010 (202)	N/A	**0.0**	[0.0 - 1.8]				94.1	5.9												
	2011 (162)	N/A	**3.7**	[1.4 - 7.9]				93.8	2.5					**3.7**							
	2012 (91)	N/A	**0.0**	[0.0 - 4.0]				98.9	1.1												
Macrolides																					
Azithromycin	2011 (162)	N/A	**0.0**	[0.0 - 2.3]								7.4	79.0	12.4	1.2						
	2012 (91)	N/A	**0.0**	[0.0 - 4.0]								9.9	81.3	8.8							
Penicillins																					
Ampicillin	2002 (74)	0.0	**16.2**	[8.7 - 26.6]							41.9	36.5	4.1	1.4			**16.2**				
	2003 (114)	0.0	**28.9**	[20.8 - 38.2]							36.8	31.6	1.8	0.9			**28.9**				
	2004 (142)	0.0	**20.4**	[14.1 - 28.0]							64.1	14.1	1.4				**20.4**				
	2005 (183)	0.0	**26.8**	[20.5 - 33.8]							63.9	8.7	0.5				**26.8**				
	2006 (159)	0.0	**25.8**	[19.2 - 33.3]							67.9	6.3					**25.8**				
	2007 (190)	0.0	**42.6**	[35.5 - 50.0]							49.5	7.9					**42.6**				
	2008 (246)	0.0	**51.2**	[44.8 - 57.6]							42.7	5.7	0.4			**0.4**	**50.8**				
	2009 (193)	0.0	**58.0**	[50.7 - 65.1]							34.7	6.7	0.5				**58.0**				
	2010 (202)	0.0	**48.0**	[41.0 - 55.1]							50.0	2.0					**48.0**				
	2011 (162)	0.0	**58.0**	[50.0 - 65.7]							38.3	3.7				**0.6**	**57.4**				
	2012 (91)	0.0	**40.7**	[30.5 - 51.5]							53.9	5.5					**40.7**				
Phenicols																					
Chloramphenicol	2002 (74)	6.8	**1.4**	[0.0 - 7.3]									39.2	52.7	6.8		**1.4**				
	2003 (114)	2.6	**0.9**	[0.0 - 4.8]									13.2	83.3	2.6		**0.9**				
	2004 (142)	4.2	**2.8**	[0.8 - 7.1]									12.7	80.3	4.2		**2.8**				
	2005 (183)	2.7	**0.5**	[0.0 - 3.0]									41.0	55.7	2.7		**0.5**				
	2006 (159)	0.6	**0.6**	[0.0 - 3.5]									27.7	71.1	0.6		**0.6**				
	2007 (190)	1.6	**1.6**	[0.3 - 4.5]									32.1	64.7	1.6		**1.6**				
	2008 (246)	1.2	**1.6**	[0.4 - 4.1]									34.6	62.6	1.2		**1.6**				
	2009 (193)	1.0	**1.6**	[0.3 - 4.5]								1.0	22.8	73.6	1.0	**1.0**	**0.5**				
	2010 (202)	0.5	**2.5**	[0.8 - 5.7]								3.0	60.9	33.2	0.5		**2.5**				
	2011 (162)	1.2	**3.7**	[1.4 - 7.9]									37.0	58.0	1.2	**1.9**	**1.9**				
	2012 (91)	1.1	**3.3**	[0.7 - 9.3]									47.3	48.4	1.1		**3.3**				
Quinolones																					
Ciprofloxacin	2002 (74)	5.4	**2.7**	[0.3 - 9.4]	71.6	17.6	2.7	1.4	1.4	2.7	**2.7**										
	2003 (114)	4.4	**0.0**	[0.0 - 3.2]	86.0	8.8	0.9		3.5	0.9											
	2004 (142)	0.0	**0.0**	[0.0 - 2.6]	93.7	4.9	1.4														
	2005 (183)	1.0	**0.0**	[0.0 - 2.0]	80.9	16.4	1.6	0.5	0.5												
	2006 (159)	0.6	**0.0**	[0.0 - 2.3]	74.8	24.5				0.6											
	2007 (190)	2.6	**0.0**	[0.0 - 1.9]	87.4	10.0			2.6												
	2008 (246)	0.4	**0.0**	[0.0 - 1.5]	78.5	20.3	0.8		0.4												
	2009 (193)	0.0	**0.0**	[0.0 - 1.9]	85.0	14.5	0.5														
	2010 (202)	1.0	**0.0**	[0.0 - 1.8]	97.5	1.5		0.5	0.5												
	2011 (162)	0.0	**0.0**	[0.0 - 2.3]	92.6	7.4															
	2012 (91)	0.0	**0.0**	[0.0 - 4.0]	87.9	12.1															
Nalidixic Acid	2002 (74)	N/A	**8.1**	[3.0 - 16.8]							1.4		64.9	24.3	1.4		**8.1**				
	2003 (114)	N/A	**4.4**	[1.4 - 9.9]								0.9	82.5	11.4	0.9		**4.4**				
	2004 (142)	N/A	**0.0**	[0.0 - 2.6]								4.2	85.2	9.9	0.7						
	2005 (183)	N/A	**1.1**	[0.1 - 3.9]								14.2	80.9	3.8			**1.1**				
	2006 (159)	N/A	**0.0**	[0.0 - 2.3]								10.1	86.2	3.1	0.6						
	2007 (190)	N/A	**2.6**	[0.9 - 6.0]							1.1	28.4	67.4	0.5			**2.6**				
	2008 (246)	N/A	**0.4**	[0.0 - 2.2]								17.4	78.9	2.8	0.4		**0.4**				
	2009 (193)	N/A	**0.0**	[0.0 - 1.9]							0.5	16.1	80.8	2.6							
	2010 (202)	N/A	**0.5**	[0.0 - 2.7]							1.0	61.9	36.6				**0.5**				
	2011 (162)	N/A	**0.0**	[0.0 - 2.3]								25.3	73.5	1.2							
	2012 (91)	N/A	**0.0**	[0.0 - 4.0]								40.7	58.2	1.1							
Tetracyclines																					
Tetracycline	2002 (74)	0.0	**55.4**	[43.4 - 67.0]									44.6		**1.4**	**2.7**	**51.4**				
	2003 (114)	2.6	**39.5**	[30.4 - 49.1]									57.9	2.6			**39.5**				
	2004 (142)	7.7	**56.3**	[47.8 - 64.6]									35.9	7.7	**4.2**	**0.7**	**51.4**				
	2005 (183)	0.0	**39.9**	[32.7 - 47.4]									60.1			**0.5**	**39.3**				
	2006 (159)	0.0	**56.0**	[47.9 - 63.8]									44.0			**0.6**	**55.3**				
	2007 (190)	0.5	**67.4**	[60.2 - 74.0]									32.1	0.5	**0.5**	**3.7**	**63.2**				
	2008 (246)	0.4	**66.3**	[60.0 - 72.1]									33.5	0.4		**4.1**	**62.0**				
	2009 (193)	1.0	**64.8**	[57.6 - 71.5]									34.2	1.0	**1.0**	**1.0**	**62.7**				
	2010 (202)	0.0	**54.5**	[47.3 - 61.5]									46.0		**0.5**	**5.9**	**47.5**				
	2011 (162)	2.5	**64.8**	[56.9 - 72.1]									32.7	2.5	**0.6**	**1.9**	**62.3**				
	2012 (91)	0.0	**45.1**	[34.6 - 55.8]									55.0			**2.2**	**42.9**				

Table 12.3 MIC Distribution among *Salmonella* from Ground Beef, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (9)	0.0	**0.0**	[0.0 - 33.6]					55.6	44.4											
	2003 (10)	0.0	**0.0**	[0.0 - 30.8]					30.0	40.0	30.0										
	2004 (14)	0.0	**0.0**	[0.0 - 23.2]					57.1	42.9											
	2005 (8)	0.0	**25.0**	[3.2 - 65.1]					37.5	37.5					**25.0**						
	2006 (19)	0.0	**0.0**	[0.0 - 17.6]					15.8	68.5	15.8										
	2007 (13)	0.0	**7.7**	[0.2 - 36.0]					15.4	76.9					**7.7**						
	2008 (24)	0.0	**8.3**	[1.0 - 27.0]					4.2	75.0	8.3	4.2				**8.3**					
	2009 (14)	0.0	**14.3**	[1.8 - 42.8]					7.1	57.1	14.3	7.1			**7.1**	**7.1**					
	2010 (7)	0.0	**0.0**	[0.0 - 41.0]					57.1	42.9											
	2011 (9)	0.0	**0.0**	[0.0 - 33.6]						77.8	22.2										
	2012 (13)	0.0	**0.0**	[0.0 - 24.7]					7.7	61.5	30.8										
Kanamycin	2002 (9)	0.0	**0.0**	[0.0 - 33.6]										100.0							
	2003 (10)	0.0	**0.0**	[0.0 - 30.8]										100.0							
	2004 (14)	0.0	**0.0**	[0.0 - 23.2]										100.0							
	2005 (8)	0.0	**25.0**	[3.2 - 65.1]										75.0				**25.0**			
	2006 (19)	0.0	**5.3**	[0.1 - 26.0]										94.7				**5.3**			
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]										100.0							
	2008 (24)	0.0	**8.3**	[1.0 - 27.0]										83.3	8.3			**8.3**			
	2009 (14)	0.0	**14.3**	[1.8 - 42.8]										85.7				**14.3**			
	2010 (7)	0.0	**14.3**	[0.4 - 57.9]										85.7				**14.3**			
	2011 (9)	0.0	**11.1**	[0.3 - 48.2]										88.9				**11.1**			
	2012 (13)	0.0	**23.1**	[5.0 - 53.8]										76.9				**23.1**			
Streptomycin	2002 (9)	N/A	**22.2**	[2.8 - 60.0]												77.8		**22.2**			
	2003 (10)	N/A	**40.0**	[12.2 - 73.8]												60.0		**40.0**			
	2004 (14)	N/A	**14.3**	[1.8 - 42.8]												85.7		**14.3**			
	2005 (8)	N/A	**25.0**	[3.2 - 65.1]												75.0	**12.5**	**12.5**			
	2006 (19)	N/A	**10.5**	[1.3 - 33.1]												89.2	**5.3**	**5.3**			
	2007 (13)	N/A	**0.0**	[0.0 - 24.7]												100.0					
	2008 (24)	N/A	**20.8**	[7.1 - 42.2]												79.2		**20.8**			
	2009 (14)	N/A	**28.6**	[8.4 - 58.1]												71.4		**28.6**			
	2010 (7)	N/A	**42.9**	[9.9 - 81.6]												57.1	**14.3**	**28.6**			
	2011 (9)	N/A	**33.3**	[7.5 - 70.1]												66.7	**22.2**	**11.1**			
	2012 (13)	N/A	**23.1**	[5.0 - 53.8]												76.9	**23.1**				
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (9)	0.0	**22.2**	[2.8 - 60.0]							55.6	22.2					**22.2**				
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]							50.0	10.0					**40.0**				
	2004 (14)	0.0	**14.3**	[1.8 - 42.8]							71.4	7.1		7.1			**14.3**				
	2005 (8)	25.0	**0.0**	[0.0 - 36.9]							75.0				25.0						
	2006 (19)	5.3	**0.0**	[0.0 - 17.6]							84.2	5.3		5.3	5.3						
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]							92.3	7.7									
	2008 (24)	4.2	**8.3**	[1.0 - 27.0]							75.0	12.5			4.2		**8.3**				
	2009 (14)	14.3	**14.3**	[1.8 - 42.8]							50.0	21.4			14.3		**14.3**				
	2010 (7)	0.0	**28.6**	[3.7 - 71.0]							71.4						**28.6**				
	2011 (9)	0.0	**11.1**	[0.3 - 48.2]							88.9					**11.1**					
	2012 (13)	0.0	**15.4**	[1.9 - 45.4]							69.2	7.7	7.7				**15.4**				
Cephems																					
Ceftiofur	2002 (9)	0.0	**22.2**	[2.8 - 60.0]						44.4	33.3				**22.2**						
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]				30.0	30.0						**40.0**						
	2004 (14)	0.0	**14.3**	[1.8 - 42.8]						50.0	35.7				**14.3**						
	2005 (8)	0.0	**0.0**	[0.0 - 36.9]						37.5	62.5										
	2006 (19)	0.0	**0.0**	[0.0 - 17.6]						10.5	89.5										
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]						30.8	61.5	7.7									
	2008 (24)	0.0	**8.3**	[1.0 - 27.0]						8.3	70.8	12.5			**8.3**						
	2009 (14)	0.0	**14.3**	[1.8 - 42.8]						14.3	71.4				**14.3**						
	2010 (7)	0.0	**28.6**	[3.7 - 71.0]							57.1	14.3			**28.6**						
	2011 (9)	0.0	**11.1**	[0.3 - 48.2]							88.9				**11.1**						
	2012 (13)	0.0	**15.4**	[1.9 - 45.4]						15.4	61.5	7.7		**15.4**							
Ceftriaxone	2002 (9)	0.0	**22.2**	[2.8 - 60.0]					77.8						**11.1**	**11.1**					
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]					60.0						**30.0**		**10.0**				
	2004 (14)	0.0	**14.3**	[1.8 - 42.8]					85.7							**7.1**	**7.1**				
	2005 (8)	0.0	**0.0**	[0.0 - 36.9]					100.0												
	2006 (19)	0.0	**0.0**	[0.0 - 17.6]					100.0												
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]					100.0												
	2008 (24)	0.0	**8.3**	[1.0 - 27.0]					91.7					**4.2**		**4.2**					
	2009 (14)	0.0	**14.3**	[1.8 - 42.8]					85.7							**7.1**	**7.1**				
	2010 (7)	0.0	**28.6**	[3.7 - 71.0]					57.1	14.3					**14.3**	**14.3**					
	2011 (9)	0.0	**11.1**	[0.3 - 48.2]					88.9					**11.1**							
	2012 (13)	0.0	**15.4**	[1.9 - 45.4]					84.6					**15.4**							
Cefoxitin	2002 (9)	11.1	**22.2**	[2.8 - 60.0]								33.3	22.2	11.1	11.1	**22.2**					
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]								40.0	20.0			**40.0**					
	2004 (14)	0.0	**14.3**	[1.8 - 42.8]								50.0	14.3	21.4			**14.3**				
	2005 (8)	0.0	**0.0**	[0.0 - 36.9]								50.0	37.5	12.5							
	2006 (19)	0.0	**0.0**	[0.0 - 17.6]								52.6	47.4								
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]								61.5	38.5								
	2008 (24)	0.0	**8.3**	[1.0 - 27.0]							4.2	41.7	45.8			**4.2**	**4.2**				
	2009 (14)	0.0	**14.3**	[1.8 - 42.8]								57.1	14.3	14.3			**14.3**				
	2010 (7)	0.0	**28.6**	[3.7 - 71.0]								14.3	57.1				**28.6**				
	2011 (9)	11.1	**0.0**	[0.0 - 33.6]							11.1	33.3	44.4		11.1						
	2012 (13)	0.0	**15.4**	[1.9 - 45.4]								30.8	38.5	15.4			**15.4**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding. [3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 12.3 MIC Distribution among *Salmonella* from Ground Beef, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (9)	N/A	**22.2**	[2.8 - 60.0]											22.2	44.4	11.1				**22.2**
	2003 (10)	N/A	**40.0**	[12.2 - 73.8]											20.0	30.0	10.0				**40.0**
Sulfisoxazole	2004 (14)	N/A	**14.3**	[1.8 - 42.8]											7.1	7.1	71.4			**14.3**	
	2005 (8)	N/A	**25.0**	[3.2 - 65.1]											0.0	12.5	62.5			**25.0**	
	2006 (19)	N/A	**10.5**	[1.3 - 33.1]											5.3	21.1	57.9	5.3		**10.5**	
	2007 (13)	N/A	**7.7**	[0.2 - 36.0]												38.5	30.8	7.7	15.4	**7.7**	
	2008 (24)	N/A	**20.8**	[7.1 - 42.2]												20.8	54.2	4.2		**20.8**	
	2009 (14)	N/A	**35.7**	[12.8 - 64.9]												7.1	57.1			**35.7**	
	2010 (7)	N/A	**42.9**	[9.9 - 81.6]												42.9	14.3			**42.9**	
	2011 (9)	N/A	**0.0**	[0.0 - 33.6]											22.2	55.6	11.1	11.1			
	2012 (13)	N/A	**23.1**	[5.0 - 53.8]											30.8	23.1	23.1			**23.1**	
Trimethoprim-	2002 (9)	N/A	**0.0**	[0.0 - 33.6]				100.0													
Sulfamethoxazole	2003 (10)	N/A	**0.0**	[0.0 - 30.8]				60.0	40.0												
	2004 (14)	N/A	**7.1**	[0.2 - 33.9]				92.9						**7.1**							
	2005 (8)	N/A	**0.0**	[0.0 - 36.9]				87.5	12.5												
	2006 (19)	N/A	**0.0**	[0.0 - 17.6]				94.7	5.3												
	2007 (13)	N/A	**0.0**	[0.0 - 24.7]				76.9	23.1												
	2008 (24)	N/A	**0.0**	[0.0 - 14.2]				91.7	4.2	4.2											
	2009 (14)	N/A	**0.0**	[0.0 - 23.2]				71.4	28.6												
	2010 (7)	N/A	**0.0**	[0.0 - 41.0]				85.7	14.3												
	2011 (9)	N/A	**0.0**	[0.0 - 33.6]				100.0													
	2012 (13)	N/A	**0.0**	[0.0 - 24.7]				84.6	15.4												
Macrolides																					
Azithromycin	2011 (9)	N/A	**0.0**	[0.0 - 33.6]									100.0								
	2012 (13)	N/A	**0.0**	[0.0 - 24.7]								15.4	76.9	7.7							
Penicillins																					
Ampicillin	2002 (9)	0.0	**22.2**	[2.8 - 60.0]							33.3	33.3	11.1								**22.2**
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]							10.0	50.0									**40.0**
	2004 (14)	0.0	**21.4**	[4.7 - 50.8]							78.6										**21.4**
	2005 (8)	0.0	**25.0**	[3.2 - 65.1]							75.0										**25.0**
	2006 (19)	0.0	**10.5**	[1.3 - 33.1]							84.2	5.3									**10.5**
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]							76.9	23.1									
	2008 (24)	0.0	**12.5**	[2.7 - 32.4]							70.8	16.7									**12.5**
	2009 (14)	0.0	**28.6**	[8.4 - 58.1]							42.9	28.6									**28.6**
	2010 (7)	0.0	**28.6**	[3.7 - 71.0]							57.1	14.3									**28.6**
	2011 (9)	0.0	**11.1**	[0.3 - 48.2]							88.9										**11.1**
	2012 (13)	0.0	**23.1**	[5.0 - 53.8]							69.2	7.7									**23.1**
Phenicols																					
Chloramphenicol	2002 (9)	0.0	**22.2**	[2.8 - 60.0]									11.1	66.7							**22.2**
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]									10.0	50.0							**40.0**
	2004 (14)	0.0	**14.3**	[1.8 - 42.8]									7.1	78.6							**14.3**
	2005 (8)	0.0	**12.5**	[0.3 - 52.7]									12.5	75.0							**12.5**
	2006 (19)	5.3	**5.3**	[0.1 - 26.0]									10.5	78.9	5.3						**5.3**
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]										100.0							
	2008 (24)	0.0	**12.5**	[2.7 - 32.4]									8.3	79.2							**12.5**
	2009 (14)	0.0	**21.4**	[4.7 - 50.8]									7.1	71.4							**21.4**
	2010 (7)	0.0	**42.9**	[9.9 - 81.6]										57.1							**42.9**
	2011 (9)	0.0	**0.0**	[0.0 - 33.6]									44.4	55.6							
	2012 (13)	7.7	**23.1**	[5.0 - 53.8]									23.1	46.2	7.7						**23.1**
Quinolones																					
Ciprofloxacin	2002 (9)	0.0	**0.0**	[0.0 - 33.6]	66.7	22.2	11.1														
	2003 (10)	0.0	**0.0**	[0.0 - 30.8]	70.0	30.0															
	2004 (14)	0.0	**0.0**	[0.0 - 23.2]	100.0																
	2005 (8)	0.0	**0.0**	[0.0 - 36.9]	75.0	25.0															
	2006 (19)	0.0	**0.0**	[0.0 - 17.6]	68.4	31.6															
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]	76.9	23.1															
	2008 (24)	0.0	**0.0**	[0.0 - 14.2]	95.8	4.2															
	2009 (14)	14.3	**0.0**	[0.0 - 23.2]	71.4	14.3			14.3												
	2010 (7)	0.0	**0.0**	[0.0 - 41.0]	85.7	14.3															
	2011 (9)	0.0	**0.0**	[0.0 - 33.6]	77.8	22.2															
	2012 (13)	0.0	**0.0**	[0.0 - 24.7]	61.5	38.5															
Nalidixic Acid	2002 (9)	N/A	**0.0**	[0.0 - 33.6]									66.7	22.2	11.1						
	2003 (10)	N/A	**0.0**	[0.0 - 30.8]								10.0	70.0	20.0							
	2004 (14)	N/A	**0.0**	[0.0 - 23.2]								7.1	92.9								
	2005 (8)	N/A	**0.0**	[0.0 - 36.9]									100.0								
	2006 (19)	N/A	**0.0**	[0.0 - 17.6]								10.5	89.5								
	2007 (13)	N/A	**0.0**	[0.0 - 24.7]								30.8	69.2								
	2008 (24)	N/A	**0.0**	[0.0 - 14.2]								37.5	62.5								
	2009 (14)	N/A	**14.3**	[1.8 - 42.8]								21.4	64.3								**14.3**
	2010 (7)	N/A	**0.0**	[0.0 - 41.0]								28.6	71.4								
	2011 (9)	N/A	**0.0**	[0.0 - 33.6]								55.6	44.4								
	2012 (13)	N/A	**0.0**	[0.0 - 24.7]								15.4	69.2	15.4							
Tetracyclines																					
Tetracycline	2002 (9)	0.0	**22.2**	[2.8 - 60.0]									77.8								**22.2**
	2003 (10)	0.0	**40.0**	[12.2 - 73.8]									60.0								**40.0**
	2004 (14)	0.0	**14.3**	[1.8 - 42.8]									85.7								**14.3**
	2005 (8)	0.0	**12.5**	[0.3 - 52.7]									87.5								**12.5**
	2006 (19)	0.0	**21.1**	[6.1 - 45.6]									78.9				**15.8**				**5.3**
	2007 (13)	0.0	**0.0**	[0.0 - 24.7]									100.0								
	2008 (24)	0.0	**20.8**	[7.1 - 42.2]									79.2				**4.2**				**16.7**
	2009 (14)	0.0	**42.9**	[17.7 - 71.1]									57.1								**42.9**
	2010 (7)	0.0	**42.9**	[9.9 - 81.6]									57.1								**42.9**
	2011 (9)	0.0	**44.4**	[13.7 - 78.8]									55.6				**11.1**				**33.3**
	2012 (13)	0.0	**23.1**	[5.0 - 53.8]									76.9								**23.1**

Table 12.4 MIC Distribution among *Salmonella* from Pork Chop, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (10)	0.0	**30.0**	[6.7 - 65.2]					30.0	40.0						**30.0**					
	2003 (5)	20.0	**0.0**	[0.0 - 52.2]					40.0	40.0				20.0							
	2004 (11)	0.0	**0.0**	[0.0 - 28.5]					63.6	36.4											
	2005 (9)	0.0	**0.0**	[0.0 - 33.6]					55.6	33.3		11.1									
	2006 (8)	12.5	**50.0**	[15.7 - 84.3]					12.5	25.0				12.5	**25.0**	**25.0**					
	2007 (18)	0.0	**5.6**	[0.1 - 27.3]					27.8	50.0	16.7					**5.6**					
	2008 (23)	0.0	**13.0**	[2.8 - 33.6]					4.4	52.2	26.1	4.4			**8.7**	**4.4**					
	2009 (8)	0.0	**0.0**	[0.0 - 36.9]					12.5	75.0	12.5										
	2010 (20)	0.0	**10.0**	[1.2 - 31.7]					25.0	60.0	5.0					**10.0**					
	2011 (28)	0.0	**3.6**	[0.1 - 18.3]					10.7	71.4	14.3					**3.6**					
	2012 (12)	0.0	**8.3**	[0.2 - 38.5]						75.0	16.7					**8.3**					
Kanamycin	2002 (10)	0.0	**10.0**	[0.3 - 44.5]										70.0	20.0			**10.0**			
	2003 (5)	20.0	**0.0**	[0.0 - 52.2]										80.0		20.0					
	2004 (11)	0.0	**9.1**	[0.2 - 41.3]										81.8	9.1			**9.1**			
	2005 (9)	0.0	**0.0**	[0.0 - 33.6]										100.0							
	2006 (8)	0.0	**25.0**	[3.2 - 65.1]										75.0				**25.0**			
	2007 (18)	0.0	**5.6**	[0.1 - 27.3]										94.4				**5.6**			
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]										100.0							
	2009 (8)	0.0	**12.5**	[0.3 - 52.7]										87.5				**12.5**			
	2010 (20)	0.0	**10.0**	[1.2 - 31.7]										90.0				**10.0**			
	2011 (28)	0.0	**7.1**	[0.9 - 23.5]										92.9				**7.1**			
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]										100.0							
Streptomycin	2002 (10)	N/A	**70.0**	[34.8 - 93.3]												30.0	**10.0**	**60.0**			
	2003 (5)	N/A	**40.0**	[5.3 - 85.3]												60.0	**20.0**	**20.0**			
	2004 (11)	N/A	**27.3**	[6.0 - 61.0]												72.7		**27.3**			
	2005 (9)	N/A	**33.3**	[7.5 - 70.1]												66.7	**22.2**	**11.1**			
	2006 (8)	N/A	**25.0**	[3.2 - 65.1]												75.0		**25.0**			
	2007 (18)	N/A	**16.7**	[3.6 - 41.4]												83.3	**11.1**	**5.6**			
	2008 (23)	N/A	**13.0**	[2.8 - 33.6]												87.0	**8.7**	**4.4**			
	2009 (8)	N/A	**37.5**	[8.5 - 75.5]												62.5		**37.5**			
	2010 (20)	N/A	**45.0**	[23.1 - 68.5]												55.0	**15.0**	**30.0**			
	2011 (28)	N/A	**57.1**	[37.2 - 75.5]												42.9	**17.9**	**39.3**			
	2012 (12)	N/A	**41.7**	[15.2 - 72.3]												58.3	**16.7**	**25.0**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (10)	20.0	**20.0**	[2.5 - 55.6]							60.0				20.0		**20.0**				
	2003 (5)	20.0	**20.0**	[0.5 - 71.6]							40.0	20.0			20.0		**20.0**				
	2004 (11)	18.2	**0.0**	[0.0 - 28.5]							72.7	9.1			18.2						
	2005 (9)	22.2	**0.0**	[0.0 - 33.6]							66.7	11.1			22.2						
	2006 (8)	25.0	**0.0**	[0.0 - 36.9]							50.0	25.0			25.0						
	2007 (18)	5.6	**0.0**	[0.0 - 18.5]							66.7	27.8			5.6						
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]							82.6	4.4		13.0							
	2009 (8)	12.5	**25.0**	[3.2 - 65.1]							62.5				12.5	**12.5**	**12.5**				
	2010 (20)	5.0	**0.0**	[0.0 - 16.8]							80.0	5.0	5.0	5.0	5.0						
	2011 (28)	28.6	**3.6**	[0.1 - 18.3]							39.3	14.3		14.3	28.6		**3.6**				
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]							83.3		8.3	8.3							
Cephems																					
Ceftiofur	2002 (10)	0.0	**20.0**	[2.5 - 55.6]						50.0	30.0				**20.0**						
	2003 (5)	0.0	**20.0**	[0.5 - 71.6]						60.0		20.0			**20.0**						
	2004 (11)	0.0	**0.0**	[0.0 - 28.5]						72.7	27.3										
	2005 (9)	0.0	**0.0**	[0.0 - 33.6]						22.2	66.7	11.0									
	2006 (8)	0.0	**0.0**	[0.0 - 36.9]							62.5	37.5									
	2007 (18)	0.0	**0.0**	[0.0 - 18.5]						5.6	66.7	27.8									
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]						13.0	87.0										
	2009 (8)	0.0	**25.0**	[3.2 - 65.1]							75.0				**25.0**						
	2010 (20)	0.0	**0.0**	[0.0 - 16.8]						5.0	85.0	10.0									
	2011 (28)	0.0	**7.1**	[0.9 - 23.5]						10.7	67.9	14.3		**3.6**	**3.6**						
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]						41.7	58.3										
Ceftriaxone	2002 (10)	0.0	**20.0**	[2.5 - 55.6]					80.0						**20.0**						
	2003 (5)	0.0	**20.0**	[0.5 - 71.6]					80.0							**20.0**					
	2004 (11)	0.0	**0.0**	[0.0 - 28.5]					100.0												
	2005 (9)	0.0	**0.0**	[0.0 - 33.6]					100.0												
	2006 (8)	0.0	**0.0**	[0.0 - 36.9]					100.0												
	2007 (18)	0.0	**0.0**	[0.0 - 18.5]					94.4	5.6											
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]					100.0												
	2009 (8)	0.0	**25.0**	[3.2 - 65.1]					75.0							**25.0**					
	2010 (20)	0.0	**0.0**	[0.0 - 16.8]					100.0												
	2011 (28)	3.6	**7.1**	[0.9 - 23.5]					89.3			3.6		**3.6**		**3.6**					
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]					100.0												
Cefoxitin	2002 (10)	0.0	**20.0**	[2.5 - 55.6]								40.0	40.0			**20.0**					
	2003 (5)	0.0	**20.0**	[0.5 - 71.6]								20.0	20.0	40.0		**20.0**					
	2004 (11)	0.0	**0.0**	[0.0 - 28.5]								81.8	18.2								
	2005 (9)	11.1	**0.0**	[0.0 - 33.6]							11.1	22.2	55.6		11.1						
	2006 (8)	25.0	**0.0**	[0.0 - 36.9]								62.5	12.5		25.0						
	2007 (18)	27.8	**0.0**	[0.0 - 18.5]								22.2	50.0		27.8						
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]								39.1	60.9								
	2009 (8)	0.0	**25.0**	[3.2 - 65.1]								12.5	62.5			**12.5**	**12.5**				
	2010 (20)	0.0	**0.0**	[0.0 - 16.8]								45.0	55.0								
	2011 (28)	3.6	**10.7**	[2.3 - 28.2]							3.6	53.6	28.6		3.6	**7.1**	**3.6**				
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]								75.0	25.0								

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding.
[3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 12.4 MIC Distribution among *Salmonella* from Pork Chop, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (10)	N/A	**70.0**	[34.8 - 93.3]											10.0		20.0				**70.0**
	2003 (5)	N/A	**40.0**	[5.3 - 85.3]											20.0	40.0					**40.0**
Sulfisoxazole	2004 (11)	N/A	**18.2**	[2.3 - 51.8]												9.1	72.7			**18.2**	
	2005 (9)	N/A	**33.3**	[7.5 - 70.1]											11.1	22.2	33.3			**33.3**	
	2006 (8)	N/A	**75.0**	[34.9 - 96.8]												12.5	12.5			**75.0**	
	2007 (18)	N/A	**16.7**	[3.6 - 41.4]												11.1	33.3	38.9		**16.7**	
	2008 (23)	N/A	**30.4**	[13.2 - 52.9]												8.7	60.9			**30.4**	
	2009 (8)	N/A	**37.5**	[8.5 - 75.5]												12.5	50.0			**37.5**	
	2010 (20)	N/A	**50.0**	[27.2 - 72.8]											10.0	15.0	25.0			**50.0**	
	2011 (28)	N/A	**25.0**	[10.7 - 44.9]											42.9	10.7	17.9	3.6		**25.0**	
	2012 (12)	N/A	**33.3**	[9.9 - 65.1]											25.0	33.3	8.3			**33.3**	
Trimethoprim-	2002 (10)	N/A	**20.0**	[2.5 - 55.6]				70.0	10.0					**20.0**							
Sulfamethoxazole	2003 (5)	N/A	**0.0**	[0.0 - 52.2]				60.0	40.0												
	2004 (11)	N/A	**0.0**	[0.0 - 28.5]				100.0													
	2005 (9)	N/A	**11.1**	[0.3 - 48.2]				77.8	11.1					**11.1**							
	2006 (8)	N/A	**50.0**	[15.7 - 84.3]				37.5	12.5				**50.0**								
	2007 (18)	N/A	**5.6**	[0.1 - 27.3]				88.9	5.6					**5.6**							
	2008 (23)	N/A	**0.0**	[0.0 - 14.8]				91.3	4.4	4.4											
	2009 (8)	N/A	**25.0**	[3.2 - 65.1]				75.0						**25.0**							
	2010 (20)	N/A	**0.0**	[0.0 - 16.8]				85.0	15.0												
	2011 (28)	N/A	**0.0**	[0.0 - 12.3]				92.9	7.1												
	2012 (12)	N/A	**0.0**	[0.0 - 26.5]				100.0													
Macrolides																					
Azithromycin	2011 (28)	N/A	**0.0**	[0.0 - 12.3]								21.4	57.1	21.4							
	2012 (12)	N/A	**0.0**	[0.0 - 26.5]								8.3	91.7								
Penicillins																					
Ampicillin	2002 (10)	0.0	**40.0**	[12.2 - 73.8]							50.0	10.0					**40.0**				
	2003 (5)	0.0	**40.0**	[5.3 - 85.3]							40.0	20.0					**40.0**				
	2004 (11)	0.0	**9.1**	[0.2 - 41.3]							81.8		9.1				**9.1**				
	2005 (9)	0.0	**22.2**	[2.8 - 60.0]							66.7		11.1				**22.2**				
	2006 (8)	0.0	**25.0**	[3.2 - 65.1]							50.0		25.0				**25.0**				
	2007 (18)	0.0	**5.6**	[0.1 - 27.3]							44.4	22.2	27.8				**5.6**				
	2008 (23)	0.0	**13.0**	[2.8 - 33.6]							82.6	4.4					**13.0**				
	2009 (8)	0.0	**37.5**	[8.5 - 75.5]							62.5						**37.5**				
	2010 (20)	0.0	**15.0**	[3.2 - 37.9]							75.0	10.0					**15.0**				
	2011 (28)	0.0	**46.4**	[27.5 - 66.1]							35.7	10.7	7.1				**46.4**				
	2012 (12)	0.0	**16.7**	[2.1 - 48.4]							66.7	16.7					**16.7**				
Phenicols																					
Chloramphenicol	2002 (10)	0.0	**40.0**	[12.2 - 73.8]									30.0	30.0			**40.0**				
	2003 (5)	0.0	**40.0**	[5.3 - 85.3]										60.0			**40.0**				
	2004 (11)	0.0	**18.2**	[2.3 - 51.8]										81.8			**18.2**				
	2005 (9)	11.1	**22.2**	[2.8 - 60.0]								11.1	22.2	33.3	11.1		**22.2**				
	2006 (8)	37.5	**37.5**	[8.5 - 75.5]										62.5	37.5						
	2007 (18)	33.3	**0.0**	[0.0 - 18.5]									5.6	61.1	33.3						
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]										100.0							
	2009 (8)	12.5	**12.5**	[0.3 - 52.7]										75.0	12.5		**12.5**				
	2010 (20)	0.0	**15.0**	[3.2 - 37.9]									25.0	60.0		**10.0**	**5.0**				
	2011 (28)	3.6	**17.9**	[6.1 - 36.9]									39.3	39.3	3.6	**7.1**	**10.7**				
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]								8.3	33.3	58.3							
Quinolones																					
Ciprofloxacin	2002 (10)	0.0	**0.0**	[0.0 - 30.8]	80.0	20.0															
	2003 (5)	0.0	**0.0**	[0.0 - 52.2]	60.0	20.0	20.0														
	2004 (11)	0.0	**0.0**	[0.0 - 28.5]	100.0																
	2005 (9)	0.0	**0.0**	[0.0 - 33.6]	77.8	22.2															
	2006 (8)	0.0	**0.0**	[0.0 - 36.9]	62.5	12.5	25.0														
	2007 (18)	0.0	**0.0**	[0.0 - 18.5]	66.7	5.6	27.8														
	2008 (23)	0.0	**0.0**	[0.0 - 14.8]	82.6	13.0	4.4														
	2009 (8)	0.0	**0.0**	[0.0 - 36.9]	62.5	37.5															
	2010 (20)	0.0	**0.0**	[0.0 - 16.8]	95.0	5.0															
	2011 (28)	0.0	**0.0**	[0.0 - 12.3]	78.6	21.4															
	2012 (12)	0.0	**0.0**	[0.0 - 26.5]	83.3	16.7															
Nalidixic Acid	2002 (10)	N/A	**0.0**	[0.0 - 30.8]									60.0	40.0							
	2003 (5)	N/A	**0.0**	[0.0 - 52.2]									80.0		20.0						
	2004 (11)	N/A	**0.0**	[0.0 - 28.5]									100.0								
	2005 (9)	N/A	**0.0**	[0.0 - 33.6]								11.1	77.8	11.1							
	2006 (8)	N/A	**0.0**	[0.0 - 36.9]									75.0	25.0							
	2007 (18)	N/A	**0.0**	[0.0 - 18.5]								22.2	44.4	27.8	5.6						
	2008 (23)	N/A	**0.0**	[0.0 - 14.8]								21.7	73.9	4.4							
	2009 (8)	N/A	**0.0**	[0.0 - 36.9]									87.5	12.5							
	2010 (20)	N/A	**0.0**	[0.0 - 16.8]								40.0	60.0								
	2011 (28)	N/A	**0.0**	[0.0 - 12.3]								42.9	50.0	7.1							
	2012 (12)	N/A	**0.0**	[0.0 - 26.5]								33.3	66.7								
Tetracyclines																					
Tetracycline	2002 (10)	0.0	**70.0**	[34.8 - 93.3]									30.0			**10.0**	**60.0**				
	2003 (5)	0.0	**80.0**	[28.4 - 99.5]									20.0				**80.0**				
	2004 (11)	0.0	**54.5**	[23.4 - 83.3]									45.5			**18.2**	**36.4**				
	2005 (9)	0.0	**55.6**	[21.2 - 86.3]									44.4			**11.1**	**44.4**				
	2006 (8)	0.0	**25.0**	[3.2 - 65.1]									75.0				**25.0**				
	2007 (18)	0.0	**50.0**	[26.0 - 74.0]									50.0			**5.6**	**44.4**				
	2008 (23)	0.0	**34.8**	[16.4 - 57.3]									65.2				**34.8**				
	2009 (8)	0.0	**37.5**	[8.5 - 75.5]									62.5			**12.5**	**25.0**				
	2010 (20)	0.0	**45.0**	[23.1 - 68.5]									55.0			**5.0**	**40.0**				
	2011 (28)	0.0	**39.3**	[21.5 - 59.4]									60.7			**3.6**	**35.7**				
	2012 (12)	0.0	**41.7**	[15.2 - 72.3]									58.3				**41.7**				

Table 13. Broad-Spectrum β-lactam Resistance among all Ceftiofur or Ceftriaxone Resistant *Salmonella* Retail Meat Isolates, 2012

Antimicrobial	Isolate Source (# of Isolates)	%I[1] (or S-DD[2])	%R[3]	[95% CI][4]	Distribution (%) of MICs (µg/ml)[5] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
β-Lactam/β-Lactamase Inhibitor Combinations																					
Piperacillin-tazobactam	Retail Chicken (67)	1.5	**0.0**	[0.0 - 5.4]								43.3	47.8	6.0	1.5		1.5				
	Ground Turkey (14)	7.1	**0.0**	[0.0 - 23.2]								14.3	14.3	42.9	21.4		7.1				
	Ground Beef (3)	0.0	**0.0**	[0.0 - 70.8]								33.3	66.7								
Cephems																					
Cefepime[2]	Retail Chicken (67)	(0.0)	**0.0**	[0.0 - 5.4]			6.0	11.9	47.8	29.8	3.0	1.5									
	Ground Turkey (14)	(0.0)	**0.0**	[0.0 - 23.2]			7.1	7.1	14.3	35.7	35.7										
	Ground Beef (3)	(0.0)	**0.0**	[0.0 - 70.8]			33.3		33.3	33.3											
Cefotaxime	Retail Chicken (67)	4.5	**89.6**	[0.0 - 100.0]			3.0	3.0				4.5	**34.3**	**20.9**	**31.3**	**1.5**	**1.5**				
	Ground Turkey (14)	0.0	**92.9**	[0.0 - 100.0]			7.1						**7.1**		**28.6**	**50.0**	**7.1**				
	Ground Beef (3)	0.0	**66.7**	[0.0 - 100.0]			33.3								**66.7**						
Ceftazidime	Retail Chicken (67)	35.8	**53.7**	[41.1 - 66.0]					4.5	1.5			4.5	35.8	**38.8**	**13.4**	**1.5**				
	Ground Turkey (14)	7.1	**85.7**	[57.2 - 98.2]					7.1					7.1	**21.4**	**57.2**	**7.1**				
	Ground Beef (3)	33.3	**33.3**	[0.8 - 90.6]					33.3					33.3	**33.3**						
Monobactam																					
Aztreonam	Retail Chicken (67)	19.4	**3.0**	[0.4 - 10.4]			4.5	1.5		4.5		29.9	37.3	19.4	**3.0**						
	Ground Turkey (14)	21.4	**50.0**	[23.0 - 77.0]			7.1				7.1		14.3	21.4	**50.0**						
	Ground Beef (3)	0.0	**0.0**	[0.0 - 70.8]			33.3						66.7								
Penems																					
Imipenem	Retail Chicken (67)	0.0	**0.0**	[0.0 - 5.5]				4.5	53.7	41.8											
	Ground Turkey (14)	0.0	**0.0**	[0.0 - 37.6]					71.4	28.6											
	Ground Beef (3)	0.0	**0.0**	[0.0 - 70.8]					100.0												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that are susceptible-dose dependent (S-DD). Cefepime MIC's above the suceptible range but below the resistant range are designated by CLSI to be S-DD.

[3] 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.

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

[5] The unshaded areas indicate tthe 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 14. *Campylobacter* Species by Meat Type, 2002-2012

	Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Species (a) Per Year	***C. jejuni***	**202**	**330**	**517**	**414**	**439**	**356**	**339**	**413**	**360**	**406**	**424**
	C. coli	**95**	**147**	**204**	**160**	**157**	**162**	**200**	**192**	**155**	**228**	**196**
Total (A)[1]		**297**	**479**	**721**	**576**	**599**	**518**	**539**	**605**	**515**	**634**	**620**
Meat Type[2]	**Species[3]**											
Retail Chicken	***C. jejuni***	98.0% 198	98.5% 325	98.6% 510	97.3% 403	97.0% 426	93.3% 332	97.1% 329	97.8% 404	98.6% 355	96.8% 393	99.3% 421
	C. coli	94.7% 90	96.6% 142	96.1% 196	94.4% 151	92.4% 145	88.3% 143	90.5% 181	91.7% 176	95.5% 148	92.1% 210	98.5% 193
	Total (N)[4]	**97.0% 288**	**97.5% 467**	**97.9% 706**	**96.2% 554**	**95.3% 571**	**91.7% 475**	**94.6% 510**	**95.9% 580**	**97.7% 503**	**95.1% 603**	**99.0% 614**
Ground Turkey	***C. jejuni***	1.0% 2	1.2% 4	1.4% 7	2.4% 10	2.7% 12	5.6% 20	3.0% 10	2.2% 9	1.4% 5	3.2% 13	0.7% 3
	C. coli	2.1% 2	0.7% 1	2.5% 5	5.6% 9	6.4% 10	8.6% 14	9.5% 19	8.3% 16	4.5% 7	7.9% 18	1.5% 3
	Total (N)	**1.3% 4**	**1.0% 5**	**1.7% 12**	**3.3% 19**	**3.7% 22**	**6.6% 34**	**5.4% 29**	**4.1% 25**	**2.3% 12**	**4.9% 31**	**1.0% 6**

[1] Totals reflect all species found including those not shown on chart.

[2] Ground beef and pork chop are no longer tested for *Campylobacter* due to low recovery from 2002-2007. Data for these years are available in the 2007 Retail Meat Report.

[3] Where % = Number of a given species per meat type (n) / total # of isolates per species (a)

[4] Where Total (N) % = total # of isolates in meat type (N) / total # of isolates in that year (A)

Table 15.1 *Campylobacter jejuni* Isolates from Retail Chicken by Month for All Sites, 2002-2012

Month	2002 n (%[1])	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)
January	13 (6.6)	26 (8.0)	42 (8.2)	30 (7.4)	32 (7.5)	29 (8.7)	24 (7.3)	38 (9.4)	31 (8.7)	35 (8.9)	28 (6.7)
February	25 (12.6)	26 (8.0)	40 (7.8)	44 (10.9)	42 (9.9)	24 (7.2)	31 (9.4)	30 (7.4)	31 (8.7)	30 (7.6)	35 (8.3)
March	23 (11.6)	21 (6.5)	32 (6.3)	37 (9.2)	49 (11.5)	32 (9.6)	21 (6.4)	31 (7.7)	21 (5.9)	36 (9.2)	41 (9.7)
April	16 (8.1)	15 (4.6)	27 (5.3)	31 (7.7)	20 (4.7)	25 (7.5)	39 (11.9)	28 (6.9)	26 (7.3)	32 (8.1)	22 (5.2)
May	15 (7.6)	29 (8.9)	41 (8.0)	37 (9.2)	30 (7.0)	18 (5.4)	16 (4.9)	23 (5.7)	37 (10.4)	28 (7.1)	38 (9.0)
June	7 (3.5)	30 (9.2)	49 (9.6)	28 (6.9)	45 (10.6)	26 (7.8)	22 (6.7)	43 (10.7)	20 (5.6)	27 (6.9)	38 (9.0)
July	17 (8.6)	29 (8.9)	51 (10.0)	36 (8.9)	36 (8.5)	32 (9.6)	37 (11.3)	32 (7.9)	36 (10.1)	36 (9.2)	33 (7.8)
August	24 (12.1)	24 (7.4)	45 (8.8)	41 (10.2)	35 (8.2)	33 (9.9)	26 (7.9)	36 (8.9)	28 (7.9)	23 (5.9)	45 (10.7)
September	19 (9.6)	30 (9.2)	52 (10.2)	28 (6.9)	44 (10.3)	17 (5.1)	21 (6.4)	29 (7.2)	24 (6.8)	29 (7.4)	34 (8.1)
October	11 (5.6)	39 (12.0)	55 (10.8)	28 (6.9)	32 (7.5)	35 (10.5)	32 (9.7)	32 (7.9)	26 (7.3)	32 (8.1)	36 (8.6)
November	19 (9.6)	22 (6.8)	33 (6.5)	31 (7.7)	29 (6.8)	35 (10.5)	34 (10.3)	38 (9.4)	28 (7.9)	44 (11.2)	30 (7.1)
December	9 (4.5)	34 (10.5)	43 (8.4)	32 (7.9)	32 (7.5)	26 (7.8)	26 (7.9)	44 (10.9)	47 (13.2)	41 (10.4)	41 (9.7)
Total N (%)[2]	**198 (100)**	**325 (100)**	**510 (100)**	**403 (100)**	**426 (100)**	**332 (100)**	**329 (100)**	**404 (100)**	**355 (100)**	**393 (100)**	**421 (100)**

Table 15.2 *Campylobacter coli* Isolates from Retail Chicken by Month for All Sites, 2002-2012

Month	2002 n (%)	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)
January	5 (5.6)	4 (2.8)	18 (9.2)	15 (9.9)	7 (4.8)	5 (3.5)	14 (7.7)	12 (6.8)	16 (10.8)	18 (8.6)	11 (5.7)
February	4 (4.4)	5 (3.5)	19 (9.7)	16 (10.6)	8 (5.5)	10 (7.0)	12 (6.6)	13 (7.4)	13 (8.8)	15 (7.1)	16 (8.3)
March	6 (6.7)	6 (4.2)	15 (7.7)	9 (6.0)	10 (6.9)	10 (7.0)	29 (16.0)	17 (9.7)	10 (6.8)	12 (5.7)	14 (7.3)
April	6 (6.7)	15 (10.6)	8 (4.1)	11 (7.3)	11 (7.6)	12 (8.4)	11 (6.1)	17 (9.7)	8 (5.4)	9 (4.3)	15 (7.8)
May	11 (12.2)	11 (7.7)	10 (5.1)	10 (6.6)	12 (8.3)	14 (9.8)	9 (5.0)	19 (10.8)	13 (8.8)	21 (10.0)	16 (8.3)
June	17 (18.9)	11 (7.7)	10 (5.1)	17 (11.3)	12 (8.3)	10 (7.0)	13 (7.2)	12 (6.8)	12 (8.1)	19 (9.0)	15 (7.8)
July[3]		24 (16.9)	16 (8.2)	15 (9.9)	16 (11.0)	14 (9.8)	14 (7.7)	17 (9.7)	12 (8.1)	21 (10.0)	17 (8.8)
August	7 (7.8)	5 (3.5)	17 (8.7)	6 (4.0)	7 (4.8)	11 (7.7)	16 (8.8)	19 (10.8)	20 (13.5)	23 (11.0)	17 (8.8)
September	8 (8.9)	20 (14.1)	20 (10.2)	7 (4.6)	14 (9.7)	10 (7.0)	16 (8.8)	16 (9.1)	12 (8.1)	18 (8.6)	14 (7.3)
October	10 (11.1)	19 (13.4)	18 (9.2)	19 (12.6)	14 (9.7)	16 (11.2)	18 (9.9)	12 (6.8)	12 (8.1)	21 (10.0)	23 (11.9)
November	2 (2.2)	4 (2.8)	25 (12.8)	11 (7.3)	23 (15.9)	14 (9.8)	10 (5.5)	11 (6.2)	12 (8.1)	18 (8.6)	27 (14.0)
December	14 (15.6)	18 (12.7)	20 (10.2)	15 (9.9)	11 (7.6)	17 (11.9)	19 (10.5)	11 (6.2)	8 (5.4)	15 (7.1)	8 (4.1)
Total N (%)	**90 (100)**	**142 (100)**	**196 (100)**	**151 (100)**	**145 (100)**	**143 (100)**	**181 (100)**	**176 (100)**	**148 (100)**	**210 (100)**	**193 (100)**

[1] Where % = # of isolates that month (n) / total # of isolates that year (N).

[2] Where % in Total N = the total % of isolates from January to December.

[3] Grey area indicates that no isolates were identified in that month.

Table 16. Antimicrobial Resistance among *Campylobacter* Species by Meat Type, 2002-2012[1]

Meat Type[2]	Species	Antimicrobial	Aminoglycosides	Ketolides	Lincosamides	Macrolides		Phenicols	Quinolones		Tetracyclines
			GEN	TEL	CLI	AZI	ERY	FFN	CIP	NAL	TET[3]
		C. jejuni ECOFF	(MIC ≥ 4)	(MIC ≥ 8)	(MIC ≥ 1)	(MIC ≥ 0.5)	(MIC ≥ 8)	(MIC ≥ 8)	(MIC ≥ 1)	(MIC ≥ 32)	(MIC ≥ 2)
		C. coli ECOFF	(MIC ≥ 4)	(MIC ≥ 8)	(MIC ≥ 2)	(MIC ≥ 1)	(MIC ≥ 16)	(MIC > 8)	(MIC ≥ 4)	(MIC ≥ 1)	(MIC ≥ 4)
		Year (N)									
Retail Chicken	*C. jejuni*	2002 (198)	-				-		17.2%		58.1%
		2003 (325)	0.3%				-		14.8%		50.2%
		2004 (510)	-	0.8%	2.2%	1.8%	0.8%	-	15.1%	15.3%	50.4%
		2005 (403)	-	0.5%	1.2%	0.5%	0.5%	-	15.1%	15.1%	46.9%
		2006 (426)	-	0.9%	0.7%	0.9%	0.9%	-	16.7%	16.7%	48.4%
		2007 (332)	-	0.6%	0.6%	0.6%	0.6%	-	17.2%	17.2%	48.8%
		2008 (329)	-	1.2%	1.8%	1.2%	1.2%	-	14.6%	14.6%	50.5%
		2009 (404)	-	0.7%	1.5%	1.0%	1.0%	-	21.3%	21.3%	46.5%
		2010 (355)	-	0.9%	0.6%	0.6%	0.6%	-	22.5%	22.8%	36.3%
		2011 (393)	-	0.5%	1.0%	0.5%	0.5%	-	22.6%	21.6%	50.1%
		2012 (421)	0.2%	0.7%	1.2%	1.2%	0.7%	-	16.4%	16.4%	49.6%
		Total (4096)	<0.1%	0.7%	1.1%	0.8%	0.7%	-	17.6%	15.5%	48.4%
	C. coli	2002 (90)	-				7.8%		17.8%		44.4%
		2003 (142)	-				7.7%		13.4%		53.5%
		2004 (196)	-	10.7%	9.2%	9.7%	9.2%	-	16.8%	16.3%	46.9%
		2005 (151)	-	9.9%	10.6%	9.9%	9.9%	-	29.8%	29.1%	44.4%
		2006 (145)	-	5.5%	10.3%	6.2%	5.5%	-	22.1%	20.7%	46.9%
		2007 (143)	0.7%	7.0%	6.3%	7.0%	7.0%	-	25.9%	25.9%	39.9%
		2008 (181)	1.7%	9.4%	8.8%	9.9%	9.9%	-	20.4%	20.4%	48.1%
		2009 (176)	5.7%	5.1%	8.0%	4.5%	4.5%	-	18.2%	18.2%	38.6%
		2010 (148)	12.8%	4.1%	5.4%	4.1%	4.1%	-	13.5%	14.2%	40.5%
		2011 (210)	18.1%	5.7%	5.2%	4.3%	5.2%	-	18.1%	18.1%	51.0%
		2012 (193)	4.1%	14.0%	12.4%	11.9%	11.4%	-	31.1%	31.1%	48.7%
		Total (1775)	4.5%	7.0%	7.4%	6.6%	7.5%	-	20.8%	18.6%	46.0%
	Total (N= 5871)		1.4%	2.6%	3.0%	2.6%	2.7%	-	18.6%	16.5%	47.6%
Ground Turkey	*C. jejuni*	2002 (2)	-				-		50.0%		100.0%
		2003 (4)	-				-		-		75.0%
		2004 (7)	-	-	14.3%	-	-	-	28.6%	28.6%	42.9%
		2005 (10)	-	-	-	-	-	-	10.0%	10.0%	70.0%
		2006 (12)	-	-	-	-	-	-	50.0%	50.0%	75.0%
		2007 (20)	-	5.0%	5.0%	5.0%	5.0%	-	30.0%	30.0%	90.0%
		2008 (10)	-	10.0%	10.0%	10.0%	10.0%	-	60.0%	60.0%	100.0%
		2009 (9)	-	-	11.1%	-	-	-	44.4%	44.4%	100.0%
		2010 (5)	-	-	-	-	-	-	40.0%	40.0%	80.0%
		2011 (13)	-	-	-	-	-	-	46.2%	46.2%	92.3%
		2012 (3)	-	-	-	-	-	-	33.3%	33.3%	100.0%
		Total (95)	-	2.1%	4.2%	2.1%	2.1%	-	36.8%	35.8%	84.2%
	C. coli	2002 (2)	-				-		50.0%		50.0%
		2003 (1)	-				-		100.0%		100.0%
		2004 (5)	-	-	-	-	-	-	-	-	-
		2005 (9)	-	22.2%	22.2%	22.2%	22.2%	-	55.6%	55.6%	88.9%
		2006 (10)	-	-	10.0%	-	-	-	30.0%	30.0%	80.0%
		2007 (14)	-	-	21.4%	-	-	-	50.0%	50.0%	64.3%
		2008 (19)	-	5.3%	10.5%	5.3%	5.3%	-	47.4%	47.4%	94.7%
		2009 (16)	-	-	-	-	-	-	43.8%	43.8%	75.0%
		2010 (7)	-	14.3%	14.3%	14.3%	14.3%	-	57.1%	57.1%	100.0%
		2011 (18)	-	5.6%	5.6%	5.6%	5.6%	-	50.0%	50.0%	77.8%
		2012 (3)	-	-	-	-	-	-	66.7%	66.7%	66.7%
		Total (104)	-	4.8%	9.6%	4.8%	4.8%	-	46.1%	44.2%	76.9%
	Total (N= 199)		-	3.5%	7.0%	3.5%	3.5%	-	41.7%	40.2%	80.4%
Grand Total (N= 6070)			1.3%	2.6%	3.1%	2.6%	2.8%	-	19.3%	17.2%	48.7%

[1] Dashes indicate 0% resistance and gray areas indicate antimicrobial not included in the testing year. Totals for these antimicrobials exclude years when they were not tested.

[2] Ground beef and pork chop are no longer tested for *Campylobacter* due to low recovery from 2002-2007 (grand total excludes these).

[3] Results for 2002 and 2003 are for Doxycycline.

Table 17. Trends in Antimicrobial Resistance among *Campylobacter* Species from Retail Chicken, 2002-2012[1]

Species	Year (N)	Antimicrobial	Aminoglycosides	Ketolides	Lincosamides	Macrolides		Phenicols	Quinolones		Tetracyclines[2]
		C. jejuni ECOFF[3]	GEN (MIC ≥ 4)	TEL (MIC ≥ 8)	CLI (MIC ≥ 1)	AZI (MIC ≥ 0.5)	ERY (MIC ≥ 8)	FFN (MIC ≥ 8)	CIP (MIC ≥ 1)	NAL (MIC ≥ 32)	TET (MIC ≥ 2)
		C. coli ECOFF	(MIC ≥ 4)	(MIC ≥ 8)	(MIC ≥ 2)	(MIC ≥ 1)	(MIC ≥ 16)	(MIC > 8)	(MIC ≥ 1)	(MIC ≥ 32)	(MIC ≥ 4)
C. jejuni	2002 (198)		–	Not Tested	Not Tested	Not Tested	–	Not Tested	34 (17.2)	Not Tested	115 (58.1)
	2003 (325)		1 (0.3)	Not Tested	Not Tested	Not Tested	–	Not Tested	48 (14.8)	Not Tested	163 (50.2)
	2004 (510)		–	4 (0.8)	11 (2.2)	9 (1.8)	4 (0.8)	–	77 (15.1)	78 (15.3)	257 (50.4)
	2005 (403)		–	2 (0.5)	5 (1.2)	2 (0.5)	2 (0.5)	–	61 (15.1)	61 (15.1)	189 (46.9)
	2006 (426)		–	4 (0.9)	3 (0.7)	4 (0.9)	4 (0.9)	–	71 (16.7)	71 (16.7)	206 (48.4)
	2007 (332)	n (%R[4])	–	2 (0.6)	2 (0.6)	2 (0.6)	2 (0.6)	–	57 (17.2)	57 (17.2)	162 (48.8)
	2008 (329)		–	4 (1.2)	6 (1.8)	4 (1.2)	4 (1.2)	–	48 (14.6)	48 (14.6)	166 (50.5)
	2009 (404)		–	3 (0.7)	6 (1.5)	4 (1.0)	4 (1.0)	–	86 (21.3)	86 (21.3)	188 (46.5)
	2010 (355)		–	3 (0.8)	2 (0.6)	2 (0.6)	2 (0.6)	–	80 (22.5)	81 (22.8)	129 (36.3)
	2011 (393)		–	2 (0.5)	4 (1.0)	2 (0.5)	2 (0.5)	–	89 (22.6)	85 (21.6)	197 (50.1)
	2012 (421)		1 (0.2)	3 (0.7)	5 (1.2)	5 (1.2)	3 (0.7)	–	69 (16.4)	69 (16.4)	209 (49.6)
	P-value[5]		0.8643	0.3019	0.6173	0.5994	0.3283	N/A	0.0011	<0.0001	0.1642
C. coli	2002 (90)		–	Not Tested	Not Tested	Not Tested	7 (7.8)	Not Tested	16 (17.8)	Not Tested	40 (44.4)
	2003 (142)		–	Not Tested	Not Tested	Not Tested	11 (7.7)	Not Tested	19 (13.4)	Not Tested	76 (53.5)
	2004 (196)		–	21 (10.7)	18 (9.2)	19 (9.7)	18 (9.2)	–	33 (16.8)	32 (16.3)	92 (46.9)
	2005 (151)		–	15 (9.9)	16 (10.6)	15 (9.9)	15 (9.9)	–	45 (29.8)	44 (29.1)	67 (44.4)
	2006 (145)		–	8 (5.5)	15 (10.3)	9 (6.2)	8 (5.5)	–	32 (22.1)	30 (20.7)	68 (46.9)
	2007 (143)	n (%R)	1 (0.7)	10 (7.0)	9 (6.3)	10 (7.0)	10 (7.0)	–	37 (25.9)	37 (25.9)	57 (39.9)
	2008 (181)		3 (1.7)	17 (9.4)	16 (8.8)	18 (9.9)	18 (9.9)	–	37 (20.4)	37 (20.4)	87 (48.1)
	2009 (176)		10 (5.7)	9 (5.1)	14 (8.0)	8 (4.5)	8 (4.5)	–	32 (18.2)	32 (18.2)	68 (38.6)
	2010 (148)		19 (12.8)	6 (4.1)	8 (5.4)	6 (4.1)	6 (4.1)	–	20 (13.5)	21 (14.2)	60 (40.5)
	2011 (210)		38 (18.1)	12 (5.7)	11 (5.2)	9 (4.3)	11 (5.2)	–	38 (18.1)	38 (18.1)	107 (51.0)
	2012 (193)		8 (4.1)	27 (14.0)	24 (12.4)	23 (11.9)	22 (11.4)	–	60 (31.1)	60 (31.1)	94 (48.7)
	P-value		<0.0001	0.2538	0.4049	0.6872	0.0711	N/A	0.1398	< 0.0001	0.1160

[1] Dashes indicate 0% resistance.

[2] Results for 2002 and 2003 are for Doxycycline.

[3] Epidemiological cut off established to determine resistance (ECOFF).

[4] % R = the number of resistant isolates (n) / the total number of positive isolates (N) for a given year.

[5] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

Figure 7. Temporal Variation in Resistance to Selected Antimicrobials in *Campylobacter jejuni* and *C. coli* Isolates from Retail Chicken, 2002-2012

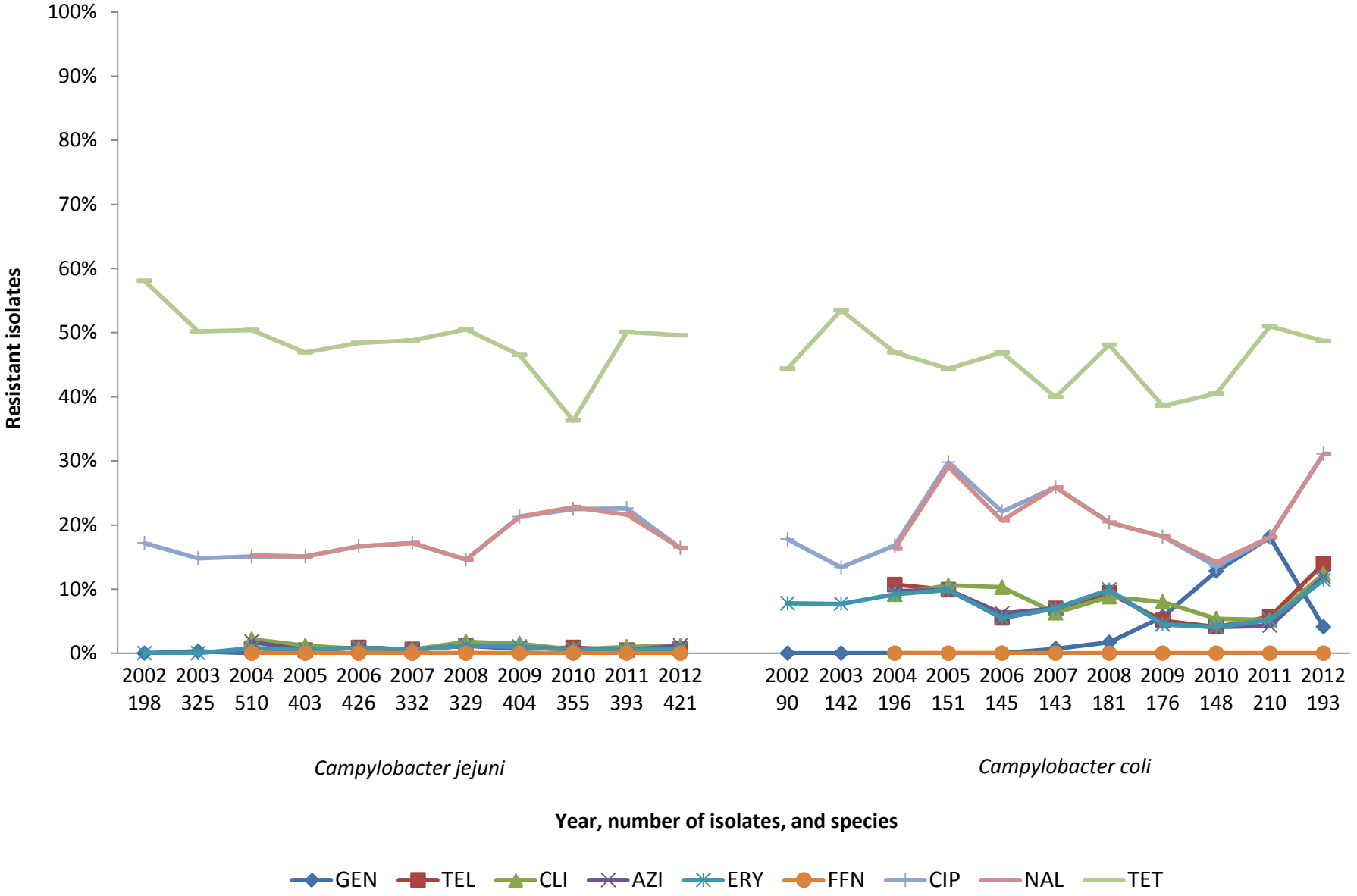


Table 18. Multidrug Resistance among *Campylobacter* Isolates by Species, 2002-2012[1]

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. of Isolates Tested by Species and Source	*C. jejuni*	Retail Chicken	198	325	510	403	426	332	329	404	355	393	421
		Ground Turkey	2	4	7	10	12	20	10	9	5	13	3
	C. coli	Retail Chicken	90	142	196	151	145	143	181	176	148	210	193
		Ground Turkey	2	1	5	9	10	14	19	16	7	18	3
Resistance Pattern	**Species**	**Isolate Source[2]**											
1. No Resistance Detected	*C. jejuni*	Retail Chicken	37.4% 74	42.8% 139	39.8% 203	42.7% 172	43.2% 184	40.1% 133	39.2% 129	40.8% 165	51.3% 182	40.5% 159	42.3% 178
		Ground Turkey	–	25.0% 1	42.9% 3	30.0% 3	16.7% 2	10.0% 2	–	–	20.0% 1	–	–
	C. coli	Retail Chicken	47.8% 43	40.1% 57	36.2% 71	34.4% 52	38.6% 56	45.5% 65	38.7% 70	46.6% 82	52.0% 77	40.5% 85	30.1% 58
		Ground Turkey	50.0% 1	–	100.0% 5	11.1% 1	20.0% 2	28.6% 4	5.3% 1	18.8% 3	–	22.2% 4	–
2. Resistance to ≥ 2 Antimicrobial Classes	*C. jejuni*	Retail Chicken	12.6% 25	8.0% 26	8.4% 43	6.5% 26	9.4% 40	7.2% 24	7.3% 24	10.9% 44	11.5% 41	14.2% 56	10.7% 45
		Ground Turkey	50.0% 1	–	28.6% 2	10.0% 1	41.7% 5	30.0% 6	70.0% 7	44.4% 4	40.0% 2	38.5% 5	33.3% 1
	C. coli	Retail Chicken	16.7% 15	11.3% 16	16.3% 32	21.9% 33	20.0% 29	20.3% 29	24.3% 44	17.0% 30	24.3% 36	34.8% 73	30.1% 58
		Ground Turkey	50.0% 1	100.0% 1	–	55.6% 5	30.0% 3	42.9% 6	52.6% 10	37.5% 6	71.4% 5	55.6% 10	33.3% 1
3. Resistance to ≥ 3 Antimicrobial Classes	*C. jejuni*	Retail Chicken	–	–	1.0% 5	0.5% 2	0.7% 3	0.6% 2	1.2% 4	1.0% 4	0.6% 2	0.5% 2	1.0% 4
		Ground Turkey	–	–	–	–	–	5.0% 1	10.0% 1	11.1% 1	–	–	–
	C. coli	Retail Chicken	1.1% 1	3.5% 5	9.2% 18	9.9% 15	6.9% 10	7.0% 10	9.9% 18	5.1% 9	4.1% 6	4.8% 10	11.4% 22
		Ground Turkey	–	–	–	22.2% 2	10.0% 1	21.4% 3	10.5% 2	–	14.3% 1	5.6% 1	–
4. Resistance to ≥ 4 Antimicrobial Classes	*C. jejuni*	Retail Chicken	–	–	0.8% 4	0.3% 1	0.7% 3	–	–	–	0.3% 1	0.3% 1	–
		Ground Turkey	–	–	–	–	–	5.0% 1	10.0% 1	–	–	–	–
	C. coli	Retail Chicken	–	–	3.6% 7	6.6% 10	2.8% 4	3.5% 5	2.8% 5	2.8% 5	4.1% 6	3.8% 8	7.3% 14
		Ground Turkey	–	–	–	22.2% 2	–	–	5.3% 1	–	14.3% 1	5.6% 1	–
5. Resistance to ≥ 5 Antimicrobial Classes	*C. jejuni*	Retail Chicken	–	–	–	–	–	–	–	–	–	0.3% 1	–
		Ground Turkey	–	–	–	–	–	5.0% 1	–	–	–	–	–
	C. coli	Retail Chicken	–	–	0.5% 1	0.7% 1	–	1.4% 2	–	1.7% 3	0.7% 1	0.5% 1	3.1% 6
		Ground Turkey	–	–	–	22.2% 2	–	–	–	–	–	–	–

[1] Dashes indicate 0.0% resistance.

[2] Ground beef and pork chop are no longer tested for Campylobacter due to low recovery from 2002-2007.

Table 19.1 MIC Distribution among *Campylobacter jejuni* from Retail Chicken, 2002-2012

Antimicrobial	Year (n)	%R[1]	[95% CI][2]	Distribution (%) of MICs (µg/ml)[3] 0.008	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides																		
Gentamicin	2002 (198)	**0.0**	[0.0 - 1.8]				1.0	3.5	24.7	65.7	5.1							
	2003 (325)	**0.3**	[0.0 - 1.7]					0.9	15.4	67.7	15.7					**0.3**		
	2004 (510)	**0.0**	[0.0 - 0.7]					1.8	5.1	85.1	8.0							
	2005 (403)	**0.0**	[0.0 - 0.9]						5.5	89.1	5.5							
	2006 (426)	**0.0**	[0.0 - 0.9]					0.2	12.9	82.9	3.8	0.2						
	2007 (332)	**0.0**	[0.0 - 1.1]					0.6	17.2	79.8	2.4							
	2008 (329)	**0.0**	[0.0 - 1.1]						3.7	88.2	8.2							
	2009 (404)	**0.0**	[0.0 - 0.9]						1.0	49.7	49.3							
	2010 (355)	**0.0**	[0.0 - 1.0]						10.7	83.7	5.4	0.3						
	2011 (393)	**0.0**	[0.0 - 0.9]						10.4	80.4	8.9	0.3						
	2012 (421)	**0.2**	[0.0 - 1.3]					0.5	8.8	75.1	15.2	0.2					**0.2**	
Ketolides																		
Telithromycin	2004 (510)	**0.8**	[0.2 - 2.0]		0.2		0.4	0.2	13.1	56.5	23.7	4.9	0.2	**0.4**	**0.4**			
	2005 (403)	**0.5**	[0.1 - 1.8]		0.2			1.0	11.4	45.4	35.7	5.7			**0.5**			
	2006 (426)	**0.9**	[0.3 - 2.4]					0.9	11.5	50.0	31.7	4.9		**0.2**	**0.7**			
	2007 (332)	**0.6**	[0.1 - 2.2]					0.6	11.4	39.8	40.1	6.6	0.9		**0.6**			
	2008 (329)	**1.2**	[0.3 - 3.1]					1.2	10.6	42.9	30.4	13.7		**0.9**	**0.3**			
	2009 (404)	**0.7**	[0.2 - 2.2]					0.3	7.4	36.1	41.8	12.6	1.0	**0.5**	**0.3**			
	2010 (355)	**0.8**	[0.2 - 2.4]					2.0	23.7	50.1	20.8	2.3	0.3		**0.8**			
	2011 (393)	**0.5**	[0.1 - 1.8]				0.3	0.8	16.0	51.9	24.9	5.1	0.5	**0.3**	**0.3**			
	2012 (421)	**0.7**	[0.1 - 2.1]				0.2	1.4	21.9	43.9	26.8	4.3	0.7	**0.2**	**0.5**			
Lincosamides																		
Clindamycin	2004 (510)	**2.2**	[1.1 - 3.8]			0.6	10.2	55.5	29.6	2.0	**1.2**	**0.6**			**0.4**			
	2005 (403)	**1.2**	[0.4 - 2.9]			0.5	8.4	55.1	30.3	4.5	**0.7**			**0.5**				
	2006 (426)	**0.7**	[0.1 - 2.0]			1.6	14.1	46.9	32.4	4.2				**0.7**				
	2007 (332)	**0.6**	[0.1 - 2.2]			1.2	12.7	58.4	24.7	2.4						**0.6**		
	2008 (329)	**1.8**	[0.7 - 3.9]			3.7	20.4	45.3	27.4	1.5	**0.6**		**0.3**	**0.6**	**0.3**			
	2009 (404)	**1.5**	[0.5 - 3.2]				3.7	42.8	45.8	6.2	**0.5**	**0.2**	**0.2**	**0.5**				
	2010 (355)	**0.6**	[0.1 - 2.0]			3.1	33.8	47.0	13.8	1.7				**0.3**	**0.3**			
	2011 (393)	**1.0**	[0.3 - 2.6]			0.5	29.8	45.0	21.1	2.5	**0.5**	**0.3**		**0.3**				
	2012 (421)	**1.2**	[0.4 - 2.7]			3.8	29.0	47.7	15.9	2.4			**0.5**	**0.2**		**0.5**		
Macrolides																		
Azithromycin	2004 (510)	**1.8**	[0.8 - 3.3]		4.9	49.6	38.2	5.3	0.2	**0.2**	**0.6**	**0.2**						**0.8**
	2005 (403)	**0.5**	[0.1 - 1.8]		3.5	46.4	46.4	3.0	0.2									**0.5**
	2006 (426)	**0.9**	[0.3 - 2.4]		6.6	47.9	39.4	5.2										**0.9**
	2007 (332)	**0.6**	[0.1 - 2.2]		4.8	41.6	48.5	4.5										**0.6**
	2008 (329)	**1.2**	[0.3 - 3.1]		3.7	32.2	45.6	15.8	1.5									**1.2**
	2009 (404)	**1.0**	[0.3 - 2.5]		1.2	22.8	64.1	9.9	1.0									**1.0**
	2010 (355)	**0.6**	[0.1 - 2.0]		10.4	59.4	28.2	1.4										**0.6**
	2011 (393)	**0.5**	[0.1 - 1.8]		8.4	56.7	29.8	4.3	0.3									**0.5**
	2012 (421)	**1.2**	[0.4 - 2.7]		12.1	48.9	31.1	6.7			**0.5**							**0.7**
Erythromycin	2002 (198)	**0.0**	[0.0 - 1.8]							6.1	48.0	39.4	6.6					
	2003 (325)	**0.0**	[0.0 - 1.1]						0.9	18.5	55.7	21.2	3.7					
	2004 (510)	**0.8**	[0.2 - 2.0]				0.4	2.5	53.1	35.3	7.8							**0.8**
	2005 (403)	**0.5**	[0.1 - 1.8]				0.5	4.5	36.7	46.2	11.2	0.5						**0.5**
	2006 (426)	**0.9**	[0.3 - 2.4]					8.0	39.4	39.0	12.7							**0.9**
	2007 (332)	**0.6**	[0.1 - 2.2]				0.3	6.9	43.7	34.3	13.6	0.6						**0.6**
	2008 (329)	**1.2**	[0.3 - 3.1]				0.6	6.1	35.9	38.6	14.9	2.7						**1.2**
	2009 (404)	**1.0**	[0.3 - 2.5]					1.7	34.2	45.5	17.6						**0.2**	**0.7**
	2010 (355)	**0.6**	[0.1 - 2.0]				1.1	14.1	54.1	26.8	3.1	0.3						**0.6**
	2011 (393)	**0.5**	[0.1 - 1.8]				0.3	11.5	48.1	28.2	10.4	1.0						**0.5**
	2012 (421)	**0.7**	[0.1 - 2.1]			0.2	0.2	15.7	47.5	24.9	10.0	0.5	0.2					**0.7**
Phenicols																		
Florfenicol	2004 (510)	**0.0**	[0.0 - 0.7]					0.6		5.1	85.9	8.0	0.4					
	2005 (403)	**0.0**	[0.0 - 0.9]							10.4	77.7	11.7	0.2					
	2006 (426)	**0.0**	[0.0 - 0.9]					0.2		8.2	77.9	13.6						
	2007 (332)	**0.0**	[0.0 - 1.1]							9.3	80.7	9.9						
	2008 (329)	**0.0**	[0.0 - 1.1]						0.6	14.9	73.6	10.3	0.6					
	2009 (404)	**0.0**	[0.0 - 0.9]						0.2	6.7	80.5	12.6						
	2010 (355)	**0.0**	[0.0 - 1.0]					0.3		33.5	63.1	2.8	0.3					
	2011 (393)	**0.0**	[0.0 - 0.9]						0.3	39.2	55.2	5.1	0.3					
	2012 (421)	**0.0**	[0.0 - 0.9]															
Quinolones																		
Ciprofloxacin	2002 (198)	**17.2**	[12.2 - 23.2]				2.0	41.9	29.8	9.1	**2.0**				**12.1**	**2.5**	**0.5**	
	2003 (325)	**14.8**	[11.1 - 19.1]				2.2	58.2	21.5	3.4		**0.3**	**0.6**	**2.5**	**6.2**	**4.9**	**0.3**	
	2004 (510)	**15.1**	[12.1 - 18.5]			0.2	39.8	37.3	7.6				**0.4**	**9.0**	**4.5**	**1.2**		
	2005 (403)	**15.1**	[11.8 - 19.0]				24.8	50.9	8.9	0.2			**0.5**	**6.2**	**6.7**	**1.7**		
	2006 (426)	**16.7**	[13.3 - 20.6]			0.7	29.8	44.8	8.0				**0.2**	**7.0**	**7.5**	**1.9**		
	2007 (332)	**17.2**	[13.3 - 21.7]			0.9	30.1	44.0	7.8					**6.3**	**7.5**	**3.3**		
	2008 (329)	**14.6**	[11.0 - 18.9]			0.3	26.4	46.8	11.6	0.3				**4.0**	**7.9**	**2.7**		
	2009 (404)	**21.3**	[17.4 - 25.6]			0.5	8.4	58.2	11.7					**4.7**	**7.9**	**8.7**		
	2010 (355)	**22.5**	[18.3 - 27.2]				31.8	40.3	5.1	0.3			**0.6**	**8.7**	**9.9**	**2.8**		**0.6**
	2011 (393)	**22.6**	[18.6 - 27.1]			0.5	18.1	43.0	15.8		**0.3**		**0.8**	**6.9**	**11.2**	**3.0**	**0.5**	
	2012 (421)	**16.4**	[13.0 - 20.3]			1.2	24.9	44.9	12.6				**0.7**	**7.4**	**4.5**	**3.8**		
Nalidixic acid	2004 (510)	**15.3**	[12.3 - 18.7]										64.3	20.4		**0.2**	**0.4**	**14.7**
	2005 (403)	**14.9**	[11.6 - 18.7]										69.0	15.9		**0.2**	**0.2**	**14.6**
	2006 (426)	**16.7**	[13.3 - 20.6]										71.4	12			**0.5**	**16.2**
	2007 (332)	**17.2**	[13.3 - 21.7]										69.3	13.6			**0.3**	**16.9**
	2008 (329)	**14.6**	[11.0 - 18.9]										69.3	15.8	0.3		**0.9**	**13.7**
	2009 (404)	**21.3**	[17.4 - 25.6]										59.4	19.3			**0.3**	**21.0**
	2010 (355)	**22.8**	[18.6 - 27.5]										60.3	16.6	0.3		**2.5**	**20.3**
	2011 (393)	**21.6**	[17.7 - 26.0]										43.5	33.8	1.0	**0.8**	**8.4**	**12.5**
	2012 (421)	**16.4**	[13.0 - 20.3]										48.0	34.4	1.2		**5.2**	**11.2**
Tetracyclines																		
Doxycycline	2002 (198)	**58.1**	[50.9 - 65.0]				15.2	16.2	6.6	4.0	**2.5**	**8.1**	**9.1**	**17.7**	**11.1**	**9.6**		
	2003 (325)	**50.2**	[44.6 - 55.7]				23.4	20.9	4.0	1.5	**0.6**	**2.8**	**6.2**	**17.8**	**16.6**	**6.2**		
Tetracycline	2004 (510)	**50.4**	[46.0 - 54.8]				0.6	24.3	15.3	7.6	1.8			**0.2**	**2.2**	**4.9**	**25.9**	**17.3**
	2005 (403)	**46.9**	[41.9 - 51.9]				0.7	19.1	20.6	9.4	3.2	**0.5**			**1.0**	**3.2**	**17.9**	**24.3**
	2006 (426)	**48.4**	[43.5 - 53.2]				1.4	23.2	13.8	10.3	2.8	**0.7**	**0.5**		**1.2**	**3.3**	**17.4**	**25.4**
	2007 (332)	**48.8**	[43.3 - 54.3]				1.2	13.3	21.1	10.5	5.1		**0.3**		**2.4**	**6.3**	**14.5**	**25.3**
	2008 (329)	**50.5**	[44.9 - 56.0]				0.6	16.1	19.5	9.7	3.7	**0.6**			**0.6**	**4.6**	**20.4**	**24.3**
	2009 (404)	**46.5**	[41.6 - 51.5]					16.4	23.8	10.7	2.2	**0.7**			**1.0**	**5.5**	**13.6**	**26.1**
	2010 (355)	**36.3**	[31.3 - 41.6]				2.3	26.2	23.1	9.0	3.1				**1.1**	**3.9**	**16.3**	**14.9**
	2011 (393)	**48.3**	[43.3 - 53.4]				0.3	15.3	19.3	12.7	2.3	**0.5**	**0.5**	**0.8**	**1.5**	**6.9**	**21.9**	**18.1**
	2012 (421)	**48.3**	[43.3 - 53.4]				3.3	19.0	18.1	6.4	3.6		**0.2**		**1.9**	**9.3**	**17.1**	**21.1**

[1] Percent of isolates that are resistant. Discrepancies between %R and sums of distribution are due to rounding. [2] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. 3 Unshaded areas indicate dilution ranges of the Sensititre plates. Breakpoints for susceptibility are indicated by single black bars and resistance double red vertical bars. Numbers in shaded area indicate isolates with MICs greater than the highest concentration on the Sensititre plate. Numbers in the lowest tested concentrations represent isolates with MICs equal to or less than the lowest tested concentration.

Table 19.2 MIC Distribution among *Campylobacter coli* from Retail Chicken, 2002-2012

Antimicrobial	Year (n)	%R[1]	[95% CI][2]	Distribution (%) of MICs (µg/ml)[3] 0.008	0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128
Aminoglycosides																		
Gentamicin	2002 (198)	**0.0**	[0.0 - 1.8]						23.3	75.6	1.1							
	2003 (325)	**0.0**	[0.0 - 1.1]					1.4	36.6	52.8	9.2							
	2004 (196)	**0.0**	[0.0 - 1.9]					0.5	4.1	85.7	9.7							
	2005 (151)	**0.0**	[0.0 - 2.4]						4.0	88.1	7.9							
	2006 (145)	**0.0**	[0.0 - 2.5]						2.8	93.1	4.1							
	2007 (143)	**0.7**	[0.0 - 3.8]					0.7	2.8	88.8	7.0					**0.7**		
	2008 (181)	**1.7**	[0.3 - 4.8]						1.1	73.5	23.2	0.6					**1.7**	
	2009 (176)	**5.7**	[2.8 - 10.2]							57.4	36.9						**5.7**	
	2010 (148)	**12.8**	[7.9 - 19.3]						2.7	75.0	9.5						**12.8**	
	2011 (210)	**18.1**	[13.1 - 24.0]						1.4	55.7	24.8						**18.1**	
	2012 (193)	**4.1**	[1.8 - 8.0]						1.6	73.6	19.7	1.0					**4.1**	
Ketolides																		
Telithromycin	2004 (196)	**10.7**	[6.8 - 15.9]		0.5			1.0	20.4	5.6	18.9	35.7	7.1	**2.6**	**8.2**			
	2005 (151)	**9.9**	[5.7 - 15.9]					4.0	17.2	5.3	17.2	33.1	13.2	**2.0**	**7.9**			
	2006 (145)	**5.5**	[2.4 - 10.6]					1.4	13.1	2.1	11.7	47.6	18.6	**0.7**	**4.8**			
	2007 (143)	**7.0**	[3.4 - 12.5]						11.2	8.4	17.5	48.3	7.7		**7.0**			
	2008 (181)	**9.4**	[5.6 - 14.6]				0.6	0.6	14.4	6.1	22.1	32.6	14.4	**1.7**	**7.7**			
	2009 (176)	**5.1**	[2.4 - 9.5]					0.6	18.2	9.1	14.8	38.6	13.6	**0.6**	**4.5**			
	2010 (148)	**4.1**	[1.5 - 8.6]					6.8	27.0	3.4	26.4	28.4	4.1		**4.1**			
	2011 (210)	**5.7**	[3.0 - 9.8]					1.9	26.2	7.1	20.0	31.4	7.6	**1.9**	**3.8**			
	2012 (193)	**14.0**	[9.4 - 19.7]					1.0	14.5	2.1	23.8	35.2	9.3	**2.1**	**11.9**			
Lincosamides																		
Clindamycin	2004 (196)	**9.2**	[5.5 - 14.1]				1.5	19.4	51.0	14.3	4.6		**2.0**	**3.1**	**4.1**			
	2005 (151)	**10.6**	[6.2 - 16.6]			0.7	0.7	20.5	42.4	25.2		**0.7**	**1.3**	**5.3**	**3.3**			
	2006 (145)	**10.3**	[5.9 - 16.5]			0.7	0.7	22.8	44.1	15.9	5.5	**4.8**	**0.7**	**4.8**				
	2007 (143)	**6.3**	[2.9 - 11.6]				0.7	16.8	60.8	11.9	3.5		**1.4**	**2.1**	**2.8**			
	2008 (181)	**8.8**	[5.1 - 14.0]				4.4	27.1	40.9	13.3	5.5	**1.1**	**2.8**	**2.8**	**1.1**	**1.1**		
	2009 (176)	**8.0**	[4.4 - 13.0]				0.6	8.5	60.2	19.3	3.4	**2.8**	**1.7**	**0.6**	**1.7**	**1.1**		
	2010 (148)	**5.4**	[2.4 - 10.4]				2.0	42.6	47.3	2.7		**0.7**	**3.4**	**0.7**	**0.7**			
	2011 (210)	**5.2**	[2.6 - 9.2]				5.2	40.0	39.5	7.6	2.4	**2.4**	**1.9**	**1.0**				
	2012 (193)	**12.4**	[8.1 - 17.9]				1.0	19.7	52.3	10.9	3.6	**1.6**	**8.8**	**1.0**		**1.0**		
Macrolides																		
Azithromycin	2004 (196)	**9.7**	[5.9 - 14.7]			14.3	42.9	29.6	3.1	0.5	**0.5**							**9.2**
	2005 (151)	**9.9**	[5.7 - 15.9]			13.2	44.4	29.1	3.3									**9.9**
	2006 (145)	**6.2**	[2.9 - 11.5]			11.7	37.9	37.9	5.5	0.7	**0.7**							**5.5**
	2007 (143)	**7.0**	[3.4 - 12.5]			9.1	61.5	21.7	0.7		**0.7**							**6.3**
	2008 (181)	**9.9**	[6.0 - 15.3]			8.3	40.3	33.2	7.7	0.6								**9.9**
	2009 (176)	**4.5**	[2.0 - 8.8]			3.4	46.6	40.9	4.6									**4.5**
	2010 (148)	**4.1**	[1.5 - 8.6]		1.4	17.6	60.8	15.5	0.7									**4.1**
	2011 (210)	**4.3**	[2.0 - 8.0]			17.6	58.6	18.6	1.0									**4.3**
	2012 (193)	**11.9**	[7.7 - 17.3]			6.7	48.2	28.0	5.2		**0.5**							**11.4**
Erythromycin	2002 (90)	**7.8**	[3.2 - 15.4]						2.2	26.7	10.0	26.7	15.6	11.1				**7.8**
	2003 (142)	**7.7**	[3.9 - 13.4]						5.6	11.3	16.9	27.5	29.6	1.4	**0.7**			**7.0**
	2004 (196)	**9.2**	[5.5 - 14.1]					1.0	21.9	17.3	39.8	8.7	1.5	0.5				**9.2**
	2005 (151)	**9.9**	[5.7 - 15.9]					2.6	21.2	10.6	39.1	15.9	0.7					**9.9**
	2006 (145)	**5.5**	[2.4 - 10.6]					2.1	13.1	10.3	49.0	17.9	2.1					**5.5**
	2007 (143)	**7.0**	[3.4 - 12.5]				0.7	1.4	19.6	11.2	46.2	14.0			**0.7**		**6.3**	
	2008 (181)	**9.9**	[6.0 - 15.3]					2.2	12.7	19.3	39.8	14.9	0.6	0.6			**0.6**	**9.4**
	2009 (176)	**4.5**	[2.0 - 8.8]					0.6	17.6	25.6	39.8	10.8	1.1					**4.5**
	2010 (148)	**4.1**	[1.5 - 8.6]					8.1	26.4	27.7	31.1	2.7						**4.1**
	2011 (210)	**5.2**	[2.6 - 9.2]					3.3	30.0	24.3	32.4	4.8			**0.5**			**4.8**
	2012 (193)	**11.4**	[7.3 - 16.7]					0.5	14.5	23.3	37.8	9.3	1.6	1.6			**2.1**	**9.3**
Phenicols																		
Florfenicol	2004 (196)	**0.0**	[0.0 - 1.9]							1.5	64.3	33.7	0.5					
	2005 (151)	**0.0**	[0.0 - 2.4]							3.3	55.6	39.1	2.0					
	2006 (145)	**0.0**	[0.0 - 2.5]							1.4	61.4	33.8	3.4					
	2007 (143)	**0.0**	[0.0 - 2.5]							2.1	78.3	19.6						
	2008 (181)	**0.0**	[0.0 - 2.0]							6.6	63.0	29.3	1.1					
	2009 (176)	**0.0**	[0.0 - 2.1]							1.7	59.1	37.5	1.7					
	2010 (148)	**0.0**	[0.0 - 2.5]							7.4	75.0	17.6						
	2011 (210)	**0.0**	[0.0 - 1.7]							7.1	77.6	14.8	0.5					
	2012 (193)	**0.0**	[0.0 - 1.9]							3.1	76.7	19.7	0.5					
Quinolones																		
Ciprofloxacin	2002 (90)	**17.8**	[10.5 - 27.3]				1.1	27.8	36.7	16.7	**7.8**				**5.6**	**4.4**		
	2003 (142)	**13.4**	[8.3 - 20.1]				1.4	28.2	37.3	19.7				**0.7**	**0.7**	**11.3**	**0.7**	
	2004 (196)	**16.8**	[11.9 - 22.8]				23.0	36.7	23.5		**0.5**			**2.0**	**12.8**	**1.5**		
	2005 (151)	**29.8**	[22.6 - 37.8]				11.3	29.1	29.1	0.7	**0.7**			**7.3**	**15.2**	**6.6**		
	2006 (145)	**22.1**	[15.6 - 29.7]				6.2	36.6	31.7	3.4				**2.8**	**13.8**	**5.5**		
	2007 (143)	**25.9**	[18.9 - 33.9]				9.8	34.3	30.1					**3.5**	**18.2**	**4.2**		
	2008 (181)	**20.4**	[14.8 - 27.1]				7.2	45.9	25.4	1.1			**0.6**	**4.4**	**12.2**	**3.3**		
	2009 (176)	**18.2**	[12.8 - 24.7]				5.1	46.6	30.1				**0.6**	**4.0**	**5.7**	**7.4**	**0.6**	
	2010 (148)	**13.5**	[8.5 - 20.1]				14.9	49.3	21.0	1.4				**4.7**	**6.1**	**2.7**		
	2011 (210)	**18.1**	[13.1 - 24.0]				3.8	44.8	32.4	1.0				**3.8**	**11.0**	**3.3**		
	2012 (193)	**31.1**	[24.6 - 38.1]				7.8	30.6	29.0	1.6				**7.3**	**20.2**	**3.1**	**0.5**	
Nalidixic acid	2004 (196)	**16.3**	[11.4 - 22.3]										47.4	34.7	1.5		**3.6**	**12.8**
	2005 (151)	**29.1**	[22.0 - 37.1]										44.4	26.5			**5.3**	**23.8**
	2006 (145)	**20.7**	[14.4 - 28.2]										51.0	24.8	3.4		**4.8**	**15.9**
	2007 (143)	**25.9**	[18.9 - 33.9]										50.3	22.4	1.4		**6.3**	**19.6**
	2008 (181)	**20.4**	[14.8 - 27.1]										47.5	31.5	0.55		**5.5**	**14.9**
	2009 (176)	**18.2**	[12.8 - 24.7]										40.3	37.5	4.0		**5.1**	**13.1**
	2010 (148)	**14.2**	[9.0 - 20.9]										56.8	29.1		**0.7**	**8.8**	**4.7**
	2011 (210)	**18.1**	[13.1 - 24.0]										25.7	53.8	2.4	**1.0**	**9.5**	**7.6**
	2012 (193)	**31.1**	[24.6 - 38.1]										19.7	48.7	0.5		**15.5**	**15.5**
Tetracyclines																		
Doxycycline	2002 (90)	**44.4**	[34.0 - 55.3]				4.4	32.2	12.2	4.4	2.2			**2.2**	**7.8**	**26.7**	**7.8**	
	2003 (142)	**53.5**	[45.0 - 61.9]				3.5	30.3	7.7	2.1	2.8	**2.1**	**0.7**	**5.6**	**14.8**	**23.9**	**6.4**	
Tetracycline	2004 (196)	**46.9**	[39.8 - 54.2]					6.6	21.4	9.7	9.7	5.6	0.5			**1.0**	**2.6**	**42.9**
	2005 (151)	**44.4**	[36.3 - 52.7]					2.6	22.5	11.3	13.9	5.3	2.0			**1.3**	**4.6**	**36.4**
	2006 (145)	**46.9**	[38.6 - 55.4]					2.8	19.3	18.6	6.9	5.5					**3.4**	**43.4**
	2007 (143)	**39.9**	[31.8 - 48.4]				0.7	0.7	32.9	18.2	6.3	1.4					**3.5**	**36.4**
	2008 (181)	**48.1**	[40.6 - 55.6]					0.6	24.9	21.5	3.3	1.7	1.1	0.6			**2.8**	**43.6**
	2009 (176)	**38.6**	[31.4 - 46.3]					2.3	19.3	23.3	9.7	6.8		0.6			**2.3**	**35.8**
	2010 (148)	**40.5**	[32.6 - 48.9]					2.0	30.4	14.9	8.1	4.1	0.7	0.7			**2.7**	**36.5**
	2011 (210)	**49.0**	[42.1 - 56.0]					1.4	27.6	10.0	4.8	5.2	1.0	1.0	**0.5**	**1.4**	**10.0**	**37.1**
	2012 (193)	**49.0**	[42.1 - 56.0]					2.1	30.6	5.7	10.4	2.6	0.5	0.5	**0.5**	**1.6**	**2.6**	**43.0**

[1] Percent of isolates that are resistant. Discrepancies between %R and sums of distribution are due to rounding. [2] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. 3 Unshaded areas indicate dilution ranges of the Sensititre plates. Breakpoints for susceptibility are indicated by single black bars and resistance double red vertical bars. Numbers in shaded area indicate isolates with MICs greater than the highest concentration on the Sensititre plate. Numbers in the lowest tested concentrations represent isolates with MICs equal to or less than the lowest tested concentration.

Table 20. *Enterococcus* Species by Meat Type, 2002 - 2012[1]

	Species	2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
Total (a) Isolates per Year	*E. faecalis*	893		1014		855		1001		945		852		901		884		1221		1181		1215	
	E. faecium	506		575		757		618		649		357		341		353		335		380		451	
	E. hirae	102		129		129		117		115		87		70		36		74		64		75	
	Total (A)[2]	1520		1742		1755		1765		1731		1312		1337		1307		1677		1674		1785	
Meat Type	**Species**	**n**	**%[3]**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Retail Chicken	*E. faecalis*	134	15.0%	188	18.5%	88	10.3%	116	11.6%	126	13.3%	123	14.4%	165	18.3%	138	15.6%	214	17.5%	186	15.7%	204	16.8%
	E. faecium	231	45.7%	248	43.1%	348	46.0%	307	49.7%	315	48.5%	189	52.9%	163	47.8%	202	57.2%	197	58.8%	221	58.2%	235	52.1%
	E. hirae	12	11.8%	28	21.7%	27	20.9%	30	25.6%	27	23.5%	22	25.3%	16	22.9%	8	22.2%	24	32.4%	18	28.1%	10	13.3%
	Total (N)[4]	**381**	**25.1%**	**466**	**26.8%**	**466**	**26.6%**	**457**	**25.9%**	**469**	**27.1%**	**339**	**25.8%**	**348**	**26.0%**	**349**	**26.7%**	**439**	**26.2%**	**433**	**25.9%**	**456**	**25.5%**
Ground Turkey	*E. faecalis*	294	32.9%	289	28.5%	260	30.4%	339	33.9%	291	30.8%	261	30.6%	271	30.1%	260	29.4%	369	30.2%	392	33.2%	384	31.6%
	E. faecium	89	17.6%	118	20.5%	172	22.7%	107	17.3%	139	21.4%	65	18.2%	70	20.5%	66	18.7%	45	13.4%	40	10.5%	73	16.2%
	E. hirae	2	2.0%	3	2.3%	–	–	1	0.9%	3	2.6%	2	2.3%	–	–	–	–	2	2.7%	–	–	3	4.0%
	Total (N)	**387**	**25.5%**	**418**	**24.0%**	**437**	**24.9%**	**452**	**25.6%**	**435**	**25.1%**	**329**	**25.1%**	**343**	**25.7%**	**328**	**25.1%**	**417**	**24.9%**	**435**	**26.0%**	**460**	**25.8%**
Ground Beef	*E. faecalis*	210	23.5%	224	22.1%	194	22.7%	226	22.6%	227	24.0%	205	24.1%	202	22.4%	227	25.7%	285	23.3%	269	22.8%	277	22.8%
	E. faecium	93	18.4%	112	19.5%	162	21.4%	129	20.9%	125	19.3%	70	19.6%	73	21.4%	59	16.7%	61	18.2%	82	21.6%	91	20.2%
	E. hirae	76	74.5%	84	65.1%	88	68.2%	82	70.1%	77	67.0%	57	65.5%	49	70.0%	26	72.2%	41	55.4%	44	68.8%	57	76.0%
	Total (N)	**383**	**25.2%**	**432**	**24.8%**	**448**	**25.5%**	**447**	**25.3%**	**438**	**25.3%**	**334**	**25.5%**	**337**	**25.2%**	**327**	**25.0%**	**415**	**24.7%**	**423**	**25.3%**	**453**	**25.4%**
Pork Chop	*E. faecalis*	255	28.6%	313	30.9%	313	36.6%	320	32.0%	301	31.9%	263	30.9%	263	29.2%	259	29.3%	353	28.9%	334	28.3%	350	28.8%
	E. faecium	93	18.4%	97	16.9%	75	9.9%	75	12.1%	70	10.8%	33	9.2%	35	10.3%	26	7.4%	32	9.6%	37	9.7%	52	11.5%
	E. hirae	12	11.8%	14	10.9%	14	10.9%	4	3.4%	8	7.0%	6	6.9%	5	7.1%	2	5.6%	7	9.5%	2	3.1%	5	6.7%
	Total (N)	**369**	**24.3%**	**426**	**24.5%**	**404**	**23.0%**	**409**	**23.2%**	**389**	**22.5%**	**310**	**23.6%**	**309**	**23.1%**	**303**	**23.2%**	**406**	**24.2%**	**383**	**22.9%**	**416**	**23.3%**

[1] Dashes indicate 0.0% prevalence

[2] Totals reflect all species found including those not shown on chart

[3] Where % = Number of a given species per meat type (n) / total # of isolates per species (a)

[4] Where Total (N) % = total # of isolates in meat type (N) / total # of isolates in that year (A)

Table 21. Trend in Antimicrobial Resistance among *Enterococcus* by Meat Type, 2002-2012[1,2,3]

Meat Type	Year (n)	Aminoglycosides			Glyco-peptides	Glycyl-cycline	Lincos-amides	Macrolides		Nitro-furans	Oxazolidi-nones	Penicillins	Phenicols	Quino-lones	Strepto-gramins	Tetra-cyclines
		GEN	KAN	STR	VAN	TGC	LIN	ERY	TYL	NIT	LZD	PEN	CHL	CIP	QDA[4]	TET
		(MIC ≥ 512)	(MIC ≥ 1024)	(MIC ≥ 1024)	(MIC ≥ 32)	(MIC ≥ 1)	(MIC ≥ 8)	(MIC ≥ 8)	(MIC ≥ 32)	(MIC ≥ 128)	(MIC ≥ 8)	(MIC ≥ 16)	(MIC ≥ 32)	(MIC ≥ 4)	(MIC ≥ 4)	(MIC ≥ 16)
Chicken Breast	2002 (381)	10.0%	15.7%	21.0%	–	Not Tested	91.9%	32.8%	31.2%	33.9%	–	27.3%	–	8.1%	56.3%	61.2%
	2003 (466)	11.2%	18.2%	21.2%	–	Not Tested	92.7%	31.1%	28.1%	35.6%	–	27.9%	–	11.6%	61.9%	59.2%
	2004 (466)	7.1%	11.8%	11.4%	–	Not Tested	86.7%	17.0%	15.0%	65.5%	–	30.9%	–	40.8%	29.9%	49.1%
	2005 (457)	9.6%	16.0%	15.5%	–	–	85.1%	22.8%	21.7%	38.7%	0.2%	21.4%	0.2%	23.2%	39.0%	58.9%
	2006 (469)	10.4%	12.6%	6.4%	–	–	81.9%	16.6%	16.2%	26.4%	–	15.4%	–	26.2%	35.0%	56.7%
	2007 (339)	13.0%	18.6%	9.1%	–	–	90.3%	30.1%	29.8%	18.6%	–	7.4%	–	11.5%	54.6%	66.4%
	2008 (348)	14.9%	20.1%	9.5%	–	–	90.8%	27.6%	26.7%	22.4%	–	12.9%	0.3%	22.7%	50.3%	64.9%
	2009 (349)	14.3%	18.1%	23.2%	–	–	89.7%	27.8%	27.5%	29.8%	–	13.5%	0.6%	19.8%	49.3%	63.3%
	2010 (439)	18.5%	20.3%	19.8%	–	–	91.6%	24.8%	24.1%	18.7%	–	11.6%	0.5%	14.8%	27.1%	54.4%
	2011 (433)	16.9%	19.9%	22.4%	–	–	90.3%	27.9%	27.3%	23.3%	–	9.9%	–	17.1%	30.0%	53.8%
	2012 (456)	17.1%	20.2%	17.1%	–	–	88.4%	27.0%	26.8%	19.7%	–	6.4%	–	20.6%	36.1%	57.0%
	P-value[5]	<0.0001	0.0011	0.5235	N/A	N/A	0.8518	<0.0001	0.2725	<0.0001	N/A	<0.0001	0.2529	0.6974	<0.0001	0.4192
Ground Turkey	2002 (387)	20.4%	28.9%	27.6%	–	Not Tested	96.6%	35.1%	32.6%	13.4%	–	15.2%	0.3%	5.4%	79.6%	85.8%
	2003 (418)	22.7%	33.3%	30.1%	–	Not Tested	96.2%	43.1%	38.5%	15.8%	–	18.4%	–	11.2%	79.8%	87.3%
	2004 (437)	20.1%	31.8%	29.5%	–	Not Tested	94.7%	37.1%	34.6%	27.0%	–	24.3%	–	24.7%	62.7%	87.0%
	2005 (452)	17.9%	28.1%	24.8%	–	–	96.2%	38.5%	36.1%	11.9%	–	15.5%	–	12.2%	61.1%	85.8%
	2006 (435)	19.8%	32.4%	20.9%	–	–	98.4%	46.4%	43.7%	7.6%	–	22.5%	–	12.9%	75.0%	87.8%
	2007 (329)	34.0%	41.6%	32.5%	–	–	97.6%	43.2%	41.9%	2.4%	–	12.5%	0.6%	7.6%	73.5%	94.8%
	2008 (343)	34.7%	46.4%	34.4%	–	–	97.4%	49.0%	43.1%	5.5%	–	12.5%	0.3%	13.4%	66.7%	88.0%
	2009 (328)	27.4%	37.5%	32.3%	–	–	97.0%	41.2%	34.8%	8.5%	–	14.0%	–	8.8%	67.7%	86.6%
	2010 (417)	33.8%	41.2%	27.8%	–	–	95.7%	39.6%	37.6%	2.4%	–	5.5%	0.2%	4.6%	56.3%	85.9%
	2011 (435)	31.3%	41.1%	30.1%	–	0.2%	97.2%	45.5%	44.6%	3.7%	–	7.1%	0.2%	5.5%	53.5%	91.5%
	2012 (460)	29.3%	36.3%	24.8%	–	–	96.1%	35.2%	33.7%	6.3%	–	11.1%	0.4%	8.7%	61.8%	86.7%
	P-value	<0.0001	0.0008	0.5635	N/A	N/A	0.5431	0.2727	0.1006	<0.0001	N/A	<0.0001	0.1688	<0.0001	0.0300	0.2316
Ground Beef	2002 (383)	1.8%	2.1%	3.9%	–	Not Tested	91.9%	7.6%	6.5%	4.7%	–	–	0.5%	3.1%	46.2%	28.2%
	2003 (432)	0.9%	4.4%	4.2%	–	Not Tested	85.9%	7.9%	5.8%	10.0%	–	2.1%	–	8.8%	54.3%	27.8%
	2004 (448)	0.4%	4.5%	5.4%	–	Not Tested	84.4%	6.5%	5.1%	20.1%	–	1.3%	0.4%	15.8%	7.5%	30.4%
	2005 (447)	1.3%	3.4%	5.6%	–	–	91.1%	6.9%	7.2%	7.8%	–	0.7%	0.2%	6.5%	9.0%	38.5%
	2006 (438)	0.7%	2.1%	3.7%	–	–	78.8%	6.8%	6.4%	3.7%	–	1.4%	0.7%	6.2%	5.7%	27.6%
	2007 (334)	0.3%	1.2%	3.3%	–	–	88.9%	5.4%	5.4%	0.9%	–	0.3%	0.6%	2.4%	6.2%	33.2%
	2008 (337)	1.2%	3.9%	1.5%	–	–	91.7%	6.5%	4.5%	5.0%	–	2.1%	0.3%	8.0%	10.4%	35.0%
	2009 (327)	0.9%	2.4%	5.2%	–	–	93.0%	3.1%	2.5%	4.3%	–	1.5%	–	4.6%	13.0%	27.2%
	2010 (415)	0.2%	1.7%	1.4%	–	–	94.7%	2.9%	2.7%	2.7%	–	0.5%	0.7%	2.4%	2.3%	24.3%
	2011 (423)	–	2.1%	2.4%	–	–	92.7%	4.5%	4.3%	6.9%	–	0.7%	0.5%	3.3%	8.4%	25.5%
	2012 (453)	–	1.1%	2.0%	–	–	92.7%	2.6%	2.4%	4.9%	–	0.7%	0.2%	3.1%	17.6%	32.0%
	P-value	0.0013	<0.0001	0.0005	N/A	N/A	<0.0001	<0.0001	<0.0001	<0.0001	N/A	0.6255	0.8517	<0.0001	<0.0001	0.3371
Pork Chop	2002 (369)	2.2%	4.1%	8.9%	–	Not Tested	97.0%	11.4%	8.7%	1.4%	–	0.8%	0.3%	1.9%	27.2%	76.2%
	2003 (426)	0.2%	4.0%	6.1%	–	Not Tested	95.8%	6.8%	5.9%	4.2%	–	0.2%	0.9%	1.6%	60.2%	73.7%
	2004 (404)	1.5%	2.7%	8.4%	–	Not Tested	92.1%	8.7%	7.7%	7.9%	–	1.7%	0.5%	8.2%	5.5%	73.5%
	2005 (409)	1.2%	3.9%	7.6%	–	–	93.9%	6.6%	6.1%	3.2%	–	1.2%	1.0%	3.7%	13.5%	80.0%
	2006 (389)	0.8%	2.3%	6.4%	–	–	91.3%	6.9%	7.5%	0.8%	–	0.3%	0.8%	1.5%	8.0%	74.3%
	2007 (310)	0.6%	2.3%	7.7%	–	–	93.5%	8.7%	8.7%	1.3%	–	–	0.3%	1.0%	2.1%	82.3%
	2008 (309)	0.3%	3.2%	9.1%	–	–	92.9%	9.4%	7.8%	1.3%	–	0.3%	0.3%	5.5%	6.5%	72.5%
	2009 (303)	1.7%	2.3%	7.9%	–	–	95.7%	6.6%	5.6%	2.3%	–	1.0%	1.0%	2.0%	11.4%	80.2%
	2010 (406)	1.2%	1.7%	6.2%	–	–	95.8%	4.7%	4.2%	0.5%	–	0.7%	–	1.0%	3.8%	76.1%
	2011 (383)	0.8%	2.6%	5.7%	–	0.3%	94.5%	5.5%	5.2%	2.1%	–	0.3%	1.0%	1.3%	12.2%	75.5%
	2012 (416)	1.4%	1.7%	3.4%	–	–	96.4%	4.8%	4.6%	1.0%	–	0.2%	1.9%	0.7%	19.7%	74.3%
	P-value	<0.0001	0.0073	0.0037	N/A	N/A	0.4171	0.0003	0.0051	0.0001	N/A	0.2079	0.1506	0.0010	<0.0001	0.9094

[1] Dashes indicate 0.0% resistance to antimicrobial. Percent resistance (%) = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type)

[2] Percent non susceptible is reported for TGC as no CLSI breakpoint has been established. NARMS breakpoint established to determine resistance.

[3] Daptomycin data not presented as only a CLSI susceptible breakpoint is established for *E. faecalis*. See Trend in Antimicrobial Resistance among *E. faecalis* for corresponding data where nonsusceptible is reported.

[4] Data presented for all species except *E. faecalis*, which is considered intrinsically resistant to Quinupristin-Dalfopristin

[5] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

Figure 8. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Retail Chicken and Ground Turkey, 2002-2012*

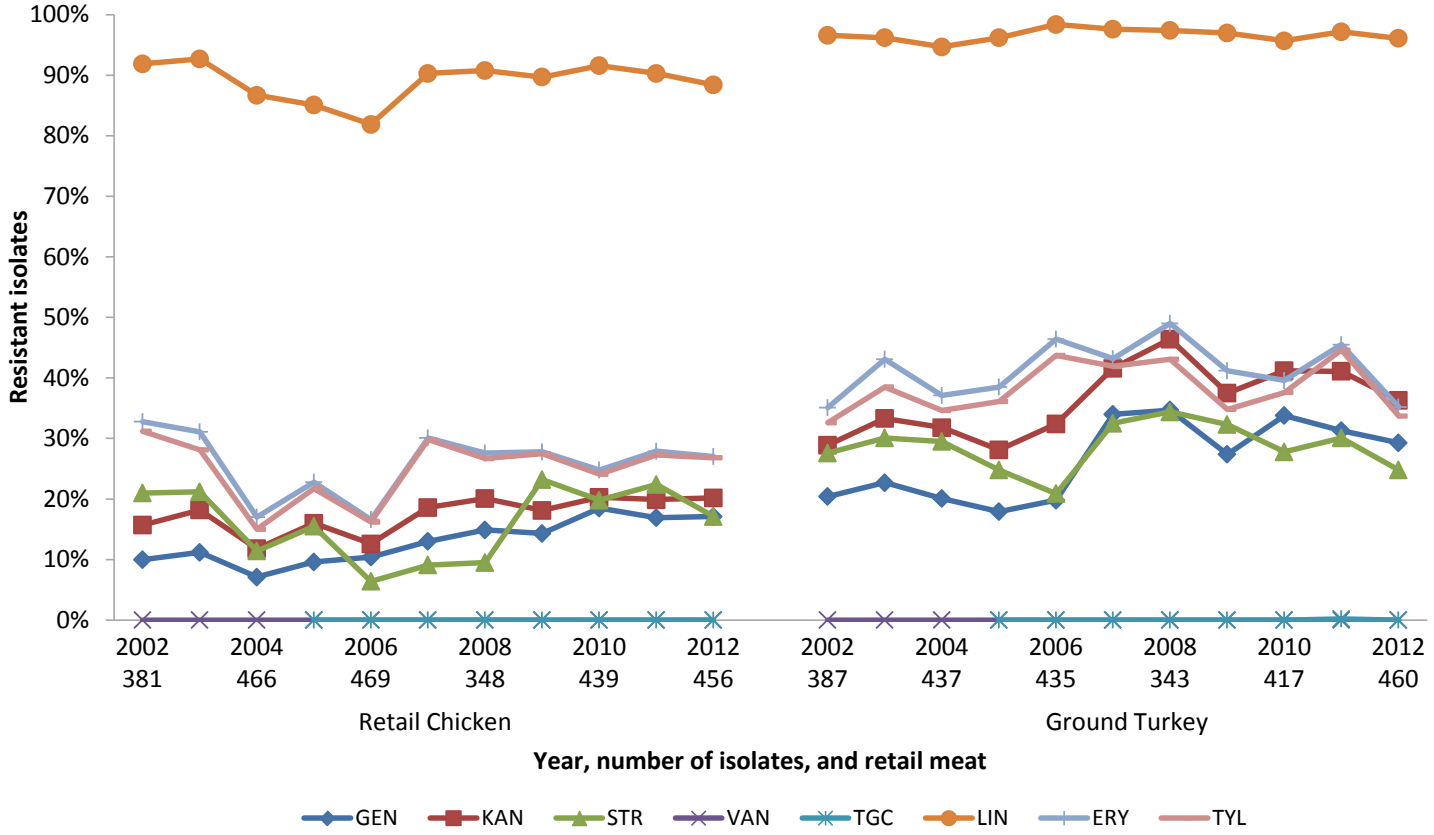
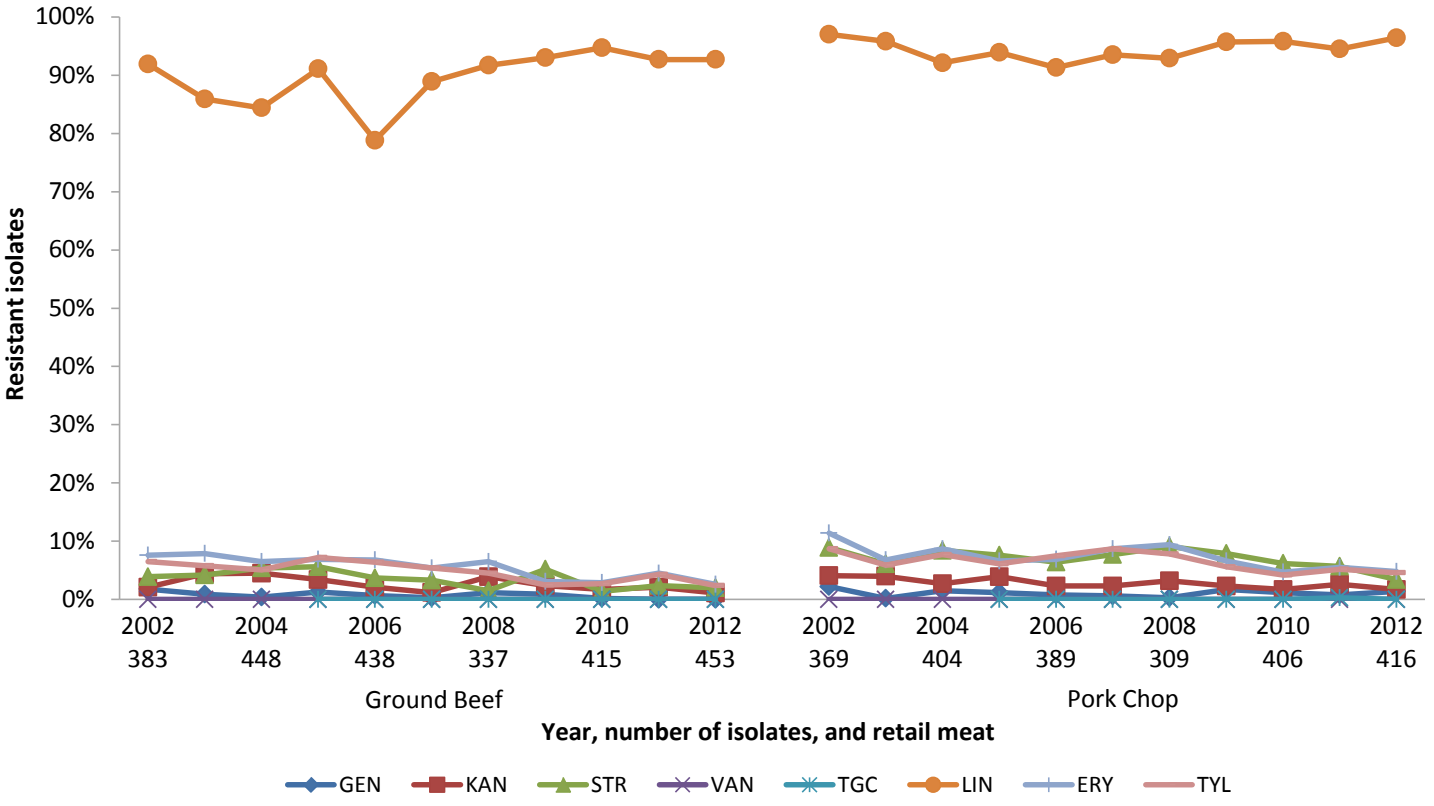


Figure 9. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Ground Beef and Pork Chop, 2002-2012*



*DAP excluded until further evaluation of the resistance breakpoints for non *E. faecalis* species

Figure 10. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Retail Chicken and Ground Turkey, 2002-2012*

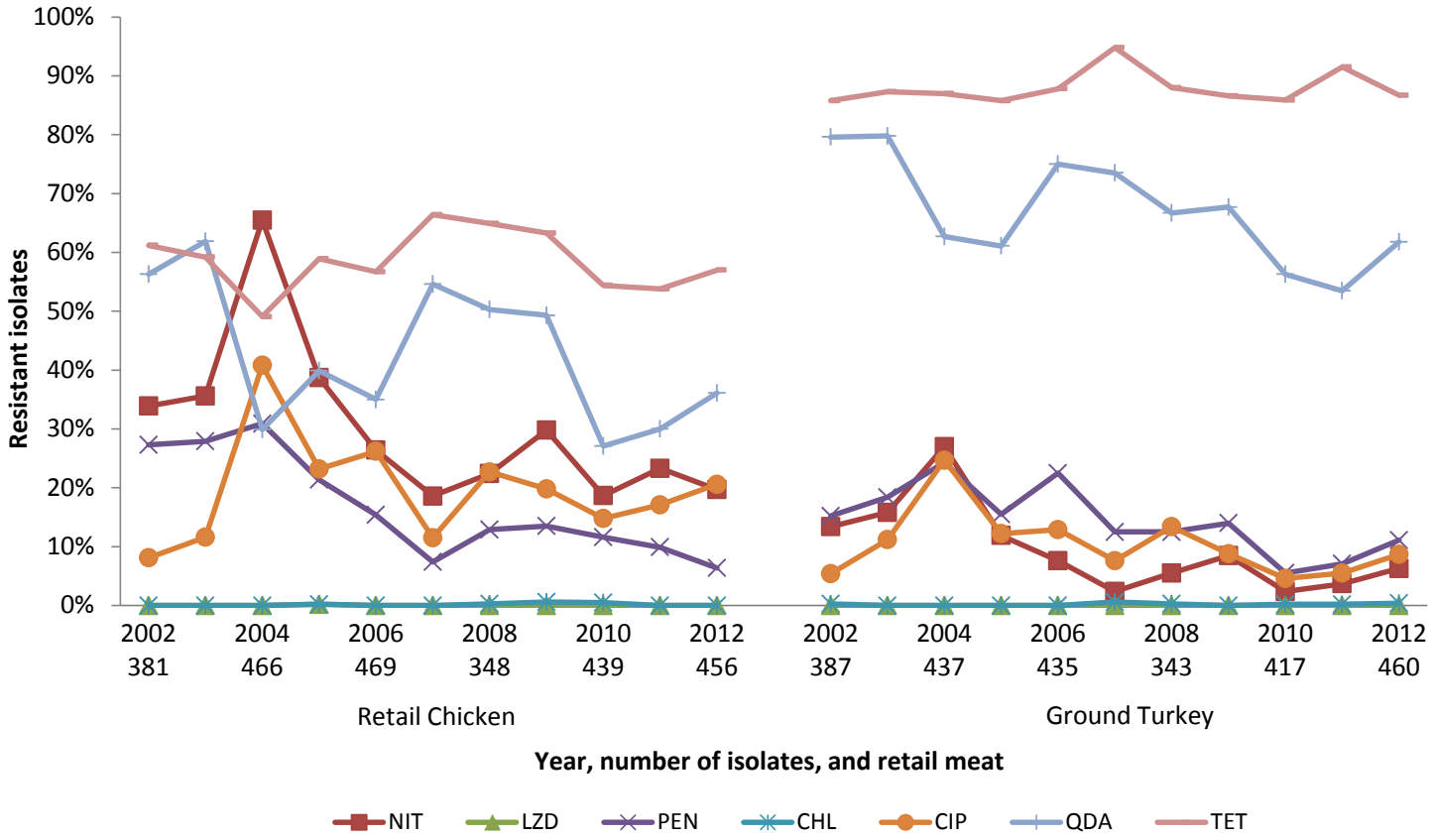
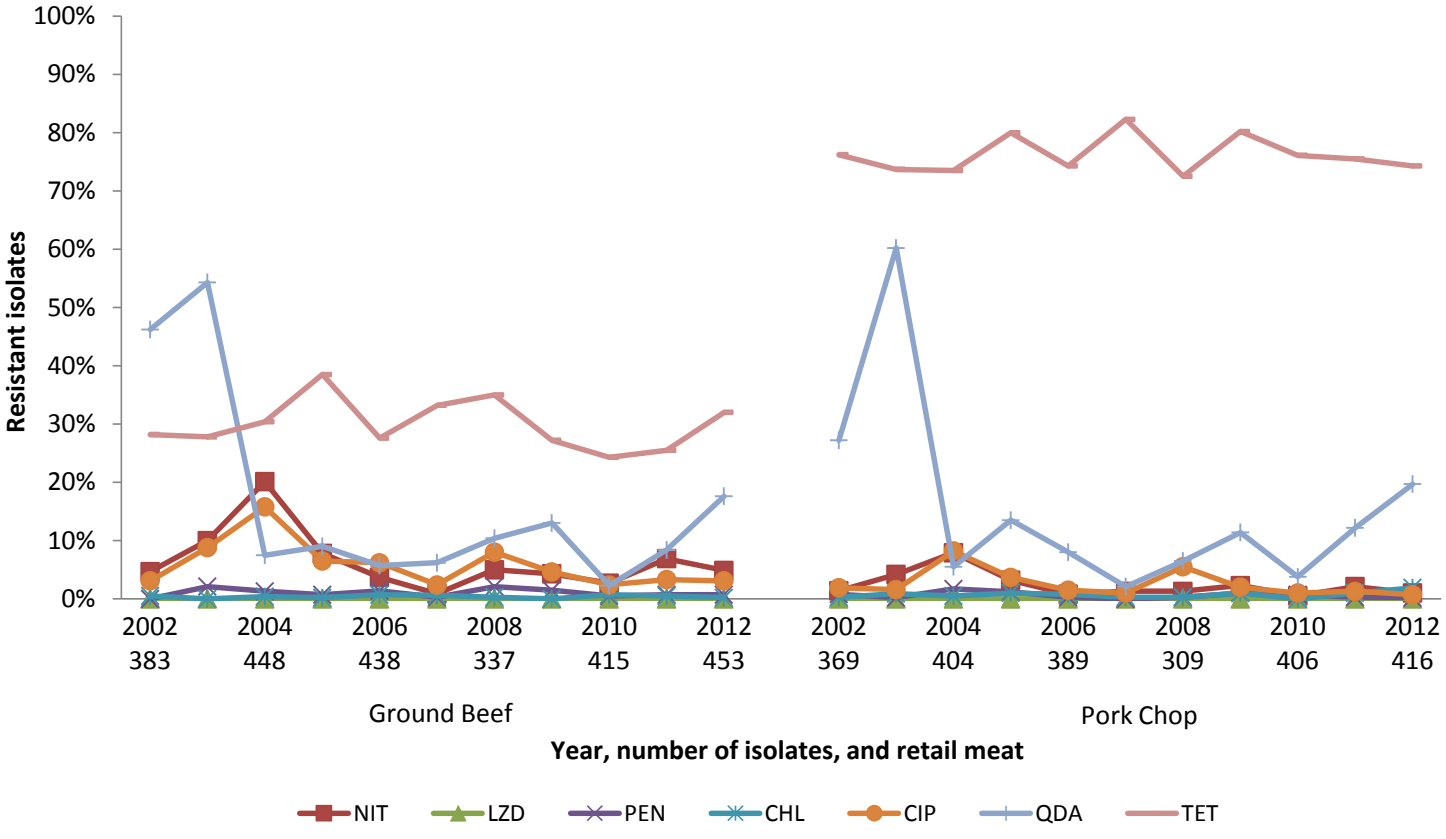


Figure 11. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Ground Beef and Pork Chop, 2002-2012*



*DAP excluded until further evaluation of the resistance breakpoints for non *E. faecalis* species

Table 22.1 Trends in Antimicrobial Resistance among *Enterococcus faecalis* by Meat Type, 2002-2012[1,2]

Meat Type	Year (n)	Aminoglycosides			Glyco-peptides	Glycyl-cycline	Lincos-amides	Lipo-peptides	Macrolides		Nitro-furans	Oxazolidi-nones	Penicillins	Phenicols	Quino-lones	Strepto-gramins	Tetra-cyclines
		GEN	KAN	STR	VAN	TGC	LIN	DAP	ERY	TYL	NIT	LZD	PEN	CHL	CIP	QDA[3]	TET
Retail Chicken	2002 (134)	22.4%	32.1%	29.1%	–	Not Tested	99.3%	Not Tested	45.5%	48.5%	0.7%	–	–	–	–	–	67.2%
	2003 (188)	20.2%	27.1%	22.9%	–	Not Tested	99.5%	Not Tested	43.1%	42.6%	1.1%	–	–	–	–	–	68.6%
	2004 (88)	19.3%	22.7%	18.2%	–	Not Tested	98.9%	–	35.2%	34.1%	1.1%	–	–	–	8.0%	–	63.6%
	2005 (116)	18.1%	26.7%	18.1%	–	–	99.1%	–	37.1%	37.1%	4.3%	–	–	–	0.9%	–	75.0%
	2006 (126)	23.0%	30.2%	10.3%	–	–	100.0%	–	34.9%	36.5%	–	–	–	–	0.8%	–	70.6%
	2007 (123)	19.5%	28.5%	17.9%	–	–	99.2%	–	44.7%	44.7%	–	–	–	–	–	–	65.9%
	2008 (165)	19.4%	29.7%	10.9%	–	–	100.0%	–	32.7%	32.7%	1.2%	–	–	–	3.0%	–	69.1%
	2009 (138)	25.4%	30.4%	13.0%	–	–	98.6%	–	39.9%	39.9%	–	–	–	1.4%	–	–	72.4%
	2010 (214)	31.8%	36.0%	15.4%	–	–	99.1%	–	32.2%	32.2%	–	–	0.5%	0.9%	–	–	72.4%
	2011 (186)	26.9%	33.3%	19.4%	–	–	98.9%	–	35.5%	35.5%	0.5%	–	–	–	–	–	63.4%
	2012 (204)	29.4%	34.8%	17.6%	–	–	99.0%	–	34.3%	34.3%	–	–	–	–	–	–	56.9%
	P-value[4]	0.0013	0.0209	0.0099	N/A	N/A	0.5097	N/A	0.0180	0.0042	0.0155	N/A	N/A	N/A	0.0426	N/A	0.3639
Ground Turkey	2002 (294)	22.1%	26.2%	24.1%	–	Not Tested	97.3%	Not Tested	31.0%	32.0%	2.0%	–	–	0.3%	0.3%	–	85.0%
	2003 (289)	27.7%	36.0%	30.4%	–	Not Tested	99.0%	Not Tested	43.6%	43.9%	1.4%	–	–	–	–	–	87.9%
	2004 (260)	24.6%	29.6%	26.9%	–	Not Tested	98.8%	–	33.8%	34.6%	1.2%	–	–	–	5.8%	–	88.1%
	2005 (339)	20.1%	27.4%	21.5%	–	–	97.3%	0.3%	38.3%	38.3%	2.4%	–	1.5%	–	2.1%	–	84.4%
	2006 (291)	22.0%	32.0%	20.3%	–	–	98.6%	–	47.1%	47.1%	–	–	0.3%	–	0.7%	–	85.9%
	2007 (261)	42.1%	50.2%	36.4%	–	–	98.9%	–	48.7%	49.4%	–	–	–	0.8%	–	–	94.3%
	2008 (271)	41.3%	55.4%	39.1%	–	–	99.3%	0.4%	51.7%	51.3%	–	–	–	0.4%	3.0%	–	90.0%
	2009 (260)	30.0%	38.8%	27.7%	–	–	97.7%	–	37.7%	37.7%	0.4%	–	–	–	0.8%	–	85.8%
	2010 (369)	37.4%	44.7%	27.9%	–	–	97.3%	–	40.4%	40.4%	–	–	0.3%	0.3%	–	–	87.8%
	2011 (392)	33.7%	42.9%	27.6%	–	0.3%	98.5%	–	47.2%	47.2%	–	–	–	0.3%	0.3%	–	92.3%
	2012 (384)	32.6%	38.5%	20.6%	–	–	98.7%	–	37.0%	37.0%	–	–	0.3%	0.3%	–	–	88.8%
	P-value	<0.0001	<0.0001	0.9263	N/A	N/A	0.7169	0.7185	0.0413	0.0811	<0.0001	N/A	0.7333	0.4946	0.0028	N/A	0.0145
Ground Beef	2002 (210)	2.4%	1.9%	4.8%	–	Not Tested	98.6%	Not Tested	1.4%	1.9%	–	–	–	–	–	–	18.6%
	2003 (224)	1.8%	3.1%	5.4%	–	Not Tested	96.4%	Not Tested	4.9%	4.9%	–	–	–	–	0.4%	–	20.5%
	2004 (194)	1.0%	3.1%	7.7%	–	Not Tested	97.4%	–	3.6%	3.6%	–	–	–	–	12.9%	–	25.3%
	2005 (226)	1.8%	4.0%	8.4%	–	–	97.8%	–	4.4%	5.8%	0.9%	–	–	0.4%	0.9%	–	34.1%
	2006 (227)	0.9%	2.6%	5.7%	–	–	97.8%	–	4.0%	4.0%	–	–	–	1.3%	–	–	22.5%
	2007 (205)	0.5%	2.0%	4.9%	–	–	98.0%	–	2.4%	2.4%	–	–	–	1.0%	–	–	32.7%
	2008 (202)	2.0%	4.0%	1.5%	–	–	99.0%	–	2.5%	3.0%	0.5%	–	–	–	4.0%	–	31.7%
	2009 (227)	0.9%	1.8%	5.3%	–	–	97.8%	–	2.6%	2.2%	–	–	0.4%	–	1.3%	–	21.1%
	2010 (285)	0.4%	0.7%	1.4%	–	–	98.9%	–	0.7%	0.7%	–	–	–	0.7%	0.4%	–	16.5%
	2011 (269)	–	1.5%	1.9%	–	–	97.4%	–	3.0%	3.0%	–	–	–	0.7%	–	–	18.2%
	2012 (277)	–	–	1.8%	–	–	98.9%	–	–	–	–	–	–	–	1.1%	–	22.0%
	P-value	0.0015	0.0042	<0.0001	N/A	N/A	0.1956	N/A	0.0029	0.0008	N/A	N/A	N/A	0.5567	0.0038	N/A	0.1110
Pork Chop	2002 (255)	2.7%	4.7%	10.6%	–	Not Tested	99.2%	Not Tested	9.0%	9.0%	–	–	–	0.4%	1.2%	–	80.4%
	2003 (313)	0.3%	4.8%	7.3%	–	Not Tested	98.1%	Not Tested	7.0%	7.0%	–	–	–	1.0%	–	–	78.0%
	2004 (313)	1.9%	2.6%	9.3%	–	Not Tested	94.9%	–	9.9%	9.9%	0.3%	–	–	0.6%	6.1%	–	75.7%
	2005 (320)	1.6%	3.1%	7.8%	–	–	95.3%	–	5.9%	6.3%	0.3%	–	1.3%	1.3%	2.5%	–	86.3%
	2006 (301)	0.7%	2.3%	7.6%	–	–	97.3%	0.3%	6.6%	7.3%	–	–	–	1.0%	0.3%	–	81.4%
	2007 (263)	0.8%	2.3%	8.7%	–	–	97.7%	–	9.1%	9.1%	–	–	–	0.4%	–	–	90.1%
	2008 (263)	0.4%	3.0%	10.3%	–	–	97.3%	–	8.0%	7.6%	–	–	0.4%	0.4%	4.6%	–	77.2%
	2009 (259)	1.9%	2.7%	8.9%	–	–	97.3%	–	6.9%	6.6%	–	–	0.4%	1.2%	1.5%	–	83.8%
	2010 (353)	1.4%	1.7%	6.8%	–	–	97.2%	–	4.5%	4.5%	–	–	0.3%	–	–	–	79.0%
	2011 (334)	0.9%	2.4%	5.7%	–	0.3%	97.0%	–	4.5%	4.8%	–	–	–	0.9%	0.3%	–	79.3%
	2012 (350)	1.7%	2.0%	4.0%	–	–	98.0%	–	5.1%	5.1%	0.3%	–	–	2.3%	0.3%		81.7%
	P-value	0.6634	0.0073	0.0048	N/A	N/A	0.6946	N/A	0.0029	0.0024	N/A	N/A	0.7153	0.2915	0.0029	N/A	0.5443

[1] Dashes indicate 0.0% resistance to antimicrobial. Percent resistance (%) = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type)

[2] Percent non susceptible is reported for TGC and DAP as no CLSI breakpoint has been established. NARMS breakpoint established to determine resistance.

[3] Data not presented for *E. faecalis*, as the specie is considered intrinsically resistant to Quinupristin-Dalfopristin.

[4] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

Table 22.2 Trends in Antimicrobial Resistance among *Enterococcus faecium* by Meat Type, 2002-2012[1,2]

Meat Type	Year (n)	Aminoglycosides			Glyco-peptides	Glycyl-cycline	Lincos-amides	Macrolides		Nitro-furans	Oxazolidi-nones	Penicillins	Phenicols	Quino-lones	Strepto-gramins	Tetra-cyclines
		GEN	KAN	STR	VAN	TGC[3]	LIN	ERY	TYL	NIT	LZD	PEN	CHL	CIP	QDA	TET
Retail Chicken	2002 (231)	3.0%	6.5%	16.9%	–	Not Tested	87.0%	25.5%	21.2%	54.5%	–	44.2%	–	13.0%	55.4%	56.7%
	2003 (248)	5.6%	10.5%	16.9%	–	Not Tested	86.7%	17.3%	12.5%	64.5%	–	51.2%	–	21.8%	59.7%	51.6%
	2004 (348)	4.3%	9.5%	8.3%	–	Not Tested	83.3%	12.6%	10.3%	85.3%	–	39.1%	–	52.3%	31.6%	45.1%
	2005 (307)	6.2%	10.7%	14.0%	–	–	78.2%	13.7%	12.4%	54.7%	0.3%	31.9%	–	33.9%	39.1%	54.4%
	2006 (315)	6.0%	6.3%	3.8%	–	–	74.9%	9.5%	7.9%	38.4%	–	22.2%	–	37.5%	36.5%	53.0%
	2007 (189)	9.5%	12.2%	3.7%	–	–	84.1%	19.6%	19.0%	32.8%	–	12.2%	–	19.6%	57.1%	66.1%
	2008 (163)	11.7%	11.7%	6.7%	–	–	81.0%	22.1%	20.2%	46.0%	–	27.6%	0.6%	43.6%	54.6%	64.4%
	2009 (202)	6.9%	9.9%	30.2%	–	–	83.2%	19.8%	19.3%	51.5%	–	23.3%	–	34.2%	50.0%	56.9%
	2010 (197)	6.1%	5.6%	26.4%	–	–	82.2%	13.7%	12.2%	40.1%	–	24.4%	–	32.5%	28.9%	35.5%
	2011 (221)	9.5%	9.5%	27.1%	–	–	81.9%	21.7%	20.4%	41.6%	–	18.6%	–	33.5%	32.1%	43.4%
	2012 (235)	6.8%	8.1%	17.9%	–	–	78.7%	21.3%	20.9%	36.6%	–	11.9%	–	39.6%	37.4%	55.7%
	P-Value[4]	0.0275	0.7743	<0.0001	N/A	N/A	0.0278	0.1946	0.0026	<0.0001	N/A	<0.0001	N/A	0.0037	<0.0001	0.0897
Ground Turkey	2002 (89)	15.7%	39.3%	39.3%	–	Not Tested	94.4%	50.6%	36.0%	50.6%	–	66.3%	–	22.5%	82.0%	88.8%
	2003 (118)	12.7%	28.0%	32.2%	–	Not Tested	89.0%	44.1%	27.1%	52.5%	–	65.3%	–	39.0%	79.7%	91.5%
	2004 (172)	13.4%	35.5%	34.3%	–	Not Tested	88.4%	43.0%	35.5%	66.9%	–	61.6%	–	53.5%	64.5%	86.6%
	2005 (107)	12.1%	29.9%	34.6%	–	–	92.5%	41.1%	29.9%	43.0%	–	59.8%	–	43.9%	63.6%	91.6%
	2006 (139)	15.1%	33.8%	22.3%	–	–	97.8%	44.6%	36.0%	22.3%	–	67.6%	–	37.4%	75.5%	92.8%
	2007 (65)	1.5%	7.7%	16.9%	–	–	92.3%	23.1%	13.8%	12.3%	–	60.0%	–	35.4%	76.9%	96.9%
	2008 (70)	10.0%	12.9%	17.1%	–	–	91.4%	37.1%	12.9%	27.1%	–	61.4%	–	54.3%	68.6%	81.4%
	2009 (66)	18.2%	33.3%	51.5%	–	–	93.9%	56.1%	24.2%	40.9%	–	69.7%	–	40.9%	69.7%	92.4%
	2010 (45)	6.7%	15.6%	28.9%	–	–	86.7%	33.3%	15.6%	22.2%	–	48.9%	–	42.2%	57.8%	71.1%
	2011 (40)	10.0%	25.0%	55.0%	–	–	87.5%	32.5%	22.5%	40.0%	–	75.0%	–	57.5%	55.0%	82.5%
	2012 (73)	13.7%	26.0%	48.0%	–	–	83.6%	27.4%	17.8%	39.7%	–	68.5%	1.4%	54.8%	64.4%	78.1%
	P-Value	0.9331	0.3858	0.0009	N/A	N/A	0.6380	0.1204	0.0320	0.0027	N/A	0.0128	N/A	0.0037	0.0378	0.0031
Ground Beef	2002 (93)	1.1%	4.3%	3.2%	–	Not Tested	76.3%	11.8%	6.5%	18.3%	–	–	1.1%	12.9%	47.3%	22.6%
	2003 (112)	–	8.0%	2.7%	–	Not Tested	58.9%	8.9%	0.9%	36.6%	–	8.0%	–	33.0%	50.0%	28.6%
	2004 (162)	–	8.6%	5.6%	–	Not Tested	67.9%	9.3%	5.6%	51.9%	–	3.1%	1.2%	27.2%	6.2%	24.7%
	2005 (129)	0.8%	3.9%	1.6%	–	–	74.4%	4.7%	2.3%	18.6%	–	2.3%	–	20.9%	7.8%	28.7%
	2006 (125)	–	1.6%	0.8%	–	–	41.6%	7.2%	4.8%	12.8%	–	4.8%	–	21.6%	6.4%	20.0%
	2007 (70)	–	–	–	–	–	55.7%	4.3%	2.9%	4.3%	–	1.4%	–	10.0%	5.7%	18.6%
	2008 (73)	–	5.5%	2.7%	–	–	75.3%	13.7%	4.1%	20.5%	–	9.6%	1.4%	26.0%	16.4%	28.8%
	2009 (59)	1.7%	6.8%	8.5%	–	–	79.7%	5.1%	3.4%	16.9%	–	6.8%	–	18.6%	18.6%	39.0%
	2010 (61)	–	8.2%	3.3%	–	–	73.8%	6.6%	3.3%	6.6%	–	3.3%	1.6%	14.8%	–	27.9%
	2011 (82)	–	6.1%	6.1%	–	–	79.3%	6.1%	3.7%	28.0%	–	3.7%	–	17.1%	11.0%	22.0%
	2012 (91)	–	5.5%	3.3%	–	–	72.5%	3.3%	2.2%	22.0%	–	3.3%	1.1%	12.1%	26.4%	23.1%
	P-Value	0.5557	0.8513	0.4193	N/A	N/A	0.0476	<0.0001	0.4357	<0.0001	N/A	0.4467	0.8392	0.0065	<0.0001	0.9735
Pork Chop	2002 (93)	1.1%	3.2%	5.4%	–	Not Tested	90.3%	20.4%	9.7%	5.4%	–	3.2%	–	4.3%	24.7%	68.8%
	2003 (97)	–	2.1%	3.1%	–	Not Tested	89.7%	6.2%	2.1%	16.5%	–	1.0%	–	6.2%	64.9%	69.1%
	2004 (75)	–	2.7%	6.7%	–	Not Tested	84.0%	5.3%	–	37.3%	–	8.0%	–	17.3%	6.7%	72.0%
	2005 (75)	–	8.0%	6.7%	–	–	88.0%	9.3%	5.3%	10.7%	–	1.3%	–	9.3%	13.3%	56.0%
	2006 (70)	1.4%	2.9%	2.9%	–	–	64.3%	7.1%	5.7%	4.3%	–	1.4%	–	4.3%	10.0%	54.3%
	2007 (33)	–	3.0%	–	–	–	66.7%	3.0%	3.0%	9.1%	–	–	–	9.1%	3.0%	33.3%
	2008 (35)	–	5.7%	–	–	–	57.1%	14.3%	5.7%	8.6%	–	–	–	14.3%	5.7%	45.7%
	2009 (26)	–	–	3.8%	–	–	84.6%	3.8%	–	11.5%	–	7.7%	–	7.7%	19.2%	50.0%
	2010 (32)	–	3.1%	3.1%	–	–	78.1%	9.4%	3.1%	6.3%	–	6.3%	–	12.5%	3.1%	50.0%
	2011 (37)	–	5.4%	5.4%	–	–	73.0%	10.8%	5.4%	18.9%	–	2.7%	2.7%	10.8%	13.5%	48.6%
	2012 (52)	–	–	–	–	–	90.4%	1.9%	–	5.8%	–	–	–	3.8%	23.1%	30.8%
	P-Value	N/A	0.6664	0.1276	N/A	N/A	0.0143	0.0326	0.1703	0.2175	N/A	0.7732	N/A	0.3466	<0.0001	<0.0001

[1] Dashes indicate 0.0% resistance to antimicrobial. Percent resistance (%) = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type)

[2] Daptomycin data not presented for *E. faecium* , as only a susceptible CLSI breakpoint is established for *E. faecalis* .

[3] Percent non susceptible is reported for tigecycline as no CLSI breakpoint is established. NARMS established breakpoint was used to determine resistance.

[4] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

Table 22.3 Trends in Antimicrobial Resistance among *Enterococcus hirae* by Meat Type, 2002-2012[1,2]

Meat Type	Year (n)	Aminoglycosides			Glyco-peptides	Glycyl-cycline	Lincos-amides	Macrolides		Nitro-furans	Oxazolidi-nones	Penicillins	Phenicols	Quino-lones	Strepto-gramins	Tetra-cyclines
		GEN	KAN	STR	VAN	TGC[3]	LIN	ERY	TYL	NIT	LZD	PEN	CHL	CIP	QDA	TET
Retail Chicken	2002 (12)	8.3%	16.7%	16.7%	–	Not Tested	100.0%	16.7%	16.7%	8.3%	–	8.3%	–	8.3%	66.7%	83.3%
	2003 (28)	–	28.6%	42.9%	–	Not Tested	100.0%	67.9%	64.3%	10.7%	–	7.1%	–	–	82.1%	64.3%
	2004 (27)	–	3.7%	22.2%	–	Not Tested	92.6%	11.1%	11.1%	14.8%	–	25.9%	–	3.7%	7.4%	51.9%
	2005 (30)	10.0%	26.7%	23.3%	–	–	100.0%	63.3%	60.0%	6.7%	–	-	3.3%	–	40.0%	46.7%
	2006 (27)	3.7%	3.7%	18.5%	–	–	77.8%	14.8%	18.5%	7.4%	–	7.4%	–	14.8%	18.5%	33.3%
	2007 (22)	4.5%	18.2%	9.1%	–	–	95.5%	45.5%	45.5%	–	–	4.5%	–	4.5%	40.9%	81.8%
	2008 (16)	6.3%	12.5%	25.0%	–	–	100.0%	37.5%	37.5%	–	–	–	–	–	18.8%	43.8%
	2009 (8)	12.5%	12.5%	25.0%	–	–	100.0%	25.0%	25.0%	–	–	–	–	–	25.0%	62.5%
	2010 (24)	4.2%	4.2%	8.3%	–	–	100.0%	41.7%	41.7%	4.2%	–	8.3%	–	–	16.7%	50.0%
	2011 (18)	11.1%	16.7%	5.6%	–	–	100.0%	16.7%	16.7%	5.6%	–	5.6%	–	–	5.6%	72.2%
	2012 (10)	20.0%	20.0%	–	–	–	100.0%	20.0%	20.0%	10.0%	–	10.0%	–	–	20.0%	90.0%
	P-Value[4]	0.0335	0.4074	0.0022	N/A	N/A	0.7274	0.1261	0.1954	0.2259	N/A	0.1888	0.6199	0.3620	<0.0001	0.4806
Ground[5] Turkey	2002 (2)	–	–	50.0%	–	Not Tested	100.0%	–	–	50.0%	–	–	–	–	50.0%	100.0%
	2003 (3)	–	66.7%	–	–	Not Tested	100.0%	66.7%	66.7%	–	–	–	–	–	66.7%	–
	2005 (1)	–	–	–	–	–	100.0%	–	–	–	–	–	–	–	–	–
	2006 (3)	33.3%	33.3%	33.3%	–	–	100.0%	66.7%	66.7%	66.7%	–	66.7%	–	33.3%	33.3%	66.7%
	2007 (2)	–	–	–	–	–	100.0%	–	–	–	–	100.0%	–	100.0%	–	100.0%
	2010 (2)	–	–	–	–	–	50.0%	50.0%	50.0%	–	–	–	–	–	50.0%	50.0%
	2012 (3)	–	–	–	–	–	66.7%	–	–	–	–	–	–	–	–	33.3%
	P-Value	N/A	0.2270	0.3254	N/A	N/A	0.1964	0.4532	0.4532	0.3305	N/A	N/A	N/A	0.8999	0.1955	0.8498
Ground Beef	2002 (76)	–	–	2.6%	–	Not Tested	93.4%	19.7%	19.7%	–	–	–	1.3%	–	44.7%	60.5%
	2003 (84)	–	3.6%	3.6%	–	Not Tested	91.7%	15.5%	15.5%	–	–	–	–	–	60.7%	46.4%
	2004 (88)	–	–	–	–	Not Tested	85.2%	8.0%	8.0%	6.8%	–	1.1%	–	1.1%	10.2%	53.4%
	2005 (82)	1.2%	1.2%	4.9%	–	–	98.8%	17.1%	17.1%	4.9%	–	–	–	–	11.0%	65.9%
	2006 (77)	1.3%	1.3%	2.6%	–	–	81.8%	14.3%	15.6%	–	–	–	–	–	5.2%	53.2%
	2007 (57)	–	–	1.8%	–	–	96.5%	17.5%	19.3%	–	–	–	–	1.8%	5.3%	52.6%
	2008 (49)	–	2.0%	–	–	–	91.8%	12.2%	12.2%	–	–	–	–	–	4.1%	53.1%
	2009 (26)	–	–	–	–	–	88.5%	3.8%	3.8%	–	–	–	–	–	7.7%	50.0%
	2010 (41)	–	–	–	–	–	95.1%	14.6%	14.6%	–	–	–	–	–	7.3%	43.9%
	2011 (44)	–	–	–	–	–	84.1%	13.6%	13.6%	2.3%	–	–	–	–	9.1%	38.6%
	2012 (57)	–	–	1.8%	–	–	93.0%	14.0%	14.0%	1.8%	–	–	–	–	12.3%	66.7%
	P-Value	N/A	0.2389	0.1423	N/A	N/A	0.5312	0.4117	0.4214	0.4843	N/A	N/A	0.1286	N/A	<0.0001	0.6670
Pork Chop	2002 (12)	–	–	–	–	Not Tested	100.0%	–	–	–	–	–	–	–	25.0%	66.7%
	2003 (14)	–	–	–	–	Not Tested	100.0%	7.1%	7.1%	7.1%	–	–	–	–	35.7%	14.3%
	2004 (14)	–	7.1%	–	–	Not Tested	71.4%	–	–	21.4%	–	7.1%	–	7.1%	–	35.7%
	2005 (4)	–	–	25.0%	–	–	100.0%	25.0%	25.0%	25.0%	–	–	–	–	25.0%	50.0%
	2006 (8)	–	–	–	–	–	87.5%	25.0%	25.0%	–	–	–	–	12.5%	–	50.0%
	2007 (6)	–	–	16.7%	–	–	83.3%	33.3%	33.3%	–	–	–	–	–	–	83.3%
	2008 (5)	–	–	–	–	–	100.0%	60.0%	40.0%	20.0%	–	–	–	–	20.0%	60.0%
	2009 (2)	–	–	–	–	–	100.0%	–	–	–	–	–	–	–	–	100.0%
	2010 (7)	–	–	–	–	–	100.0%	–	–	–	–	–	–	–	–	85.7%
	2011 (2)	–	–	50.0%	–	–	100.0%	50.0%	50.0%	–	–	–	–	–	50.0%	50.0%
	2012 (5)	–	–	–	–	–	80.0%	20.0%	20.0%	–	–	–	–	–	20.0%	80.0%
	P-Value	N/A	N/A	N/A	N/A	N/A	0.8145	0.2096	0.2519	0.3866	N/A	N/A	N/A	N/A	0.1946	0.0259

[1] Dashes indicate 0.0% resistance to antimicrobial. Percent resistance (%) = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type)

[2] Daptomycin data not presented for *E. hirae* , as only a susceptible CLSI breakpoint is established for *E. faecalis* .

[3] Percent non susceptible is reported for tigecycline as no CLSI breakpoint is established. NARMS established breakpoint was used to determine resistance.

[4] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

[5] There were no *E. hirae* isolates among any NARMS retail ground turkey isolates in 2004, 2008, 2009, and 2011.

Table 23.1 Multidrug Resistance among *Enterococcus faecalis* Isolates by Antimicrobial Class, 2002-2012[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of Isolates Tested by Source	Retail Chicken	134	188	88	116	126	123	165	138	214	186	204
	Ground Turkey	294	289	260	339	291	261	271	260	369	392	384
	Ground Beef	210	224	194	226	227	205	202	227	285	269	277
	Pork Chop	255	313	313	320	301	263	263	259	353	334	350
Resistance Pattern[2]	**Isolate Source**											
1. No Resistance Detected	Retail Chicken	0.7% 1	0.5% 1	–	0.9% 1	–	–	–	0.7% 1	0.5% 1	0.5% 1	1.0% 2
	Ground Turkey	1.4% 4	1.0% 3	0.4% 1	0.6% 2	0.3% 1	–	–	1.5% 4	2.2% 8	0.8% 3	0.5% 2
	Ground Beef	–	2.7% 6	1.5% 3	1.3% 3	1.8% 4	2.0% 4	0.5% 1	1.8% 4	0.7% 2	2.2% 6	1.1% 3
	Pork Chop	0.4% 1	–	0.6% 2	1.3% 4	–	0.4% 1	0.4% 1	0.4% 1	0.3% 1	0.6% 2	0.9% 3
2. Resistance to ≥ 3 Antimicrobial Classes	Retail Chicken	52.2% 70	47.9% 90	42.0% 37	50.0% 58	43.7% 55	45.5% 56	40.6% 67	43.5% 60	39.7% 85	41.4% 77	37.3% 76
	Ground Turkey	49.3% 145	54.3% 157	52.7% 137	43.4% 147	56.7% 165	67.0% 175	69.7% 189	50.0% 130	58.5% 216	60.2% 236	53.6% 206
	Ground Beef	4.8% 10	6.7% 15	10.8% 21	10.2% 23	7.5% 17	6.8% 14	5.4% 11	6.6% 15	2.5% 7	3.7% 10	1.8% 5
	Pork Chop	15.7% 40	9.9% 31	18.8% 59	14.4% 46	12.3% 37	16.3% 43	17.5% 46	14.7% 38	9.3% 33	8.4% 28	8.6% 30
3. Resistance to ≥ 4 Antimicrobial Classes	Retail Chicken	32.1% 43	19.1% 36	18.2% 16	20.7% 24	19.8% 25	22.8% 28	21.2% 35	21.7% 30	23.8% 51	23.1% 43	21.1% 43
	Ground Turkey	17.7% 52	31.1% 90	22.3% 58	25.7% 87	22.7% 66	36.4% 95	42.4% 115	28.1% 73	29.5% 109	30.9% 121	23.7% 91
	Ground Beef	1.9% 4	3.1% 7	3.1% 6	4.4% 10	2.2% 5	1.5% 3	2.0% 4	1.3% 3	0.7% 2	1.5% 4	–
	Pork Chop	4.7% 12	5.1% 16	5.8% 18	4.4% 14	3.3% 10	2.3% 6	4.9% 13	3.9% 10	2.5% 9	3.3% 11	3.1% 11
4. Resistance to ≥ 5 Antimicrobial Classes	Retail Chicken	–	0.5% 1	1.1% 1	0.9% 1	–	–	1.2% 2	1.4% 2	0.9% 2	–	–
	Ground Turkey	0.7% 2	0.7% 2	–	1.5% 5	0.3% 1	–	0.7% 2	–	–	0.8% 3	–
	Ground Beef	–	–	–	0.4% 1	0.4% 1	0.5% 1	–	–	–	0.7% 2	–
	Pork Chop	0.4% 1	0.6% 2	1.0% 3	1.3% 4	0.7% 2	0.4% 1	0.8% 2	0.8% 2	–	0.6% 2	0.9% 3
5. Resistance to ≥ 6 Antimicrobial Classes	Retail Chicken	–	–	–	–	–	–	–	–	–	–	–
	Ground Turkey	0.3% 1	–	–	1.2% 4	–	–	–	–	–	–	–
	Ground Beef	–	–	–	0.4% 1	–	–	–	–	–	–	–
	Pork Chop	–	–	–	–	–	–	–	–	–	–	–

[1] Dash indicates 0.0% resistance.

[2] Resistance pattern does not include QDA, as *E. faecalis* is considered intrinsically resistant.

Table 23.2 Multidrug Resistance among *Enterococcus faecium* Isolates by Antimicrobial Class, 2002-2012[1,2]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of Isolates Tested by Source	Retail Chicken	231	248	348	307	315	189	163	202	197	221	235
	Ground Turkey	89	118	172	107	139	65	70	66	45	40	73
	Ground Beef	93	112	162	129	125	70	73	59	61	82	91
	Pork Chop	93	97	75	75	70	33	35	26	32	37	52
Resistance Pattern	**Isolate Source**											
1. No Resistance Detected	**Retail Chicken**	3.5% 8	1.2% 3	1.1% 4	9.8% 30	10.8% 34	9.0% 17	4.9% 8	4.5% 9	6.1% 12	5.0% 11	3.4% 8
	Ground Turkey	–	–	0.6% 1	–	–	1.5% 1	2.9% 2	1.5% 1	6.7% 3	5.0% 2	1.4% 1
	Ground Beef	16.1% 15	10.7% 12	9.9% 16	9.3% 12	40.0% 50	38.6% 27	8.2% 6	3.4% 2	11.5% 7	7.3% 6	11.0% 10
	Pork Chop	4.3% 4	3.1% 3	1.3% 1	6.7% 5	21.4% 15	18.2% 6	17.1% 6	11.5% 3	15.6% 5	10.8% 4	5.8% 3
2. Resistance to ≥ 3 Antimicrobial Classes	**Retail Chicken**	71.9% 166	79.4% 197	75.9% 264	63.2% 194	53.3% 168	66.7% 126	63.8% 104	65.8% 133	48.7% 96	54.8% 121	60.0% 141
	Ground Turkey	86.5% 77	88.1% 104	91.9% 158	86.9% 93	93.5% 130	90.8% 59	85.7% 60	92.4% 61	75.6% 34	85.0% 34	84.9% 62
	Ground Beef	31.2% 29	40.2% 45	27.2% 44	15.5% 20	9.6% 12	7.1% 5	27.4% 20	20.3% 12	9.8% 6	20.7% 17	22.0% 20
	Pork Chop	33.3% 31	54.6% 53	41.3% 31	21.3% 16	12.9% 9	3.0% 1	17.1% 6	23.1% 6	12.5% 4	16.2% 6	7.7% 4
3. Resistance to ≥ 4 Antimicrobial Classes	**Retail Chicken**	49.4% 114	52.8% 131	52.6% 183	43.6% 134	36.5% 115	38.6% 73	51.5% 84	56.4% 114	38.1% 75	42.1% 93	44.3% 104
	Ground Turkey	78.7% 70	72.9% 86	82.6% 142	73.8% 79	82.0% 114	75.4% 49	80.0% 56	86.4% 57	64.4% 29	75.0% 30	75.3% 55
	Ground Beef	11.8% 11	18.8% 21	9.9% 16	6.2% 8	4.8% 6	4.3% 3	15.1% 11	13.6% 8	3.3% 2	7.3% 6	7.7% 7
	Pork Chop	8.6% 8	7.2% 7	12.0% 9	9.3% 7	4.3% 3	3.0% 1	5.7% 2	3.8% 1	9.4% 3	10.8% 4	–
4. Resistance to ≥ 5 Antimicrobial Classes	**Retail Chicken**	30.3% 70	35.5% 88	28.7% 100	28.3% 87	16.8% 53	16.9% 32	34.4% 56	39.1% 79	25.4% 50	23.1% 51	19.6% 46
	Ground Turkey	66.3% 59	68.6% 81	62.2% 107	57.0% 61	57.6% 80	38.5% 25	55.7% 39	65.2% 43	42.2% 19	62.5% 25	56.2% 41
	Ground Beef	5.4% 5	8.0% 9	5.6% 9	4.7% 6	4.0% 5	–	8.2% 6	1.7% 1	1.6% 1	3.7% 3	3.3% 3
	Pork Chop	4.3% 4	5.2% 5	4.0% 3	6.7% 5	4.3% 3	–	2.9% 1	3.8% 1	6.3% 2	8.1% 3	–
5. Resistance to ≥ 6 Antimicrobial Classes	**Retail Chicken**	12.1% 28	12.9% 32	14.9% 52	15.0% 46	9.8% 31	10.6% 20	23.3% 38	14.4% 29	12.2% 24	11.8% 26	8.1% 19
	Ground Turkey	47.2% 42	43.2% 51	44.8% 77	38.3% 41	30.9% 43	15.4% 10	30.0% 21	47.0% 31	24.4% 11	50.0% 20	32.9% 24
	Ground Beef	–	4.5% 5	4.3% 7	–	2.4% 3	–	4.1% 3	1.7% 1	1.6% 1	2.4% 2	1.1% 1
	Pork Chop	1.1% 1	1.0% 1	–	2.7% 2	1.4% 1	–	2.9% 1	3.8% 1	3.1% 1	2.7% 1	–

[1] Dash indicates 0.0% resistance.

[2] Resistance patterns do not include daptomycin as there are no established CLSI breakpoints

Table 24.1 MIC Distribution among *Enterococcus faecalis* and *E. faecium* from Retail Chicken, 2012

Antimicrobial	Species	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048
Aminoglycosides																							
Gentamicin	*faecalis*	N/A	**29.4**	[23.3 - 36.2]														67.6	2.9		**3.9**	**25.5**	
	faecium	N/A	**6.8**	[3.9 - 10.8]														93.2		**0.4**	**0.9**	**5.5**	
Kanamycin	*faecalis*	N/A	**34.8**	[28.3 - 41.8]														64.2	0.5	0.5	**2.0**	**32.8**	
	faecium	N/A	**8.1**	[4.9 - 12.3]														73.2	12.8	6.0	**1.7**	**6.4**	
Streptomycin	*faecalis*	N/A	**17.6**	[12.7 - 23.6]																82.4	**0.5**	**1.0**	**16.2**
	faecium	N/A	**17.9**	[13.2 - 23.4]																82.1	**8.5**	**6.8**	**2.6**
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 1.8]						1.0	52.9	46.1											
	faecium	0.0	**0.0**	[0.0 - 1.6]						63.8	23.0	13.2											
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.0**	[0.0 - 1.8]			28.4	53.9	17.6														
	faecium	N/A	**0.0**	[0.0 - 1.6]		4.7	43.8	41.3	10.2														
Lincosamides																							
Lincomycin	*faecalis*	0.0	**99.0**	[96.5 - 99.9]							1.0				**99.0**								
	faecium	0.0	**78.7**	[72.9 - 83.8]							20.9	0.4		**1.7**	**77.0**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 1.8]						3.4	54.4	40.7	1.5										
	faecium[5]	N/A	**N/A**	N/A							4.7	10.2	79.6	5.5									
Macrolides																							
Erythromicin	*faecalis*	44.1	**34.3**	[27.8 - 41.3]					16.2	5.4	28.4	14.7	1.0		**34.3**								
	faecium	51.9	**21.3**	[16.2 - 27.1]					14.5	12.3	15.7	29.8	6.4	**0.4**	**20.9**								
Tylosin	*faecalis*	0.0	**34.3**	[27.8 - 41.3]						0.5	10.3	52.9	2.0				**34.3**						
	faecium	1.3	**20.9**	[15.8 - 26.6]							12.3	24.7	28.5	12.3	1.3		**20.9**						
Nitrofurans																							
Nitrofurantoin	*faecalis*	3.4	**0.0**	[0.0 - 1.8]										33.8	60.8	2.0	3.4						
	faecium	60.4	**36.6**	[30.4 - 43.1]											0.4	2.6	60.4	**36.6**					
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 1.8]							49.5	50.5											
	faecium	0.4	**0.0**	[0.0 - 1.6]							37.5	62.1	0.4										
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 1.8]							1.0	17.6	80.9	0.5									
	faecium	N/A	**11.9**	[8.1 - 16.8]					2.1	3.4	2.1	28.1	44.3	8.1	**6.8**	**5.1**							
Phenicols																							
Chloramphenicol	*faecalis*	4.4	**0.0**	[0.0 - 1.8]									3.9	91.7	4.4								
	faecium	0.9	**0.0**	[0.0 - 1.6]									28.5	70.6	0.9								
Quinolones																							
Ciprofloxacin	*faecalis*	46.1	**0.0**	[0.0 - 1.8]						0.5	53.4	46.1											
	faecium	46.8	**39.6**	[33.3 - 46.1]					0.4	0.9	12.3	46.8	**34.9**	**4.7**									
Streptogramins																							
Quinupristin-	*faecalis*[6]																						
Dalfopristin	*faecium*	39.1	**37.4**	[31.2 - 44.0]						20.9	2.6	39.1	**8.5**	**17.5**	**4.3**	**7.2**							
Tetracyclines																							
Tetracycline	*faecalis*	0.0	**56.9**	[49.8 - 63.8]							42.6	0.5			**0.5**	**4.4**	**52.0**						
	faecium	1.7	**55.7**	[49.1 - 62.2]							39.1	1.3	2.1	1.7	**1.3**		**54.5**						

[1] Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

[2] Percent of isolates with resistance. Discrepancies between %R and sums of distributions are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

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

[4] Unshaded areas indicate dilution ranges of the Sensititre plates. Breakpoints for susceptibility are indicated by single black bars and resistance double red vertical bars. Numbers in shaded area indicate isolates with MICs greater than the highest concentration on the Sensititre plate. Numbers in the lowest tested concentrations represent isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

[5] There are no established CLSI breakpoints for daptomycin in *E. faecium*.

[6] Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin.

Table 24.2 MIC Distribution among *Enterococcus faecalis* and *E. faecium* from Ground Turkey, 2012

Antimicrobial	Species	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048
Aminoglycosides																							
Gentamicin	*faecalis*	N/A	**32.6**	[27.9 - 37.5]														67.2	0.3	**0.3**		**32.3**	
	faecium	N/A	**13.7**	[6.8 - 23.8]														86.3			**4.1**	**9.6**	
Kanamycin	*faecalis*	N/A	**38.5**	[33.6 - 43.6]														60.9	0.3	0.3	**0.3**	**38.3**	
	faecium	N/A	**26.0**	[16.5 - 37.6]														43.8	24.7	5.5		**26.0**	
Streptomycin	*faecalis*	N/A	**20.6**	[16.6 - 25.0]																79.4		**0.5**	**20.1**
	faecium	N/A	**47.9**	[36.1 - 60.0]																52.1	**15.1**	**19.2**	**13.7**
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 1.0]						0.3	65.4	33.3	1.0										
	faecium	0.0	**0.0**	[0.0 - 4.9]						50.7	27.4	20.5	1.4										
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.0**	[0.0 - 1.0]		0.3	9.1	71.3	19.3														
	faecium	N/A	**0.0**	[0.0 - 4.9]		1.4	47.9	45.2	5.5														
Lincosamides																							
Lincomycin	*faecalis*	0.3	**98.7**	[97.0 - 99.6]							1.0		0.3		**98.7**								
	faecium	2.7	**83.6**	[73.0 - 91.2]							12.3	1.4	2.7	**2.7**	**80.8**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 1.0]					0.8	3.9	58.1	35.9	1.3										
	faecium[5]	N/A	**N/A**	N/A							1.4	13.7	63.0	20.5	1.4								
Macrolides																							
Erythromicin	*faecalis*	32.3	**37.0**	[32.1 - 42.0]					25.3	5.5	18.2	13.8	0.3		**37.0**								
	faecium	45.2	**27.4**	[17.6 - 39.1]					20.6	6.8	21.9	11.0	12.3	**4.1**	**23.3**								
Tylosin	*faecalis*	0.0	**37.0**	[32.1 - 42.0]							10.9	48.2	3.9				**37.0**						
	faecium	0.0	**17.8**	[9.8 - 28.5]						1.4	4.1	21.9	47.9	6.9			**17.8**						
Nitrofurans																							
Nitrofurantoin	*faecalis*	1.8	**0.0**	[0.0 - 1.0]										39.8	57.3	1.0	1.8						
	faecium	54.8	**39.7**	[28.5 - 51.9]										1.4		4.1	54.8	**39.7**					
Oxazolidinones																							
Linezolid	*faecalis*	0.3	**0.0**	[0.0 - 1.0]						0.3	52.3	47.1	0.3										
	faecium	0.0	**0.0**	[0.0 - 4.9]							45.2	54.8											
Penicillins																							
Penicillin	*faecalis*	N/A	**0.3**	[0.0 - 1.4]							2.1	21.6	76.0		**0.3**								
	faecium	N/A	**68.5**	[56.6 - 78.9]						1.4	6.8	4.1	17.8	1.4	**17.8**	**50.7**							
Phenicols																							
Chloramphenicol	*faecalis*	5.0	**0.3**	[0.0 - 1.4]									2.6	92.2	5.0		**0.3**						
	faecium	0.0	**1.4**	[0.0 - 7.4]									41.1	57.5		**1.4**							
Quinolones																							
Ciprofloxacin	*faecalis*	43.8	**0.0**	[0.0 - 1.0]						1.3	54.9	43.8											
	faecium	24.7	**54.8**	[42.7 - 66.5]						8.2	12.3	24.7	**49.3**	**5.5**									
Streptogramins																							
Quinupristin-	*faecalis*[6]																						
Dalfopristin	*faecium*	26.0	**64.4**	[52.3 - 75.3]						6.9	2.7	26.0	**12.3**	**17.8**	**23.3**	**11.0**							
Tetracyclines																							
Tetracycline	*faecalis*	1.6	**88.8**	[85.2 - 91.8]							8.9		0.8	1.6		**2.1**	**86.7**						
	faecium	0.0	**78.1**	[66.9 - 86.9]							20.5		1.4				**78.1**						

[1] Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

[2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

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

[4] Unshaded areas indicate dilution ranges of the Sensititre plates. Breakpoints for susceptibility are indicated by single black bars and resistance double red vertical bars. Numbers in shaded area indicate isolates with MICs greater than the highest concentration on the Sensititre plate. Numbers in the lowest tested concentrations represent isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

[5] There are no established CLSI breakpoints for daptomycin in *E. faecium*.

[6] Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin.

Table 24.3 MIC Distribution among *Enterococcus faecalis* and *E. faecium* from Ground Beef, 2012

Antimicrobial	Species	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048
Aminoglycosides																							
Gentamicin	*faecalis*	N/A	**0.0**	[0.0 - 1.3]														100.0					
	faecium	N/A	**0.0**	[0.0 - 4.0]														100.0					
Kanamycin	*faecalis*	N/A	**0.0**	[0.0 - 1.3]														100.0					
	faecium	N/A	**5.5**	[1.8 - 12.4]														64.8	25.3	4.4	**2.2**	**3.3**	
Streptomycin	*faecalis*	N/A	**1.8**	[0.6 - 4.2]																98.2		**1.1**	**0.7**
	faecium	N/A	**3.3**	[0.7 - 9.3]																96.7		**3.3**	
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 1.3]						0.4	54.5	44.4	0.7										
	faecium	0.0	**0.0**	[0.0 - 4.0]					2.2	82.4	7.7	7.7											
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.0**	[0.0 - 1.3]		1.1	42.2	36.5	20.2														
	faecium	N/A	**0.0**	[0.0 - 4.0]		2.2	63.7	22.0	12.1														
Lincosamides																							
Lincomycin	*faecalis*	0.0	**98.9**	[96.9 - 99.8]							1.1				**98.9**								
	faecium	1.1	**72.5**	[62.2 - 81.4]							23.1	3.3	1.1	**14.3**	**58.2**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 1.3]					0.4	2.5	49.1	45.8	2.2										
	faecium[5]	N/A	**N/A**	N/A							1.1	31.9	65.9	1.1									
Macrolides																							
Erythromicin	*faecalis*	72.5	**0.0**	[0.0 - 1.3]					17.0	10.5	46.9	23.8	1.8										
	faecium	80.3	**3.3**	[0.7 - 9.3]					15.4	1.1	20.9	29.7	29.7	**1.1**	**2.2**								
Tylosin	*faecalis*	0.0	**0.0**	[0.0 - 1.3]						0.4	7.2	91.3	1.1										
	faecium	9.9	**2.2**	[0.3 - 7.7]							7.7	27.5	33.0	19.8	9.9		**2.2**						
Nitrofurans																							
Nitrofurantoin	*faecalis*	0.0	**0.0**	[0.0 - 1.3]									0.4	25.6	73.6	0.4							
	faecium	73.6	**22.0**	[14.0 - 31.9]										1.1		3.3	73.6	**22.0**					
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 1.3]						0.7	30.7	68.6											
	faecium	1.1	**0.0**	[0.0 - 4.0]							16.5	82.4	1.1										
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 1.3]								22.7	76.9	0.4									
	faecium	N/A	**3.3**	[0.7 - 9.3]					18.7	3.3	5.5	12.1	45.1	12.1	**3.3**								
Phenicols																							
Chloramphenicol	*faecalis*	0.0	**0.0**	[0.0 - 1.3]									3.6	96.4									
	faecium	0.0	**1.1**	[0.0 - 6.0]									11.0	87.9		**1.1**							
Quinolones																							
Ciprofloxacin	*faecalis*	50.9	**1.1**	[0.2 - 3.1]						1.1	46.9	50.9	**1.1**										
	faecium	26.4	**12.1**	[6.2 - 20.6]						16.5	45.0	26.4	**12.1**										
Streptogramins																							
Quinupristin-	*faecalis*[6]																						
Dalfopristin	*faecium*	44.0	**26.4**	[17.7 - 36.7]						22.0	7.7	44.0	**25.3**	**1.1**									
Tetracyclines																							
Tetracycline	*faecalis*	0.0	**21.7**	[17.0 - 27.0]							77.6	0.4			**0.4**	**1.8**	**19.9**						
	faecium	0.0	**23.1**	[14.9 - 33.1]							76.9						**23.1**						

[1] Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

[2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

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

[4] Unshaded areas indicate dilution ranges of the Sensititre plates. Breakpoints for susceptibility are indicated by single black bars and resistance double red vertical bars. Numbers in shaded area indicate isolates with MICs greater than the highest concentration on the Sensititre plate. Numbers in the lowest tested concentrations represent isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

[5] There are no established CLSI breakpoints for daptomycin in *E. faecium*.

[6] Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin.

Table 24.4 MIC Distribution among *Enterococcus faecalis* and *E. faecium* from Pork Chop, 2012

Antimicrobial	Species	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048
Aminoglycosides																							
Gentamicin	*faecalis*	N/A	**1.7**	[0.6 - 3.7]														98.0	0.3		**0.9**	**0.9**	
	faecium	N/A	**0.0**	[0.0 - 6.8]														100.0					
Kanamycin	*faecalis*	N/A	**2.0**	[0.8 - 4.1]														98.0				**2.0**	
	faecium	N/A	**0.0**	[0.0 - 6.8]														86.5	11.5	1.9			
Streptomycin	*faecalis*	N/A	**4.0**	[2.2 - 6.6]																96.0		**1.1**	**2.9**
	faecium	N/A	**0.0**	[0.0 - 6.8]																100.0			
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 1.0]						0.6	62.9	35.4	1.1										
	faecium	0.0	**0.0**	[0.0 - 6.8]					3.9	86.5	7.7	1.9											
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.0**	[0.0 - 1.0]			15.1	64.6	20.3														
	faecium	N/A	**0.0**	[0.0 - 6.8]		3.9	57.7	26.9	11.5														
Lincosamides																							
Lincomycin	*faecalis*	0.0	**98.0**	[95.9 - 99.2]							2.0				**98.0**								
	faecium	0.0	**90.4**	[79.0 - 96.8]							9.6			**36.5**	**53.9**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 1.0]					1.4	2.3	41.1	52.3	2.9										
	faecium[5]	N/A	**N/A**	N/A							1.9	46.2	50.0	1.9									
Macrolides																							
Erythromicin	*faecalis*	74.6	**5.1**	[3.1 - 8.0]					8.3	12.0	44.9	22.0	7.7	**0.3**	**4.9**								
	faecium	94.2	**1.9**	[0.0 - 10.3]						3.9	19.2	36.5	38.5		**1.9**								
Tylosin	*faecalis*	0.0	**5.1**	[3.1 - 8.0]						0.3	11.1	82.3	1.1				**5.1**						
	faecium	3.9	**0.0**	[0.0 - 6.8]						1.9	3.9	11.5	44.2	34.6	3.9								
Nitrofurans																							
Nitrofurantoin	*faecalis*	0.0	**0.3**	[0.0 - 1.6]										37.4	62.3							**0.3**	
	faecium	86.5	**5.8**	[1.2 - 15.9]										1.9		5.8	86.5					**5.8**	
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 1.0]							36.3	63.7											
	faecium	0.0	**0.0**	[0.0 - 6.8]							28.9	71.1											
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 1.0]							1.4	28.3	70.3										
	faecium	N/A	**0.0**	[0.0 - 6.8]					15.4	3.9	17.3	25.0	28.8	9.6									
Phenicols																							
Chloramphenicol	*faecalis*	0.3	**2.3**	[1.0 - 4.5]									4.0	93.4	0.3	**0.6**	**1.7**						
	faecium	0.0	**0.0**	[0.0 - 6.8]									34.6	65.4									
Quinolones																							
Ciprofloxacin	*faecalis*	42.9	**0.3**	[0.0 - 1.6]						4.9	52.0	42.9	**0.3**										
	faecium	30.8	**3.8**	[0.5 - 13.2]					13.5	11.5	40.4	30.8	**3.8**										
Streptogramins																							
Quinupristin-	*faecalis*[6]																						
Dalfopristin	*faecium*	67.3	**23.1**	[12.5 - 36.8]						3.8	5.8	67.3	**21.2**	**1.9**									
Tetracyclines																							
Tetracycline	*faecalis*	0.3	**81.7**	[77.3 - 85.6]							17.7	0.3		0.3		**4.0**	**77.7**						
	faecium	0.0	**0.0**	[0.0 - 6.8]							69.2						**30.8**						

[1] Percent of isolates with intermediate susceptibility. N/A used when there is no intermediate breakpoint established.

[2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution %'s are due to rounding. Percent (%) non-susceptible is reported rather than %R for daptomycin and tigecycline because there is no CLSI breakpoint established.

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

[4] Unshaded areas indicate dilution ranges of the Sensititre plates. Breakpoints for susceptibility are indicated by single black bars and resistance double red vertical bars. Numbers in shaded area indicate isolates with MICs greater than the highest concentration on the Sensititre plate. Numbers in the lowest tested concentrations represent isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

[5] There are no established CLSI breakpoints for daptomycin in *E. faecium*.

[6] Data not presented as *E. faecalis* is considered intrinsically resistant to Quinupristin-Dalfopristin.

Table 25. *Escherichia coli* by Meat Type, 2002-2012

Year	Retail Chicken			Ground Turkey			Ground Beef			Pork Chop		
	N	n	%	N	n	%	N	n	%	N	n	%
2002	390	282	72.3%	395	304	77.0%	399	295	73.9%	390	184	47.2%
2003	477	396	83.0%	447	333	74.5%	470	311	66.2%	479	218	45.5%
2004	476	400	84.0%	466	376	80.7%	480	338	70.4%	478	232	48.5%
2005	468	393	84.0%	470	396	84.3%	468	316	67.5%	465	205	44.1%
2006	475	418	88.0%	466	388	83.3%	478	295	61.7%	472	182	38.6%
2007	342	299	87.4%	338	315	93.2%	343	256	74.6%	356	152	42.7%
2008	360	306	85.0%	360	300	83.3%	360	250	69.4%	359	146	40.7%
2009	360	315	87.5%	360	306	85.0%	360	247	68.6%	360	147	40.8%
2010	460	357	77.6%	460	369	80.2%	460	269	58.5%	460	183	39.8%
2011	480	341	71.0%	480	368	76.7%	480	215	44.8%	480	146	30.4%
2012	480	386	80.4%	476	391	82.1%	480	271	56.5%	480	161	33.5%
Total	4768	3893	81.6%	4718	3846	81.5%	4778	3063	64.1%	4779	1956	40.9%

Figure 12. Percent of Retail Meat Samples Culture Positive for *Escherichia coli* , 2002-2012

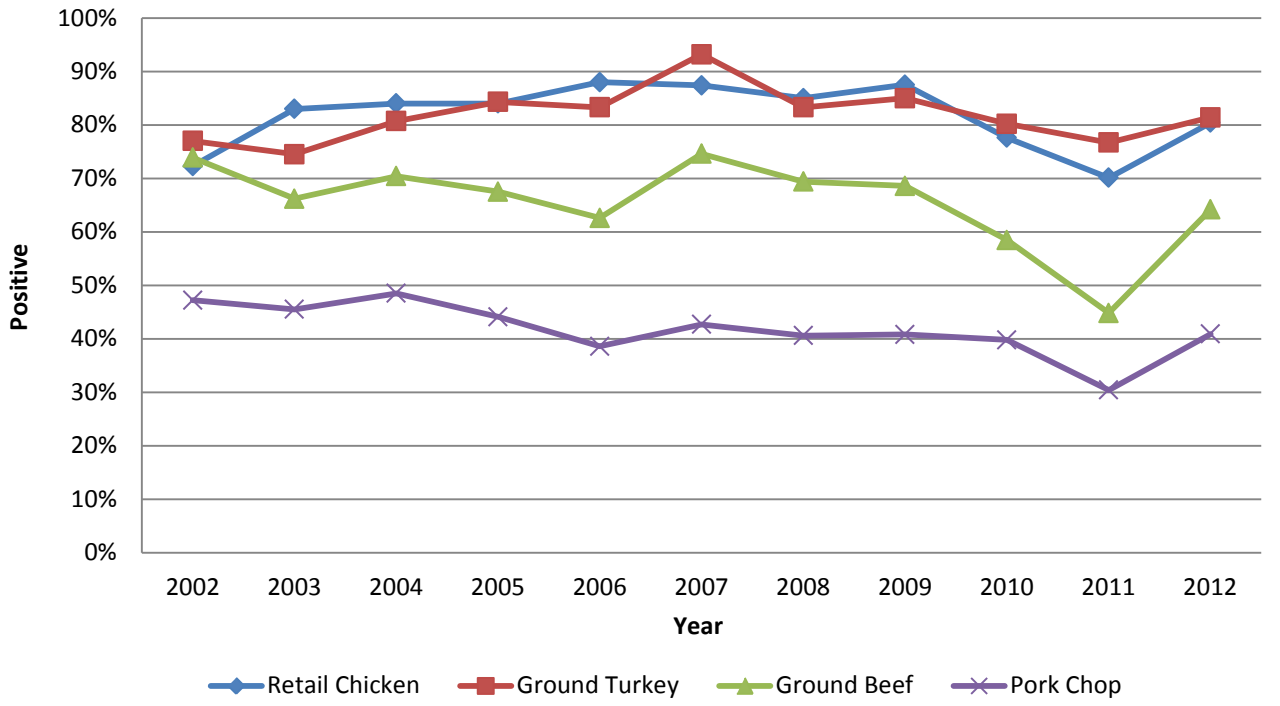


Table 26. Trends in Antimicrobial Resistance among *Escherichia coli* by Meat Type, 2002-2012[1]

Meat Type	Year (N)	Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	Cephems			Folate Pathway Inhibitors		Macrolides	Penicillins	Phenicols	Quinolones		Tetra-cyclines
		GEN (MIC ≥ 16)	KAN (MIC ≥ 64)	STR (MIC ≥ 64)	AMC (MIC ≥ 32)	TIO (MIC ≥ 32)	AXO (MIC ≥ 4)	FOX (MIC ≥ 32)	FIS[2] (MIC ≥ 512)	COT (MIC ≥ 4)	AZI[3] (MIC > 16)	AMP (MIC ≥ 32)	CHL (MIC ≥ 512)	CIP (MIC ≥ 1)	NAL (MIC ≥ 32)	TET (MIC ≥ 16)
Retail Chicken	2002 (282)	23.1%	6.0%	49.3%	12.1%	7.1%	7.8%	11.0%	32.3%	3.6%		21.6%	0.7%	0.7%	2.8%	46.1%
	2003 (396)	29.3%	6.8%	56.1%	13.6%	7.6%	9.1%	9.3%	38.4%	7.1%		25.3%	–	–	4.0%	42.9%
	2004 (400)	30.0%	6.8%	56.8%	10.0%	5.8%	6.5%	8.3%	41.3%	4.3%		17.0%	1.8%	–	7.0%	48.0%
	2005 (393)	37.7%	7.1%	50.6%	12.2%	8.7%	10.2%	11.2%	48.1%	7.4%		24.7%	0.5%	–	6.6%	46.6%
	2006 (418)	37.3%	11.5%	48.1%	11.5%	8.6%	9.1%	11.2%	46.9%	8.9%		20.1%	2.6%	–	5.0%	50.5%
	2007 (299)	34.4%	9.0%	46.8%	7.4%	6.0%	6.4%	7.4%	42.1%	5.0%		18.1%	2.0%	–	3.0%	40.5%
	2008 (306)	34.0%	6.9%	43.8%	11.8%	10.8%	11.1%	11.8%	39.2%	3.6%		23.5%	1.0%	–	2.9%	43.8%
	2009 (315)	34.3%	5.4%	38.1%	13.3%	11.7%	12.4%	13.3%	40.6%	2.2%		22.2%	0.6%	0.3%	2.9%	41.6%
	2010 (357)	31.9%	6.2%	39.2%	6.7%	5.6%	6.4%	6.7%	38.9%	4.2%		16.5%	1.4%	0.6%	3.6%	38.9%
	2011 (341)	38.4%	5.6%	43.4%	14.1%	12.3%	12.6%	13.2%	44.3%	2.3%	–	26.4%	1.2%	–	2.3%	40.8%
	2012 (386)	30.6%	5.7%	39.6%	7.8%	7.5%	7.8%	7.8%	37.8%	2.6%	–	15.8%	0.3%	–	1.8%	39.4%
	P-value[4]	<0.0001	0.0902	<0.0001	0.1332	0.0424	0.1822	0.9429	0.8175	0.9743	N/A	0.1420	0.7585	0.7900	0.0015	<0.0001
Ground Turkey	2002 (304)	27.0%	13.2%	57.6%	5.6%	1.0%	1.3%	3.3%	48.0%	4.0%		31.3%	0.3%	0.7%	4.3%	77.0%
	2003 (333)	29.7%	16.8%	54.7%	3.0%	0.3%	0.3%	1.2%	51.7%	6.9%		35.7%	3.6%	0.3%	11.7%	77.8%
	2004 (376)	29.3%	16.0%	49.2%	5.3%	1.1%	1.3%	4.5%	48.4%	3.7%		33.2%	0.8%	0.8%	10.6%	74.2%
	2005 (396)	27.5%	11.4%	43.4%	3.8%	1.8%	2.3%	3.3%	48.0%	5.1%		38.1%	4.0%	–	10.4%	78.0%
	2006 (388)	29.6%	14.7%	43.8%	6.7%	3.1%	3.1%	6.2%	48.5%	8.0%		42.0%	2.3%	0.5%	5.2%	76.5%
	2007 (315)	27.0%	15.6%	44.8%	6.3%	6.0%	6.0%	6.3%	48.9%	7.9%		48.3%	2.9%	0.3%	2.2%	80.0%
	2008 (300)	37.0%	19.0%	57.3%	8.3%	3.7%	3.7%	6.3%	51.0%	5.3%		58.0%	3.7%	–	3.7%	85.7%
	2009 (306)	37.9%	20.6%	57.5%	9.8%	6.2%	6.9%	7.8%	53.9%	5.9%		56.2%	3.3%	0.7%	2.6%	82.0%
	2010 (369)	24.9%	21.4%	47.7%	10.0%	7.9%	8.9%	9.2%	44.7%	5.1%		52.6%	3.5%	0.5%	2.7%	69.4%
	2011 (368)	32.6%	24.7%	60.3%	13.0%	9.8%	10.1%	12.5%	51.9%	4.3%	0.3%	51.6%	4.9%	–	1.6%	79.9%
	2012 (391)	40.9%	22.8%	67.0%	11.8%	9.2%	9.7%	11.3%	56.8%	6.1%	0.8%	55.5%	5.9%	0.3	1.8%	77.2%
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0654	0.7970	N/A	<0.0001	0.0001	0.3517	<0.0001	0.9290
Ground Beef	2002 (295)	0.3%	2.4%	9.5%	2.0%	–	–	1.4%	9.8%	0.7%		6.1%	1.0%	–	–	30.9%
	2003 (311)	1.0%	2.9%	9.0%	2.3%	0.3%	0.3%	0.3%	10.3%	0.3%		5.1%	2.3%	–	1.0%	25.1%
	2004 (338)	0.6%	2.4%	11.8%	3.9%	0.9%	1.5%	1.2%	13.0%	0.6%		5.3%	3.6%	–	1.5%	22.8%
	2005 (316)	–	0.6%	5.4%	1.3%	0.6%	1.9%	1.0%	7.0%	0.6%		3.5%	1.6%	0.3%	1.3%	16.5%
	2006 (295)	4.1%	4.7%	14.2%	2.4%	1.0%	1.7%	2.0%	12.5%	1.4%		9.2%	1.4%	–	0.7%	25.4%
	2007 (256)	–	1.6%	6.3%	0.8%	0.8%	0.8%	0.8%	9.4%	1.2%		6.6%	3.9%	–	0.4%	21.9%
	2008 (250)	2.0%	4.0%	10.4%	2.4%	1.6%	1.6%	2.4%	11.6%	2.0%		6.4%	0.8%	–	0.4%	24.0%
	2009 (247)	0.8%	2.0%	8.1%	1.6%	0.8%	0.8%	1.6%	7.7%	2.0%		4.9%	2.4%	–	0.4%	18.6%
	2010 (269)	0.4%	3.7%	9.3%	1.1%	1.1%	1.1%	1.1%	12.6%	0.7%		4.8%	2.6%	–	–	22.7%
	2011 (215)	0.5%	1.4%	6.5%	0.5%	0.9%	0.5%	0.5%	7.9%	2.3%	–	3.7%	1.4%	–	–	17.7%
	2012 (271)	0.7%	2.2%	10.0%	1.5%	–	–	1.8%	7.4%	0.4%	–	2.6%	1.1%	–	1.5%	22.1%
	P-value	0.9748	0.9367	0.4428	0.0220	0.4904	0.6429	0.6241	0.2232	0.1826	N/A	0.0411	0.4731	N/A	0.6002	0.0161
Pork Chop	2002 (184)	1.1%	5.4%	22.3%	5.4%	0.5%	0.5%	3.3%	12.5%	1.1%		13.6%	1.6%	–	0.5%	52.7%
	2003 (218)	1.4%	8.7%	19.7%	5.1%	0.9%	0.9%	2.3%	15.1%	2.8%		13.3%	4.1%	–	0.5%	46.3%
	2004 (232)	1.3%	8.2%	21.1%	5.6%	0.4%	0.4%	2.2%	19.4%	3.9%		15.1%	4.3%	–	–	56.0%
	2005 (205)	–	7.3%	13.2%	2.9%	–	0.5%	1.5%	14.1%	1.5%		16.1%	3.4%	–	1.5%	45.9%
	2006 (182)	1.1%	6.0%	13.7%	2.2%	–	0.6%	1.6%	20.3%	2.2%		15.9%	6.6%	–	0.5%	52.7%
	2007 (152)	1.3%	4.6%	13.8%	0.7%	0.7%	0.7%	0.7%	11.8%	1.3%		15.8%	3.9%	–	–	50.0%
	2008 (146)	1.4%	6.2%	19.9%	3.4%	3.4%	3.4%	3.4%	16.4%	6.2%		15.1%	3.4%	–	–	54.8%
	2009 (147)	4.1%	6.1%	19.7%	6.8%	6.8%	6.8%	6.8%	14.3%	2.7%		11.6%	4.8%	–	–	46.9%
	2010 (183)	2.7%	7.7%	19.7%	2.2%	–	–	0.5%	16.4%	3.8%		19.1%	1.6%	–	0.5%	44.3%
	2011 (146)	0.7%	1.4%	15.1%	–	–	–	–	10.3%	3.4%	–	13.0%	2.7%	–	–	46.6%
	2012 (161)	0.6%	5.0%	14.9%	3.1%	1.2%	1.2%	1.9%	6.8%	1.9%	–	13.0%	3.7%	–	–	39.1%
	P-value	0.2060	0.0658	0.1157	0.0195	0.1876	0.2685	0.2717	0.0122	0.3683	N/A	0.9256	0.7863	N/A	0.2574	0.0058

[1] Dashes indicate 0.0% resistance to antimicrobial. Where % resistance = (# isolates resistant to antimicrobial per meat type) / (total # isolates per meat type).

[2] Sulfisoxazole replaced Sulfamethoxazole on NARMS panel in 2004.

[3] Data for Azithromycin available beginning in 2011.

[4] P-values calculated using a binary logistic random effects regression model to account for site variation. P-values are not available (N/A) for antimicrobials where resistance has only one level, i.e. zero, or when there is insufficient variation among the resistance observed. P-values < 0.05 indicate a trend.

Figure 13. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Retail Chicken and Ground Turkey, 2002-2012

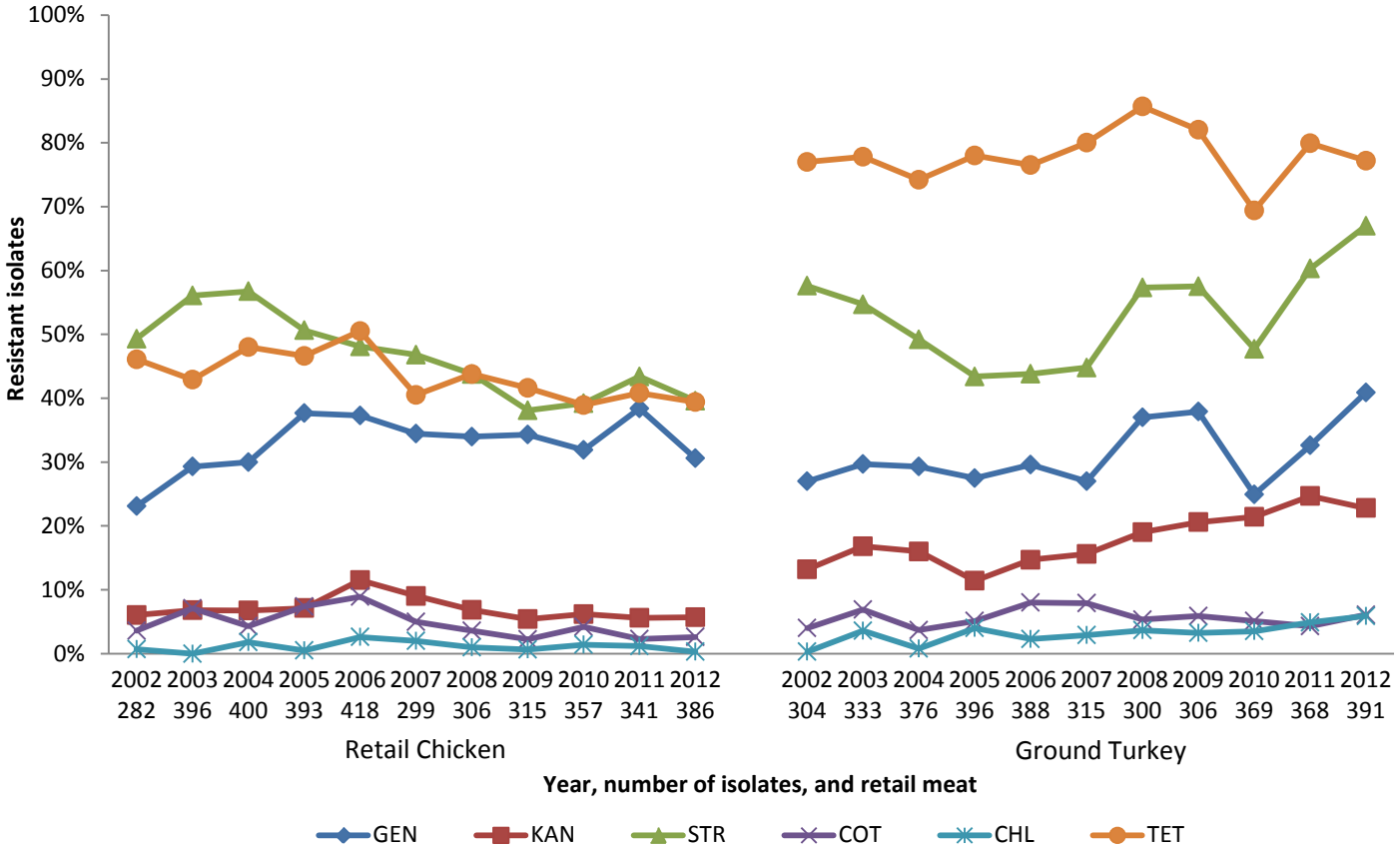


Figure 14. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Ground Beef and Pork Chop, 2002-2012

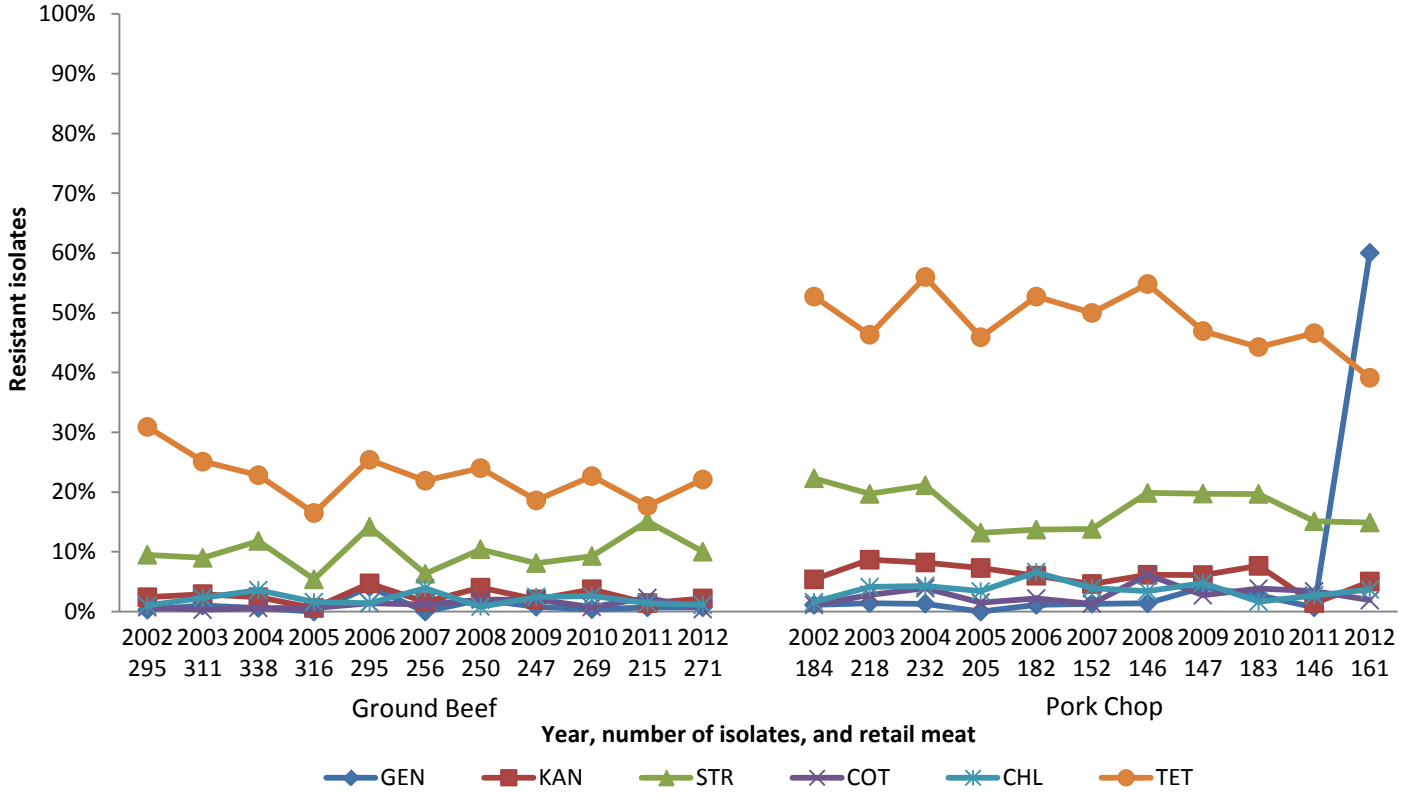


Figure 15. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Retail Chicken and Ground Turkey, 2002-2012

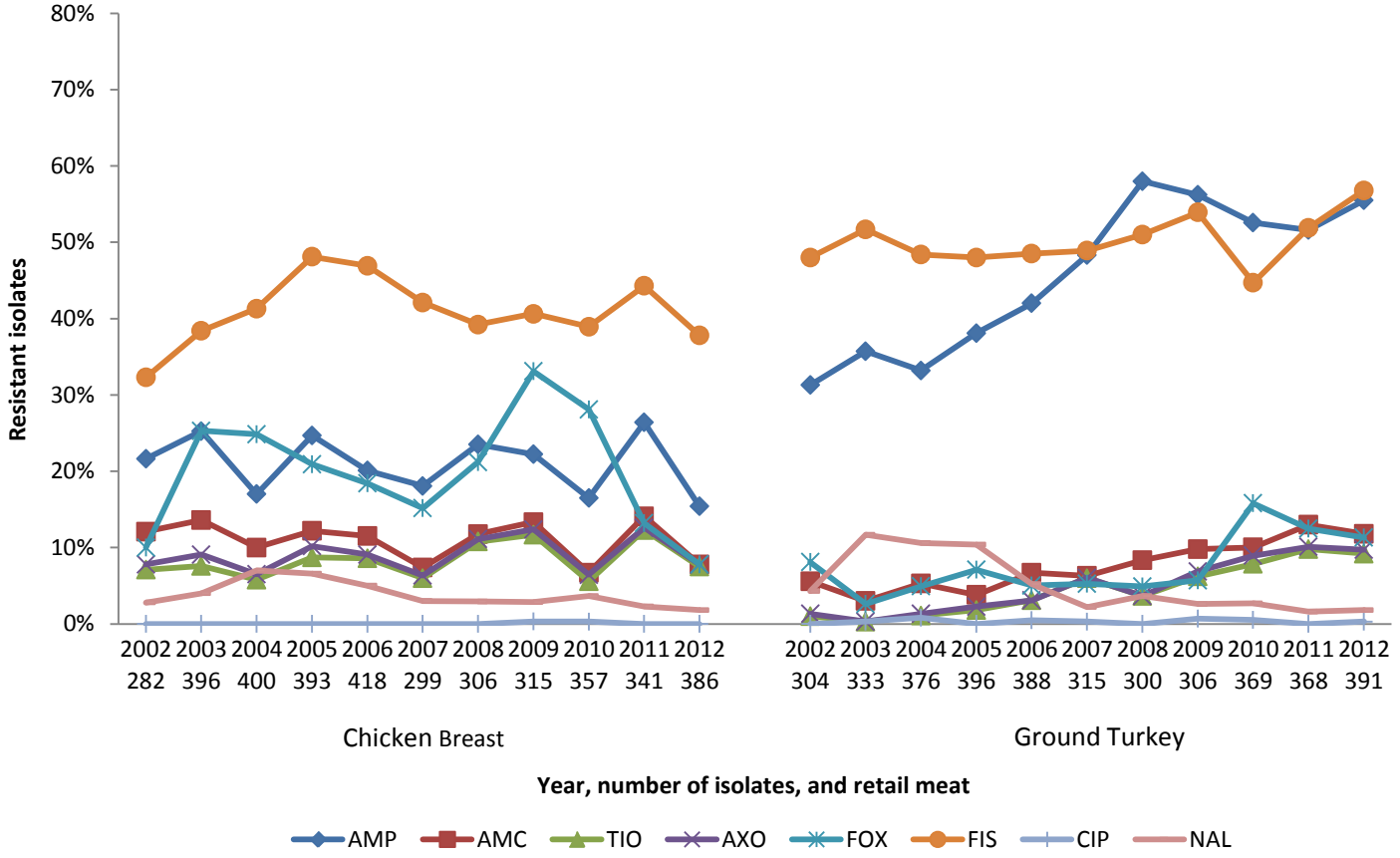


Figure 16. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Ground Beef and Pork Chop, 2002-2012

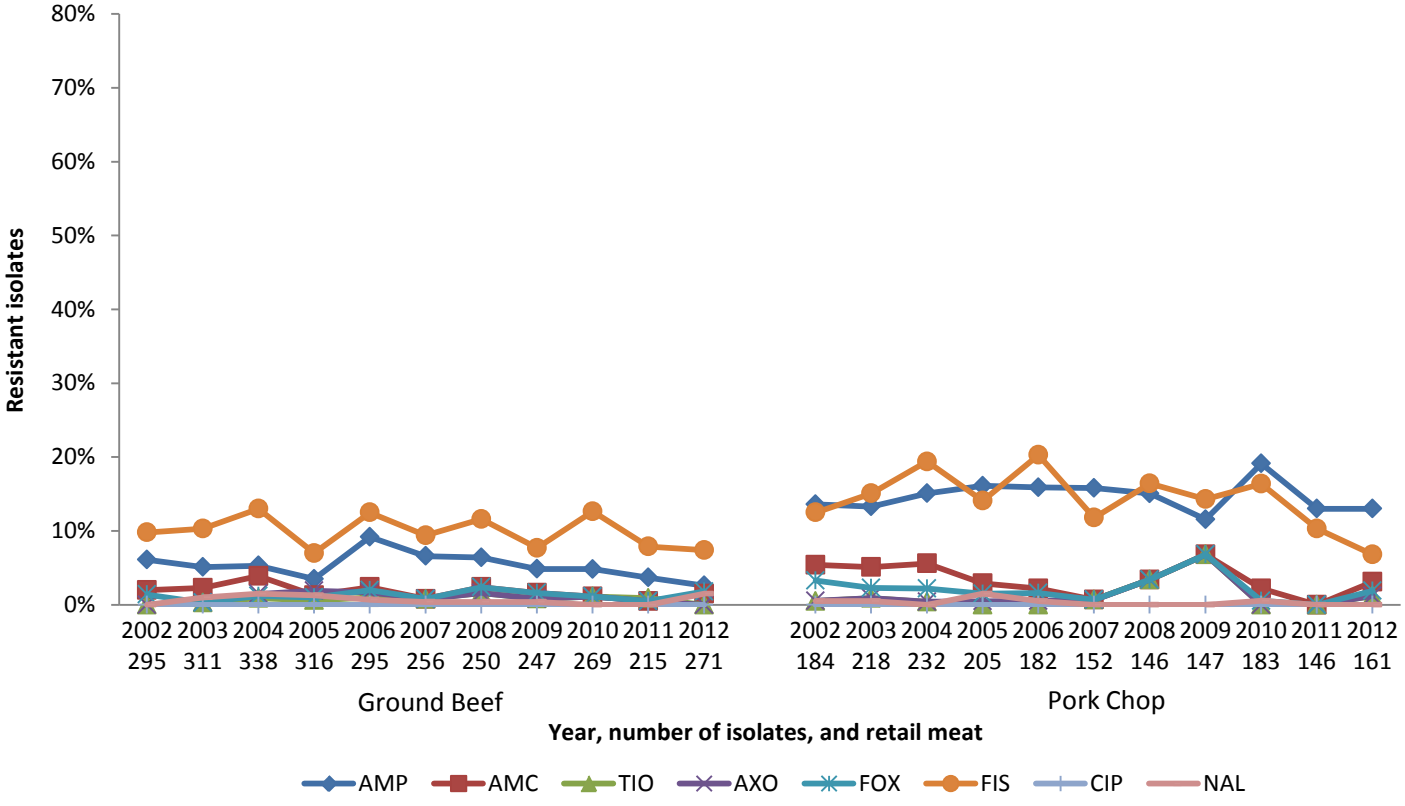


Table 27. Multidrug Resistance Patterns among *Escherichia coli* Isolates by Year, 2002-2012[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of Isolates Tested by Source	Retail Chicken	282	396	400	393	418	299	306	315	357	341	386
	Ground Turkey	304	333	376	397	388	315	300	306	369	368	391
	Ground Beef	295	311	338	316	295	256	250	247	269	215	271
	Pork Chop	184	218	232	205	182	152	146	147	183	146	161
Resistance Pattern	**Isolate Source**											
1. At Least ACSSuT[2] Resistant	Retail Chicken	0.4% 1	–	1.3% 5	0.3% 1	1.4% 6	2.0% 6	1.0% 3	0.6% 2	1.1% 4	1.2% 4	0.3% 1
	Ground Turkey	–	2.7% 9	0.5% 2	1.8% 7	0.8% 3	1.9% 6	2.0% 6	2.3% 7	2.2% 8	3.0% 11	5.1% 20
	Ground Beef	0.3% 1	1.0% 3	1.5% 5	0.6% 2	0.3% 1	0.4% 1	–	–	0.4% 1	0.9% 2	–
	Pork Chop	0.5% 1	1.4% 3	1.3% 3	1.0% 2	1.1% 2	0.7% 1	1.4% 2	2.0% 3	0.5% 1	–	0.6% 1
2. At Least ACT/S[3] Resistant	Retail Chicken	–	–	0.3% 1	–	–	0.3% 1	–	–	0.3% 1	–	–
	Ground Turkey	–	0.9% 3	–	0.8% 3	0.3% 1	0.3% 1	–	0.3% 1	1.1% 4	–	1.0% 4
	Ground Beef	–	–	–	0.3% 1	0.3% 1	–	–	–	–	–	–
	Pork Chop	0.5% 1	–	0.4% 1	0.5% 1	–	–	–	0.7% 1	–	–	0.6% 1
3. At Least ACSSuTAuCx[4] Resistant	Chicken Breast	0.4% 1	–	1.0% 4	0.3% 1	1.0% 4	0.7% 2	0.7% 2	0.6% 2	0.8% 3	1.2% 4	0.3% 1
	Ground Turkey	–	0.3% 1	–	0.3% 1	–	1.3% 4	1.3% 4	1.0% 3	1.1% 4	2.2% 8	1.0% 4
	Ground Beef	–	–	0.9% 3	0.3% 1	–	–	–	–	0.4% 1	–	–
	Pork Chop	–	0.5% 1	0.4% 1	–	–	0.7% 1	0.7% 1	2.0% 3	–	–	0.6% 1
4. At Least Ceftriaxone and Nalidixic Acid Resistant	Retail Chicken	0.7% 2	0.5% 2	1.5% 6	0.3% 1	0.2% 1	–	1.0% 3	1.0% 3	0.3% 1	–	0.5% 2
	Ground Turkey	0.3% 1	0.3% 1	0.3% 1	0.3% 1	–	0.6% 2	–	–	–	0.3% 1	0.8% 3
	Ground Beef	–	–	0.3% 1	0.3% 1	0.3% 1	–	–	0.4% 1	–	–	–
	Pork Chop	0.5% 1	–	–	–	–	–	–	–	–	–	–

[1] Dashes indicate 0.0% resistance.

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

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

[4] ACSSuTAuCx = ACSSuT, amoxicillin-clavulanic acid, and ceftriaxone.

Table 28. Multidrug Resistance among *Escherichia coli* Isolates by Antimicrobial Class, 2002-20112[1,2]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of Isolates Tested by Source	Retail Chicken	282	396	400	393	418	299	306	315	357	341	386
	Ground Turkey	304	333	376	396	388	315	300	306	369	368	391
	Ground Beef	295	311	338	316	295	256	250	247	269	215	271
	Pork Chop	184	218	232	205	182	152	146	147	183	146	161
Resistance Pattern	**Isolate Source**											
1. No Resistance Detected	Retail Chicken	27.0% 76	21.7% 86	20.8% 83	20.6% 81	23.7% 99	29.1% 87	33.3% 102	34.3% 108	33.3% 119	25.2% 86	35.8% 138
	Ground Turkey	17.1% 52	15.9% 53	19.1% 72	16.2% 64	16.0% 62	13.0% 41	8.3% 25	11.8% 36	17.3% 64	13.3% 49	13.3% 52
	Ground Beef	64.4% 190	70.7% 220	73.1% 247	80.1% 253	71.5% 211	77.0% 197	73.2% 183	78.1% 193	76.6% 206	79.5% 171	75.6% 205
	Pork Chop	43.5% 80	49.5% 108	37.9% 88	49.3% 101	42.9% 78	48.0% 73	43.8% 64	51.0% 75	50.8% 93	52.1% 76	56.5% 91
2. Resistance to ≥ 3 Antimicrobial Classes	Retail Chicken	34.8% 98	38.9% 154	35.3% 141	45.0% 177	43.3% 181	33.8% 101	36.6% 112	37.5% 118	28.6% 102	37.5% 128	29.8% 115
	Ground Turkey	53.3% 162	53.5% 178	51.9% 195	52.5% 208	55.2% 214	57.5% 181	63.7% 191	66.3% 203	55.3% 204	64.4% 237	67.8% 265
	Ground Beef	8.1% 24	6.4% 20	10.4% 35	5.4% 17	11.5% 34	9.0% 23	11.2% 28	6.9% 17	11.5% 31	6.0% 13	9.6% 26
	Pork Chop	16.8% 31	16.5% 36	21.1% 49	16.1% 33	15.9% 29	15.1% 23	17.8% 26	15.0% 22	17.5% 32	8.9% 13	12.4% 20
3. Resistance to ≥ 4 Antimicrobial Classes	Retail Chicken	11.3% 32	11.1% 44	12.5% 50	12.2% 48	14.6% 61	10.4% 31	13.7% 42	13.7% 43	10.6% 38	13.5% 46	7.5% 29
	Ground Turkey	20.1% 61	26.1% 87	24.5% 92	24.0% 95	25.8% 100	27.0% 85	32.3% 97	38.9% 119	28.2% 104	34.5% 127	37.9% 148
	Ground Beef	1.7% 5	3.9% 12	4.7% 16	1.9% 6	5.8% 17	4.7% 12	4.4% 11	3.6% 9	3.0% 8	1.9% 4	1.1% 3
	Pork Chop	4.3% 8	6.0% 13	7.8% 18	4.9% 10	7.7% 14	3.3% 5	7.5% 11	10.9% 16	6.0% 11	2.1% 3	4.3% 7
4. Resistance to ≥ 5 Antimicrobial Classes	Retail Chicken	4.6% 13	5.8% 23	6.0% 24	5.9% 23	7.4% 31	5.7% 17	8.2% 25	6.3% 20	4.5% 16	6.5% 22	3.1% 12
	Ground Turkey	3.6% 11	7.8% 26	6.9% 26	6.3% 25	5.7% 22	4.1% 13	6.3% 19	7.8% 24	6.5% 24	10.9% 40	12.8% 50
	Ground Beef	0.3% 1	2.6% 8	2.7% 9	1.0% 3	2.4% 7	0.4% 1	2.0% 5	1.2% 3	0.7% 2	0.9% 2	0.4% 1
	Pork Chop	1.6% 3	2.8% 6	2.2% 5	1.5% 3	3.3% 6	1.3% 2	4.1% 6	5.4% 8	1.1% 2	–	1.9% 3
5. Resistance to ≥ 6 Antimicrobial Classes	Retail Chicken	2.8% 8	2.8% 11	3.3% 13	3.6% 14	5.3% 22	3.3% 10	6.2% 19	4.4% 14	1.7% 6	3.5% 12	2.6% 10
	Ground Turkey	1.6% 5	1.8% 6	3.2% 12	1.8% 7	3.1% 12	2.9% 9	4.0% 12	3.6% 11	3.5% 13	6.5% 24	6.6% 26
	Ground Beef	0.3% 1	0.6% 2	2.1% 7	0.6% 2	1.7% 5	–	1.6% 4	0.4% 1	0.4% 1	–	0.4% 1
	Pork Chop	1.1% 2	1.8% 4	0.4% 1	0.5% 1	1.1% 2	0.7% 1	2.1% 3	4.1% 6	0.5% 1	–	0.6% 1

[1] Dashes indicate 0.0% resistance.

[2] NARMS Retail Meat Reports 2002-2010 included amikacin in the multidrug resistance patterns. Begining in 2011, multidrug resistance patterns contain azithromycin. Because resistance to azithromycin and amikacin are less than 1%, the multidrug resistance patterns are comparable across years.

Table 29.1 MIC Distribution among *Escherichia coli* from Retail Chicken, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (282)	3.2	**23.1**	[18.3 - 28.4]					3.6	46.1	20.2	2.5	1.4	3.2	**9.2**	**13.8**					
	2003 (396)	1.3	**29.3**	[24.9 - 34.0]					3.5	43.9	20.2	1.5	0.3	1.3	**10.6**	**18.7**					
	2004 (400)	2.8	**30.0**	[25.5 - 34.8]					5.8	43.3	14.8	2.5	1.0	2.8	**10.0**	**20.0**					
	2005 (393)	2.8	**37.7**	[32.9 - 42.7]					3.8	36.6	17.0	1.3	0.8	2.8	**17.6**	**20.1**					
	2006 (418)	1.9	**37.3**	[32.7 - 42.2]					2.4	36.1	18.7	2.4	1.2	1.9	**12.2**	**25.1**					
	2007 (299)	2.0	**34.4**	[29.1 - 40.1]					2.3	43.5	14.4	2.3	1.0	2.0	**14.4**	**20.1**					
	2008 (306)	1.3	**34.0**	[28.7 - 39.6]						15.7	45.8	2.9	0.3	1.3	**3.6**	**30.4**					
	2009 (315)	2.2	**34.3**	[29.1 - 39.8]					2.9	32.4	26.3	1.9		2.2	**8.6**	**25.7**					
	2010 (357)	3.4	**31.9**	[27.1 - 37.0]					3.4	39.8	19.6	1.7	0.3	3.4	**14.0**	**17.9**					
	2011 (341)	0.9	**38.4**	[33.2 - 43.8]					0.3	29.6	28.4	1.8	0.6	0.9	**9.7**	**28.7**					
	2012 (386)	3.4	**30.6**	[26.0 - 35.4]					0.3	5.2	53.4	6.5	0.8	3.4	**6.2**	**24.3**					
Kanamycin	2002 (282)	0.0	**6.0**	[3.6 - 9.5]										91.5	2.5			**6.0**			
	2003 (396)	1.3	**6.8**	[4.5 - 9.8]										84.1	7.8	1.3	**0.5**	**6.3**			
	2004 (400)	1.0	**6.8**	[4.5 - 9.7]										81.8	10.5	1.0		**6.8**			
	2005 (393)	1.0	**7.1**	[4.8 - 10.1]										84.0	7.9	1.0		**7.1**			
	2006 (418)	1.0	**11.5**	[8.6 - 14.9]										77.5	10.0	1.0	**0.5**	**11.0**			
	2007 (299)	0.7	**9.0**	[6.0 - 12.9]										81.9	8.4	0.7	**0.7**	**8.4**			
	2008 (306)	2.6	**6.9**	[4.3 - 10.3]										74.8	15.7	2.6	**0.3**	**6.5**			
	2009 (315)	0.3	**5.4**	[3.2 - 8.5]										83.2	11.1	0.3	**0.6**	**4.8**			
	2010 (357)	0.6	**6.2**	[3.9 - 9.2]										89.4	3.9	0.6	**0.3**	**5.9**			
	2011 (341)	0.6	**5.6**	[3.4 - 8.6]										89.7	4.1	0.6	**0.3**	**5.3**			
	2012 (386)	0.8	**5.7**	[3.6 - 8.5]										88.9	4.7	0.8	**0.3**	**5.4**			
Streptomycin	2002 (282)	N/A	**49.3**	[43.3 - 55.3]												50.7	**11.4**	**37.9**			
	2003 (396)	N/A	**56.1**	[51.0 - 61.0]												44.0	**15.2**	**40.9**			
	2004 (400)	N/A	**56.8**	[51.7 - 61.7]												43.3	**13.0**	**43.8**			
	2005 (393)	N/A	**50.6**	[45.6 - 55.7]												49.1	**17.8**	**33.1**			
	2006 (418)	N/A	**48.1**	[43.2 - 53.0]												51.9	**18.7**	**29.4**			
	2007 (299)	N/A	**46.8**	[41.1 - 52.7]												53.2	**18.1**	**28.8**			
	2008 (306)	N/A	**43.8**	[38.2 - 49.6]												56.2	**13.7**	**30.1**			
	2009 (315)	N/A	**38.1**	[32.7 - 43.7]												61.9	**16.5**	**21.6**			
	2010 (357)	N/A	**39.2**	[34.1 - 44.5]												60.8	**11.2**	**28.0**			
	2011 (341)	N/A	**43.4**	[38.1 - 48.8]												56.6	**17.6**	**25.8**			
	2012 (386)	N/A	**39.6**	[34.7 - 44.7]												60.4	**17.4**	**22.3**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (282)	3.2	**12.1**	[8.5 - 16.4]							3.2	21.3	47.9	12.4	3.2	**6.0**	**6.0**				
	2003 (396)	1.5	**13.6**	[10.4 - 17.4]							2.3	21.2	45.7	15.7	1.5	**4.3**	**9.3**				
	2004 (400)	0.5	**10.0**	[7.2 - 13.4]							1.8	21.8	51.3	14.8	0.5	**7.3**	**2.8**				
	2005 (393)	1.8	**12.2**	[9.1 - 15.9]							2.8	16.8	47.3	19.1	1.8	**9.9**	**2.3**				
	2006 (418)	0.7	**11.5**	[8.6 - 14.9]							1.4	23.2	50.0	13.2	0.7	**8.1**	**3.3**				
	2007 (299)	0.3	**7.4**	[4.7 - 10.9]							1.7	31.4	47.5	11.7	0.3	**7.0**	**0.3**				
	2008 (306)	2.9	**11.8**	[8.4 - 15.9]							2.3	21.2	41.8	19.9	2.9	**7.5**	**4.3**				
	2009 (315)	1.0	**13.3**	[9.8 - 17.6]							2.5	23.5	46.0	13.7	1.0	**9.2**	**4.1**				
	2010 (357)	1.4	**6.7**	[4.4 - 9.8]							4.8	31.1	44.0	12.0	1.4	**5.9**	**0.8**				
	2011 (341)	0.3	**14.1**	[10.6 - 18.2]							2.6	22.3	44.6	16.1	0.3	**11.1**	**2.9**				
	2012 (386)	1.6	**7.8**	[5.3 - 10.9]							2.6	18.4	58.6	11.1	1.6	**4.2**	**3.6**				
Cephems																					
Ceftiofur	2002 (282)	0.4	**7.1**	[4.4 - 10.7]				6.4	48.9	29.8	6.0	1.4	0.4	**5.3**	**1.8**						
	2003 (396)	1.5	**7.6**	[5.2 - 10.6]				4.0	43.2	39.4	3.3	1.0	1.5	**4.8**	**2.8**						
	2004 (400)	1.0	**5.8**	[3.7 - 8.5]				4.8	50.5	35.3	2.8		1.0	**4.3**	**1.5**						
	2005 (393)	1.5	**8.7**	[6.1 - 11.9]				2.0	38.7	46.3	2.3	0.5	1.5	**6.7**	**2.0**						
	2006 (418)	0.2	**8.6**	[6.1 - 11.7]				1.2	25.6	60.3	1.9	2.2	0.2	**5.5**	**3.1**						
	2007 (299)	0.3	**6.0**	[3.6 - 9.3]				0.7	37.1	54.5	0.3	1.0	0.3	**3.3**	**2.7**						
	2008 (306)	0.3	**10.8**	[7.5 - 14.8]				1.3	22.9	58.5	5.9	0.3	0.3	**7.5**	**3.3**						
	2009 (315)	0.6	**11.7**	[8.4 - 15.8]				2.5	28.3	54.6	1.3	1.0	0.6	**6.3**	**5.4**						
	2010 (357)	1.1	**5.6**	[3.5 - 8.5]				3.4	45.4	42.0	2.5		1.1	**5.0**	**0.6**						
	2011 (341)	0.3	**12.3**	[9.0 - 16.3]				0.6	33.1	51.3	2.1	0.3	0.3	**5.9**	**6.5**						
	2012 (386)	0.3	**7.5**	[5.1 - 10.6]					23.6	66.6	1.8	0.3	0.3	**2.3**	**5.2**						
Ceftriaxone	2002 (282)	0.4	**7.8**	[5.0 - 11.6]					87.6	1.8	2.5	0.4	**1.8**	**3.9**	**2.1**						
	2003 (396)	0.3	**9.1**	[6.4 - 12.4]					87.1	1.0	2.5	0.3	**1.5**	**3.5**	**3.5**	**0.5**					
	2004 (400)	0.3	**6.5**	[4.3 - 9.4]					90.0	1.3	2.0	0.3		**3.5**	**2.0**	**1.0**					
	2005 (393)	0.3	**10.2**	[7.4 - 13.6]					87.0	0.8	1.8	0.3	**1.0**	**5.9**	**2.5**	**0.3**	**0.5**				
	2006 (418)	0.2	**9.1**	[6.5 - 12.3]					88.5	0.7	1.4	0.2		**4.3**	**3.8**	**0.2**	**0.7**				
	2007 (299)	0.0	**6.4**	[3.9 - 9.7]					92.6		1.0		**0.3**	**3.0**	**2.3**	**0.3**	**0.3**				
	2008 (306)	0.3	**11.1**	[7.8 - 15.2]					88.6			0.3	**0.7**	**5.9**	**4.3**	**0.3**					
	2009 (315)	0.0	**12.4**	[9.0 - 16.5]					86.3	0.6	0.6		**0.3**	**5.7**	**4.4**	**1.9**					
	2010 (357)	0.0	**6.4**	[4.1 - 9.5]					92.7	0.6	0.3		**0.6**	**2.8**	**3.1**						
	2011 (341)	0.0	**12.6**	[9.3 - 16.6]					85.9	0.3	1.2			**2.9**	**9.1**	**0.6**					
	2012 (386)	0.3	**8.0**	[5.5 - 11.2]					91.5	0.3	0.3	0.3		**0.8**	**5.2**	**1.3**	**0.3**	**0.3**			
Cefoxitin	2002 (282)	5.0	**11.0**	[7.6 - 15.2]							1.1	16.3	52.5	14.2	5.0	**11.0**					
	2003 (396)	3.8	**9.3**	[6.7 - 12.6]								10.6	50.5	25.8	3.8	**9.3**					
	2004 (400)	2.3	**8.3**	[5.7 - 11.4]							0.3	15.5	53.0	20.8	2.3	**3.8**	**4.5**				
	2005 (393)	1.5	**11.2**	[8.3 - 14.7]							1.0	24.9	49.9	11.5	1.5	**4.3**	**6.9**				
	2006 (418)	2.4	**11.2**	[8.4 - 14.7]							0.2	8.6	57.2	20.3	2.4	**3.8**	**7.4**				
	2007 (299)	1.3	**7.4**	[4.7 - 10.9]							0.3	12.7	61.2	17.1	1.3	**2.0**	**5.4**				
	2008 (306)	2.3	**11.8**	[8.4 - 15.9]							1.3	8.8	57.2	18.6	2.3	**3.9**	**7.8**				
	2009 (315)	0.0	**13.3**	[9.8 - 17.6]							1.0	14.9	61.0	9.8		**3.5**	**9.8**				
	2010 (357)	2.5	**6.7**	[4.4 - 9.8]							1.4	21.8	54.9	12.6	2.5	**2.8**	**3.9**				
	2011 (341)	1.2	**13.2**	[9.8 - 17.3]								13.2	61.9	10.6	1.2	**3.5**	**9.7**				
	2012 (386)	1.0	**7.8**	[5.3 - 10.9]							0.3	8.6	65.8	16.6	1.0	**1.0**	**6.7**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding. [3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 29.1 MIC Distribution among *Escherichia coli* from Retail Chicken, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (282)	N/A	**32.3**	[26.8 - 38.1]											66.0	1.42		0.35			**32.3**
	2003 (396)	N/A	**38.4**	[33.6 - 43.4]											59.8	1.3	0.5				**38.4**
Sulfisoxazole	2004 (400)	N/A	**41.3**	[36.4 - 46.2]											48.5	6.3	4.0			**41.3**	
	2005 (393)	N/A	**48.1**	[43.1 - 53.2]											39.4	9.2	2.8	0.3	0.3	**48.1**	
	2006 (418)	N/A	**46.9**	[42.0 - 51.8]											33.0	18.2	1.9			**46.9**	
	2007 (299)	N/A	**42.1**	[36.5 - 48.0]											41.8	14.7	1.3			**42.1**	
	2008 (306)	N/A	**39.2**	[33.7 - 44.9]											47.1	13.4	0.3			**39.2**	
	2009 (315)	N/A	**40.6**	[35.2 - 46.3]											41.0	16.5	1.9			**40.6**	
	2010 (357)	N/A	**38.9**	[33.8 - 44.2]											34.5	25.2	0.8	0.6		**38.9**	
	2011 (341)	N/A	**44.3**	[38.9 - 49.7]											39.9	14.1	1.5		0.3	**44.3**	
	2012 (386)	N/A	**37.8**	[33.0 - 42.9]											45.3	15.5	1.3			**37.8**	
Trimethoprim-Sulfamethoxazole	2002 (282)	N/A	**3.5**	[1.7 - 6.4]				82.6	6.4	6.0	0.4	1.1		**3.6**							
	2003 (396)	N/A	**7.1**	[4.7 - 10.1]				83.6	5.3	2.3	1.3	0.5		**7.1**							
	2004 (400)	N/A	**4.3**	[2.5 - 6.7]				85.5	7.0	2.5	0.5	0.3		**4.3**							
	2005 (393)	N/A	**7.4**	[5.0 - 10.4]				66.2	17.3	6.4	2.5	0.3	**0.5**	**6.9**							
	2006 (418)	N/A	**8.9**	[6.3 - 12.0]				58.1	18.9	9.8	3.3	1.0	**1.0**	**7.9**							
	2007 (299)	N/A	**5.0**	[2.8 - 8.1]				51.8	28.4	9.7	4.7	0.3	**0.3**	**4.7**							
	2008 (306)	N/A	**3.6**	[1.8 - 6.3]				69.0	20.6	4.6	1.6	0.7		**3.6**							
	2009 (315)	N/A	**2.2**	[0.9 - 4.5]				78.1	13.0	4.1	1.6	1.0		**2.2**							
	2010 (357)	N/A	**4.2**	[2.4 - 6.8]				77.6	10.4	5.6	1.1	1.1	**0.6**	**3.6**							
	2011 (341)	N/A	**2.3**	[1.0 - 4.6]				77.4	15.0	3.5	1.2	0.6		**2.3**							
	2012 (386)	N/A	**2.6**	[1.2 - 4.7]				80.1	9.8	5.7	1.8			**2.6**							
Macrolides																					
Azithromycin	2011 (341)	N/A	**0.0**	[0.0 - 1.1]						0.3	0.9	22.0	71.0	5.9							
	2012 (386)	N/A	**0.0**	[0.0 - 1.0]							1.0	17.6	74.1	7.0	0.3						
Penicillins																					
Ampicillin	2002 (282)	0.4	**21.6**	[17.0 - 26.9]							6.0	27.7	39.0	5.3	0.4	**0.4**	**21.3**				
	2003 (396)	0.3	**25.3**	[21.0 - 29.8]							1.5	24.5	43.9	4.5	0.3	**0.5**	**24.7**				
	2004 (400)	0.3	**17.0**	[13.4 - 21.0]							6.7	40.2	34.0	1.7	0.3	**0.3**	**16.8**				
	2005 (393)	0.8	**24.7**	[20.5 - 29.3]							5.9	35.4	31.8	1.5	0.8	**0.3**	**24.4**				
	2006 (418)	0.5	**20.1**	[16.4 - 24.3]							8.1	39.7	30.1	1.4	0.5		**20.1**				
	2007 (299)	0.0	**18.1**	[13.9 - 22.9]							6.4	46.8	28.4	0.3		**0.3**	**17.7**				
	2008 (306)	0.0	**23.5**	[18.9 - 28.7]							5.9	35.6	33.3	1.6		**0.3**	**23.2**				
	2009 (315)	0.0	**22.2**	[17.8 - 27.2]							9.2	41.9	25.7	1.0			**22.2**				
	2010 (357)	0.3	**16.5**	[12.8 - 20.8]							13.4	48.2	21.3	0.3	0.3		**16.5**				
	2011 (341)	0.0	**26.4**	[21.8 - 31.4]							8.5	43.1	21.4	0.6			**26.4**				
	2012 (386)	0.0	**15.8**	[12.3 - 19.8]							6.0	39.9	37.3	1.0		**0.3**	**15.5**				
Phenicols																					
Chloramphenicol	2002 (282)	1.8	**0.7**	[0.1 - 2.5]								3.9	41.5	52.1	1.8		**0.7**				
	2003 (396)	3.5	**0.0**	[0.0 - 0.9]								1.5	25.5	69.4	3.5						
	2004 (400)	2.5	**1.8**	[0.7 - 3.6]								3.3	34.5	58.0	2.5	**0.3**	**1.5**				
	2005 (393)	2.0	**0.5**	[0.1 - 1.8]								2.5	41.2	53.7	2.0		**0.5**				
	2006 (418)	1.0	**2.6**	[1.3 - 4.7]								1.0	39.5	56.0	1.0	**0.2**	**2.4**				
	2007 (299)	1.3	**2.0**	[0.7 - 4.3]								1.0	35.8	59.9	1.3	**0.7**	**1.3**				
	2008 (306)	1.0	**1.0**	[0.2 - 2.8]								1.6	42.5	53.9	1.0		**1.0**				
	2009 (315)	1.0	**0.6**	[0.1 - 2.3]								7.3	57.5	33.7	1.0		**0.6**				
	2010 (357)	0.6	**1.4**	[0.5 - 3.2]								5.0	56.0	37.0	0.6		**1.4**				
	2011 (341)	0.0	**1.2**	[0.3 - 3.0]								5.9	59.2	33.7			**1.2**				
	2012 (386)	1.8	**0.3**	[0.0 - 1.4]								1.6	43.3	53.1	1.8		**0.3**				
Quinolones																					
Ciprofloxacin	2002 (282)	2.1	**0.7**	[0.1 - 2.5]	90.4	6.4	0.4	0.4	1.4	0.4	**0.4**	**0.4**									
	2003 (396)	4.1	**0.0**	[0.0 - 0.9]	92.9	3.0		2.3	1.5	0.3											
	2004 (400)	6.9	**0.0**	[0.0 - 0.9]	90.3	2.3	0.5	1.7	4.0	1.2											
	2005 (393)	8.7	**0.0**	[0.0 - 0.9]	84.2	4.8	2.3	3.8	4.6	0.3											
	2006 (418)	4.8	**0.0**	[0.0 - 0.9]	93.3	1.7	0.2	1.2	2.9	0.7											
	2007 (299)	3.0	**0.0**	[0.0 - 1.2]	96.7	0.3		1.0	1.7	0.3											
	2008 (306)	3.3	**0.0**	[0.0 - 1.2]	93.8	2.9		0.3	2.6	0.3											
	2009 (315)	2.5	**0.3**	[0.0 - 1.8]	96.5	0.3	0.3	0.3	2.2					**0.3**							
	2010 (357)	3.1	**0.6**	[0.1 - 2.0]	95.0	1.4		0.6	2.5		**0.3**			**0.3**							
	2011 (341)	2.7	**0.0**	[0.0 - 1.1]	96.8	0.6		1.2	1.5												
	2012 (386)	1.6	**0.0**	[0.0 - 1.0]	93.5	4.4	0.5	0.3	1.0	0.3											
Nalidixic Acid	2002 (282)	N/A	**2.8**	[1.2 - 5.5]							1.1	17.7	72.3	5.7	0.4		**2.8**				
	2003 (396)	N/A	**4.0**	[2.3 - 6.5]							4.0	47.5	43.2	1.3		**0.3**	**3.8**				
	2004 (400)	N/A	**7.0**	[4.7 - 10.0]							6.5	63.0	23.2	0.3		**0.3**	**6.8**				
	2005 (393)	N/A	**6.6**	[4.4 - 9.5]							8.1	66.4	15.8	2.0	1.0	**0.5**	**6.1**				
	2006 (418)	N/A	**5.0**	[3.1 - 7.6]						0.5	6.9	72.5	14.8		0.2		**5.0**				
	2007 (299)	N/A	**3.0**	[1.4 - 5.6]							11.0	78.6	7.4				**3.0**				
	2008 (306)	N/A	**2.9**	[1.4 - 5.5]						1.0	13.1	70.3	12.4	0.3		**0.3**	**2.6**				
	2009 (315)	N/A	**2.9**	[1.3 - 5.4]						1.0	17.5	74.0	4.4		0.3	**0.3**	**2.5**				
	2010 (357)	N/A	**3.6**	[2.0 - 6.1]						1.7	17.1	70.6	7.0				**3.6**				
	2011 (341)	N/A	**2.3**	[1.0 - 4.6]							19.1	71.9	6.4		0.3	**0.3**	**2.1**				
	2012 (386)	N/A	**1.8**	[0.7 - 3.7]							14.8	67.4	15.8	0.3		**0.3**	**1.6**				
Tetracyclines																					
Tetracycline	2002 (282)	1.1	**46.1**	[40.2 - 52.1]									52.8	1.1	**1.1**	**1.4**	**43.6**				
	2003 (396)	1.5	**42.9**	[38.0 - 48.0]									55.6	1.5	**0.8**	**1.0**	**41.2**				
	2004 (400)	0.8	**48.0**	[43.0 - 53.0]									51.2	0.8	**0.5**	**3.3**	**44.3**				
	2005 (393)	2.0	**46.6**	[41.5 - 51.6]									51.4	2.0		**2.8**	**43.8**				
	2006 (418)	2.2	**50.5**	[45.6 - 55.4]									47.4	2.2	**1.2**	**4.8**	**44.5**				
	2007 (299)	2.3	**40.5**	[34.9 - 46.3]									57.2	2.3		**2.3**	**38.1**				
	2008 (306)	0.7	**43.8**	[38.2 - 49.6]									55.6	0.7	**1.0**	**2.3**	**40.5**				
	2009 (315)	1.3	**41.6**	[36.1 - 47.2]									57.1	1.3	**1.0**	**2.2**	**38.4**				
	2010 (357)	1.1	**38.9**	[33.8 - 44.2]									59.9	1.1	**0.3**	**0.8**	**37.8**				
	2011 (341)	1.2	**40.8**	[35.5 - 46.2]									58.1	1.2		**2.1**	**38.7**				
	2012 (386)	1.6	**39.4**	[34.5 - 44.4]									59.1	1.6	**0.3**	**2.9**	**36.3**				

Table 29.2 MIC Distribution among *Escherichia coli* from Ground Turkey, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (304)	1.3	**27.0**	[7.7 - 25.0]					5.9	47.4	16.5	1.6	0.3	1.3	**12.2**	**14.8**					
	2003 (333)	1.5	**29.7**	[15.5 - 31.6]					5.1	42.3	18.3	2.1	0.9	1.5	**10.5**	**19.2**					
	2004 (376)	2.1	**29.3**	[14.1 - 28.0]					4.8	42.6	19.1	2.1		2.1	**12.5**	**16.8**					
	2005 (396)	3.0	**27.5**	[20.5 - 33.8]					4.0	46.2	17.2	2.0		3.0	**12.4**	**15.2**					
	2006 (388)	3.6	**29.6**	[22.0 - 36.6]					0.8	42.3	20.4	2.3	1.0	3.6	**11.9**	**17.8**					
	2007 (315)	5.4	**27.0**	[22.2 - 32.2]					5.4	43.2	18.1	0.3	0.6	5.4	**15.2**	**11.7**					
	2008 (300)	1.7	**37.0**	[31.5 - 42.7]					0.3	15.3	39.3	6.3		1.7	**7.0**	**30.0**					
	2009 (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**					
	2010 (369)	3.8	**24.9**	[20.6 - 29.7]					4.3	45.0	18.7	1.1	2.2	3.8	**11.7**	**13.3**					
	2011 (368)	4.9	**32.6**	[27.8 - 37.7]						29.6	31.3	1.4	0.3	4.9	**8.7**	**23.9**					
	2012 (391)	3.6	**40.9**	[36.0 - 46.0]					0.3	5.1	43.5	6.4	0.3	3.6	**6.1**	**34.8**					
Kanamycin	2002 (304)	1.0	**13.2**	[10.7 - 29.7]										82.2	3.6	1.0	**0.3**	**12.8**			
	2003 (333)	1.5	**16.8**	[19.3 - 36.3]										74.2	7.5	1.5	**0.3**	**16.5**			
	2004 (376)	2.1	**16.0**	[12.3 - 25.7]										75.0	6.9	2.1	**0.3**	**15.7**			
	2005 (396)	0.5	**11.4**	[14.7 - 26.8]										84.1	4.0	0.5	**0.3**	**11.1**			
	2006 (388)	1.0	**14.7**	[9.9 - 21.6]										78.4	5.9	1.0	**0.8**	**13.9**			
	2007 (315)	0.3	**15.6**	[11.7 - 20.0]										80.3	3.8	0.3		**15.6**			
	2008 (300)	1.3	**19.0**	[14.7 - 23.9]										69.0	10.7	1.3	**0.3**	**18.7**			
	2009 (306)	0.0	**20.6**	[16.2 - 25.6]										76.1	3.3			**20.6**			
	2010 (369)	0.0	**21.4**	[17.3 - 26.0]										77.8	0.8			**21.4**			
	2011 (368)	0.0	**24.7**	[20.4 - 29.5]										73.4	1.9			**24.7**			
	2012 (391)	0.0	**22.8**	[18.7 - 27.2]										72.1	5.1			**22.8**			
Streptomycin	2002 (304)	N/A	**57.6**	[26.8 - 49.9]												42.4	**23.0**	**34.5**			
	2003 (333)	N/A	**54.7**	[36.3 - 55.2]												45.3	**17.7**	**36.9**			
	2004 (376)	N/A	**49.2**	[26.7 - 42.9]												50.8	**18.6**	**30.6**			
	2005 (396)	N/A	**43.4**	[36.9 - 51.8]												56.6	**19.2**	**24.2**			
	2006 (388)	N/A	**43.8**	[33.2 - 48.9]												56.2	**19.8**	**24.0**			
	2007 (315)	N/A	**44.8**	[39.2 - 50.4]												55.2	**23.2**	**21.6**			
	2008 (300)	N/A	**57.3**	[51.5 - 63.0]												42.7	**14.7**	**42.7**			
	2009 (306)	N/A	**57.5**	[51.8 - 63.1]												42.5	**18.0**	**39.5**			
	2010 (369)	N/A	**47.7**	[42.5 - 52.9]												52.3	**22.0**	**25.7**			
	2011 (368)	N/A	**60.3**	[55.1 - 65.4]												39.7	**27.2**	**33.2**			
	2012 (391)	N/A	**67.0**	[62.1 - 71.7]												33.0	**21.0**	**46.0**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (304)	4.3	**5.6**	[5.7 - 21.8]							1.6	18.1	46.1	24.3	4.3	**4.6**	**1.0**				
	2003 (333)	6.0	**3.0**	[6.2 - 18.7]							3.0	15.3	45.6	27.0	6.0	**1.5**	**1.5**				
	2004 (376)	3.5	**5.3**	[3.9 - 13.4]							1.3	19.9	41.8	28.2	3.5	**4.5**	**0.8**				
	2005 (396)	5.1	**3.8**	[5.1 - 13.8]							4.8	12.4	42.7	31.3	5.1	**2.8**	**1.0**				
	2006 (388)	6.2	**6.7**	[2.2 - 9.7]							2.3	12.4	41.0	31.4	6.2	**6.2**	**0.5**				
	2007 (315)	9.5	**6.3**	[3.9 - 9.6]							1.3	16.2	34.9	31.7	9.5	**4.4**	**1.9**				
	2008 (300)	21.3	**8.3**	[5.5 - 12.1]								8.0	29.7	32.7	21.3	**6.7**	**1.7**				
	2009 (306)	14.4	**9.8**	[6.7 - 13.7]							1.6	10.5	31.0	32.7	14.4	**6.5**	**3.3**				
	2010 (369)	9.2	**10.0**	[7.2 - 13.6]							2.4	15.4	30.6	32.2	9.2	**9.2**	**0.8**				
	2011 (368)	12.8	**13.0**	[9.8 - 16.9]							1.9	13.6	32.1	26.6	12.8	**9.5**	**3.5**				
	2012 (391)	14.8	**11.8**	[8.7 - 15.4]							1.3	10.0	32.5	29.7	14.8	**5.6**	**6.1**				
Cephems																					
Ceftiofur	2002 (304)	0.0	**1.0**	[3.0 - 16.8]				5.3	57.6	33.2	2.6	0.3		**1.0**							
	2003 (333)	0.0	**0.3**	[0.5 - 7.5]				4.2	55.3	38.7	1.2	0.3		**0.3**							
	2004 (376)	0.3	**1.1**	[2.0 - 9.9]				1.9	47.9	45.2	2.4	1.3	0.3	**0.5**	**0.5**						
	2005 (396)	0.2	**1.8**	[3.8 - 11.8]				1.3	51.3	41.7	2.0	1.8	0.2	**0.8**	**1.0**						
	2006 (388)	0.0	**3.1**	[2.2 - 9.7]				1.0	26.8	62.9	5.7	0.5		**0.8**	**2.3**						
	2007 (315)	0.0	**6.0**	[3.7 - 9.3]					31.7	61.0	1.3			**2.2**	**3.8**						
	2008 (300)	0.7	**3.7**	[1.8 - 6.5]				0.7	17.7	71.0	4.7	1.7	0.7	**1.0**	**2.7**						
	2009 (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**						
	2010 (369)	1.1	**7.9**	[5.3 - 11.1]				1.4	41.7	45.3	2.2	0.5	1.1	**5.4**	**2.4**						
	2011 (368)	0.3	**9.8**	[6.9 - 13.3]				1.9	38.6	45.9	1.4	2.2	0.3	**3.0**	**6.8**						
	2012 (391)	0.5	**9.2**	[6.5 - 12.5]				0.3	18.7	65.7	4.6	1.0	0.5	**1.3**	**7.9**						
Ceftriaxone	2002 (304)	0.0	**1.3**	[0.4 - 3.3]					95.7	2.3	0.7		**0.7**	**0.7**							
	2003 (333)	0.3	**0.3**	[0.0 - 1.7]					97.9	0.3	1.2	0.3			**0.3**						
	2004 (376)	0.0	**1.3**	[0.4 - 3.1]					95.5	1.3	1.9			**0.8**	**0.3**	**0.3**					
	2005 (396)	0.3	**2.3**	[1.0 - 4.3]					93.7	1.8	2.0	0.3		**1.0**	**1.0**	**0.3**					
	2006 (388)	0.3	**3.1**	[1.6 - 5.3]					93.6	1.8	1.3	0.3		**0.5**	**1.5**	**0.8**	**0.3**				
	2007 (315)	0.0	**6.0**	[3.7 - 9.3]					93.3	0.6				**1.3**	**3.2**	**1.3**	**0.3**				
	2008 (300)	1.0	**3.7**	[1.8 - 6.5]					93.0	0.3	2.0	1.0		**2.0**	**1.3**	**0.3**					
	2009 (306)	0.0	**6.9**	[4.3 - 10.3]					91.2	0.7	1.3			**3.6**	**2.9**	**0.3**					
	2010 (369)	0.3	**8.9**	[6.2 - 12.3]					90.0	0.3	0.5	0.3	**1.1**	**3.5**	**3.5**	**0.5**	**0.3**				
	2011 (368)	0.5	**10.1**	[7.2 - 13.6]					87.0	0.3	2.2	0.5		**2.2**	**6.8**	**1.1**					
	2012 (391)	0.8	**9.7**	[7.0 - 13.1]					88.0	0.3	1.3	0.8		**1.3**	**5.4**	**2.8**	**0.3**				
Cefoxitin	2002 (304)	2.3	**3.3**	[1.6 - 6.0]								17.1	57.6	19.7	2.3	**3.3**					
	2003 (333)	3.3	**1.2**	[0.5 - 7.5]							0.3	12.6	60.4	22.2	3.3	**1.2**					
	2004 (376)	0.8	**4.5**	[2.0 - 9.9]							0.8	22.1	55.8	16.0	0.8	**2.7**	**1.9**				
	2005 (396)	1.0	**3.3**	[3.8 - 11.8]							2.0	35.9	47.2	10.6	1.0	**1.3**	**2.0**				
	2006 (388)	2.3	**6.2**	[2.2 - 9.7]							0.3	12.1	60.3	18.8	2.3	**2.6**	**3.6**				
	2007 (315)	0.6	**6.3**	[3.9 - 9.6]							0.3	16.8	61.9	14.0	0.6	**1.6**	**4.8**				
	2008 (300)	1.7	**6.3**	[3.9 - 9.7]							0.3	14.7	59.3	17.7	1.7	**2.0**	**4.3**				
	2009 (306)	1.6	**7.8**	[5.1 - 11.4]							1.0	18.6	59.5	11.4	1.6	**3.3**	**4.6**				
	2010 (369)	1.6	**9.2**	[6.5 - 12.6]							0.3	21.7	56.1	11.1	1.6	**4.1**	**5.1**				
	2011 (368)	1.4	**12.5**	[9.3 - 16.3]							0.8	19.3	55.2	10.9	1.4	**1.9**	**10.6**				
	2012 (391)	1.3	**11.3**	[8.3 - 14.8]								9.5	62.7	15.3	1.3	**1.8**	**9.5**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding. [3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 29.2 MIC Distribution among *Escherichia coli* from Ground Turkey, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (304)	N/A	**3.9**	[11.8 - 31.2]											49.3	1.6	1.0				**48.0**
	2003 (333)	N/A	**6.9**	[24.8 - 42.8]											45.9	2.1			0.3		**51.7**
Sulfisoxazole	2004 (376)	N/A	**48.4**	[20.9 - 36.3]											44.4	3.2	4.0			**48.4**	
	2005 (396)	N/A	**48.0**	[27.6 - 41.8]											33.1	14.4	4.5			**48.0**	
	2006 (388)	N/A	**48.5**	[24.9 - 39.9]											25.3	23.2	2.8		0.3	**48.5**	
	2007 (315)	N/A	**48.9**	[43.2 - 54.6]											34.3	14.6	1.9		0.3	**48.9**	
	2008 (300)	N/A	**51.0**	[45.2 - 56.8]											34.0	14.7	0.3			**51.0**	
	2009 (306)	N/A	**53.9**	[48.2 - 59.6]											29.4	15.0	1.6			**53.9**	
	2010 (369)	N/A	**44.7**	[39.6 - 49.9]											30.9	21.1	3.0	0.3		**44.7**	
	2011 (368)	N/A	**51.9**	[46.7 - 57.1]											29.9	17.4	0.8			**51.9**	
	2012 (391)	N/A	**56.8**	[51.7 - 61.7]											30.2	11.3	1.8			**56.8**	
Trimethoprim-	2002 (304)	N/A	**3.9**	[0.0 - 7.3]				77.3	13.5	4.9	0.3			**4.0**							
Sulfamethoxazole	2003 (333)	N/A	**6.9**	[0.0 - 3.2]				81.7	7.5	3.0	0.6	0.3		**6.9**							
	2004 (376)	N/A	**3.7**	[0.0 - 2.6]				83.8	9.3	2.7	0.5			**3.7**							
	2005 (396)	N/A	**5.1**	[0.0 - 3.0]				69.4	18.2	5.8	1.3	0.3	**0.3**	**4.8**							
	2006 (388)	N/A	**8.0**	[0.0 - 2.3]				61.1	17.8	7.2	4.4	1.5	**0.5**	**7.5**							
	2007 (315)	N/A	**7.9**	[5.2 - 11.5]				44.1	35.2	9.2	1.9	1.6		**7.9**							
	2008 (300)	N/A	**5.3**	[3.1 - 8.5]				55.0	24.0	10.3	3.7	1.7		**5.3**							
	2009 (306)	N/A	**5.9**	[3.5 - 9.1]				69.3	16.3	6.2	1.0	1.3		**5.9**							
	2010 (369)	N/A	**5.1**	[3.1 - 7.9]				75.3	13.0	3.8	1.6	1.1	**0.5**	**4.6**							
	2011 (368)	N/A	**4.3**	[2.5 - 7.0]				70.1	19.3	4.6	1.1	0.5		**4.3**							
	2012 (391)	N/A	**6.1**	[4.0 - 9.0]				72.4	14.1	7.2	0.3			**6.1**							
Macrolides																					
Azithromycin	2011 (368)	N/A	**0.3**	[0.0 - 1.5]						0.3	2.2	27.2	63.3	6.5	0.3	**0.3**					
	2012 (391)	N/A	**0.8**	[0.2 - 2.2]						0.5	2.8	25.6	65.5	4.9		**0.8**					
Penicillins																					
Ampicillin	2002 (304)	0.7	**31.3**	[8.7 - 26.6]							0.7	27.6	36.8	3.0	0.7		**31.3**				
	2003 (333)	0.0	**35.7**	[20.8 - 38.2]							3.0	19.2	40.5	1.5		**0.3**	**35.4**				
	2004 (376)	0.3	**33.2**	[14.1 - 28.0]							6.4	33.2	26.9		0.3	**0.8**	**32.4**				
	2005 (396)	0.0	**38.1**	[20.5 - 33.8]							5.6	36.1	19.9	0.3			**38.1**				
	2006 (388)	0.0	**42.0**	[19.2 - 33.3]							4.1	35.6	18.3			**0.3**	**41.8**				
	2007 (315)	0.3	**48.3**	[42.6 - 53.9]							4.1	34.0	13.3		0.3	**0.3**	**47.9**				
	2008 (300)	0.0	**58.0**	[52.2 - 63.6]							2.0	20.7	19.3				**58.0**				
	2009 (306)	0.3	**56.2**	[50.4 - 61.8]							2.6	26.8	13.4	0.7	0.3		**56.2**				
	2010 (369)	0.3	**52.6**	[47.3 - 57.8]							6.8	30.1	9.8	0.5	0.3		**52.6**				
	2011 (368)	0.0	**51.6**	[46.4 - 56.8]							4.6	31.3	12.0	0.5		**0.5**	**51.1**				
	2012 (391)	0.3	**55.5**	[50.4 - 60.5]							2.8	23.0	18.2	0.3	0.3		**55.5**				
Phenicols																					
Chloramphenicol	2002 (304)	1.3	**0.3**	[0.0 - 7.3]								3.0	42.1	53.3	1.3		**0.3**				
	2003 (333)	2.4	**3.6**	[0.0 - 4.8]								1.2	24.0	68.8	2.4	**0.6**	**3.0**				
	2004 (376)	0.8	**0.8**	[0.8 - 7.1]								1.3	36.7	60.4	0.8		**0.8**				
	2005 (396)	2.5	**4.0**	[0.0 - 3.0]								0.5	34.1	58.8	2.5		**4.0**				
	2006 (388)	1.3	**2.3**	[0.0 - 3.5]								1.0	42.3	53.1	1.3		**2.3**				
	2007 (315)	1.0	**2.9**	[1.3 - 5.4]								0.3	38.1	57.8	1.0		**2.9**				
	2008 (300)	1.0	**3.7**	[1.8 - 6.5]								1.7	43.3	50.3	1.0		**3.7**				
	2009 (306)	0.3	**3.3**	[1.6 - 5.9]								4.6	52.0	39.9	0.3	**0.3**	**2.9**				
	2010 (369)	1.1	**3.5**	[1.9 - 5.9]								4.1	55.0	36.3	1.1	**0.3**	**3.3**				
	2011 (368)	0.5	**4.9**	[2.9 - 7.6]								3.5	54.1	37.0	0.5		**4.9**				
	2012 (391)	1.3	**5.9**	[3.8 - 8.7]								2.3	39.4	51.2	1.3	**0.3**	**5.6**				
Quinolones																					
Ciprofloxacin	2002 (304)	3.6	**0.7**	[0.0 - 4.9]	90.1	5.6		1.0	2.3	0.3	**0.7**										
	2003 (333)	11.7	**0.3**	[0.0 - 3.2]	83.5	3.9	0.6	4.2	6.3	1.2				**0.3**							
	2004 (376)	10.6	**0.8**	[0.0 - 2.6]	84.3	3.5	0.8	2.9	7.4	0.3				**0.8**							
	2005 (396)	12.6	**0.0**	[0.0 - 2.0]	81.3	4.8	1.3	4.0	8.6												
	2006 (388)	4.9	**0.5**	[0.0 - 2.3]	91.8	2.6	0.3	2.1	2.3	0.5				**0.5**							
	2007 (315)	2.0	**0.3**	[0.0 - 1.8]	96.5	1.3		1.0	1.0					**0.3**							
	2008 (300)	4.0	**0.0**	[0.0 - 1.2]	92.7	3.3		0.3	3.7												
	2009 (306)	2.0	**0.7**	[0.1 - 2.3]	93.8	3.6		0.3	1.6				**0.3**	**0.3**							
	2010 (369)	2.4	**0.5**	[0.1 - 1.9]	94.6	2.4		0.3	2.2				**0.3**	**0.3**							
	2011 (368)	1.6	**0.0**	[0.0 - 1.0]	95.4	2.7	0.3	1.6													
	2012 (391)	1.6	**0.3**	[0.0 - 1.4]	91.5	6.6			1.3	0.3				**0.3**							
Nalidixic Acid	2002 (304)	N/A	**4.3**	[3.0 - 16.8]							0.7	16.1	72.7	6.3			**4.3**				
	2003 (333)	N/A	**11.7**	[1.4 - 9.9]						0.3	3.0	41.7	41.4	1.5	0.3		**11.7**				
	2004 (376)	N/A	**10.6**	[0.0 - 2.6]							3.7	62.0	21.5	1.6	0.5	**0.5**	**10.1**				
	2005 (396)	N/A	**10.4**	[0.1 - 3.9]							7.1	60.9	19.2	1.8	0.8	**0.8**	**9.6**				
	2006 (388)	N/A	**5.2**	[0.0 - 2.3]						0.3	3.3	74.0	16.8	0.3	0.3	**0.3**	**4.9**				
	2007 (315)	N/A	**2.2**	[0.9 - 4.5]							9.2	76.5	12.1			**0.3**	**1.9**				
	2008 (300)	N/A	**3.7**	[1.8 - 6.5]							7.0	74.7	14.7				**3.7**				
	2009 (306)	N/A	**2.6**	[1.1 - 5.1]						0.7	16.7	71.2	8.8				**2.6**				
	2010 (369)	N/A	**2.7**	[1.3 - 4.9]						0.5	17.6	71.8	7.0	0.3		**0.3**	**2.4**				
	2011 (368)	N/A	**1.6**	[0.6 - 3.5]						0.3	23.9	66.8	7.3				**1.6**				
	2012 (391)	N/A	**1.8**	[0.7 - 3.7]						0.3	11.0	69.3	17.1	0.5		**0.3**	**1.5**				
Tetracyclines																					
Tetracycline	2002 (304)	0.3	**77.0**	[43.4 - 67.0]									22.7	0.3	**0.3**	**1.6**	**75.0**				
	2003 (333)	0.9	**77.8**	[30.4 - 49.1]									21.3	0.9	**0.3**	**0.9**	**76.6**				
	2004 (376)	0.5	**74.2**	[47.8 - 64.6]									25.3	0.5		**6.9**	**67.3**				
	2005 (396)	0.3	**78.0**	[32.7 - 47.4]									21.7	0.3		**2.0**	**76.0**				
	2006 (388)	0.3	**76.5**	[47.9 - 63.8]									23.2	0.3	**0.3**	**1.8**	**74.5**				
	2007 (315)	0.0	**80.0**	[75.2 - 84.3]									20.0			**4.1**	**75.9**				
	2008 (300)	0.3	**85.7**	[81.2 - 89.4]									14.0	0.3		**1.0**	**84.7**				
	2009 (306)	0.0	**82.0**	[77.3 - 86.2]									18.0			**3.9**	**78.1**				
	2010 (369)	0.5	**69.4**	[64.4 - 74.0]									30.1	0.5	**0.3**	**2.4**	**66.7**				
	2011 (368)	0.0	**79.9**	[75.4 - 83.9]									20.1		**0.8**	**4.6**	**74.5**				
	2012 (391)	0.8	**77.2**	[72.8 - 81.3]									22.0	0.8	**0.3**	**4.1**	**72.9**				

Table 29.3 MIC Distribution among *Escherichia coli* from Ground Beef, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (295)	0.0	**0.3**	[0.0 - 1.9]					6.8	69.8	19.3	3.1	0.7		**0.3**						
	2003 (311)	0.6	**1.0**	[0.2 - 2.8]					4.2	62.7	28.0	3.5		0.6	**0.6**	**0.3**					
	2004 (338)	0.0	**0.6**	[0.1 - 2.1]					9.2	67.8	20.7	1.8				**0.6**					
	2005 (316)	0.0	**0.0**	[0.0 - 1.2]					6.3	65.2	26.3	2.2									
	2006 (295)	1.7	**4.1**	[2.1 - 7.0]					1.0	64.1	23.1	6.1		1.7	**2.0**	**2.0**					
	2007 (256)	1.2	**0.0**	[0.0 - 1.4]					3.5	66.8	25.4	2.7	0.4	1.2							
	2008 (250)	0.0	**2.0**	[0.7 - 4.6]						26.0	68.0	4.0			**0.4**	**1.6**					
	2009 (247)	0.4	**0.8**	[0.1 - 2.9]					3.2	47.8	45.3	2.4		0.4	**0.4**	**0.4**					
	2010 (269)	0.0	**0.4**	[0.0 - 2.1]					4.1	67.7	25.7	1.9	0.4			**0.4**					
	2011 (215)	0.0	**0.5**	[0.0 - 2.6]						47.9	49.3	2.3			**0.5**						
	2012 (271)	0.0	**0.7**	[0.1 - 2.6]					0.7	6.3	81.2	10.0	1.1			**0.7**					
Kanamycin	2002 (295)	0.0	**2.4**	[1.0 - 4.8]										96.6	1.0		**0.3**	**2.0**			
	2003 (311)	0.0	**2.9**	[1.3 - 5.4]										93.2	3.9			**2.9**			
	2004 (338)	0.0	**2.4**	[1.0 - 4.6]										95.6	2.1			**2.4**			
	2005 (316)	0.0	**0.6**	[0.1 - 2.3]										98.1	1.3			**0.6**			
	2006 (295)	0.3	**4.7**	[2.6 - 7.8]										92.2	2.7	0.3	**0.7**	**4.1**			
	2007 (256)	0.0	**1.6**	[0.4 - 4.0]										97.7	0.8			**1.6**			
	2008 (250)	0.4	**4.0**	[1.9 - 7.2]										94.4	1.2	0.4		**4.0**			
	2009 (247)	0.0	**2.0**	[0.7 - 4.7]										97.6	0.4		**0.8**	**1.2**			
	2010 (269)	0.0	**3.7**	[1.8 - 6.7]										95.9	0.4			**3.7**			
	2011 (215)	0.0	**1.4**	[0.3 - 4.0]										98.6				**1.4**			
	2012 (271)	0.0	**2.2**	[0.8 - 4.8]										97.4	0.4			**2.2**			
Streptomycin	2002 (295)	N/A	**9.5**	[6.4 - 13.4]												90.5	**5.4**	**4.1**			
	2003 (311)	N/A	**9.0**	[6.1 - 12.7]												91.0	**3.5**	**5.5**			
	2004 (338)	N/A	**11.8**	[8.6 - 15.8]												88.2	**4.7**	**7.1**			
	2005 (316)	N/A	**5.4**	[3.2 - 8.5]												94.6	**3.5**	**1.9**			
	2006 (295)	N/A	**14.2**	[10.5 - 18.8]												85.8	**6.1**	**8.1**			
	2007 (256)	N/A	**6.3**	[3.6 - 10.0]												93.8	**2.0**	**4.3**			
	2008 (250)	N/A	**10.4**	[6.9 - 14.9]												89.6	**3.6**	**6.8**			
	2009 (247)	N/A	**8.1**	[5.0 - 12.2]												91.9	**2.4**	**5.7**			
	2010 (269)	N/A	**9.3**	[6.1 - 13.4]												90.7	**5.2**	**4.1**			
	2011 (215)	N/A	**6.5**	[3.6 - 10.7]												93.5	**3.7**	**2.8**			
	2012 (271)	N/A	**10.0**	[6.7 - 14.2]												90.0	**4.8**	**5.2**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (295)	0.3	**2.0**	[0.7 - 4.4]							3.7	22.0	61.7	10.2	0.3	**1.4**	**0.7**				
	2003 (311)	0.6	**2.3**	[0.9 - 4.6]							7.4	19.6	62.4	7.7	0.6	**1.6**	**0.6**				
	2004 (338)	0.3	**3.8**	[2.1 - 6.5]							4.4	23.4	60.9	7.1	0.3	**3.6**	**0.3**				
	2005 (316)	0.0	**1.3**	[0.3 - 3.2]							9.8	20.3	60.8	7.9		**0.6**	**0.6**				
	2006 (295)	1.4	**2.4**	[1.0 - 4.8]							1.4	19.0	64.1	11.9	1.4	**2.0**	**0.3**				
	2007 (256)	0.0	**0.8**	[0.1 - 2.8]							4.7	25.0	59.0	10.5		**0.8**					
	2008 (250)	2.0	**2.4**	[0.9 - 5.2]							2.0	18.8	57.6	17.2	2.0	**0.8**	**1.6**				
	2009 (247)	0.0	**1.6**	[0.4 - 4.1]							5.7	26.7	59.5	6.5		**1.6**					
	2010 (269)	0.0	**1.1**	[0.2 - 3.2]							5.6	29.4	58.7	5.2		**0.7**	**0.4**				
	2011 (215)	0.0	**0.5**	[0.0 - 2.6]							4.7	32.6	55.8	6.5		**0.5**					
	2012 (271)	0.0	**1.5**	[0.4 - 3.7]							3.7	22.1	64.2	8.5		**1.1**	**0.4**				
Cephems																					
Ceftiofur	2002 (295)	0.0	**0.0**	[0.0 - 1.2]				11.9	60.7	26.4	0.7	0.3									
	2003 (311)	0.0	**0.3**	[0.0 - 1.8]				11.3	55.3	31.5	1.6			**0.3**							
	2004 (338)	0.6	**0.9**	[0.2 - 2.6]				5.0	49.4	41.7	2.1	0.3	0.6		**0.9**						
	2005 (316)	1.0	**0.6**	[0.1 - 2.3]				8.5	54.4	32.9	1.6	1.0	1.0	**0.3**	**0.3**						
	2006 (295)	0.3	**1.0**	[0.2 - 2.9]				0.7	31.9	64.1	2.0		0.3	**0.7**	**0.3**						
	2007 (256)	0.0	**0.8**	[0.1 - 2.8]				5.1	43.0	51.2				**0.4**	**0.4**						
	2008 (250)	0.0	**1.6**	[0.4 - 4.0]				3.2	24.0	69.2	1.6	0.4		**0.8**	**0.8**						
	2009 (247)	0.0	**0.8**	[0.1 - 2.9]				7.3	39.3	51.8	0.4	0.4			**0.8**						
	2010 (269)	0.0	**1.1**	[0.2 - 3.2]				7.4	54.3	37.2				**1.1**							
	2011 (215)	0.0	**0.9**	[0.1 - 3.3]				4.2	44.2	50.2	0.5			**0.5**	**0.5**						
	2012 (271)	0.0	**0.0**	[0.0 - 1.4]				5.5	31.7	59.8	2.6	0.4									
Ceftriaxone	2002 (295)	0.3	**0.0**	[0.0 - 1.2]					99.3	0.3		0.3									
	2003 (311)	0.3	**0.3**	[0.0 - 1.8]					98.4	0.6	0.3	0.3		**0.3**							
	2004 (338)	0.3	**1.5**	[0.5 - 3.4]					95.9	1.8	0.6	0.3		**0.3**	**0.6**	**0.6**					
	2005 (316)	0.0	**1.9**	[0.7 - 4.1]					94.6	1.6	1.6		**0.6**	**0.6**	**0.6**	**0.3**					
	2006 (295)	0.0	**1.7**	[0.6 - 3.9]					97.6	0.3	0.3		**0.3**	**0.3**	**0.7**	**0.3**					
	2007 (256)	0.0	**0.8**	[0.1 - 2.8]					99.2						**0.4**	**0.4**					
	2008 (250)	0.4	**1.6**	[0.4 - 4.0]					98.0			0.4		**0.8**	**0.4**	**0.4**					
	2009 (247)	0.0	**0.8**	[0.1 - 2.9]					98.4		0.8				**0.4**	**0.4**					
	2010 (269)	0.0	**1.1**	[0.2 - 3.2]					98.5	0.4					**1.1**						
	2011 (215)	0.0	**0.5**	[0.0 - 2.6]					99.1	0.5					**0.5**						
	2012 (271)	0.4	**0.0**	[0.0 - 1.4]					99.3		0.4	0.4									
Cefoxitin	2002 (295)	1.0	**1.4**	[0.4 - 3.4]							1.7	23.7	57.6	14.6	1.0	**1.4**					
	2003 (311)	2.6	**0.3**	[0.0 - 1.8]							1.6	21.2	56.3	18.0	2.6	**0.3**					
	2004 (338)	1.8	**1.2**	[0.3 - 3.0]							4.1	30.2	53.8	8.9	1.8	**0.3**	**0.9**				
	2005 (316)	0.3	**0.9**	[0.2 - 2.7]							7.9	37.3	46.2	7.3	0.3	**0.3**	**0.6**				
	2006 (295)	1.7	**2.0**	[0.7 - 4.4]							0.3	12.5	66.8	16.6	1.7	**0.3**	**1.7**				
	2007 (256)	1.2	**0.8**	[0.1 - 2.8]						0.4	2.3	18.8	66.8	9.8	1.2		**0.8**				
	2008 (250)	0.4	**2.4**	[0.9 - 5.2]							2.0	22.0	62.8	10.4	0.4	**0.4**	**2.0**				
	2009 (247)	0.0	**1.6**	[0.4 - 4.1]							2.0	30.4	57.1	8.9		**0.8**	**0.8**				
	2010 (269)	0.0	**1.1**	[0.2 - 3.2]							3.0	32.7	56.5	6.7		**0.7**	**0.4**				
	2011 (215)	0.0	**0.5**	[0.0 - 2.6]							0.5	28.8	59.5	10.7			**0.5**				
	2012 (271)	1.1	**1.8**	[0.6 - 4.3]						0.4	1.9	19.2	66.1	9.6	1.1	**0.7**	**1.1**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding.
[3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 29.3 MIC Distribution among *Escherichia coli* from Ground Beef, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (295)	N/A	**9.8**	[6.7 - 13.8]											88.1	1.69			0.34		**9.8**
	2003 (311)	N/A	**10.3**	[7.1 - 14.2]											89.1	0.6				**0.3**	**10.0**
Sulfisoxazole	2004 (338)	N/A	**13.0**	[9.6 - 17.1]											84.6		2.4			**13.0**	
	2005 (316)	N/A	**7.0**	[4.4 - 10.4]											75.3	13.6	4.1			**7.0**	
	2006 (295)	N/A	**12.5**	[9.0 - 16.9]											58.6	27.1	0.7	0.3	0.7	**12.5**	
	2007 (256)	N/A	**9.4**	[6.1 - 13.6]											75.4	15.2				**9.4**	
	2008 (250)	N/A	**11.6**	[7.9 - 16.2]											80.4	7.6	0.4			**11.6**	
	2009 (247)	N/A	**7.7**	[4.7 - 11.8]											70.4	19.0	2.8			**7.7**	
	2010 (269)	N/A	**12.6**	[8.9 - 17.2]											56.5	30.5	0.4			**12.6**	
	2011 (215)	N/A	**7.9**	[4.7 - 12.4]											67.9	21.9	0.9	0.9	0.5	**7.9**	
	2012 (271)	N/A	**7.4**	[4.6 - 11.2]											74.5	17.3	0.7			**7.4**	
Trimethoprim-	2002 (295)	N/A	**0.7**	[0.1 - 2.4]				93.6	3.4	2.4				**0.7**							
Sulfamethoxazole	2003 (311)	N/A	**0.3**	[0.0 - 1.8]				97.4	1.3	1.0				**0.3**							
	2004 (338)	N/A	**0.6**	[0.1 - 2.1]				97.0	2.1		0.3			**0.6**							
	2005 (316)	N/A	**0.6**	[0.1 - 2.3]				89.6	8.5	0.9	0.3			**0.6**							
	2006 (295)	N/A	**1.4**	[0.4 - 3.4]				84.1	10.8	2.4	1.4		**0.3**	**1.0**							
	2007 (256)	N/A	**1.2**	[0.2 - 3.4]				73.8	24.2	0.4	0.4		**0.4**	**0.8**							
	2008 (250)	N/A	**2.0**	[0.7 - 4.6]				80.0	13.6	4.0	0.4			**2.0**							
	2009 (247)	N/A	**2.0**	[0.7 - 4.7]				93.9	3.6	0.4				**2.0**							
	2010 (269)	N/A	**0.7**	[0.1 - 2.7]				91.5	7.1	0.7				**0.7**							
	2011 (215)	N/A	**2.3**	[0.8 - 5.3]				94.4	3.3					**2.3**							
	2012 (271)	N/A	**0.4**	[0.0 - 2.0]				98.2	1.5					**0.4**							
Macrolides																					
Azithromycin	2011 (215)	N/A	**0.0**	[0.0 - 1.7]							0.5	12.6	69.3	17.2	0.5						
	2012 (271)	N/A	**0.0**	[0.0 - 1.4]					0.4	0.7	1.5	11.4	70.1	15.5	0.4						
Penicillins																					
Ampicillin	2002 (295)	0.3	**6.1**	[3.7 - 9.5]							4.8	32.2	51.9	4.8	0.3	**2.0**	**4.1**				
	2003 (311)	0.3	**5.1**	[3.0 - 8.2]							8.4	28.3	52.4	5.5	0.3		**5.1**				
	2004 (338)	0.9	**5.3**	[3.2 - 8.3]							8.9	46.2	37.9	0.9	0.9	**0.3**	**5.0**				
	2005 (316)	1.3	**3.5**	[1.8 - 6.1]							14.9	49.7	30.1	0.6	1.3		**3.5**				
	2006 (295)	0.7	**9.2**	[6.1 - 13.0]							5.1	46.4	37.6	1.0	0.7		**9.2**				
	2007 (256)	0.0	**6.6**	[3.9 - 10.4]							11.3	49.2	32.4	0.4		**0.4**	**6.3**				
	2008 (250)	0.0	**6.4**	[3.7 - 10.2]							4.8	41.2	45.6	2.0		**0.4**	**6.0**				
	2009 (247)	0.0	**4.9**	[2.5 - 8.3]							15.8	51.4	27.9				**4.9**				
	2010 (269)	0.0	**4.8**	[2.6 - 8.1]							13.0	52.8	28.6	0.7			**4.8**				
	2011 (215)	0.0	**3.7**	[1.6 - 7.2]							12.6	55.8	27.4	0.5			**3.7**				
	2012 (271)	0.4	**2.6**	[1.0 - 5.2]							8.9	45.4	41.7	1.1	0.4	**0.7**	**1.9**				
Phenicols																					
Chloramphenicol	2002 (295)	0.7	**1.0**	[0.2 - 2.9]								0.3	30.2	67.8	0.7		**1.0**				
	2003 (311)	5.1	**2.3**	[0.9 - 4.6]								1.0	15.4	76.2	5.1	**1.3**	**1.0**				
	2004 (338)	0.9	**3.6**	[1.8 - 6.1]								0.3	26.9	68.3	0.9	**0.3**	**3.3**				
	2005 (316)	1.3	**1.6**	[0.5 - 3.7]								1.9	36.7	58.5	1.3	**0.3**	**1.3**				
	2006 (295)	0.7	**1.4**	[0.4 - 3.4]								1.0	32.5	64.4	0.7	**0.3**	**1.0**				
	2007 (256)	1.6	**3.9**	[1.9 - 7.1]								1.6	32.8	60.2	1.6		**3.9**				
	2008 (250)	1.6	**0.8**	[0.1 - 2.9]								2.8	32.4	62.4	1.6		**0.8**				
	2009 (247)	0.4	**2.4**	[0.9 - 5.2]								6.5	50.2	40.5	0.4		**2.4**				
	2010 (269)	0.4	**2.6**	[1.1 - 5.3]								4.1	53.9	39.0	0.4	**0.4**	**2.2**				
	2011 (215)	0.0	**1.4**	[0.3 - 4.0]								2.3	43.3	53.0			**1.4**				
	2012 (271)	2.6	**1.1**	[0.2 - 3.2]								2.2	36.2	57.9	2.6		**1.1**				
Quinolones																					
Ciprofloxacin	2002 (295)	0.0	**0.0**	[0.0 - 1.2]	95.3	4.8															
	2003 (311)	0.9	**0.0**	[0.0 - 1.2]	95.5	3.5		0.6	0.3												
	2004 (338)	1.8	**0.0**	[0.0 - 1.1]	94.4	3.8		0.6	0.9	0.3											
	2005 (316)	3.5	**0.3**	[0.0 - 1.8]	90.2	4.1	1.9	2.2	1.3		**0.3**										
	2006 (295)	0.6	**0.0**	[0.0 - 1.2]	98.0	1.4		0.3	0.3												
	2007 (256)	0.8	**0.0**	[0.0 - 1.4]	99.2				0.8												
	2008 (250)	0.4	**0.0**	[0.0 - 1.5]	97.6	2.0			0.4												
	2009 (247)	0.8	**0.0**	[0.0 - 1.5]	97.6	1.6			0.4	0.4											
	2010 (269)	0.0	**0.0**	[0.0 - 1.4]	100.0																
	2011 (215)	0.0	**0.0**	[0.0 - 1.7]	100.0																
	2012 (271)	1.1	**0.0**	[0.0 - 1.4]	97.8	0.7	0.4		0.7	0.4											
Nalidixic Acid	2002 (295)	N/A	**0.0**	[0.0 - 1.2]							1.0	15.6	80.7	2.7							
	2003 (311)	N/A	**1.0**	[0.2 - 2.8]							1.6	44.1	51.1	2.3			**1.0**				
	2004 (338)	N/A	**1.5**	[0.5 - 3.4]							3.0	67.5	26.9	1.2		**0.9**	**0.6**				
	2005 (316)	N/A	**1.3**	[0.3 - 3.2]						0.3	6.3	70.9	17.1	1.3	2.8	**0.9**	**0.3**				
	2006 (295)	N/A	**0.7**	[0.1 - 2.4]							4.7	74.6	20.0				**0.7**				
	2007 (256)	N/A	**0.4**	[0.0 - 2.2]						0.4	7.4	80.1	11.3	0.4			**0.4**				
	2008 (250)	N/A	**0.4**	[0.0 - 2.2]						0.8	3.2	83.6	12.0				**0.4**				
	2009 (247)	N/A	**0.4**	[0.0 - 2.2]						1.2	10.9	80.6	6.5	0.4			**0.4**				
	2010 (269)	N/A	**0.0**	[0.0 - 1.4]						1.1	12.3	79.6	7.1								
	2011 (215)	N/A	**0.0**	[0.0 - 1.7]							12.1	80.9	6.5	0.5							
	2012 (271)	N/A	**1.5**	[0.4 - 3.7]						0.4	8.9	67.9	21.0	0.4		**0.7**	**0.7**				
Tetracyclines																					
Tetracycline	2002 (295)	4.8	**30.8**	[25.6 - 36.5]									64.4	4.8	**4.4**	**2.0**	**24.4**				
	2003 (311)	3.5	**25.1**	[20.4 - 30.3]									71.4	3.5	**2.6**	**1.0**	**21.5**				
	2004 (338)	6.5	**22.8**	[18.4 - 27.6]									70.7	6.5	**2.7**	**1.2**	**18.9**				
	2005 (316)	6.3	**16.5**	[12.5 - 21.0]									77.2	6.3	**1.6**	**0.6**	**14.2**				
	2006 (295)	7.5	**25.4**	[20.6 - 30.8]									67.1	7.5	**2.0**	**4.1**	**19.3**				
	2007 (256)	4.3	**21.9**	[17.0 - 27.4]									73.8	4.3	**1.6**	**2.3**	**18.0**				
	2008 (250)	3.2	**24.0**	[18.8 - 29.8]									72.8	3.2	**0.8**	**2.8**	**20.4**				
	2009 (247)	4.9	**18.6**	[14.0 - 24.0]									76.5	4.9	**1.2**	**0.8**	**16.6**				
	2010 (269)	2.2	**22.7**	[17.8 - 28.2]									75.1	2.2	**1.9**	**1.5**	**19.3**				
	2011 (215)	3.7	**17.7**	[12.8 - 23.4]									78.6	3.7	**1.9**	**2.3**	**13.5**				
	2012 (271)	3.0	**22.1**	[17.3 - 27.6]									74.9	3.0	**0.7**	**0.7**	**20.7**				

Table 29.4 MIC Distribution among *Escherichia coli* from Pork Chop, 2002-2012

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Gentamicin	2002 (184)	0.0	**30.0**	[0.1 - 3.9]					4.9	66.3	21.2	6.0	0.5		**1.1**						
	2003 (218)	20.0	**0.0**	[0.3 - 4.0]					3.7	53.2	36.2	5.0	0.5		**0.5**	**0.9**					
	2004 (232)	0.0	**0.0**	[0.3 - 3.7]					10.3	57.8	26.7	3.4		0.4		**1.3**					
	2005 (205)	0.0	**0.0**	[0.0 - 1.8]					6.8	56.1	34.1	2.0		1.0							
	2006 (182)	12.5	**1.1**	[0.1 - 3.9]					2.7	47.8	41.2	4.4	1.1	1.6	**0.5**	**0.5**					
	2007 (152)	0.0	**1.3**	[0.2 - 4.7]					4.6	54.6	32.9	5.9		0.7	**0.7**	**0.7**					
	2008 (146)	0.0	**1.4**	[0.2 - 4.9]						22.6	62.3	12.3	0.7	0.7	**0.7**	**0.7**					
	2009 (147)	0.0	**4.1**	[1.5 - 8.7]					2.7	47.6	42.9	2.7				**4.1**					
	2010 (183)	1.6	**2.7**	[0.9 - 6.3]					4.4	49.2	38.8	2.7	0.5	1.6	**1.6**	**1.1**					
	2011 (146)	0.0	**0.7**	[0.0 - 3.8]					0.7	37.0	58.9	2.0	0.7		**0.7**						
	2012 (161)	0.6	**0.6**	[0.0 - 3.4]					1.9	11.2	70.2	13.7	1.9	0.6		**0.6**					
Kanamycin	2002 (184)	0.0	**10.0**	[2.6 - 9.8]										92.9	1.1	0.5		**5.4**			
	2003 (218)	20.0	**0.0**	[5.3 - 13.3]										89.9	1.4			**8.7**			
	2004 (232)	0.0	**9.1**	[5.0 - 12.5]										89.2	2.6			**8.2**			
	2005 (205)	0.0	**0.0**	[4.2 - 11.8]										92.7			**1.5**	**5.9**			
	2006 (182)	0.0	**25.0**	[3.1 - 10.6]										91.2	2.7			**6.0**			
	2007 (152)	0.0	**5.6**	[1.9 - 9.3]										94.1	1.3		**0.7**	**3.9**			
	2008 (146)	0.0	**6.2**	[2.9 - 11.4]										91.8	2.1			**6.2**			
	2009 (147)	0.0	**6.1**	[2.8 - 11.3]										91.8	2.0			**6.1**			
	2010 (183)	0.0	**7.7**	[4.2 - 12.5]										92.4				**7.7**			
	2011 (146)	0.0	**1.4**	[0.2 - 4.9]										98.0	0.7			**1.4**			
	2012 (161)	0.0	**5.0**	[2.2 - 9.6]										91.9	3.1		**0.6**	**4.4**			
Streptomycin	2002 (184)	N/A	**70.0**	[16.5 - 29.0]												77.7	**10.9**	**11.4**			
	2003 (218)	N/A	**40.0**	[14.7 - 25.6]												80.3	**6.9**	**12.8**			
	2004 (232)	N/A	**27.3**	[16.1 - 26.9]												78.9	**8.6**	**12.5**			
	2005 (205)	N/A	**33.3**	[8.9 - 18.6]												86.8	**7.3**	**5.9**			
	2006 (182)	N/A	**13.7**	[9.1 - 19.6]												86.3	**7.7**	**6.0**			
	2007 (152)	N/A	**13.8**	[8.8 - 20.3]												86.2	**7.9**	**5.9**			
	2008 (146)	N/A	**19.9**	[13.7 - 27.3]												80.1	**5.5**	**14.4**			
	2009 (147)	N/A	**19.7**	[13.6 - 27.1]												80.3	**7.5**	**12.2**			
	2010 (183)	N/A	**19.7**	[14.2 - 26.2]												80.3	**8.2**	**11.5**			
	2011 (146)	N/A	**15.1**	[9.7 - 21.9]												84.9	**6.9**	**8.2**			
	2012 (161)	N/A	**14.9**	[9.8 - 21.4]												85.1	**7.5**	**7.5**			
β-Lactams/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	2002 (184)	20.0	**20.0**	[2.6 - 9.8]							1.6	23.9	56.0	12.5	0.5	**4.4**	**1.1**				
	2003 (218)	20.0	**20.0**	[2.5 - 8.8]							3.2	17.9	54.1	19.3	0.5	**2.8**	**2.3**				
	2004 (232)	18.2	**0.0**	[3.0 - 9.4]							4.3	27.6	46.6	15.5	0.4	**4.7**	**0.9**				
	2005 (205)	22.2	**0.0**	[1.1 - 6.3]							2.9	21.0	52.2	20.5	0.5	**2.0**	**1.0**				
	2006 (182)	25.0	**0.0**	[0.6 - 5.5]								23.1	59.3	12.1	3.3	**2.2**					
	2007 (152)	5.6	**0.0**	[0.0 - 3.6]							1.3	18.4	63.8	15.8		**0.7**					
	2008 (146)	0.0	**3.4**	[1.1 - 7.8]							1.4	20.6	42.5	31.5	0.7	**3.4**					
	2009 (147)	0.0	**6.8**	[3.3 - 12.2]							5.4	32.0	46.9	8.8		**5.4**	**1.4**				
	2010 (183)	1.1	**2.2**	[0.6 - 5.5]							3.3	30.6	48.1	14.8	1.1	**1.6**	**0.5**				
	2011 (146)	0.0	**0.0**	[0.0 - 2.5]							1.4	33.6	52.7	12.3							
	2012 (161)	1.2	**3.1**	[1.0 - 7.1]							1.9	20.5	62.1	11.2	1.2	**1.2**	**1.9**				
Cephems																					
Ceftiofur	2002 (184)	0.0	**20.0**	[0.0 - 3.0]				7.1	64.1	27.2	0.5	0.5		**0.5**							
	2003 (218)	0.0	**20.0**	[0.1 - 3.3]				5.5	53.7	38.1	1.8			**0.9**							
	2004 (232)	0.0	**0.0**	[0.0 - 2.4]				7.3	51.7	39.7	0.9			**0.4**							
	2005 (205)	0.0	**0.0**	[0.0 - 1.8]				3.4	58.5	34.6	2.0	0.5	1.0								
	2006 (182)	0.0	**0.0**	[0.0 - 2.0]				0.5	41.2	53.8	3.8		0.5								
	2007 (152)	0.0	**0.0**	[0.0 - 3.6]				1.3	50.0	48.0					**0.7**						
	2008 (146)	0.0	**3.4**	[1.1 - 7.8]				0.7	29.5	64.4	2.1				**3.4**						
	2009 (147)	0.0	**6.8**	[3.3 - 12.2]				10.2	42.2	39.5	1.4			**3.4**	**3.4**						
	2010 (183)	0.0	**0.0**	[0.0 - 2.0]				10.9	49.7	37.2	2.2										
	2011 (146)	0.0	**0.0**	[0.0 - 2.5]				4.1	50.0	45.9											
	2012 (161)	0.0	**1.2**	[0.2 - 4.4]					33.5	62.1	2.5	0.6		**0.6**	**0.6**						
Ceftriaxone	2002 (184)	0.0	**20.0**	[0.0 - 3.0]					97.8	1.1	0.5			**0.5**							
	2003 (218)	0.0	**20.0**	[0.1 - 3.3]					97.7	0.9	0.5			**0.5**	**0.5**						
	2004 (232)	0.0	**0.0**	[0.0 - 2.4]					97.0	1.7	0.9				**0.4**						
	2005 (205)	0.0	**0.0**	[0.0 - 2.7]					96.1	2.4	1.0				**0.5**						
	2006 (182)	0.0	**0.0**	[0.0 - 3.0]					97.8	0.5	1.1			**0.6**							
	2007 (152)	0.0	**0.0**	[0.0 - 3.6]					99.3						**0.7**						
	2008 (146)	0.0	**3.4**	[1.1 - 7.8]					96.6						**2.7**	**0.7**					
	2009 (147)	0.0	**6.8**	[3.3 - 12.2]					93.2					**3.4**	**2.7**	**0.7**					
	2010 (183)	0.0	**0.0**	[0.0 - 2.0]					98.4	1.1	0.5										
	2011 (146)	0.0	**0.0**	[0.0 - 2.5]					100.0												
	2012 (161)	0.6	**1.2**	[0.2 - 4.4]					97.5	0.6		0.6		**0.6**	**0.6**						
Cefoxitin	2002 (184)	0.0	**20.0**	[1.2 - 7.0]								20.1	58.2	16.9	1.6	**3.3**					
	2003 (218)	0.0	**20.0**	[0.7 - 5.3]								12.4	54.1	28.0	3.2	**2.3**					
	2004 (232)	0.0	**0.0**	[0.7 - 5.0]						0.9	2.6	26.7	59.9	7.3	0.4	**1.3**	**0.9**				
	2005 (205)	11.1	**0.0**	[0.3 - 4.2]							1.5	30.2	55.6	10.2	0.5	**0.5**	**1.5**				
	2006 (182)	25.0	**0.0**	[0.3 - 4.7]								12.6	68.7	14.3	2.7	**1.6**					
	2007 (152)	27.8	**0.0**	[0.0 - 3.6]							0.7	18.4	63.8	16.4		**0.7**					
	2008 (146)	0.0	**3.4**	[1.1 - 7.8]								17.1	63.7	13.0	2.7	**0.7**	**2.7**				
	2009 (147)	0.7	**6.8**	[3.3 - 12.2]							2.0	28.6	55.1	6.8	0.7	**3.4**	**3.4**				
	2010 (183)	1.6	**0.5**	[0.0 - 3.0]							0.5	34.4	57.9	4.9	1.6		**0.5**				
	2011 (146)	0.0	**0.0**	[0.0 - 2.5]								26.0	65.8	8.2							
	2012 (161)	3.1	**1.9**	[0.4 - 5.3]								16.2	70.2	8.7	3.1	**0.6**	**1.2**				

[1] Percent of isolates with intermediate susceptibility. N/A used when no intermediate breakpoint is established. [2] Percent of isolates with resistance. Discrepancies between %R and sums of distribution are due to rounding. [3] 95% confidence intervals for percent resistant (%R) were calculated using the Clopper-Pearson exact method. [4] Unshaded areas indicate the dilution range of the Sensititre plate used for susceptibility testing. Susceptibility breakpoints are indicated by single black vertical bars and resistance breakpoints are double red vertical bars. Numbers in shaded areas indicate % of isolates with MIC's greater than the highest concentrations on the Sensititre plate. Numbers listed for the lowest tested concentrations represent % of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints used when available. There are no CLSI breakpoints for streptomycin or azithromycin.

Table 29.4 MIC Distribution among *Escherichia coli* from Pork Chop, 2002-2012 continued

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway																					
Sulfamethoxazole	2002 (184)	N/A	**12.5**	[8.1 - 18.2]											83.2	3.26	0.5	0.54			**12.5**
	2003 (218)	N/A	**15.1**	[10.7 - 20.6]											83.5	0.9	0.5				**15.1**
Sulfisoxazole	2004 (232)	N/A	**18.2**	[14.5 - 25.1]											69.8	3.0	6.9	0.4	0.4	**19.4**	
	2005 (205)	N/A	**33.3**	[9.7 - 19.7]											62.4	18.0	4.4	0.5	0.5	**14.2**	
	2006 (182)	N/A	**75.0**	[14.7 - 26.9]											48.4	28.6	1.1	0.5	1.1	**20.3**	
	2007 (152)	N/A	**11.8**	[7.2 - 18.1]											72.4	15.1	0.7			**11.8**	
	2008 (146)	N/A	**16.4**	[10.8 - 23.5]											65.8	17.8				**16.4**	
	2009 (147)	N/A	**14.3**	[9.1 - 21.0]											53.7	27.2	4.8			**14.3**	
	2010 (183)	N/A	**16.4**	[11.3 - 22.6]											53.0	29.5	1.1			**16.4**	
	2011 (146)	N/A	**10.3**	[5.9 - 16.4]											72.6	15.8		1.4		**10.3**	
	2012 (161)	N/A	**6.8**	[3.5 - 11.9]											76.4	15.5	1.2			**6.8**	
Trimethoprim-	2002 (184)	N/A	**20.0**	[0.1 - 3.9]				88.6	4.4	5.4	0.5		**0.5**	**0.5**							
Sulfamethoxazole	2003 (218)	N/A	**0.0**	[1.0 - 5.9]				92.2	3.2	1.4	0.5			**2.8**							
	2004 (232)	N/A	**0.0**	[1.8 - 7.2]				93.1	2.2	0.9				**3.9**							
	2005 (205)	N/A	**11.1**	[0.3 - 4.2]				75.1	18.0	4.4	1.0			**1.5**							
	2006 (182)	N/A	**2.2**	[0.6 - 5.5]				73.1	15.4	8.2	1.1			**2.2**							
	2007 (152)	N/A	**1.3**	[0.2 - 4.7]				65.1	29.6	2.6	0.7	0.7		**1.3**							
	2008 (146)	N/A	**6.2**	[2.9 - 11.4]				68.5	21.2	2.1	0.7	1.4		**6.2**							
	2009 (147)	N/A	**2.7**	[0.7 - 6.8]				88.4	6.1	2.7				**2.7**							
	2010 (183)	N/A	**3.8**	[1.6 - 7.7]				88.5	6.6	1.1				**3.8**							
	2011 (146)	N/A	**3.4**	[1.1 - 7.8]				89.0	6.2	1.4			**0.7**	**2.7**							
	2012 (161)	N/A	**1.9**	[0.4 - 5.3]				93.2	3.7	0.6		0.6	**1.9**								
Macrolides																					
Azithromycin	2011 (146)	N/A	**0.0**	[0.0 - 2.5]							2.7	21.2	61.6	13.7	0.7						
	2012 (161)	N/A	**0.0**	[0.0 - 2.3]								16.2	62.1	20.5	1.2						
Penicillins																					
Ampicillin	2002 (184)	0.0	**40.0**	[9.0 - 19.4]							1.1	30.4	47.8	5.4	1.6		**13.6**				
	2003 (218)	0.0	**40.0**	[9.1 - 18.5]							1.8	25.7	52.8	5.0	1.4		**13.3**				
	2004 (232)	0.0	**9.1**	[10.7 - 20.4]							12.9	44.4	25.0	1.7	0.9	**0.9**	**14.2**				
	2005 (205)	0.0	**22.2**	[11.3 - 21.9]							9.3	40.5	28.3	3.4	2.4	**2.0**	**14.1**				
	2006 (182)	0.0	**15.9**	[10.9 - 22.1]							3.8	47.8	30.2	0.5	1.6	**1.6**	**14.3**				
	2007 (152)	0.0	**15.8**	[10.4 - 22.6]							5.9	48.0	28.9	1.3			**15.8**				
	2008 (146)	0.0	**15.1**	[9.7 - 21.9]							8.2	30.8	42.5	3.4			**15.1**				
	2009 (147)	0.0	**11.6**	[6.9 - 17.9]							12.9	52.4	21.8	1.4			**11.6**				
	2010 (183)	0.5	**19.1**	[13.7 - 25.6]							9.8	49.7	19.7	1.1	0.5	**0.5**	**18.6**				
	2011 (146)	0.0	**13.0**	[8.0 - 19.6]							11.0	46.6	28.1	1.4			**13.0**				
	2012 (161)	1.9	**13.0**	[8.3 - 19.2]							5.0	47.8	30.4	1.9	1.9	**0.6**	**12.4**				
Phenicols																					
Chloramphenicol	2002 (184)	0.0	**40.0**	[0.3 - 4.7]								0.5	31.5	64.1	2.2	**1.6**					
	2003 (218)	0.0	**40.0**	[1.9 - 7.7]								0.9	15.1	72.9	6.9	**2.3**	**1.8**				
	2004 (232)	0.0	**18.2**	[2.1 - 7.8]								0.9	34.1	59.9	0.9	**1.3**	**3.0**				
	2005 (205)	11.1	**22.2**	[1.4 - 6.9]								2.9	35.1	56.1	2.4	**2.0**	**1.5**				
	2006 (182)	37.5	**0.0**	[3.5 - 11.2]								0.5	33.0	58.8	1.1	**2.7**	**3.8**				
	2007 (152)	33.3	**0.0**	[1.5 - 8.4]								0.7	27.0	67.1	1.3	**0.7**	**3.3**				
	2008 (146)	0.0	**3.4**	[1.1 - 7.8]								0.7	33.6	58.9	3.4	**0.7**	**2.7**				
	2009 (147)	1.4	**4.8**	[1.9 - 9.6]								6.8	55.8	31.3	1.4	**1.4**	**3.4**				
	2010 (183)	2.7	**1.6**	[0.3 - 4.7]								8.2	50.8	36.6	2.7	**1.1**	**0.5**				
	2011 (146)	0.0	**2.7**	[0.8 - 6.9]								8.2	45.9	43.2		**1.4**	**1.4**				
	2012 (161)	4.3	**3.7**	[1.4 - 7.9]								2.5	25.5	64.0	4.3	**1.9**	**1.9**				
Quinolones																					
Ciprofloxacin	2002 (184)	0.0	**0.0**	[0.0 - 2.0]	96.2	2.7	1.1														
	2003 (218)	0.5	**0.0**	[0.0 - 1.7]	96.3	3.2			0.5												
	2004 (232)	0.8	**0.0**	[0.0 - 1.6]	97.8	0.9	0.4	0.4	0.4												
	2005 (205)	2.9	**0.0**	[0.0 - 1.8]	91.2	4.9	1.0	2.4	0.5												
	2006 (182)	0.5	**0.0**	[0.0 - 2.0]	97.8	1.6			0.5												
	2007 (152)	0.0	**0.0**	[0.0 - 2.4]	99.3	0.7															
	2008 (146)	0.0	**0.0**	[0.0 - 2.5]	97.3	2.7															
	2009 (147)	0.0	**0.0**	[0.0 - 2.5]	99.3	0.7															
	2010 (183)	0.5	**0.0**	[0.0 - 2.0]	96.7	2.2	0.5		0.5												
	2011 (146)	0.0	**0.0**	[0.0 - 2.5]	100.0																
	2012 (161)	1.2	**0.0**	[0.0 - 2.3]	93.2	5.0	0.6	0.6		0.6											
Nalidixic Acid	2002 (184)	N/A	**0.0**	[0.0 - 3.0]							2.2	16.9	74.5	5.4	0.5	**0.5**					
	2003 (218)	N/A	**0.0**	[0.0 - 2.5]							2.8	44.5	50.0	2.3			**0.5**				
	2004 (232)	N/A	**0.0**	[0.0 - 1.6]							9.9	68.5	19.4	1.3	0.9						
	2005 (205)	N/A	**0.0**	[0.3 - 4.2]							9.8	67.3	18.0	2.4	1.0	**1.5**					
	2006 (182)	N/A	**0.0**	[0.0 - 3.0]							9.9	75.8	12.6	1.1			**0.5**				
	2007 (152)	N/A	**0.0**	[0.0 - 2.4]						0.7	11.2	77.0	11.2								
	2008 (146)	N/A	**0.0**	[0.0 - 2.5]							8.9	72.6	16.4	2.1							
	2009 (147)	N/A	**0.0**	[0.0 - 2.5]						4.8	16.3	68.7	10.2								
	2010 (183)	N/A	**0.5**	[0.0 - 3.0]						3.3	18.6	67.2	9.3	1.1			**0.5**				
	2011 (146)	N/A	**0.0**	[0.0 - 2.5]						1.4	14.4	74.7	9.6								
	2012 (161)	N/A	**0.0**	[0.0 - 2.3]						1.2	11.2	62.1	24.8		0.6						
Tetracyclines																					
Tetracycline	2002 (184)	0.5	**70.0**	[45.2 - 60.1]									46.7	0.5	**2.2**	**1.6**	**48.9**				
	2003 (218)	0.9	**80.0**	[39.6 - 53.2]									52.8	0.9	**1.8**	**0.9**	**43.6**				
	2004 (232)	2.2	**54.5**	[49.4 - 62.5]									41.8	2.2		**6.0**	**50.0**				
	2005 (205)	1.0	**55.6**	[38.9 - 52.9]									53.2	1.0		**2.4**	**43.4**				
	2006 (182)	0.5	**52.7**	[45.2 - 60.2]									46.7	0.5	**1.6**	**4.9**	**46.2**				
	2007 (152)	1.3	**50.0**	[41.8 - 58.2]									48.7	1.3	**1.3**	**3.3**	**45.4**				
	2008 (146)	1.4	**54.8**	[46.4 - 63.0]									43.8	1.4	**1.4**	**3.4**	**50.0**				
	2009 (147)	2.7	**46.9**	[38.7 - 55.3]									50.3	2.7		**4.1**	**42.9**				
	2010 (183)	2.7	**44.3**	[36.9 - 51.8]									53.0	2.7	**1.6**	**3.3**	**39.3**				
	2011 (146)	2.7	**46.6**	[38.3 - 55.0]									50.7	2.7		**5.5**	**41.1**				
	2012 (161)	0.0	**39.1**	[31.5 - 47.1]									60.9		**1.9**	**3.1**	**34.2**				

Table 30. Broad-Spectrum β-lactam Resistance among all Ceftiofur or Ceftriaxone Resistant *Escherichia coli* Retail Meat Isolates, 2012

Antimicrobial	Isolate Source (# of Isolates)	%I[1] (or S-DD[2])	%R[3]	[95% CI][4]	Distribution (%) of MICs (µg/ml)[5] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
β-Lactam/β-Lactamase Inhibitor Combinations																					
Piperacillin-tazobactam	Retail Chicken (29)	0.0	**0.0**	[0.0 - 11.9]							6.9	34.5	48.3	6.9	3.5						
	Ground Turkey (37)	2.7	**0.0**	[0.0 - 9.5]							2.7	21.6	43.2	24.3	5.4	2.7					
	Pork Chop (2)	0.0	**0.0**	[0.0 - 84.2]									100.0								
Cephems																					
Cefepime[2]	Retail Chicken (29)	(6.3)	**0.0**	[0.0 - 11.9]				6.9	58.6	24.1	3.5		3.5	3.5							
	Ground Turkey (37)	(0.0)	**0.0**	[0.0 - 9.5]				5.4	56.8	35.1	2.7										
	Pork Chop (2)	(33.3)	**0.0**	[0.0 - 84.2]				50.0	50.0												
Cefotaxime	Retail Chicken (29)	0.0	**100.0**	[0.0 - 100.0]									**6.9**	**69.0**	**20.7**	**3.5**					
	Ground Turkey (37)	2.7	**97.3**	[0.0 - 100.0]								2.7		**64.9**	**27.0**	**5.4**					
	Pork Chop (2)	50.0	**100.0**	[0.0 - 100.0]									**50.0**		**50.0**						
Ceftazidime	Retail Chicken (29)	44.8	**44.8**	[26.4 - 64.3]							3.5	3.5	3.5	44.8	**41.4**	**3.4**					
	Ground Turkey (37)	43.2	**54.1**	[36.9 - 70.5]									2.7	43.2	**43.2**	**10.8**					
	Pork Chop (2)	0.0	**50.0**	[1.3 - 98.7]										50.0	**50.0**						
Monobactam																					
Aztreonam	Retail Chicken (29)	37.9	**0.0**	[0.0 - 11.9]								10.3	51.7	37.9							
	Ground Turkey (37)	37.8	**10.8**	[3.0 - 25.4]								8.1	43.2	37.8	**10.8**						
	Pork Chop (2)	50.0	**0.0**	[0.0 - 84.2]									50.0	50.0							
Penems																					
Imipenem	Retail Chicken (29)	0.0	**0.0**	[0.0 - 11.9]				37.9	62.1												
	Ground Turkey (37)	0.0	**0.0**	[0.0 - 10.5]				29.7	70.3												
	Pork Chop (2)	0.0	**0.0**	[0.0 - 84.2]					100.0												

[1] Percent of isolates with intermediate susceptibility

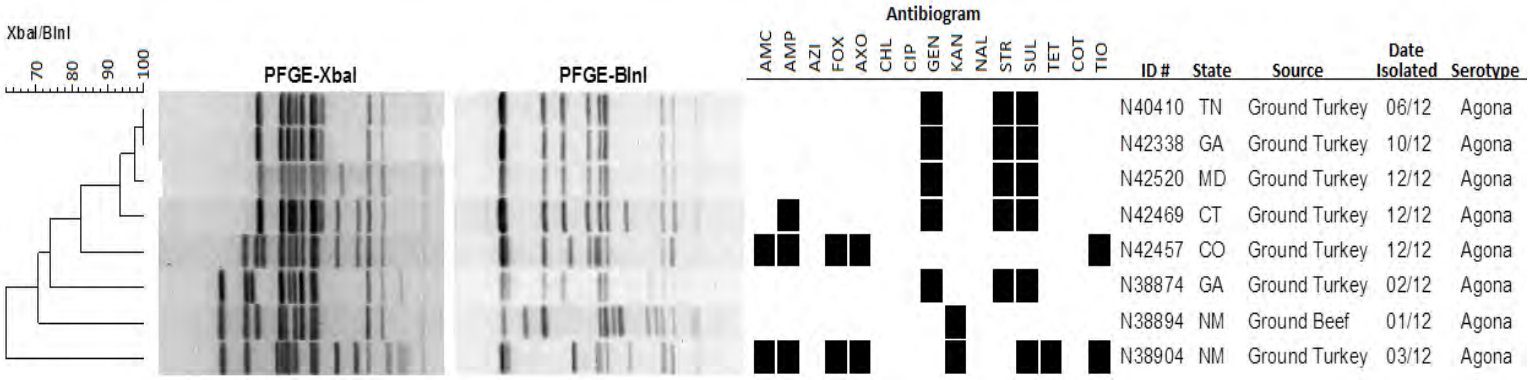
[2] Percent of isolates that are susceptible-dose dependent (S-DD). Cefepime MIC's above the suceptible range but below the resistant range are designated by CLSI to be S-DD.

[3] 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.

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

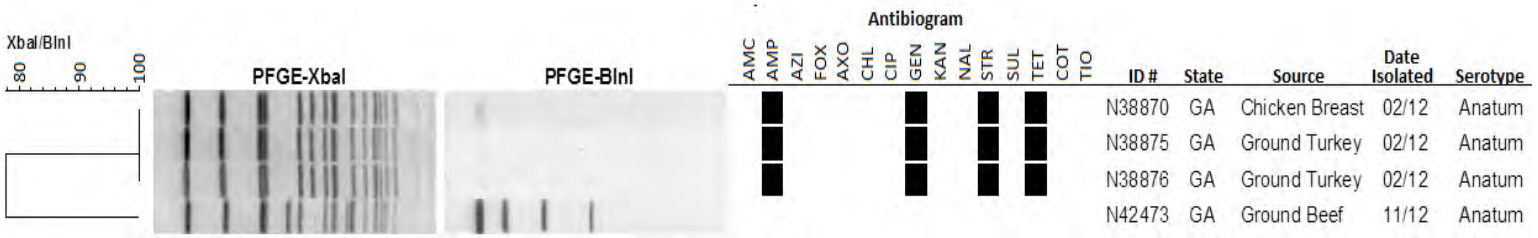
[5] The unshaded areas indicate tthe range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater 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.

A-1a. PFGE Profiles for *Salmonella* Agona



ID #	State	Source	Date Isolated	Serotype
N40410	TN	Ground Turkey	06/12	Agona
N42338	GA	Ground Turkey	10/12	Agona
N42520	MD	Ground Turkey	12/12	Agona
N42469	CT	Ground Turkey	12/12	Agona
N42457	CO	Ground Turkey	12/12	Agona
N38874	GA	Ground Turkey	02/12	Agona
N38894	NM	Ground Beef	01/12	Agona
N38904	NM	Ground Turkey	03/12	Agona

A-1b. PFGE Profiles for *Salmonella* Anatum

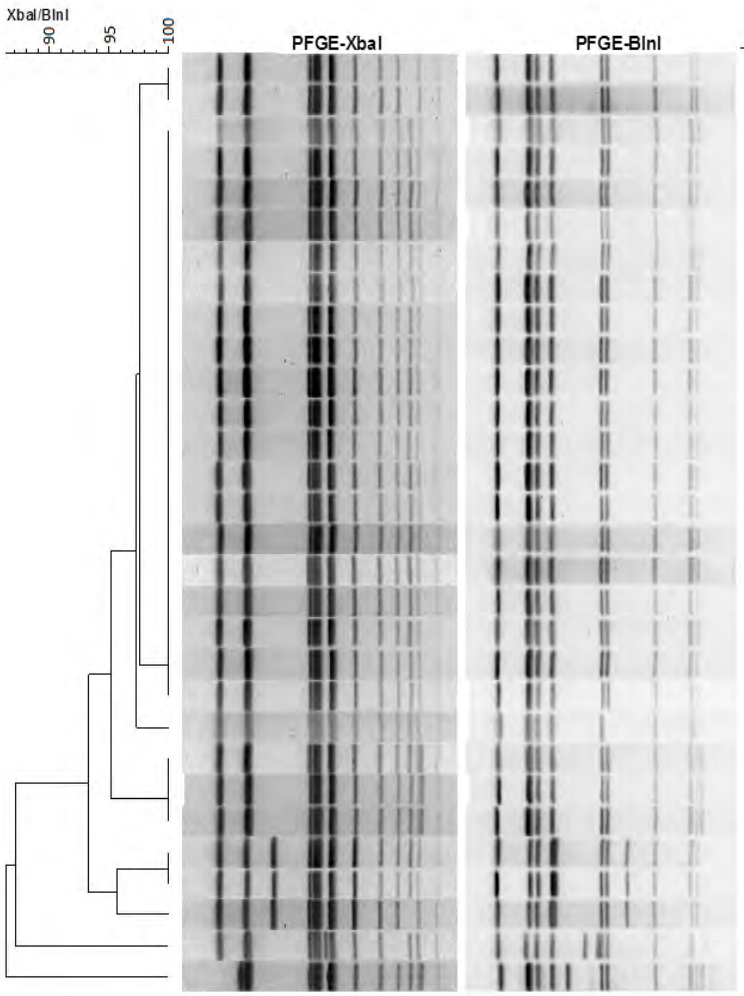


ID #	State	Source	Date Isolated	Serotype
N38870	GA	Chicken Breast	02/12	Anatum
N38875	GA	Ground Turkey	02/12	Anatum
N38876	GA	Ground Turkey	02/12	Anatum
N42473	GA	Ground Beef	11/12	Anatum

A-1c. PFGE Profiles for *Salmonella* Dublin

ID #	State	Source	Date Isolated	Serotype
N42502	NY	Ground Beef	10/12	Dublin
N42512	PA	Ground Beef	11/12	Dublin
N41733	CA	Ground Beef	08/12	Dublin
N40387	MD	Ground Beef	06/12	Dublin

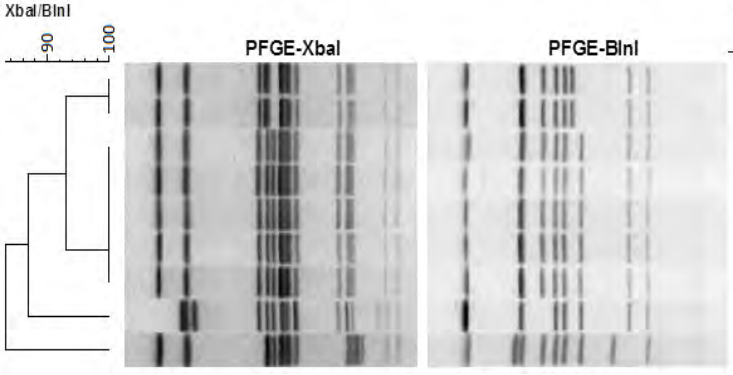
A-1d. PFGE Profiles for *Salmonella* Enteritidis



Antibiogram: AMC AMP AZI FOX AXO CHL CIP GEN KAN NAL STR SUL TET COT TIO

ID #	State	Source	Date Isolated	Serotype
N38871	GA	Chicken Breast	02/12	Enteritidis
N40931	MD	Chicken Breast	08/12	Enteritidis
N38854	CO	Chicken Breast	01/12	Enteritidis
N38872	GA	Chicken Breast	02/12	Enteritidis
N38899	NM	Chicken Breast	02/12	Enteritidis
N38908	OR	Chicken Breast	02/12	Enteritidis
N38916	OR	Chicken Breast	03/12	Enteritidis
N39850	CA	Chicken Breast	05/12	Enteritidis
N39854	GA	Chicken Breast	04/12	Enteritidis
N39856	MN	Chicken Wing	04/12	Enteritidis
N40389	MN	Chicken Breast	06/12	Enteritidis
N40390	MN	Ground Turkey	06/12	Enteritidis
N40393	NM	Chicken Wing	05/12	Enteritidis
N40400	OR	Chicken Breast	06/12	Enteritidis
N40402	PA	Chicken Breast	05/12	Enteritidis
N40927	MD	Chicken Breast	07/12	Enteritidis
N40928	MD	Chicken Breast	07/12	Enteritidis
N40937	TN	Chicken Breast	07/12	Enteritidis
N41742	NY	Chicken Breast	07/12	Enteritidis
N42329	CO	Chicken Breast	07/12	Enteritidis
N42504	NY	Chicken Breast	11/12	Enteritidis
N41912	MN	Chicken Breast	09/12	Enteritidis
N38850	CA	Chicken Breast	02/12	Enteritidis
N42461	CT	Chicken Breast	11/12	Enteritidis
N42517	WA	Chicken Wing	11/12	Enteritidis
N38901	NM	Chicken Breast	03/12	Enteritidis
N42495	NM	Chicken Breast	12/12	Enteritidis
N38895	NM	Chicken Wing	02/12	Enteritidis
N38902	NM	Chicken Breast	03/12	Enteritidis
N42516	WA	Chicken Breast	11/12	Enteritidis

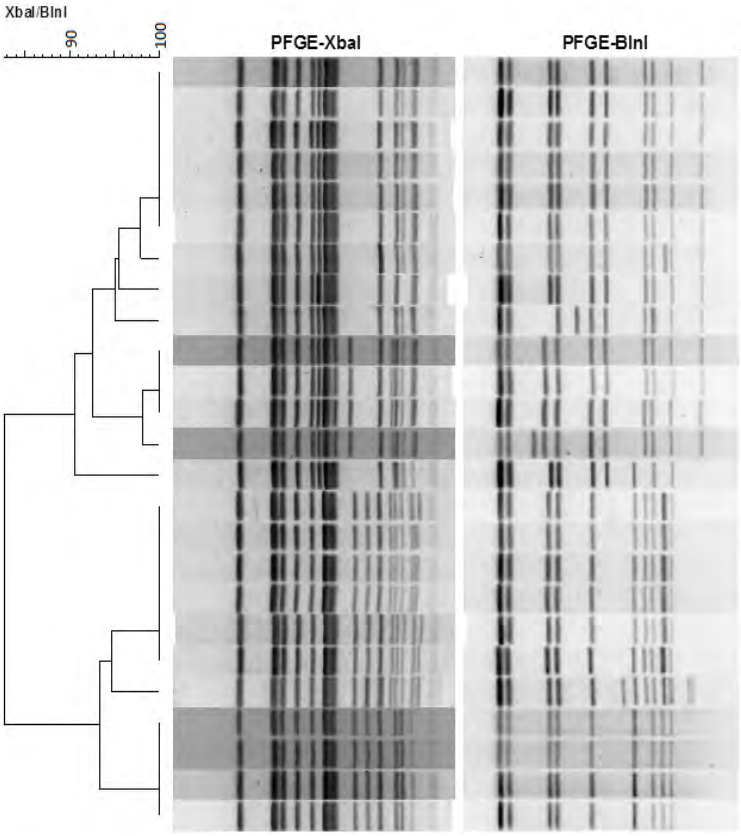
A-1e. PFGE Profiles for *Salmonella* Hadar



Antibiogram: AMC AMP AZI FOX AXO CHL CIP GEN KAN NAL STR SUL TET COT TIO

ID #	State	Source	Date Isolated	Serotype
N42466	CT	Ground Turkey	12/12	Hadar
N42468	CT	Ground Turkey	12/12	Hadar
N38861	CO	Ground Turkey	03/12	Hadar
N38863	CT	Ground Turkey	01/12	Hadar
N38866	CT	Ground Turkey	02/12	Hadar
N38869	GA	Ground Turkey	01/12	Hadar
N40388	MN	Ground Turkey	05/12	Hadar
N41909	CT	Ground Turkey	10/12	Hadar
N41902	CT	Ground Turkey	09/12	Hadar

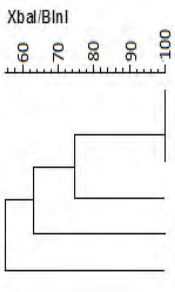
A-1f. PFGE Profiles for *Salmonella* Heidelberg

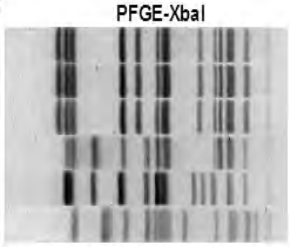


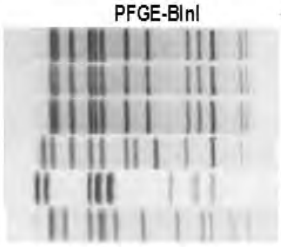
Antibiogram

AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO	ID #	State	Source	Date Isolated	Serotype
															N40392	NM	Chicken Wing	05/12	Heidelberg
															N41736	NY	Chicken Breast	07/12	Heidelberg
															N41751	OR	Chicken Breast	09/12	Heidelberg
															N42230	NM	Chicken Breast	07/12	Heidelberg
															N42231	NM	Chicken Breast	07/12	Heidelberg
															N42239	NM	Chicken Breast	10/12	Heidelberg
															N42241	NM	Chicken Breast	10/12	Heidelberg
															N38890	NM	Chicken Breast	01/12	Heidelberg
															N42234	NM	Chicken Breast	09/12	Heidelberg
															N40364	GA	Chicken Breast	05/12	Heidelberg
															N41755	WA	Chicken Breast	09/12	Heidelberg
															N42242	OR	Chicken Breast	11/12	Heidelberg
															N39858	OR	Chicken Breast	04/12	Heidelberg
															N42328	CO	Chicken Breast	07/12	Heidelberg
■	■						■			■	■				N40421	NY	Ground Turkey	06/12	Heidelberg
■	■						■			■					N41743	NY	Ground Turkey	08/12	Heidelberg
■	■						■					■			N41744	NY	Ground Turkey	08/12	Heidelberg
■	■						■					■			N41746	NY	Pork Chop	08/12	Heidelberg
■	■						■			■		■			N42462	CT	Ground Turkey	11/12	Heidelberg
■	■						■			■	■	■			N42472	GA	Ground Turkey	11/12	Heidelberg
■	■		■	■			■	■		■	■	■		■	N42482	MO	Ground Turkey	11/12	Heidelberg
															N39848	CA	Chicken Breast	05/12	Heidelberg
															N39851	CA	Chicken Breast	05/12	Heidelberg
															N40921	CO	Chicken Breast	05/12	Heidelberg
															N41731	CA	Chicken Breast	08/12	Heidelberg

A-1g. PFGE Profiles for *Salmonella* I 4,[5],12:i:-



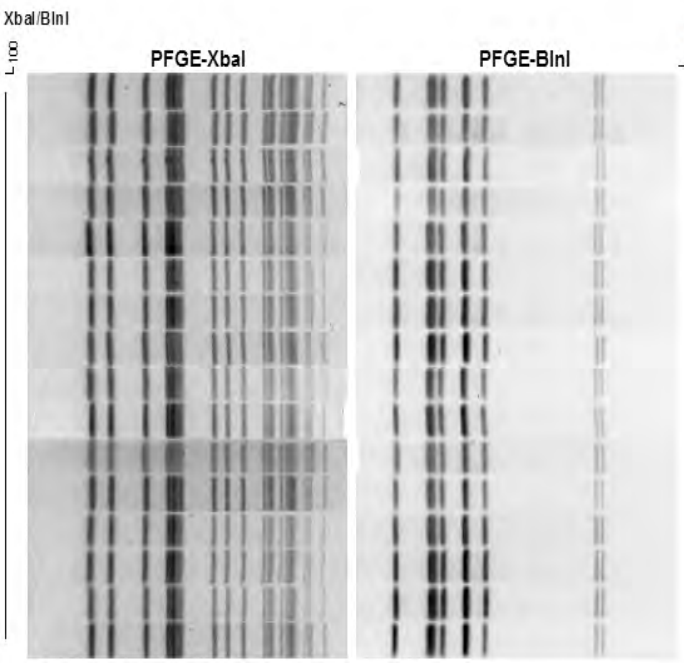




Antibiogram

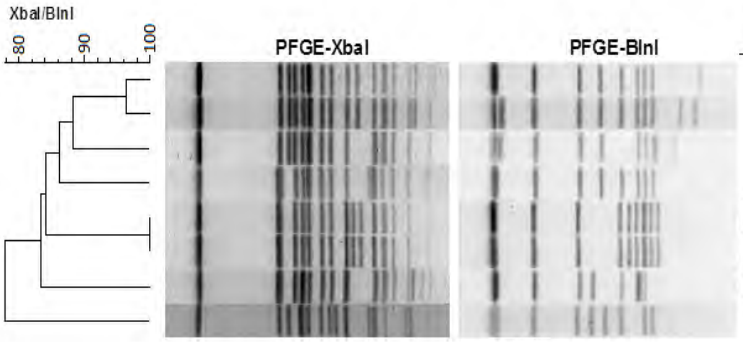
AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO	ID #	State	Source	Date Isolated	Serotype
															N40938	TN	Chicken Breast	08/12	I 4,[5],12:i:-
															N40939	TN	Chicken Breast	08/12	I 4,[5],12:i:-
															N40940	TN	Chicken Breast	08/12	I 4,[5],12:i:-
												■			N38855	CO	Chicken Breast	02/12	I 4,[5],12:i:-
■	■		■	■				■			■	■		■	N40363	CT	Chicken Breast	04/12	I 4,[5],12:i:-
■	■		■	■				■			■	■		■	N41895	CT	Chicken Breast	08/12	I 4,[5],12:i:-

A-1h. PFGE Profiles for *Salmonella* IIIa 18:z4,z23:-



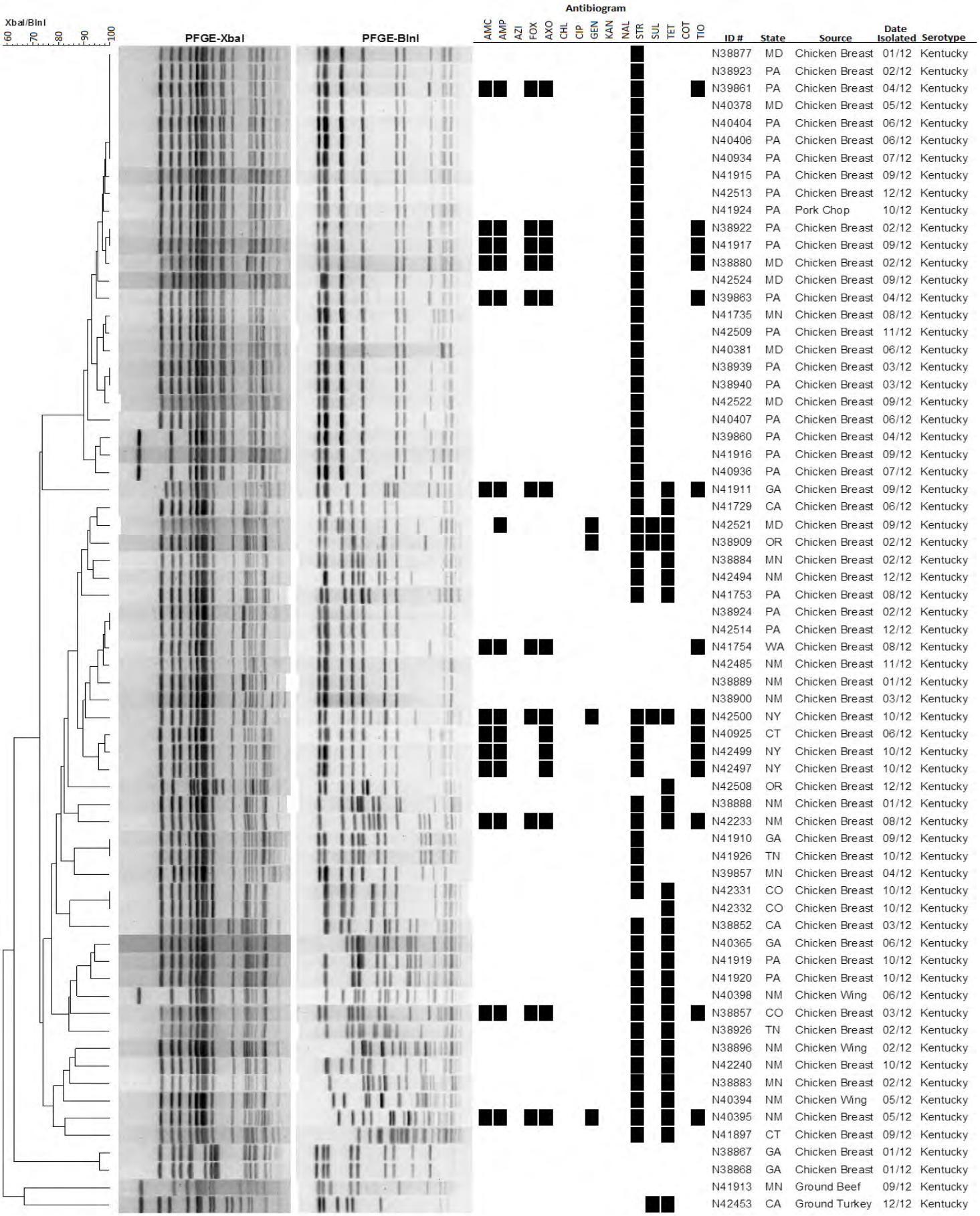
Antibiogram															ID #	State	Source	Date Isolated	Serotype
AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO					
															N38853	CA	Ground Turkey	03/12	IIIa 18:z4,z23:-
															N38859	CO	Ground Turkey	03/12	IIIa 18:z4,z23:-
															N38891	NM	Ground Turkey	01/12	IIIa 18:z4,z23:-
															N38892	NM	Ground Turkey	01/12	IIIa 18:z4,z23:-
															N39847	CA	Ground Turkey	04/12	IIIa 18:z4,z23:-
															N39852	CA	Ground Turkey	05/12	IIIa 18:z4,z23:-
															N39853	CA	Ground Turkey	05/12	IIIa 18:z4,z23:-
															N40399	NM	Ground Turkey	06/12	IIIa 18:z4,z23:-
															N41730	CA	Ground Turkey	06/12	IIIa 18:z4,z23:-
															N41732	CA	Ground Turkey	08/12	IIIa 18:z4,z23:-
															N41914	OR	Ground Turkey	10/12	IIIa 18:z4,z23:-
															N42449	CA	Ground Turkey	09/12	IIIa 18:z4,z23:-
															N42488	NM	Ground Turkey	11/12	IIIa 18:z4,z23:-
															N42489	NM	Ground Turkey	11/12	IIIa 18:z4,z23:-
															N42490	NM	Ground Turkey	11/12	IIIa 18:z4,z23:-
															N42496	NM	Ground Turkey	12/12	IIIa 18:z4,z23:-

A-1i. PFGE Profiles for *Salmonella* Infantis



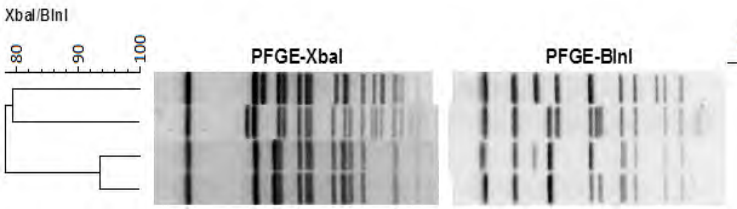
Antibiogram															ID #	State	Source	Date Isolated	Serotype
AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO					
															N39859	OR	Pork Chop	04/12	Infantis
															N41903	CT	Ground Beef	09/12	Infantis
															N38848	CA	Chicken Breast	02/12	Infantis
															N42474	GA	Chicken Breast	12/12	Infantis
■			■			■		■			■			■	N42236	NM	Ground Turkey	09/12	Infantis
■			■			■		■			■			■	N42237	NM	Ground Turkey	09/12	Infantis
■			■			■		■			■			■	N42459	CO	Ground Turkey	12/12	Infantis
															N38928	TN	Chicken Breast	02/12	Infantis

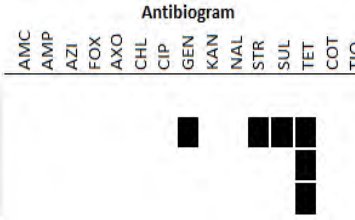
A-1j. PFGE Profiles for *Salmonella* Kentucky



ID #	State	Source	Date Isolated	Serotype
N38877	MD	Chicken Breast	01/12	Kentucky
N38923	PA	Chicken Breast	02/12	Kentucky
N39861	PA	Chicken Breast	04/12	Kentucky
N40378	MD	Chicken Breast	05/12	Kentucky
N40404	PA	Chicken Breast	06/12	Kentucky
N40406	PA	Chicken Breast	06/12	Kentucky
N40934	PA	Chicken Breast	07/12	Kentucky
N41915	PA	Chicken Breast	09/12	Kentucky
N42513	PA	Chicken Breast	12/12	Kentucky
N41924	PA	Pork Chop	10/12	Kentucky
N38922	PA	Chicken Breast	02/12	Kentucky
N41917	PA	Chicken Breast	09/12	Kentucky
N38880	MD	Chicken Breast	02/12	Kentucky
N42524	MD	Chicken Breast	09/12	Kentucky
N39863	PA	Chicken Breast	04/12	Kentucky
N41735	MN	Chicken Breast	08/12	Kentucky
N42509	PA	Chicken Breast	11/12	Kentucky
N40381	MD	Chicken Breast	06/12	Kentucky
N38939	PA	Chicken Breast	03/12	Kentucky
N38940	PA	Chicken Breast	03/12	Kentucky
N42522	MD	Chicken Breast	09/12	Kentucky
N40407	PA	Chicken Breast	06/12	Kentucky
N39860	PA	Chicken Breast	04/12	Kentucky
N41916	PA	Chicken Breast	09/12	Kentucky
N40936	PA	Chicken Breast	07/12	Kentucky
N41911	GA	Chicken Breast	09/12	Kentucky
N41729	CA	Chicken Breast	06/12	Kentucky
N42521	MD	Chicken Breast	09/12	Kentucky
N38909	OR	Chicken Breast	02/12	Kentucky
N38884	MN	Chicken Breast	02/12	Kentucky
N42494	NM	Chicken Breast	12/12	Kentucky
N41753	PA	Chicken Breast	08/12	Kentucky
N38924	PA	Chicken Breast	02/12	Kentucky
N42514	PA	Chicken Breast	12/12	Kentucky
N41754	WA	Chicken Breast	08/12	Kentucky
N42485	NM	Chicken Breast	11/12	Kentucky
N38889	NM	Chicken Breast	01/12	Kentucky
N38900	NM	Chicken Breast	03/12	Kentucky
N42500	NY	Chicken Breast	10/12	Kentucky
N40925	CT	Chicken Breast	06/12	Kentucky
N42499	NY	Chicken Breast	10/12	Kentucky
N42497	NY	Chicken Breast	10/12	Kentucky
N42508	OR	Chicken Breast	12/12	Kentucky
N38888	NM	Chicken Breast	01/12	Kentucky
N42233	NM	Chicken Breast	08/12	Kentucky
N41910	GA	Chicken Breast	09/12	Kentucky
N41926	TN	Chicken Breast	10/12	Kentucky
N39857	MN	Chicken Breast	04/12	Kentucky
N42331	CO	Chicken Breast	10/12	Kentucky
N42332	CO	Chicken Breast	10/12	Kentucky
N38852	CA	Chicken Breast	03/12	Kentucky
N40365	GA	Chicken Breast	06/12	Kentucky
N41919	PA	Chicken Breast	10/12	Kentucky
N41920	PA	Chicken Breast	10/12	Kentucky
N40398	NM	Chicken Wing	06/12	Kentucky
N38857	CO	Chicken Breast	03/12	Kentucky
N38926	TN	Chicken Breast	02/12	Kentucky
N38896	NM	Chicken Wing	02/12	Kentucky
N42240	NM	Chicken Breast	10/12	Kentucky
N38883	MN	Chicken Breast	02/12	Kentucky
N40394	NM	Chicken Wing	05/12	Kentucky
N40395	NM	Chicken Breast	05/12	Kentucky
N41897	CT	Chicken Breast	09/12	Kentucky
N38867	GA	Chicken Breast	01/12	Kentucky
N38868	GA	Chicken Breast	01/12	Kentucky
N41913	MN	Ground Beef	09/12	Kentucky
N42453	CA	Ground Turkey	12/12	Kentucky

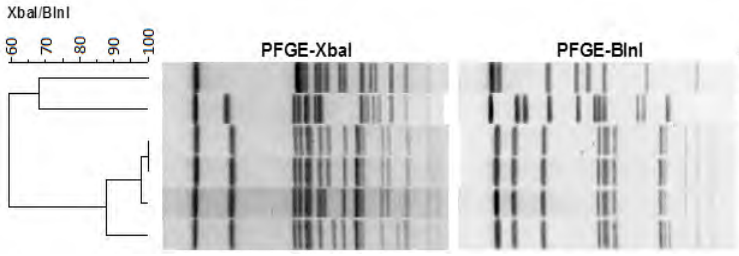
A-1k. PFGE Profiles for *Salmonella* Mbandaka





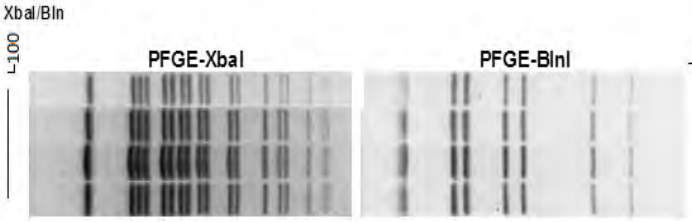
ID #	State	Source	Date Isolated	Serotype
N38886	NM	Chicken Wing	01/12	Mbandaka
N42487	NM	Chicken Breast	11/12	Mbandaka
N42451	CA	Chicken Breast	11/12	Mbandaka
N42452	CA	Chicken Breast	11/12	Mbandaka

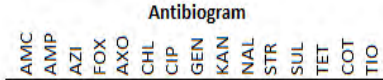
A-1l. PFGE Profiles for *Salmonella* Montevideo



ID #	State	Source	Date Isolated	Serotype
N42238	NM	Ground Beef	09/12	Montevideo
N42336	GA	Ground Turkey	10/12	Montevideo
N42483	NM	Chicken Breast	11/12	Montevideo
N42484	NM	Chicken Breast	11/12	Montevideo
N42454	CO	Chicken Breast	11/12	Montevideo
N41908	CT	Chicken Breast	10/12	Montevideo

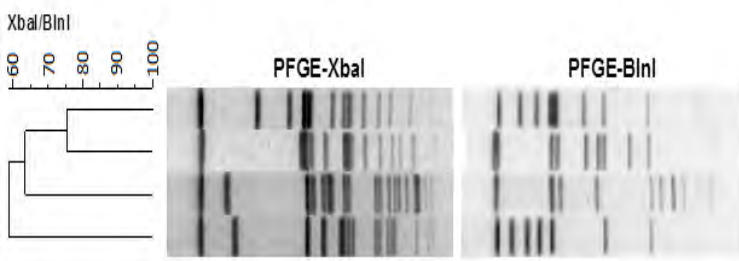
A-1m. PFGE Profiles for *Salmonella* Muenchen





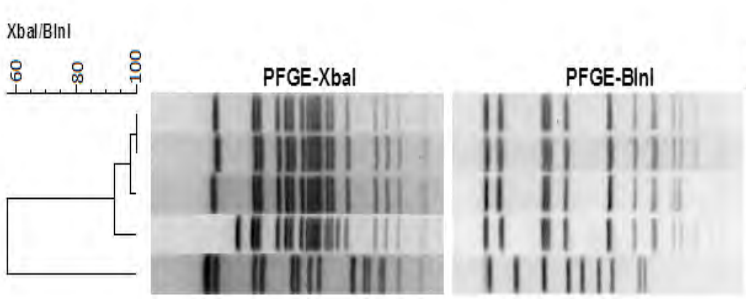
ID #	State	Source	Date Isolated	Serotype
N38885	MN	Ground Turkey	02/12	Muenchen
N42478	MO	Ground Turkey	10/12	Muenchen
N42479	MO	Ground Turkey	10/12	Muenchen
N42480	MO	Ground Turkey	10/12	Muenchen

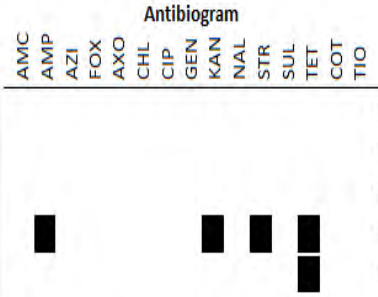
A-1n. PFGE Profiles for *Salmonella* Newport



ID #	State	Source	Date Isolated	Serotype
N40380	MD	Ground Beef	05/12	Newport
N42477	MN	Ground Turkey	12/12	Newport
N38893	NM	Ground Turkey	01/12	Newport
N42456	CO	Chicken Wing	12/12	Newport

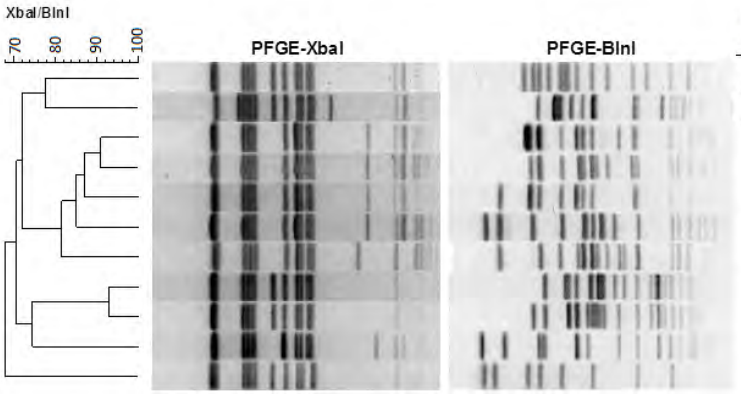
A-1o. PFGE Profiles for *Salmonella* Reading





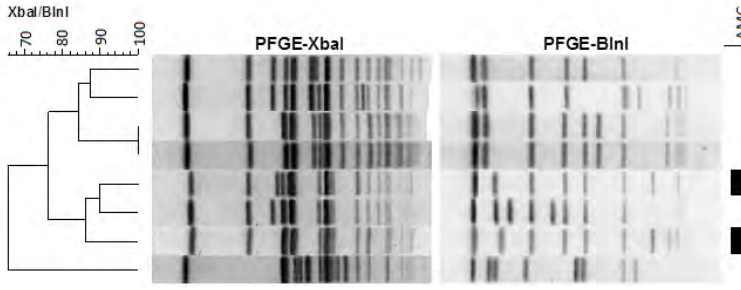
ID #	State	Source	Date Isolated	Serotype
N41745	NY	Ground Turkey	08/12	Reading
N41901	CT	Ground Turkey	09/12	Reading
N43241	TN	Ground Turkey	12/12	Reading
N40375	MD	Ground Turkey	04/12	Reading
N42528	MD	Pork Chop	10/12	Reading

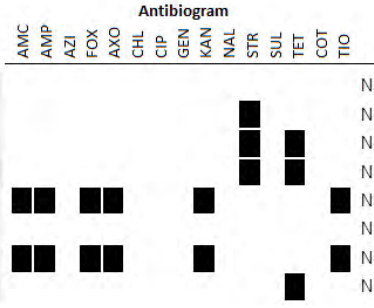
A-1p. PFGE Profiles for *Salmonella* Saintpaul



ID #	State	Source	Date Isolated	Serotype
N38847	PA	Ground Turkey	01/12	Saintpaul
N42458	CO	Ground Turkey	12/12	Saintpaul
N40385	MD	Ground Turkey	06/12	Saintpaul
N42475	LA	Ground Turkey	12/12	Saintpaul
N38936	NY	Ground Turkey	03/12	Saintpaul
N42481	MO	Ground Turkey	11/12	Saintpaul
N42519	MD	Ground Turkey	12/12	Saintpaul
N38937	NY	Ground Turkey	03/12	Saintpaul
N39855	MN	Ground Turkey	03/12	Saintpaul
N40391	NM	Ground Turkey	04/12	Saintpaul
N38930	TN	Ground Turkey	03/12	Saintpaul

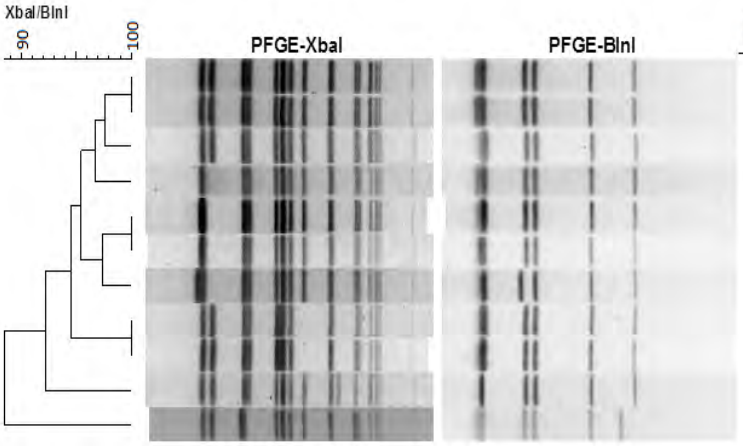
A-1q. PFGE Profiles for *Salmonella* Schwarzengrund





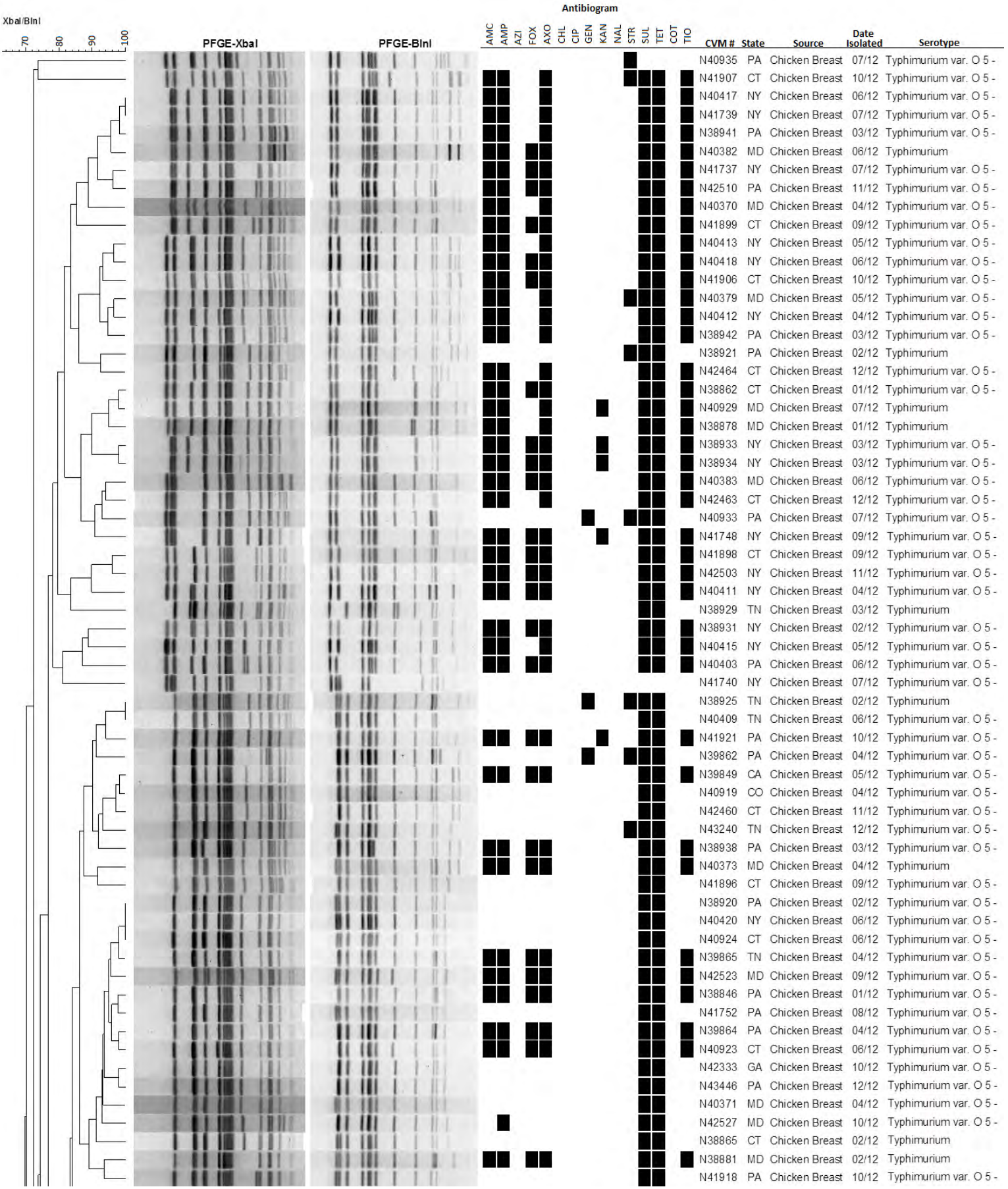
ID #	State	Source	Date Isolated	Serotype
N38851	CA	Ground Turkey	02/12	Schwarzengrund
N41734	GA	Chicken Breast	08/12	Schwarzengrund
N41750	NY	Ground Turkey	09/12	Schwarzengrund
N41900	CT	Ground Turkey	09/12	Schwarzengrund
N39866	TN	Ground Turkey	04/12	Schwarzengrund
N40922	CO	Ground Turkey	06/12	Schwarzengrund
N41923	PA	Ground Turkey	10/12	Schwarzengrund
N38910	OR	Ground Turkey	02/12	Schwarzengrund

A-1r. PFGE Profiles for *Salmonella* Thompson



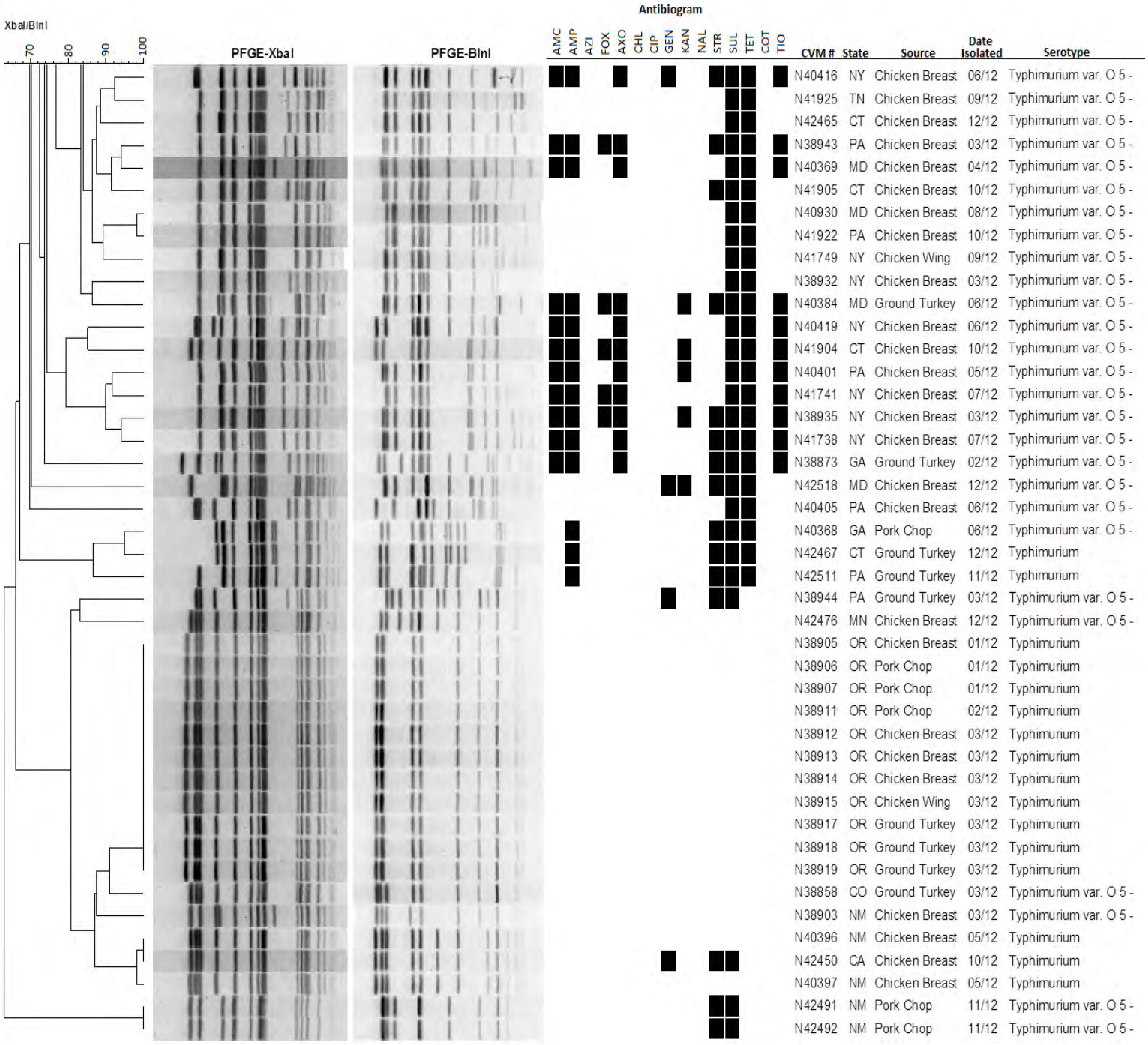
Antibiogram														ID #	State	Source	Date Isolated	Serotype
AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO					
															N38897	NM	Chicken Wing	02/12	Thompson
															N38898	NM	Chicken Wing	02/12	Thompson
															N38849	CA	Chicken Breast	02/12	Thompson
															N38856	CO	Chicken Breast	02/12	Thompson
															N38887	NM	Chicken Wing	01/12	Thompson
															N42493	NM	Chicken Breast	12/12	Thompson
															N42455	CO	Chicken Wing	12/12	Thompson
															N42334	GA	Chicken Breast	10/12	Thompson
															N42335	GA	Chicken Breast	10/12	Thompson
															N42486	NM	Chicken Breast	11/12	Thompson
															N38927	TN	Chicken Breast	02/12	Thompson

A-1s. PFGE Profiles for *Salmonella* Typhimurium



CVM #	State	Source	Date Isolated	Serotype
N40935	PA	Chicken Breast	07/12	Typhimurium var. O 5 -
N41907	CT	Chicken Breast	10/12	Typhimurium var. O 5 -
N40417	NY	Chicken Breast	06/12	Typhimurium var. O 5 -
N41739	NY	Chicken Breast	07/12	Typhimurium var. O 5 -
N38941	PA	Chicken Breast	03/12	Typhimurium var. O 5 -
N40382	MD	Chicken Breast	06/12	Typhimurium
N41737	NY	Chicken Breast	07/12	Typhimurium var. O 5 -
N42510	PA	Chicken Breast	11/12	Typhimurium var. O 5 -
N40370	MD	Chicken Breast	04/12	Typhimurium var. O 5 -
N41899	CT	Chicken Breast	09/12	Typhimurium var. O 5 -
N40413	NY	Chicken Breast	05/12	Typhimurium var. O 5 -
N40418	NY	Chicken Breast	06/12	Typhimurium var. O 5 -
N41906	CT	Chicken Breast	10/12	Typhimurium var. O 5 -
N40379	MD	Chicken Breast	05/12	Typhimurium var. O 5 -
N40412	NY	Chicken Breast	04/12	Typhimurium var. O 5 -
N38942	PA	Chicken Breast	03/12	Typhimurium var. O 5 -
N38921	PA	Chicken Breast	02/12	Typhimurium
N42464	CT	Chicken Breast	12/12	Typhimurium var. O 5 -
N38862	CT	Chicken Breast	01/12	Typhimurium var. O 5 -
N40929	MD	Chicken Breast	07/12	Typhimurium
N38878	MD	Chicken Breast	01/12	Typhimurium
N38933	NY	Chicken Breast	03/12	Typhimurium var. O 5 -
N38934	NY	Chicken Breast	03/12	Typhimurium var. O 5 -
N40383	MD	Chicken Breast	06/12	Typhimurium var. O 5 -
N42463	CT	Chicken Breast	12/12	Typhimurium var. O 5 -
N40933	PA	Chicken Breast	07/12	Typhimurium var. O 5 -
N41748	NY	Chicken Breast	09/12	Typhimurium var. O 5 -
N41898	CT	Chicken Breast	09/12	Typhimurium var. O 5 -
N42503	NY	Chicken Breast	11/12	Typhimurium var. O 5 -
N40411	NY	Chicken Breast	04/12	Typhimurium var. O 5 -
N38929	TN	Chicken Breast	03/12	Typhimurium
N38931	NY	Chicken Breast	02/12	Typhimurium var. O 5 -
N40415	NY	Chicken Breast	05/12	Typhimurium var. O 5 -
N40403	PA	Chicken Breast	06/12	Typhimurium var. O 5 -
N41740	NY	Chicken Breast	07/12	Typhimurium var. O 5 -
N38925	TN	Chicken Breast	02/12	Typhimurium
N40409	TN	Chicken Breast	06/12	Typhimurium var. O 5 -
N41921	PA	Chicken Breast	10/12	Typhimurium var. O 5 -
N39862	PA	Chicken Breast	04/12	Typhimurium var. O 5 -
N39849	CA	Chicken Breast	05/12	Typhimurium var. O 5 -
N40919	CO	Chicken Breast	04/12	Typhimurium var. O 5 -
N42460	CT	Chicken Breast	11/12	Typhimurium var. O 5 -
N43240	TN	Chicken Breast	12/12	Typhimurium var. O 5 -
N38938	PA	Chicken Breast	03/12	Typhimurium var. O 5 -
N40373	MD	Chicken Breast	04/12	Typhimurium
N41896	CT	Chicken Breast	09/12	Typhimurium var. O 5 -
N38920	PA	Chicken Breast	02/12	Typhimurium var. O 5 -
N40420	NY	Chicken Breast	06/12	Typhimurium var. O 5 -
N40924	CT	Chicken Breast	06/12	Typhimurium var. O 5 -
N39865	TN	Chicken Breast	04/12	Typhimurium var. O 5 -
N42523	MD	Chicken Breast	09/12	Typhimurium var. O 5 -
N38846	PA	Chicken Breast	01/12	Typhimurium var. O 5 -
N41752	PA	Chicken Breast	08/12	Typhimurium var. O 5 -
N39864	PA	Chicken Breast	04/12	Typhimurium var. O 5 -
N40923	CT	Chicken Breast	06/12	Typhimurium var. O 5 -
N42333	GA	Chicken Breast	10/12	Typhimurium var. O 5 -
N43446	PA	Chicken Breast	12/12	Typhimurium var. O 5 -
N40371	MD	Chicken Breast	04/12	Typhimurium var. O 5 -
N42527	MD	Chicken Breast	10/12	Typhimurium var. O 5 -
N38865	CT	Chicken Breast	02/12	Typhimurium
N38881	MD	Chicken Breast	02/12	Typhimurium
N41918	PA	Chicken Breast	10/12	Typhimurium var. O 5 -

A-1s. PFGE Profiles for *Salmonella* Typhimurium continued



CVM #	State	Source	Date Isolated	Serotype
N40416	NY	Chicken Breast	06/12	Typhimurium var. O 5 -
N41925	TN	Chicken Breast	09/12	Typhimurium var. O 5 -
N42465	CT	Chicken Breast	12/12	Typhimurium var. O 5 -
N38943	PA	Chicken Breast	03/12	Typhimurium var. O 5 -
N40369	MD	Chicken Breast	04/12	Typhimurium var. O 5 -
N41905	CT	Chicken Breast	10/12	Typhimurium var. O 5 -
N40930	MD	Chicken Breast	08/12	Typhimurium var. O 5 -
N41922	PA	Chicken Breast	10/12	Typhimurium var. O 5 -
N41749	NY	Chicken Wing	09/12	Typhimurium var. O 5 -
N38932	NY	Chicken Breast	03/12	Typhimurium var. O 5 -
N40384	MD	Ground Turkey	06/12	Typhimurium var. O 5 -
N40419	NY	Chicken Breast	06/12	Typhimurium var. O 5 -
N41904	CT	Chicken Breast	10/12	Typhimurium var. O 5 -
N40401	PA	Chicken Breast	05/12	Typhimurium var. O 5 -
N41741	NY	Chicken Breast	07/12	Typhimurium var. O 5 -
N38935	NY	Chicken Breast	03/12	Typhimurium var. O 5 -
N41738	NY	Chicken Breast	07/12	Typhimurium var. O 5 -
N38873	GA	Ground Turkey	02/12	Typhimurium var. O 5 -
N42518	MD	Chicken Breast	12/12	Typhimurium var. O 5 -
N40405	PA	Chicken Breast	06/12	Typhimurium var. O 5 -
N40368	GA	Pork Chop	06/12	Typhimurium var. O 5 -
N42467	CT	Ground Turkey	12/12	Typhimurium
N42511	PA	Ground Turkey	11/12	Typhimurium
N38944	PA	Ground Turkey	03/12	Typhimurium var. O 5 -
N42476	MN	Chicken Breast	12/12	Typhimurium var. O 5 -
N38905	OR	Chicken Breast	01/12	Typhimurium
N38906	OR	Pork Chop	01/12	Typhimurium
N38907	OR	Pork Chop	01/12	Typhimurium
N38911	OR	Pork Chop	02/12	Typhimurium
N38912	OR	Chicken Breast	03/12	Typhimurium
N38913	OR	Chicken Breast	03/12	Typhimurium
N38914	OR	Chicken Breast	03/12	Typhimurium
N38915	OR	Chicken Wing	03/12	Typhimurium
N38917	OR	Ground Turkey	03/12	Typhimurium
N38918	OR	Ground Turkey	03/12	Typhimurium
N38919	OR	Ground Turkey	03/12	Typhimurium
N38858	CO	Ground Turkey	03/12	Typhimurium var. O 5 -
N38903	NM	Chicken Breast	03/12	Typhimurium var. O 5 -
N40396	NM	Chicken Breast	05/12	Typhimurium
N42450	CA	Chicken Breast	10/12	Typhimurium
N40397	NM	Chicken Breast	05/12	Typhimurium
N42491	NM	Pork Chop	11/12	Typhimurium var. O 5 -
N42492	NM	Pork Chop	11/12	Typhimurium var. O 5 -

A2. NARMS Retail Meat Log Sheet Example

State		Completed by (Initials):			Click to email logsheet
Month		Received Date		(CVM USE ONLY)	Send original log sheet with isolates to CVM and CDC.
Year					Keep a copy for your records. Thank you.

Accession # (optional)	Sample ID	Store Name	Store Address	Organic?	Cut / Ground in store?	Sell-by date	Purchase date	Process date	Brand Code	Brand Name - (for sites only)

Accession # (optional)	Salmonella - Growth?	Salmonella serotype	Salmonella - Isolate ID	Performed PFGE?	Sent PFGE to Pulsenet?	Campylobacter Growth?	Campy species?	Campylobacter - Isolate ID	E. coli Growth?	E. coli Isolate ID	Enterococcus Growth?	Enterococcus Isolate ID	Establishment # (for CVM)

SUBJECT

NARMS Retail Food Surveillance Monthly Log Sheets

A3. Antimicrobial Resistance Trend Analysis

The purpose of the trend statistic is to model the association between antimicrobial resistances across the study years for all drugs tested. Beginning with the 2010 NARMS Retail Meat Report, the Cochran-Armitage trend statistic was replaced by trend statistics calculated from a binary logistic random effects regression model. As a result, the antimicrobial resistance (binary: resistant vs. not resistant) of tested isolates for a particular source (retail chicken, ground turkey, ground beef or pork chop) was analyzed using a logistic random effect model with year (2002 through 2012) as a fixed effect to detect trend and laboratory site as a random effect. Logistic random effects models not only provide equivalent trend test statistics to the Cochran-Armitage method, but also increase the validity of the model by accounting for any sampling differences that may occur among the 11 participating public health laboratories.

A4. Introducing Epidemiological Cut-Off Values (ECOFFs) for the Interpretation of *Campylobacter* spp. Susceptibility Data

An integral part of antimicrobial susceptibility testing is interpreting the results in order to categorize bacteria as ***susceptible*** or ***resistant***. The most commonly used criteria for interpreting lab results are the ***clinical breakpoints***. These are used to guide the selection of antibiotics most likely to successfully treat the infections. Several standards organizations determine clinical breakpoints. In the United States, clinical breakpoints are set by the Food and Drug Administration (FDA) and the Clinical and Laboratory Standards Institute (CLSI). In Europe, this role is played by the European Committee on Antimicrobial Susceptibility Testing (EUCAST).

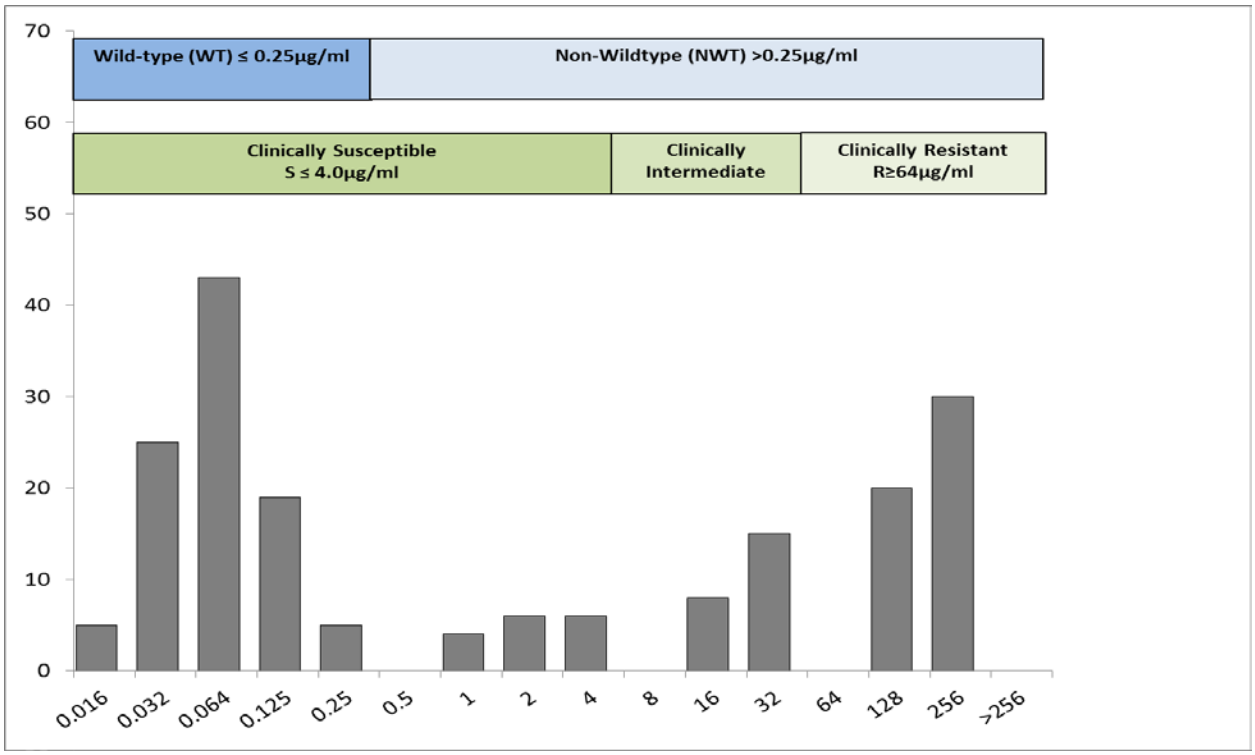
When determining clinical breakpoints, three major kinds of data are considered: 1) minimum inhibitory concentration (MIC) data for susceptible clinical isolates; 2) clinical outcome data; 3) pharmacological properties of the drug at the site of infection, and how different dosing regimens may affect outcome. Since the primary purpose of clinical breakpoints is to guide therapy and predict clinical efficacy, they can have limitations for other purposes, such as detecting emerging resistance in laboratory based surveillance programs.

In contrast to clinical breakpoints, ECOFFs distinguish bacteria without resistance mechanisms ("wild type; (WT)") from those with an acquired resistance mechanism ("non-wild type; NWT"). It is based on the testing of large numbers of strains from different institutions to determine the MIC range of WT populations. The ECOFF is defined as the highest MIC value of the susceptible population. The ECOFF value for a certain organism/drug combination is expressed as WT ≤ X mg/L. Thus, while the clinical breakpoint is set to guide therapy, ECOFFs are useful for detecting isolates with acquired resistance. ECOFFS do not take into consideration any data on dosages or clinical efficacy. Therefore, an isolate that is considered non-wild type using ECOFFs may still be considered susceptible using clinical breakpoints (Figure A). ECOFFs have been determined for a large number of organisms and drugs. Information on ECOFFs can be found on the EUCAST webpage (http://www.eucast.org/).

In this report NARMS has adopted ECOFFs to interpret results for *Campylobacter*. To highlight the fact that wild type isolates are "microbiologically susceptible" and non-wild type isolates "microbiologically resistant", isolates are being reported as "susceptible" or "resistant" (rather than "wild type" or "non-wild type") in the present report. Thus, tables in this report that describe number and percentage resistant, resistance patterns and MIC distributions for *Campylobacter* all reflect the use of ECOFFs.

A4. Introducing Epidemiological Cut-Off Values (ECOFFs) for the Interpretation of *Campylobacter* spp. Susceptibility Data continued

Figure A. Constructed example illustrating the difference between clinical breakpoints and epidemiological cut-offs (ECOFFs)



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