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Protecting Public and Animal Health

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FDA

2011 Retail Meat Report

National Antimicrobial Resistance Monitoring System

NARMS

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List of Abbreviations Used

General Abbreviations

AR	Antimicrobial Resistance
BAP	Blood Agar Plate
CCA	Campy-Cefex Agar Plate
CDC	Centers for Disease Control and Prevention
CLSI	Clinical and Laboratory Standards Institute
CVM	Center for Veterinary Medicine
EAP	Enterococcosel Agar Plate
EIP	Emerging Infections Program
EMB	Eosin Methylene Blue
ESBL	Extended Spectrum Beta Lactamase
FDA	Food and Drug Administration
FoodNet	Foodborne Diseases Active Surveillance Network
MIC	Minimum Inhibitory Concentration
NARMS	National Antimicrobial Resistance Monitoring System
PCR	Polymerase Chain Reaction
PFGE	Pulsed Field Gel Electrophoresis
PulseNet	National Molecular Subtyping Network for Foodborne Disease Surveillance
QC	Quality Control
RVR10	Rappaport-Vassiliadis Medium
USDA	United States Department of Agriculture
XLD	Xylose Lysine Deoxycholate

Antimicrobial Abbreviations

AMC	Amoxicillin/Clavulanic Acid
AMP	Ampicillin
AXO	Ceftriaxone
AZI	Azithromycin
CHL	Chloramphenicol
CIP	Ciprofloxacin
CLI	Clindamycin
COT	Trimethoprim/Sulfamethoxazole
DAP	Daptomycin
DOX	Doxycycline
ERY	Erythromycin
FFN	Florfenicol
FIS	Sulfisoxazole
FOX	Cefoxitin
GEN	Gentamicin
KAN	Kanamycin
LIN	Lincomycin
LZD	Linezolid
NAL	Nalidixic Acid
NIT	Nitrofurantoin
PEN	Penicillin
QDA	Quinupristin/Dalfopristin
STR	Streptomycin
TEL	Telithromycin
TET	Tetracycline
TGC	Tigecycline
TIO	Ceftiofur
TYL	Tylosin
VAN	Vancomycin

Meat Types Abbreviations

CK	Retail Chicken
GB	Ground Beef
GT	Ground Turkey
PC	Pork Chop

State Abbreviations

CA	California
CO	Colorado
CT	Connecticut
GA	Georgia
MD	Maryland
MN	Minnesota
NM	New Mexico
NY	New York
OR	Oregon
PA	Pennsylvania
TN	Tennessee

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NARMS Retail Meat Annual Report 2011

Introduction

The primary purpose of the NARMS retail meat surveillance program is to monitor the prevalence and trends of antimicrobial resistance among foodborne isolates of *Salmonella, Campylobacter, Enterococcus* and *Escherichia coli.*

NARMS retail meat surveillance is an ongoing collaboration between the U.S. Food and Drug Administration/Center for Veterinary Medicine (FDA/CVM), the Centers for Disease Control and Prevention (CDC), and State public health laboratories in California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, Tennessee, and Pennsylvania. From January to December, each site purchased approximately 40 food samples per month, which are comprised of 10 samples each from chicken, ground turkey, ground beef, and pork chops. All sites culture the meat and poultry samples for *Salmonella* and only poultry samples are cultured for *Campylobacter*. In 2011, 4 of the 10 participating laboratories (Georgia, Oregon, Maryland and Tennessee) also cultured meat and poultry samples for *E. coli* and *Enterococcus*. Bacterial isolates were sent to FDA/CVM for serotyping, antimicrobial susceptibility testing, and genetic analysis.

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

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

What is New in the NARMS Retail Meat Report for 2011

In the 2012 M100-S22 document, the Clinical Laboratory and Standards Institute (CLSI) revised ciprofloxacin breakpoints for invasive *Salmonella* serotypes, lowering the resistance breakpoint from 4 µg/mL to 1 µg/mL. These revised breakpoints were applied to all *Salmonella* analyses in this report.

In 2011, the gram negative CMV1AGNF Sensititre™ plate was replaced by CMV2AGNF. This new panel replaces amikacin with azithromycin. Data on amikacin susceptibility can be found in prior NARMS Retail Meat Reports. Azithromycin has no CLSI approved interpretive criteria at the time of this report, therefore provisional NARMS breakpoints (Susceptible breakpoint ≤ 16 µg/mL) were used (Table 1).

Beginning in 2011, all isolates exhibiting resistance to a third-generation cephalosporin (ceftriaxone and/or ceftiofur) were screened for the presence of ESBLs and tested against other beta-lactam compounds. These data were added to this report in Table 13 and Table 30 of the *Salmonella* and *E. coli* sections, respectively. Additionally, sites began sampling chicken wings and thighs when chicken breast with bone in and skin on was unavailable. The term 'retail chicken' has replaced 'chicken breast' in this report to reflect this change.

Highlights of the NARMS Retail 2011 Report

Salmonella[1]

- *Salmonella* serotypes Typhimurium, Kentucky, and Heidelberg accounted for 48% of retail meat isolates (Table 7). Serotype IIIa 18:z4,z23:- decreased from 6.3% in 2010 to 3.9% in 2011, removing it from the top 5 serotypes.
- Saintpaul remained the most common serotype in ground turkey, a trend which was first seen in 2009.
- Heidelberg prevalence among all retail meat increased from 9.5% in 2010 to 11.2% in 2011 but remained below the 2002 to 2010 average of 19.8%.
- Quinolones – All *Salmonella* isolates were susceptible to nalidixic acid (Table 8).
- Cephalosporins – Third-generation cephalosporin resistance rose in retail chicken (10–33.5%) and ground turkey (8.1–22.4%) isolates from 2002 through 2011 ($p < 0.05$).
- Ampicillin – There were significant increases in ampicillin resistance among retail chicken (16.7–40.5%, $p < 0.05$) and ground turkey isolates (16.2–58.4%, $p<0.001$) from 2002 through 2011.
- Multidrug Resistance – The proportion of *Salmonella* with no detected resistance declined in 2011 compared to 2010. Also in 2011, 44.9% of retail chicken isolates were resistant to ≥ 3 antimicrobial classes compared to 50.3% of ground turkey isolates. More than 27% of retail chicken isolates showed resistance to ≥ 5 classes (Table 11) with 2/3 from serotype Typhimurium (Table 9). Ground turkey isolates showed 10 different serotypes with resistance to ≥ 6 antimicrobial classes.
- No isolates displayed pheonotypes indicative of ESBL production (Table 13).

Campylobacter[2]

More than 90% of *Campylobacter* are recovered from retail chicken each year and *C. jejuni* was more prevalent than *C. coli* (Table 14).

Macrolides and fluoroquinolones are used in the treatment of *Campylobacter* infections. It is well known that *C. coli* tend to be more resistant than *C. jejuni* regardless of source, and this is reflected in the 2011 NARMS retail data with the exception of quinolones and tetracycline.

- Macrolide resistance in retail chicken isolates remained low at 4.3% of *C. coli* and 0.5% of *C. jejuni* in 2011 (Table 17).
- Ciprofloxacin resistance in *C. coli* from retail chicken rose from 10% in 2002 to its highest peak of 29.1% in 2005 when fluoroquinolone use stopped in poultry production. Since then, ciprofloxacin resistance in *C. coli* has decreased to 18.1% in 2011 (Table 17), while resistance in *C. jejuni* significantly increased from 15.2–22.4% from 2002 through 2011 ($p<0.0001$).
- Tetracycline resistance increased in *C. jejuni* (36.3–48.4%) and *C. coli* (39.2–49.1%) compared to 2010.

[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.

- Gentamicin resistance in *C. coli* markedly increased from 0.7% in 2007 when it first appeared in NARMS retail meat to 18.1% in 2011 ($p < 0.0001$).
- Multidrug resistance is rare in *Campylobacter*. There were only 9 (of 634) *Campylobacter* isolates from poultry resistant to ≥ 3 antimicrobial classes in 2011 (Table 18).

<u>*Enterococcus*</u>
E. faecalis (70.5%) was more prevalent than *E. faecium* (22.7%) in 2011 (Table 20). Retail chicken was the only meat type where *E. faecium* was more prevalent than *E. faecalis*.

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

- No isolates were resistant to vancomycin or linezolid (Table 21). These classes of compounds are critically important in human medicine but are not used in food animal production.
- Since 2002, streptogramin resistance has significantly decreased ($p < 0.05$) in retail chicken (56.3–27.1%), ground beef (46.2–8.4%), and pork chop (27.2–12.2%) isolates but has remained above 50% in 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* had much higher resistance to nitrofurantoin, penicillin and ciprofloxacin from all sources compared to *E. faecalis* (Table 22.1-2).
- The proportions of multidrug resistant poultry isolates from 2002 through 2011 were higher in *E. faecium* than *E. faecalis* (Table 23.1-2).

<u>*Escherichia coli*</u>
E. coli are common in all retail meat products tested in NARMS. Of 1,920 retail meats tested in 2011 55.7% were culture positive for *E. coli*, with pork chops having the lowest prevalence (30.4%) and ground turkey with the highest (76.7%).

- Ceftriaxone resistance among *E. coli* isolates from retail chicken was consistently higher than any other retail meat tested (Table 26).
- No isolates were resistant to ciprofloxacin (Table 26).
- From 2002–2005, nalidixic acid resistance in *E. coli* from retail chicken increased from 2.8–6.6% and increased in ground turkey from 4.3–10.4%. Since 2005, resistance has decreased to 2.3% in chicken and 1.6% in ground turkey (Table 26). No ground beef or pork chop isolates were nalidixic acid resistant.
- Gentamicin resistance is much higher in retail chicken and turkey isolates (> 20%) than ground beef and pork chop isolates (< 5%, Table 26).
- A highly statistically significant trend ($p < 0.0001$) in ampicillin resistance was seen among ground turkey with 51.6% resistance in 2011, up from 31.3% in 2002.
- Some poultry isolates exhibiting resistance to third-generation cephalosporins had additional co-resistances to other beta-lactam compounds (Table 30). No isolates displayed pheonotypes indicative of ESBL production.

Surveillance and Laboratory Testing Methods

Sample Collection and Isolate Submission

For 2011, retail meat samples were collected from 10 CDC FoodNet sites including California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, Tennessee plus the Pennsylvania Department of Health. 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 2011, Tennessee, Georgia, Maryland and Oregon 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 250 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 FoodNet

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 2011)**

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 2011)**

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; otherwise provisional NARMS breakpoints were used (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 2006, only those resistant to ciprofloxacin or erythromycin 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, 2011[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] *Salmonella*	0.015 - 4	≤ 0.06	0.12-0.5	≥ 1
	E. coli	0.015 - 4	≤ 0.12	2	≥ 4
	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, 2011

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

*No CLSI interpretative criteria for this bacterium/antimicrobial combination currently available

[1] Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute)

[2] Sulfamethoxazole was replaced by sulfisoxazole in 2004.

[3] Revised ciprofloxacin breakpoints for invasive *Salmonella* serotypes from the CLSI M100-S22 document, published in January 2012, were used for this report.

[4] Only a susceptible breakpoint (≤ 4 µg/ml) has been established. Isolates with an MIC ≥ 8 µg/ml are reported as nonsusceptible.

Table 3. Interpretive Criteria used for Antimicrobial Susceptibility Testing of *Enterococcus* , NARMS Retail Meat, 2011[1]

Antimicrobial Class	Antimicrobial Agent	Concentration Range (µg/ml)	Breakpoints (µg/ml)		
			Susceptible	Intermediate	Resistant
Aminoglycosides	Gentamycin	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 ESBL Producing Isolates, NARMS Retail Meat, 2011

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	0.125 - 32	≤ 8	16	≥ 32
	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

[1] Breakpoints were adopted from CLSI (Clinical and Laboratory Standards Institute); Ciprofloxacin breakpoints are of the M100-S22 CLSI guidelines.

[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. Isolates with an MIC ≥ 8 µg/ml are reported as nonsusceptible.

Table 5.1 Percent Positive Samples for Retail Chicken by Bacterium and Site, 2002-2011

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	Year	N[2]	# Isolates	% Positive[3]	N	# Isolates	% Positive	N	# Isolates	% Positive	N	# Isolates	% Positive
CA	2003	120	64	53.3%	120	4	3.3%						
	2004	120	96	80.0%	120	17	14.2%						
	2005	118	83	70.3%	118	21	17.8%						
	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%						
	Total	**1075**	**769**	**71.5%**	**1076**	**151**	**14.0%**						
CO	2004	97	21	21.6%	97	1	1.0%						
	2005	116	38	32.8%	116	12	10.3%						
	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%						
	Total	**933**	**438**	**46.9%**	**933**	**55**	**5.9%**						
CT	2002	120	74	61.7%	120	17	14.2%						
	2003	60	50	83.3%	60	9	15.0%						
	2004	120	86	71.7%	120	30	25.0%						
	2005	120	85	70.8%	120	19	15.8%						
	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%						
	Total	**1139**	**597**	**52.4%**	**1140**	**164**	**14.4%**						
GA	2002	120	84	70.0%	120	14	11.7%	120	120	100.0%	120	104	86.7%
	2003	120	76	63.3%	120	8	6.7%	120	119	99.2%	120	120	100.0%
	2004	120	61	50.8%	120	6	5.0%	120	120	100.0%	120	115	95.8%
	2005	120	62	51.7%	120	10	8.3%	120	120	100.0%	120	119	99.2%
	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%
	Total	**1200**	**628**	**52.3%**	**1200**	**95**	**7.9%**	**1200**	**1192**	**99.3%**	**1200**	**1141**	**95.1%**
MD	2002	120	30	25.0%	120	8	6.7%	120	117	97.5%	120	107	89.2%
	2003	120	38	31.7%	120	18	15.0%	120	113	94.2%	120	113	94.2%
	2004	120	76	63.3%	120	24	20.0%	120	114	95.0%	120	110	91.7%
	2005	120	85	70.8%	120	22	18.3%	120	110	91.7%	120	100	83.3%
	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%
	Total	**1070**	**466**	**43.6%**	**1070**	**211**	**19.7%**	**700**	**662**	**94.6%**	**700**	**602**	**86.0%**
MN	2002	106	33	31.1%	106	4	3.8%						
	2003	120	62	51.7%	120	13	10.8%						
	2004	120	73	60.8%	120	20	16.7%						
	2005	120	24	20.0%	120	24	20.0%						
	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%						
	Total	**1186**	**363**	**30.6%**	**1186**	**117**	**9.9%**						
NM	2004	119	53	44.5%	119	3	2.5%						
	2005	120	31	25.8%	120	5	4.2%						
	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%						
	Total	**958**	**359**	**37.5%**	**959**	**169**	**17.6%**						
NY	2003	120	75	62.5%	120	11	9.2%						
	2004	120	96	80.0%	120	16	13.3%						
	2005	116	50	43.1%	120	17	14.2%						
	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%						
	Total	**1075**	**529**	**49.2%**	**1080**	**254**	**23.5%**						
OR	2002	40	1	2.5%	40	4	10.0%	40	40	100.0%	40	9	22.5%
	2003	120	45	37.5%	120	17	14.2%	120	119	99.2%	120	78	65.0%
	2004	120	73	60.8%	120	25	20.8%	120	118	98.3%	120	73	60.8%
	2005	120	37	30.8%	120	16	13.3%	110	109	99.1%	120	76	63.3%
	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%
	Total	**1119**	**429**	**38.3%**	**1120**	**103**	**9.2%**	**1110**	**1089**	**98.1%**	**1118**	**803**	**71.8%**
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%						
	Total	**360**	**154**	**42.8%**	**480**	**87**	**18.1%**						
TN	2002	110	66	60.0%	110	13	11.8%	110	104	94.5%	110	62	56.4%
	2003	117	59	50.4%	117	3	2.6%	117	115	98.3%	117	85	72.6%
	2004	116	71	61.2%	116	15	12.9%	116	114	98.3%	116	102	87.9%
	2005	120	59	49.2%	120	7	5.8%	120	118	98.3%	108	98	90.7%
	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%
	Total	**1173**	**530**	**45.2%**	**1173**	**97**	**8.3%**	**1172**	**1122**	**95.7%**	**1150**	**911**	**79.2%**
Grand Total		**11288**	**5262**	**46.6%**	**11417**	**1503**	**13.2%**	**3010**	**2943**	**97.8%**	**4168**	**3457**	**82.9%**

[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. As of 2011 retail chicken sampling includes chicken breast, wings, or thighs with skin on and bone in.

[2] N= # of meat samples collected

[3] Where % Positive = the # of isolates (n) / the # of meat samples (N)

Table 5.2 Percent Positive Samples for Ground Turkey by Bacterium and Site, 2002-2011

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	Year	N[2]	# Isolates	% Positive[3]	N	# Isolates	% Positive	N	# Isolates	% Positive	N	# Isolates	% Positive
CA	2003	120	0	0.0%	120	6	5.0%						
	2004	120	0	0.0%	120	9	7.5%						
	2005	119	1	0.8%	119	15	12.6%						
	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%						
	Total	**1078**	**3**	**0.3%**	**1078**	**95**	**8.8%**						
CO	2004	101	0	0.0%	101	8	7.9%						
	2005	116	0	0.0%	116	17	14.7%						
	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%						
	Total	**937**	**49**	**5.2%**	**937**	**146**	**15.6%**						
CT	2002	120	2	1.7%	120	21	17.5%						
	2003	60	0	0.0%	60	8	13.3%						
	2004	120	2	1.7%	120	26	21.7%						
	2005	120	3	2.5%	120	12	10.0%						
	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%						
	Total	**1140**	**13**	**1.1%**	**1140**	**129**	**11.3%**						
GA	2002	120	0	0.0%	120	19	15.8%	120	120	100.0%	120	103	85.8%
	2003	120	2	1.7%	120	27	22.5%	120	120	100.0%	120	117	97.5%
	2004	120	1	0.8%	120	38	31.7%	120	120	100.0%	120	119	99.2%
	2005	120	5	4.2%	120	32	26.7%	120	120	100.0%	120	117	97.5%
	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%
	Total	**1200**	**31**	**2.6%**	**1200**	**324**	**27.0%**	**1200**	**1189**	**99.1%**	**1200**	**1169**	**97.4%**
MD	2002	120	0	0.0%	120	9	7.5%	120	113	94.2%	120	110	91.7%
	2003	120	0	0.0%	120	25	20.8%	120	103	85.8%	120	103	85.8%
	2004	120	2	1.7%	120	13	10.8%	120	106	88.3%	120	109	90.8%
	2005	120	3	2.5%	120	12	10.0%	120	111	92.5%	120	105	87.5%
	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%
	Total	**1070**	**12**	**1.1%**	**1070**	**150**	**14.0%**	**700**	**625**	**89.3%**	**700**	**600**	**85.7%**
MN	2002	127	1	0.8%	127	7	5.5%						
	2003	110	3	2.7%	110	11	10.0%						
	2004	120	6	5.0%	120	14	11.7%						
	2005	120	4	3.3%	120	28	23.3%						
	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%						
	Total	**1196**	**35**	**2.9%**	**1197**	**177**	**14.8%**						
NM	2004	118	0	0.0%	118	9	7.6%						
	2005	120	2	1.7%	120	20	16.7%						
	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%						
	Total	**956**	**23**	**2.4%**	**956**	**251**	**26.3%**						
NY	2003	120	0	0.0%	120	20	16.7%						
	2004	120	0	0.0%	120	11	9.2%						
	2005	120	1	0.8%	120	12	10.0%						
	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%						
	Total	**1080**	**6**	**0.6%**	**1080**	**129**	**11.9%**						
OR	2002	40	0	0.0%	40	2	5.0%	40	40	100.0%	40	17	42.5%
	2003	120	0	0.0%	120	5	4.2%	120	108	90.0%	120	49	40.8%
	2004	120	0	0.0%	120	6	5.0%	120	105	87.5%	120	53	44.2%
	2005	120	0	0.0%	120	16	13.3%	110	103	93.6%	120	72	60.0%
	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%
	Total	**1120**	**3**	**0.3%**	**1120**	**73**	**6.5%**	**1110**	**987**	**88.9%**	**1120**	**705**	**62.9%**
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%						
	Total	**360**	**8**	**2.2%**	**480**	**42**	**8.8%**						
TN	2002	115	1	0.9%	115	16	13.9%	115	114	99.1%	115	74	64.3%
	2003	87	0	0.0%	87	12	13.8%	87	87	100.0%	87	64	73.6%
	2004	106	1	0.9%	106	8	7.5%	106	106	100.0%	106	95	89.6%
	2005	120	1	0.8%	120	19	15.8%	120	118	98.3%	110	102	92.7%
	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%
	Total	**1122**	**16**	**1.4%**	**1122**	**149**	**13.3%**	**1121**	**1084**	**96.7%**	**1102**	**894**	**81.1%**
Grand Total		**11259**	**199**	**1.8%**	**11380**	**1665**	**14.6%**	**3010**	**2801**	**93.1%**	**4122**	**3368**	**81.7%**

[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= # of meat samples collected

[3] Where % Positive = the # of isolates (n) / the # of meat samples (N)

Table 5.3 Percent Positive Samples for Ground Beef by Bacterium and Site, 2002-2011

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	Year	N[2]	# Isolates	% Positive[3]	N	# Isolates	% Positive	N	# Isolates	% Positive	N	# Isolates	% Positive
CA	2003	120	0	0.0%	120	1	0.8%						
	2004	120	0	0.0%	120	1	0.8%						
	2005	120	0	0.0%	120	1	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%						
	Total	**599**	**0**	**0.0%**	**1079**	**9**	**0.8%**						
CO	2004	106	0	0.0%	106	0	0.0%						
	2005	116	0	0.0%	116	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%						
	Total	**462**	**0**	**0.0%**	**942**	**4**	**0.4%**						
CT	2002	120	0	0.0%	120	5	4.2%						
	2003	60	0	0.0%	60	0	0.0%						
	2004	120	0	0.0%	120	5	4.2%						
	2005	120	0	0.0%	120	3	2.5%						
	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%						
	Total	**656**	**0**	**0.0%**	**1136**	**17**	**1.5%**						
GA	2002	120	0	0.0%	120	2	1.7%	120	118	98.3%	120	93	77.5%
	2003	120	0	0.0%	120	2	1.7%	120	119	99.2%	120	90	75.0%
	2004	120	0	0.0%	120	1	0.8%	120	117	97.5%	120	91	75.8%
	2005	120	0	0.0%	120	0	0.0%	120	118	98.3%	120	102	85.0%
	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%
	Total	**720**	**0**	**0.0%**	**1200**	**15**	**1.3%**	**1200**	**1179**	**98.3%**	**1199**	**920**	**76.7%**
MD	2002	120	0	0.0%	120	2	1.7%	120	107	89.2%	120	105	87.5%
	2003	120	1	0.8%	120	3	2.5%	120	92	76.7%	120	87	72.5%
	2004	120	0	0.0%	120	1	0.8%	120	100	83.3%	120	83	69.2%
	2005	120	0	0.0%	120	0	0.0%	120	113	94.2%	120	78	65.0%
	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%
	Total	**600**	**1**	**0.2%**	**1070**	**12**	**1.1%**	**700**	**598**	**85.4%**	**700**	**452**	**64.6%**
MN	2002	123	0	0.0%	123	0	0.0%						
	2003	110	0	0.0%	110	1	0.9%						
	2004	120	0	0.0%	120	0	0.0%						
	2005	120	0	0.0%	120	1	0.8%						
	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%						
	Total	**713**	**0**	**0.0%**	**1193**	**7**	**0.6%**						
NM	2004	120	0	0.0%	120	0	0.0%						
	2005	120	0	0.0%	120	1	0.8%						
	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%						
	Total	**480**	**0**	**0.0%**	**960**	**16**	**1.7%**						
NY	2003	120	0	0.0%	120	0	0.0%						
	2004	120	0	0.0%	120	0	0.0%						
	2005	120	0	0.0%	120	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%						
	Total	**600**	**0**	**0.0%**	**1080**	**2**	**0.2%**						
OR	2002	40	0	0.0%	40	0	0.0%	40	40	100.0%	40	22	55.0%
	2003	120	0	0.0%	120	2	1.7%	120	112	93.3%	120	57	47.5%
	2004	120	0	0.0%	120	6	5.0%	120	115	95.8%	120	99	82.5%
	2005	120	0	0.0%	120	1	0.8%	110	98	89.1%	120	61	50.8%
	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%
	Total	**640**	**0**	**0.0%**	**1120**	**12**	**1.1%**	**1110**	**1000**	**90.1%**	**1119**	**619**	**55.3%**
PA	2008				120	2	1.7%						
	2009				120	1	0.8%						
	2010				120	1	0.8%						
	2011				120	0	0.0%						
	Total				**480**	**4**	**0.8%**						
TN	2002	119	0	0.0%	119	0	0.0%	119	118	99.2%	119	75	63.0%
	2003	110	0	0.0%	110	1	0.9%	110	109	99.1%	110	77	70.0%
	2004	120	0	0.0%	120	0	0.0%	120	116	96.7%	120	65	54.2%
	2005	120	0	0.0%	120	1	0.8%	120	118	98.3%	108	75	69.4%
	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%
	Total	**701**	**5**	**0.7%**	**1181**	**29**	**2.5%**	**1181**	**1122**	**95.0%**	**1160**	**767**	**66.1%**
Grand Total		**6171**	**6**	**0.1%**	**11441**	**127**	**1.1%**	**4191**	**3899**	**93.0%**	**4178**	**2758**	**66.0%**

[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= # of meat samples collected

[3] Where % Positive = the # of isolates (n) / the # of meat samples (N)

Table 5.4 Percent Positive Samples for Pork Chop by Bacterium and Site, 2002-2011

		Campylobacter			*Salmonella*			*Enterococcus*			*Escherichia coli*		
Site[1]	Year	N[2]	# Isolates	% Positive[3]	N	# Isolates	% Positive	N	# Isolates	% Positive	N	# Isolates	% Positive
CA	2003	120	2	1.7%	120	1	0.8%						
	2004	120	1	0.8%	120	1	0.8%						
	2005	120	0	0.0%	120	2	1.7%						
	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%						
	Total	**597**	**3**	**0.5%**	**1074**	**8**	**0.7%**						
CO	2004	99	0	0.0%	99	0	0.0%						
	2005	116	0	0.0%	116	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%						
	Total	**451**	**2**	**0.4%**	**931**	**3**	**0.3%**						
CT	2002	120	1	0.8%	120	1	0.8%						
	2003	60	0	0.0%	60	0	0.0%						
	2004	120	1	0.8%	120	5	4.2%						
	2005	120	1	0.8%	120	1	0.8%						
	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%						
	Total	**660**	**3**	**0.5%**	**1140**	**11**	**1.0%**						
GA	2002	120	0	0.0%	120	2	1.7%	120	119	99.2%	120	55	45.8%
	2003	120	0	0.0%	120	0	0.0%	120	116	96.7%	120	68	56.7%
	2004	120	0	0.0%	120	0	0.0%	120	116	96.7%	120	64	53.3%
	2005	120	0	0.0%	120	2	1.7%	120	117	97.5%	120	71	59.2%
	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%
	Total	**720**	**0**	**0.0%**	**1200**	**15**	**1.3%**	**1200**	**1159**	**96.6%**	**1200**	**633**	**52.8%**
MD	2002	120	1	0.8%	120	6	5.0%	120	101	84.2%	120	66	55.0%
	2003	120	0	0.0%	120	1	0.8%	120	90	75.0%	120	71	59.2%
	2004	120	0	0.0%	120	0	0.0%	120	77	64.2%	120	62	51.7%
	2005	120	1	0.8%	120	3	2.5%	120	86	71.7%	120	58	48.3%
	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%
	Total	**600**	**2**	**0.3%**	**1070**	**19**	**1.8%**	**700**	**513**	**73.3%**	**700**	**322**	**46.0%**
MN	2002	103	0	0.0%	103	0	0.0%						
	2003	120	1	0.8%	120	0	0.0%						
	2004	120	0	0.0%	120	0	0.0%						
	2005	120	0	0.0%	120	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%						
	Total	**702**	**1**	**0.1%**	**1183**	**2**	**0.2%**						
NM	2004	119	1	0.8%	119	0	0.0%						
	2005	120	0	0.0%	120	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%						
	Total	**479**	**2**	**0.4%**	**959**	**26**	**2.7%**						
NY	2003	120	0	0.0%	120	2	1.7%						
	2004	120	0	0.0%	120	3	2.5%						
	2005	120	0	0.0%	120	1	0.8%						
	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%						
	Total	**600**	**1**	**0.2%**	**1080**	**12**	**1.1%**						
OR	2002	40	0	0.0%	40	0	0.0%	40	39	97.5%	40	9	22.5%
	2003	120	1	0.8%	120	1	0.8%	120	103	85.8%	120	28	23.3%
	2004	120	0	0.0%	120	2	1.7%	120	108	90.0%	120	51	42.5%
	2005	120	0	0.0%	120	0	0.0%	110	95	86.4%	120	31	25.8%
	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%
	Total	**640**	**4**	**0.6%**	**1120**	**14**	**1.3%**	**1110**	**934**	**84.1%**	**1117**	**349**	**31.2%**
PA	2008				120	0	0.0%						
	2009				120	1	0.8%						
	2010				120	3	2.5%						
	2011				120	1	0.8%						
	Total				**480**	**5**	**1.0%**						
TN	2002	110	3	2.7%	110	1	0.9%	110	110	100.0%	110	54	49.1%
	2003	119	0	0.0%	119	0	0.0%	119	117	98.3%	119	51	42.9%
	2004	118	0	0.0%	118	0	0.0%	118	103	87.3%	118	55	46.6%
	2005	120	0	0.0%	120	0	0.0%	120	111	92.5%	105	45	42.9%
	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%
					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%
	Total	**699**	**3**	**0.4%**	**1179**	**25**	**2.1%**	**1175**	**1037**	**88.3%**	**1162**	**468**	**40.3%**
Grand Total		**6148**	**21**	**0.3%**	**11416**	**140**	**1.2%**	**4185**	**3643**	**87.0%**	**4179**	**1772**	**42.4%**

[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= # of meat samples collected

[3] Where % Positive = the # of isolates (n) / the # of meat samples (N)

Table 6. Percent Positive Samples by Bacterium and Meat Type, 2002-2011[1]

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)	471	295	(62.6)	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	342	(97.4)	348	341	(98.0)	352	336	(95.5)	356	313	(87.9)
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	346	(96.1)	360	345	(95.8)	360	336	(93.3)	360	310	(86.1)
Escherichia coli (1440)	360	306	(85.0)	360	300	(83.3)	360	250	(69.4)	360	146	(40.6)

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	415	(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)

[1] As of 2011 retail chicken sampling includes chicken breast, wings, or thighs with skin on and bone in.

Figure 1. Percent Positive Samples for *Salmonella* by Meat Type, 2002-2011

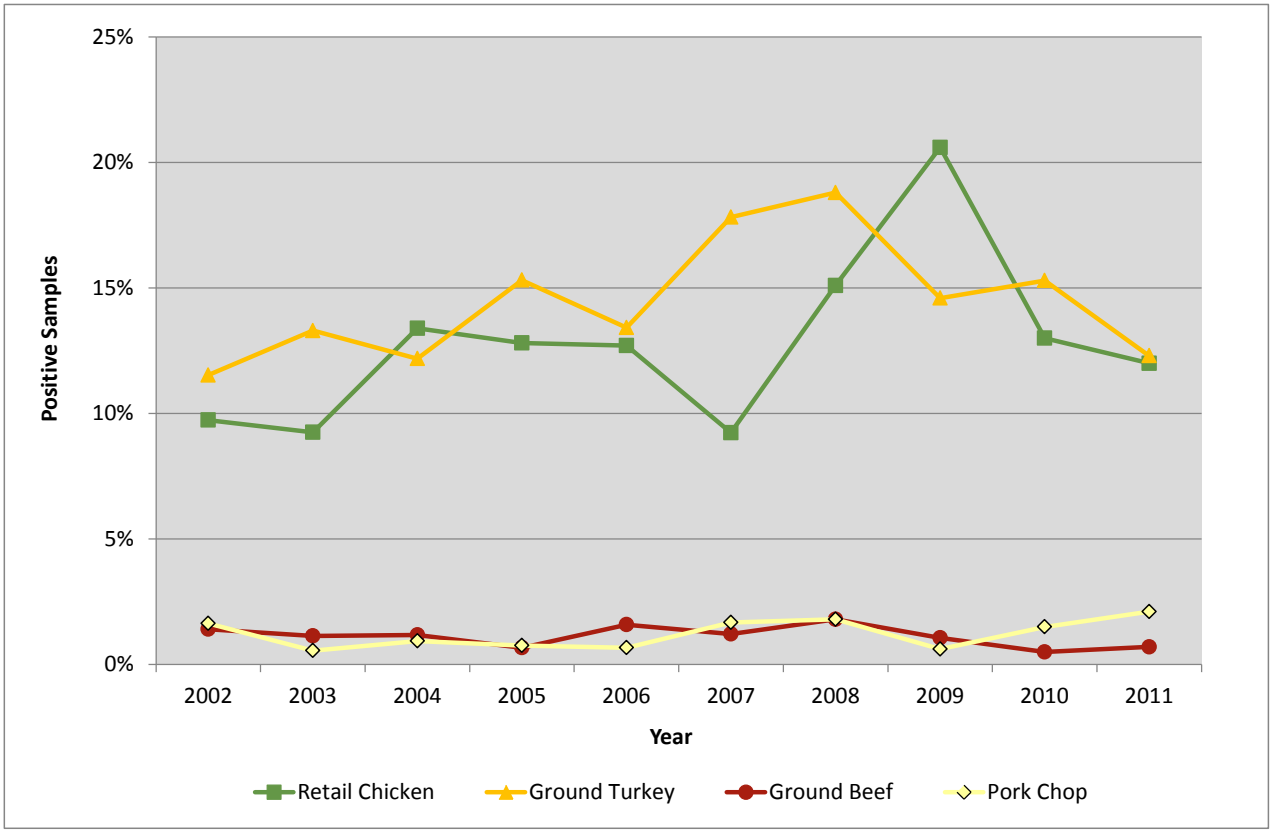
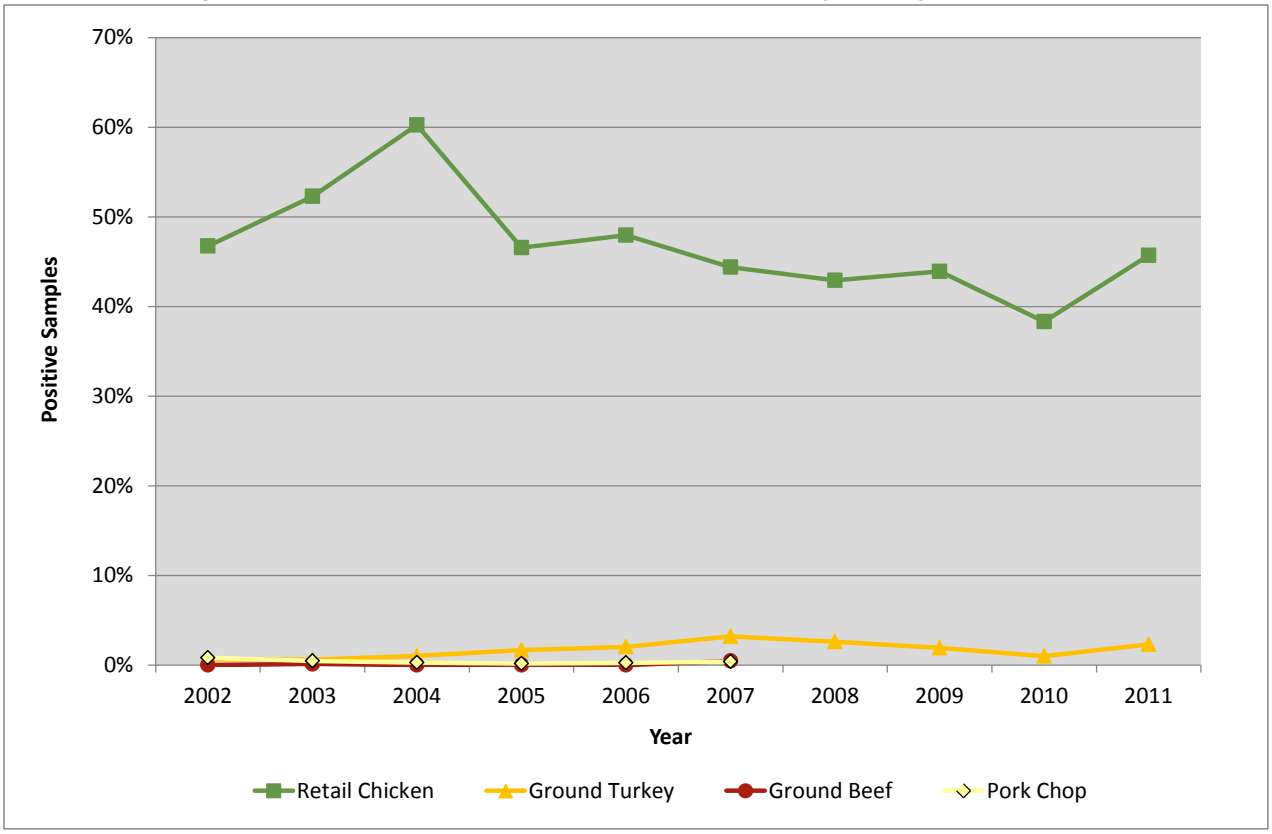


Figure 2. Percent Positive Samples for *Campylobacter* by Meat Type, 2002-2011[1]



[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, 2011

Serotype (N)[1]	Retail Chicken		Ground Turkey		Ground Beef		Pork Chop	
	n[2]	%[3]	n	%	n	%	n	%
1. Typhimurium (81)	66	81.5%	8	9.9%			7	8.6%
2. Kentucky (50)	45	90.0%	2	4.0%	3	6.0%		
3. Heidelberg (40)	11	27.5%	28	70.0%			1	2.5%
4. Saintpaul (36)			35	97.2%			1	2.8%
5. Hadar (32)	1	3.1%	23	71.9%			8	25.0%
6. Enteritidis (22)	21	95.5%	1	4.5%				
7. IIIa 18:z4,z23:- (14)			14	100.0%				
8. Agona (10)	1	10.0%	8	80.0%			1	10.0%
9. Infantis (9)	4	44.4%	1	11.1%	3	33.3%	1	11.1%
10. Schwarzengrund (9)			9	100.0%				
11. Senftenberg (9)			9	100.0%				
12. Berta (4)			3	75.0%			1	25.0%
13. Derby (4)			2	50.0%			2	50.0%
14. Mbandaka (4)	3	75.0%			1	25.0%		
15. Thompson (4)	1	25.0%	3	75.0%				
16. Montivideo (3)	1	33.3%	1	33.3%	1	33.3%		
17. Muenchen (3)			3	100.0%				
18. Ohio (3)							3	100.0%
19. I 4,12:d:- (2)			2	100.0%				
20. Litchfield (2)	1	50.0%			1	50.0%		
21. Muenster (2)			2	100.0%				
22. Tennessee (2)			2	100.0%				
23. Alachua (1)			1	100.0%				
24. Albany (1)			1	100.0%				
25. Anatum (1)	1	100.0%						
26. Braenderup (1)	1	100.0%						
27. Brandenburg (1)			1	100.0%				
28. Bredeney (1)			1	100.0%				
29. Hindmarsh (1)							1	100.0%
30. I 4,[5],12:non-motile (1)	1	100.0%						
31. Orion (1)			1	100.0%				
32. Reading (1)			1	100.0%				
33. Uganda (1)							1	100.0%
34. Worthington (1)							1	100.0%
Total (357)	**158**	**44.3%**	**162**	**45.4%**	**9**	**2.5%**	**28**	**7.8%**

[1] Where N = the total # of *Salmonella* isolates per serotype

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

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

Table 8. Resistance to Antimicrobials in *Salmonella* Isolates by Meat Type, 2002-2011[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)	6.4%	8.2%	25.7%	33.9%	35.1%	34.5%	28.1%	46.2%	–		39.2%	2.3%	–	–	56.1%
	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%
	P-value[4]	0.3748	0.1813	0.8671	0.0017	0.0008	0.0014	0.2314	<0.0001	0.2299	N/A	0.0018	0.3688	N/A	0.3276	<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)	16.8%	15.8%	31.7%	17.3%	16.3%	16.3%	15.8%	25.7%	–		48.0%	2.5%	–	0.5%	54.5%
	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%
	P-value	0.1961	0.0009	0.5145	0.0086	<0.0001	<0.0001	<0.0001	0.1129	0.0207	N/A	<0.0001	0.5175	N/A	0.0002	<0.0001
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%
	P-value	0.6247	0.1198	0.8401	0.3964	0.3964	0.3964	0.1658	0.8125	N/A	N/A	0.3514	0.6610	N/A	N/A	0.1760
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%
	P-value	0.3888	0.9659	0.4127	0.4029	0.5956	0.5956	0.8652	0.4423	0.0949	N/A	0.2901	0.1251	N/A	N/A	0.1548

[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, 2002-2011

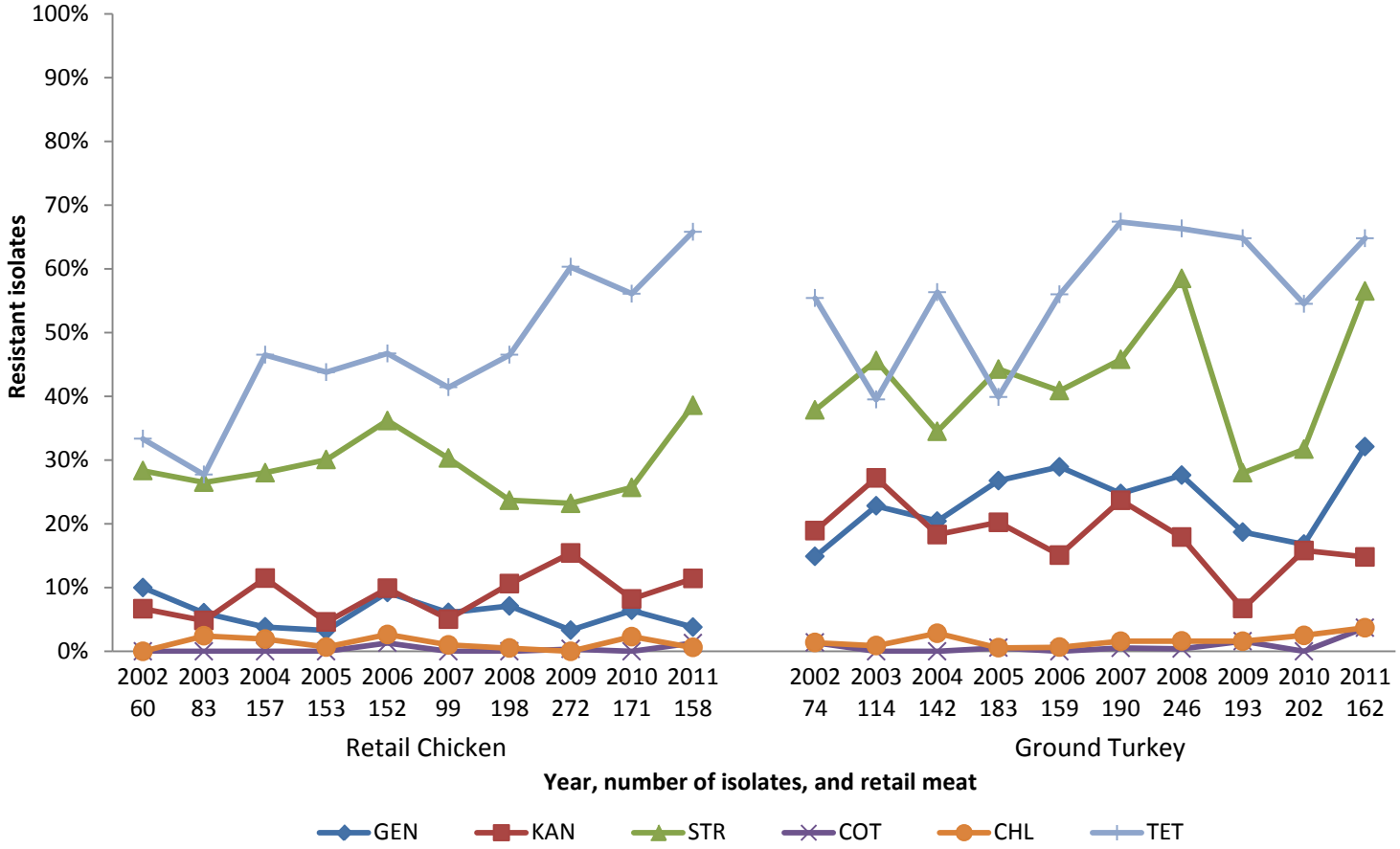


Figure 4. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Ground Beef and Pork Chop, 2002-2011

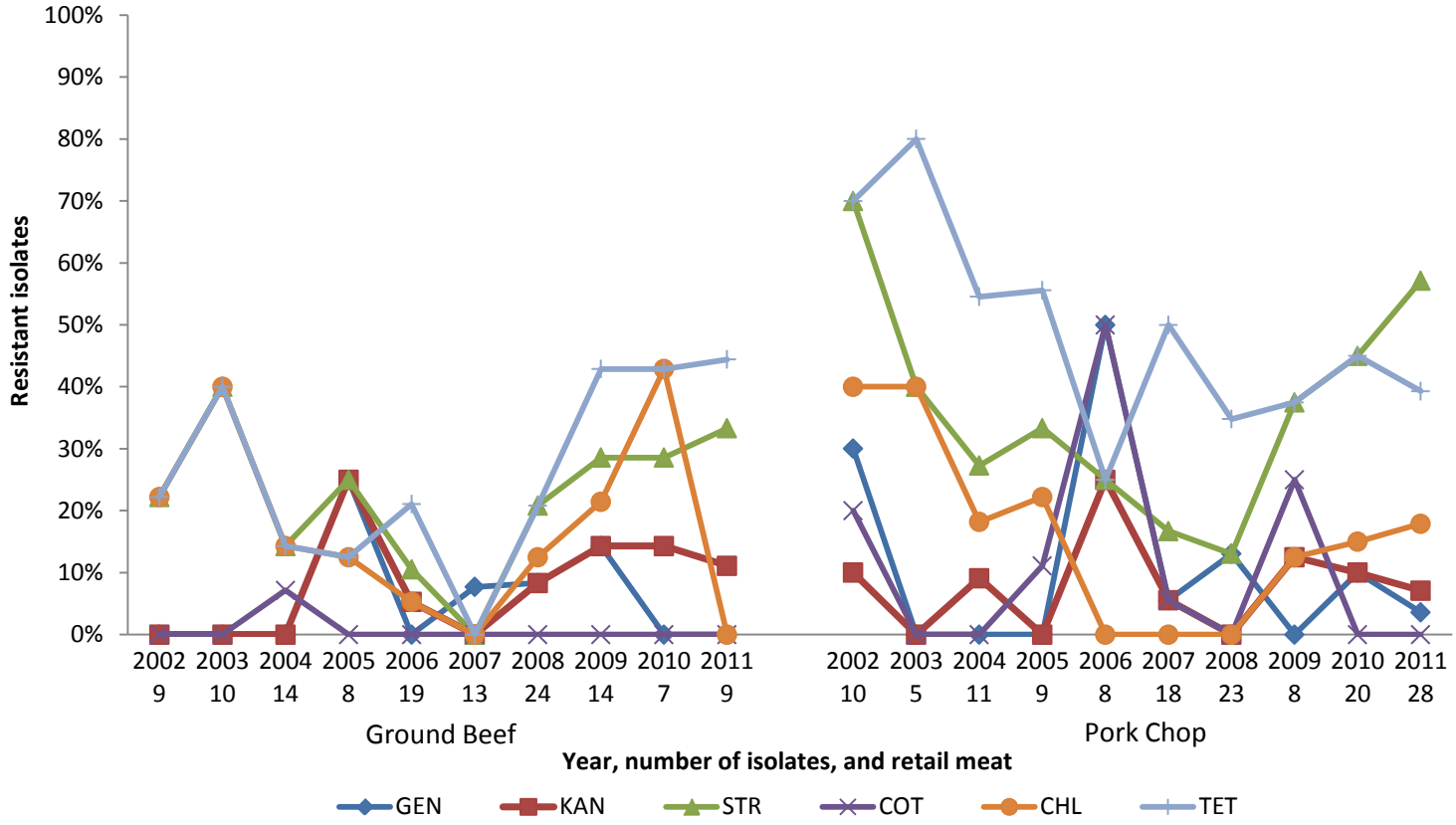


Figure 5. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Retail Chicken and Ground Turkey, 2002-2011

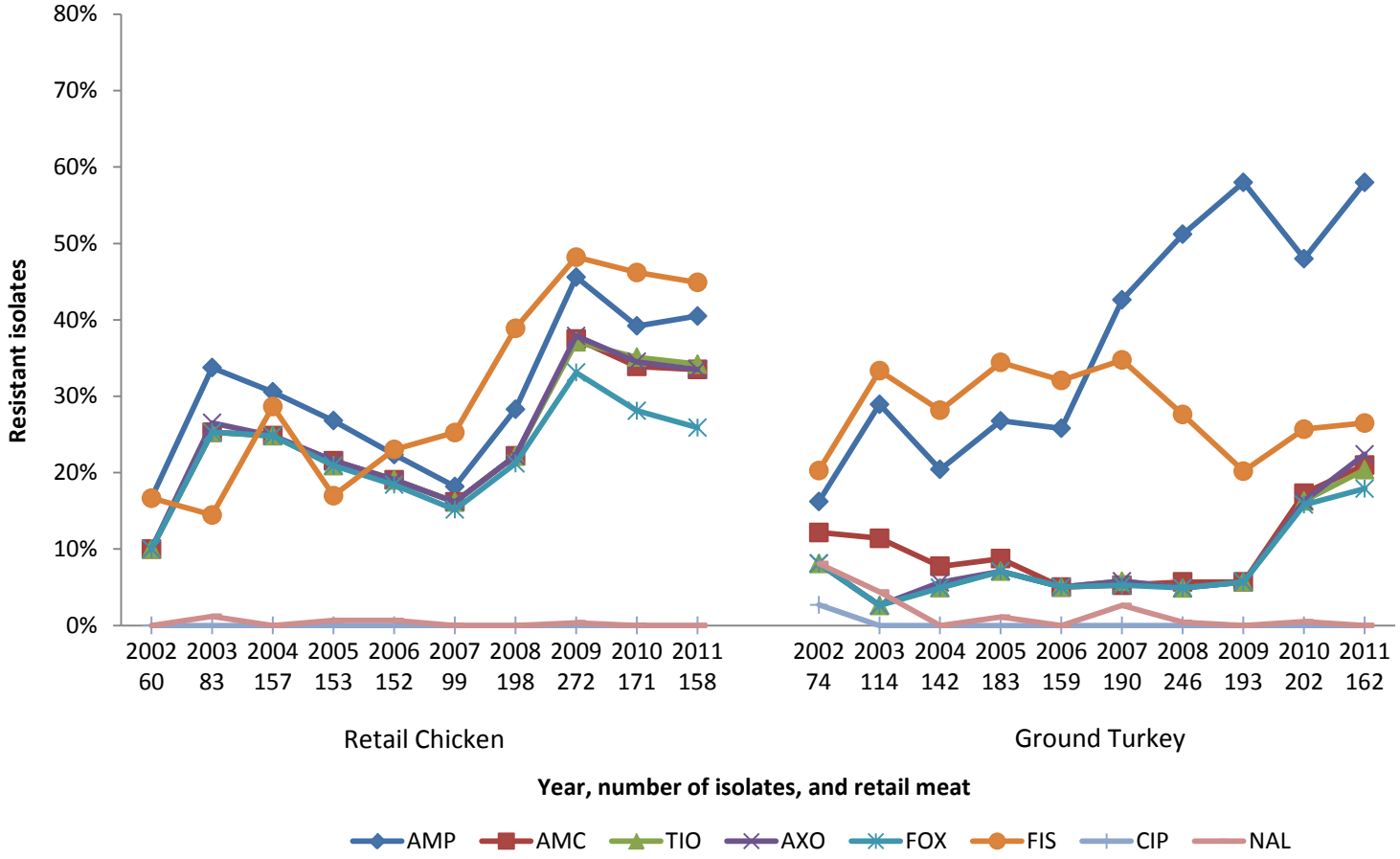


Figure 6. Temporal Variation in Resistance to Selected Antimicrobials in *Salmonella* Isolates from Ground Beef and Pork Chop, 2002-2011

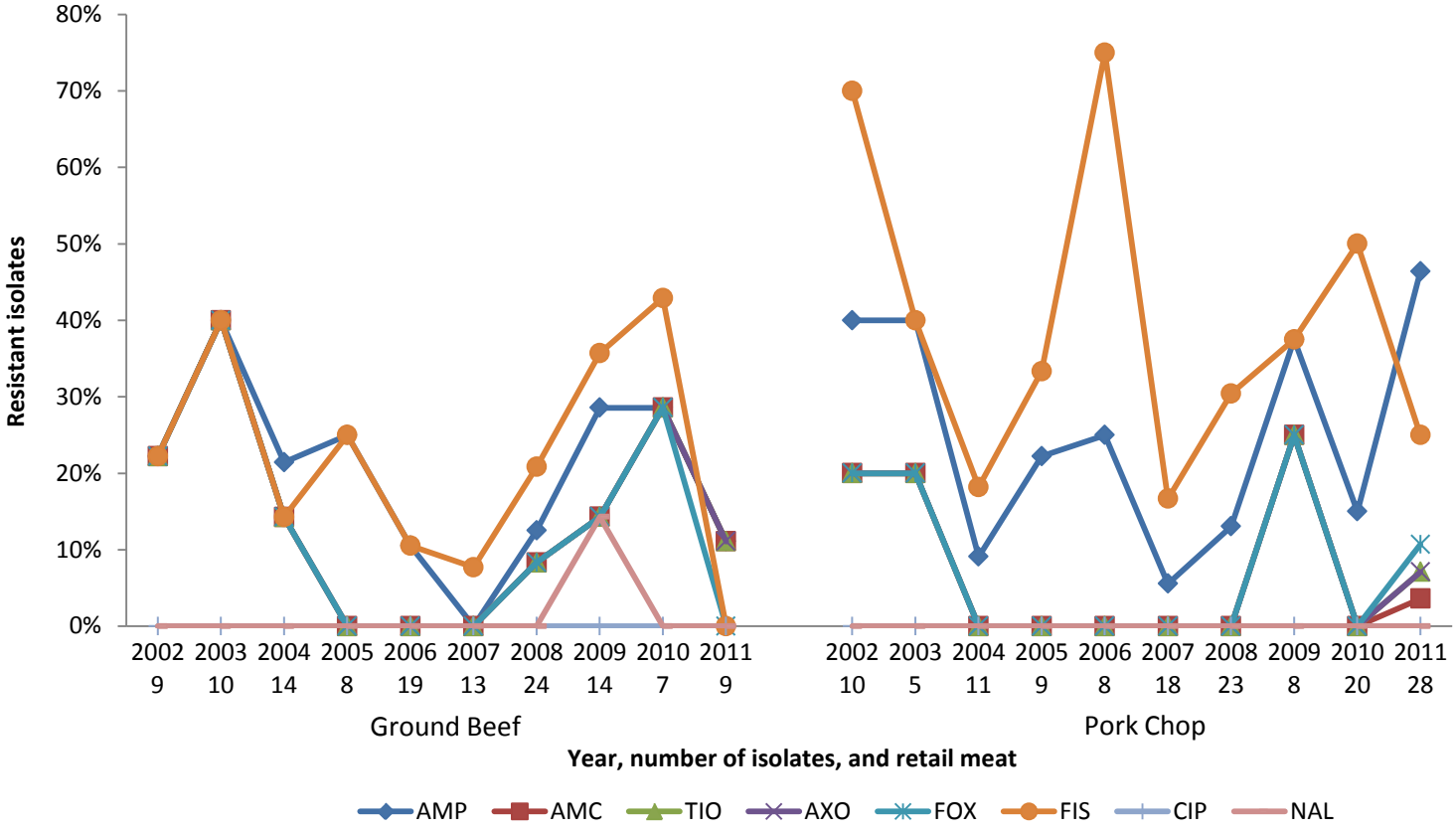


Table 9. Distribution of Resistant *Salmonella* Isolates by Meat Type and Serotype, 2011

Source	Serotype	No. of Isolates	% of Isolates	Number of Antimicrobial Classes in Resistance Pattern: 0	1	2-3	4-5	6-7	8	Number of Resistant Isolates by Antimicrobial Agent and Class: Aminoglycosides			β-Lactam/β-Lactamase Inhibitor Combinations	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	66	41.8%	3		24	21	18		2	16	16	36	23	36	36	62	1		44				61
	Kentucky	45	28.5%	3	1	34	5	2		2	1	36	13	14	13	13	4	1	1	13	1			34
	Enteritidis	21	13.3%	17	1	1	2					3					2			2				4
	Heidelberg	11	7.0%	10		1						1												1
	Infantis	4	2.5%	3		1							1	1	1	1				1				
	Mbandaka	3	1.9%				2	1		1	1	2	2	2	3	2	2			3				3
	Hadar	1	0.6%				1					1	1	1	1	1				1				1
	I 4,5,12:non-motile	1	0.6%			1				1		1					1							
	Other	6	3.8%	5	1							1												
	Total	158	100.0%	41	3	62	31	21	0	6	18	61	53	41	54	53	71	2	1	64	1	0	0	104
Ground Turkey	Saintpaul	35	21.6%	3	7	19	5	1		10	1	12	2	2	2	2	8			23				28
	Heidelberg	28	17.3%			15	7	6		22	9	26	11	10	11	11	9	3		27	3			26
	Hadar	23	14.2%			18	2	3		5	4	23	3	1	3	4	7			14				23
	IIIa 18:z4,z23:-	14	8.6%	11		3					1	3				1				3				2
	Schwarzengrund	9	5.6%	6	1	1		1		1	1	2	1	1	1	1	1	1		2				3
	Senftenberg	9	5.6%	1		4		4		5	4	7	4	4	4	4	6	1		7	2			3
	Agona	8	4.9%	4	2	1		1		1	1	3	2	1	2	2	1			2				1
	Typhimurium	8	4.9%	1		2	3	2		2		4	5	4	4	5	5			7				7
	Berta	3	1.9%	2	1																			1
	Muenchen	3	1.9%	2				1		1	1	1	1	1	1	1	1	1		1				1
	Thompson	3	1.9%	2		1						1								1				
	Derby	2	1.2%			2				2		2					2							2
	Kentucky	2	1.2%			2						2												2
	Muenster	2	1.2%		2															2				
	Tennessee	2	1.2%	2																				
	Alachua	1	0.6%					1		1	1	1	1	1	1	1	1			1				1
	Albany	1	0.6%			1							1	1	1	1				1				
	Brandenburg	1	0.6%				1					1	1	1	1	1				1				1
	Bredeney	1	0.6%				1			1			1	1	1	1				1				
	Infantis	1	0.6%					1		1		1	1	1	1	1	1			1	1			1
	Reading	1	0.6%			1						1					1							1
	Other	5	3.1%	2	3						1	1												2
	Total	162	100.0%	36	16	70	19	21	0	52	24	91	34	29	33	36	43	6	0	94	6	0	0	105
Ground Beef	Infantis	3	33.3%	3																				
	Kentucky	3	33.3%			2	1					3	1		1	1				1				3
	Litchfield	1	11.1%			1					1													1
	Other	2	22.2%	2																				
	Total	9	100.0%	5	0	3	1	0	0	0	1	3	1	0	1	1	0	0	0	1	0	0	0	4
Pork Chop	Hadar	8	28.6%			8						8								8				1
	Typhimurium	7	25.0%	2		3	2					5					5			2	2			4
	Ohio	3	10.7%	1		2								2							2			
	Derby	2	7.1%	1	1																			1
	Agona	1	3.6%					1			1	1	1	1	1	1	1			1	1			1
	Heidelberg	1	3.6%			1					1	1												1
	Hindmarsh	1	3.6%			1									1	1				1				1
	Saintpaul	1	3.6%				1			1		1					1			1				1
	Other	4	14.3%	3	1																			1
	Total	28	100.0%	7	2	15	3	1	0	1	2	16	1	3	2	2	7	0	0	13	5	0	0	11

Table 10. Multidrug Resistance Patterns among *Salmonella* Isolates, 2002-2011[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested by Source	Retail Chicken	60	83	157	153	152	99	198	272	171	158
	Ground Turkey	74	114	142	183	159	190	246	193	202	162
	Ground Beef	9	10	14	8	19	13	24	14	7	9
	Pork Chop	10	5	11	9	8	18	23	8	20	28
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	–	1.2% 2	–
	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
	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	–
	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	–	–	–	–	–
	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
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	–	–	–	8.3% 2	14.3% 2	28.6% 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, 2002-2011[1,2]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested by Source	Retail Chicken	60	83	157	153	152	99	198	272	171	158
	Ground Turkey	74	114	142	183	159	190	246	193	202	162
	Ground Beef	9	10	14	8	19	13	24	14	7	9
	Pork Chop	10	5	11	9	8	18	23	8	20	28
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	35.7% 61	25.9% 41
	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	30.7% 62	22.2% 36
	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
	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
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	43.3% 74	44.9% 71
	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	33.7% 68	50.0% 81
	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
	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
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	33.9% 58	32.9% 52
	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	18.3% 37	24.7% 40
	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
	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
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	29.8% 51	27.8% 44
	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	11.9% 24	19.1% 31
	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
	Pork Chop	40.0% 4	40.0% 2	9.1% 1	22.2% 2	–	–	–	25.0% 2	5.0% 1	10.7% 3
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	11.1% 19	13.3% 21
	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	8.4% 17	13.0% 21
	Ground Beef	22.2% 2	40.0% 4	14.3% 2	–	–	–	8.3% 2	14.3% 2	28.6% 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, 2002-2011

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)	0.6	**6.4**	[3.3 - 11.2]					71.3	21.6				0.6	**3.5**	**2.9**					
	2011 (158)	1.3	**3.8**	[1.4 - 8.1]					25.3	64.6	4.4	0.6		1.3	**0.6**	**3.2**					
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]										91.2	0.6			**8.2**			
	2011 (158)	0.0	**11.4**	[6.9 - 17.4]										88.6				**11.4**			
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	**25.7**	[19.4 - 33.0]												74.3	**17.0**	**8.8**			
	2011 (158)	N/A	**38.6**	[31.0 - 46.7]												61.4	**17.1**	**21.5**			
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)	2.9	**33.9**	[26.9 - 41.5]							60.2	0.6		2.3	2.9	**4.7**	**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**				
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	**35.1**	[28.0 - 42.7]					0.6	23.4	40.4	0.6		**9.4**	**25.7**						
	2011 (158)	0.0	**34.2**	[26.8 - 42.1]						19.6	43.0	3.2		**10.1**	**24.1**						
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]					64.9	0.6			**3.5**	**9.4**	**18.1**	**2.9**	**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**				
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)	6.4	**28.1**	[21.5 - 35.4]							10.5	43.9	9.4	1.8	6.4	**14.6**	**13.5**				
	2011 (158)	8.9	**25.9**	[19.3 - 33.5]							0.6	43.0	20.3	1.3	8.9	**17.1**	**8.9**				

[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 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 plates used to test isolates. 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, 2002-2011 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	**46.2**	[38.6 - 54.0]											2.3	31.0	19.3	0.6	0.6	**46.2**	
	2011 (158)	N/A	**44.9**	[37.0 - 53.0]											16.5	17.7	20.3	0.6		**44.9**	
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]				98.2	1.8												
	2011 (158)	N/A	**1.3**	[0.2 - 4.5]				95.6	2.5	0.6				**1.3**							
Macrolides																					
Azithromycin	2011 (158)	N/A	**0.6**	[0.0 - 3.5]								4.4	91.8	3.2		**0.6**					
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	**39.2**	[31.8 - 46.9]							55.0	4.1	0.6	1.2			**39.2**				
	2011 (158)	0.0	**40.5**	[32.8 - 48.6]							50.0	8.9	0.6				**40.5**				
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]								2.9	66.1	28.7		**1.2**	**1.2**				
	2011 (158)	0.6	**0.6**	[0.0 - 3.5]								0.6	53.8	44.3	0.6	**0.6**					
Quinolones																					
Ciprofloxacin	2002 (60)	0.0	**0.0**	[0.0 - 6.0]	90.0	10.0															
	2003 (83)	0.0	**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)	0.0	**0.0**	[0.0 - 2.4]	88.2	11.1		0.7													
	2006 (152)	0.0	**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)	0.0	**0.0**	[0.0 - 1.3]	77.6	21.0	1.1		0.4												
	2010 (171)	0.0	**0.0**	[0.0 - 2.1]	94.2	5.9															
	2011 (158)	0.0	**0.0**	[0.0 - 2.3]	84.8	14.6	0.6														
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]							1.8	49.1	48.0	1.2							
	2011 (158)	N/A	**0.0**	[0.0 - 2.3]							1.3	33.5	63.3	1.3	0.6						
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	**56.1**	[48.4 - 63.7]									42.1	1.8	**0.6**	**2.3**	**53.2**				
	2011 (158)	0.0	**65.8**	[57.9 - 73.2]									34.2		**1.9**		**63.9**				

[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 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 plates used to test isolates. 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, 2002-2011

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)	3.0	**16.8**	[11.9 - 22.7]					43.6	34.7	1.0	1.0		3.0	**7.9**	**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**					
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	**15.8**	[11.1 - 21.6]										83.7		0.5	**0.5**	**15.3**			
	2011 (162)	0.6	**14.8**	[9.7 - 21.2]										80.9	3.7	0.6	**1.2**	**13.6**			
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	**15.8**	**15.8**			
	2011 (162)	N/A	**56.2**	[48.2 - 63.9]												43.8	**25.9**	**30.3**			
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)	7.9	**17.3**	[12.4 - 23.3]							49.5	2.5	0.5	22.3	7.9	**4.5**	**12.9**				
	2011 (162)	12.3	**21.0**	[15.0 - 28.1]							38.9	2.5	1.9	23.5	12.3	**8.0**	**13.0**				
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	**16.3**	[11.5 - 22.2]						26.2	56.4	1.0		**1.5**	**14.9**						
	2011 (162)	0.6	**20.4**	[14.5 - 27.4]						16.1	59.3	3.7	0.6	**3.1**	**17.3**						
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]					83.2	0.5			**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**				
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	**15.8**	[11.1 - 21.6]							10.4	53.5	18.8	1.0	0.5	**4.0**	**11.9**				
	2011 (162)	3.7	**17.9**	[12.3 - 24.7]							2.5	53.1	19.8	3.1	3.7	**4.3**	**13.6**				

[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 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 plates used to test isolates. 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, 2002-2011 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	**25.7**	[19.9 - 32.3]											7.4	32.7	33.7		0.5	**25.7**	
	2011 (162)	N/A	**26.5**	[19.9 - 34.0]											13.0	32.1	27.8	0.6		**26.5**	
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]				93.6	6.4												
	2011 (162)	N/A	**3.7**	[1.4 - 7.9]				93.8	2.5					**3.7**							
Macrolides																					
Azithromycin	2011 (162)	N/A	**0.0**	[0.0 - 2.3]								7.4	79.0	12.4	1.2						
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**				
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**				
Quinolones																					
Ciprofloxacin	2002 (74)	2.7	**2.7**	[0.3 - 9.4]	71.6	17.6	2.7	1.4	1.4	2.7	**2.7**										
	2003 (114)	0.9	**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)	0.0	**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)	0.0	**0.0**	[0.0 - 1.9]	87.4	10.0			2.6												
	2008 (246)	0.0	**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)	0.0	**0.0**	[0.0 - 1.8]	98.0	1.5			0.5												
	2011 (162)	0.0	**0.0**	[0.0 - 2.3]	92.6	7.4															
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	63.9	34.7				**0.5**				
	2011 (162)	N/A	**0.0**	[0.0 - 2.3]								25.3	73.5	1.2							
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]									45.5		**0.5**	**5.9**	**48.0**				
	2011 (162)	2.5	**64.8**	[56.9 - 72.1]									32.7	2.5	**0.6**	**1.9**	**62.3**				

[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 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 plates used to test isolates. 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, 2002-2011

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										
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**			
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**			
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**					
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**						
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**							
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						

[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 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 plates used to test isolates. 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, 2002-2011 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			
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]				100.0													
	2011 (9)	N/A	**0.0**	[0.0 - 33.6]				100.0													
Macrolides																					
Azithromycin	2011 (9)	N/A	**0.0**	[0.0 - 33.6]									100.0								
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**				
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							
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)	0.0	**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															
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								
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**				

[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 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 plates used to test isolates. 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, 2002-2011

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]					30.0	55.0	5.0					**10.0**					
	2011 (28)	0.0	**3.6**	[0.1 - 18.3]					10.7	71.4	14.3					**3.6**					
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**			
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**			
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**				
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]						10.0	80.0	10.0									
	2011 (28)	0.0	**7.1**	[0.9 - 23.5]						10.7	67.9	14.3		**3.6**	**3.6**						
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**					
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]							5.0	40.0	55.0								
	2011 (28)	3.6	**10.7**	[2.3 - 28.2]							3.6	53.6	28.6		3.6	**7.1**	**3.6**				

[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 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 plates used to test isolates. 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, 2002-2011 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**	
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]				95.0	5.0												
	2011 (28)	N/A	**0.0**	[0.0 - 12.3]				92.9	7.1												
Macrolides																					
Azithromycin	2011 (28)	N/A	**0.0**	[0.0 - 12.3]								21.4	57.1	21.4							
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**				
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]									30.0	55.0		**10.0**	**5.0**				
	2011 (28)	3.6	**17.9**	[6.1 - 36.9]									39.3	39.3	3.6	**7.1**	**10.7**				
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															
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]								45.0	55.0								
	2011 (28)	N/A	**0.0**	[0.0 - 12.3]								42.9	50.0	7.1							
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**				

[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 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 plates used to test isolates. 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 13. Other Resistance among all Ceftiofur/Ceftriaxone Resistant *Salmonella* (Surveillance for ESBL-producing isolates), 2011

Antimicrobial	Isolate Source (# of Isolates)	%I [1]	%R [2]	[95% CI] [3]	Distribution (%) of MICs (µg/ml) [4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
β-Lactam/β-Lactamase Inhibitor Combinations																					
Piperacillin-tazobactam	Retail Chicken (54)	1.9	**0.0**	[0.0 - 6.6]							1.9	9.3	37.0	37.0	13.0		1.9				
	Ground Turkey (36)	2.8	**11.1**	[3.1 - 26.1]								13.9	27.8	36.1	8.3		2.8	**11.1**			
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]									100.0								
	Pork Chop (2)	0.0	**0.0**	[0.0 - 84.2]										50	50.0						
Penems																					
Imipenem	Retail Chicken (54)	1.9	**0.0**	[0.0 - 6.6]				1.9	59.3	37.0		1.9									
	Ground Turkey (36)	0.0	**0.0**	[0.0 - 9.7]				2.8	77.8	19.4											
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]						100.0											
	Pork Chop (2)	0.0	**0.0**	[0.0 - 84.2]					50.0	50.0											
Cephems																					
Cefepime	Retail Chicken (54)	0.0	**0.0**	[0.0 - 100.0]			1.9	5.6	37.0	42.6	9.3	3.7									
	Ground Turkey (36)	0.0	**0.0**	[0.0 - 100.0]			8.3	8.3	27.8	41.7	11.1	2.8									
	Ground Beef (1)	0.0	**0.0**	[0.0 - 100.0]						100.0											
	Pork Chop (2)	0.0	**0.0**	[0.0 - 100.0]							100.0										
Cefotaxime	Retail Chicken (54)	1.9	**96.3**	[87.3 - 99.5]				1.9				1.9	**3.7**	**9.2**	**59.3**	**22.2**	**1.9**				
	Ground Turkey (36)	0.0	**86.1**	[70.5 - 95.3]			5.6	8.3					**2.8**	**11.1**	**38.9**	**27.8**	**5.6**				
	Ground Beef (1)	0.0	**100.0**	[2.5 - 100.0]										**100.0**							
	Pork Chop (2)	0.0	**100.0**	[15.8 - 100.0]												**100.0**					
Ceftazidime	Retail Chicken (54)	5.6	**90.7**	[79.7 - 96.9]					1.9				1.9	5.6	**20.4**	**64.8**	**5.5**				
	Ground Turkey (36)	5.6	**80.6**	[64.0 - 91.8]					8.3	5.6				5.6	**5.6**	**61.1**	**13.9**				
	Ground Beef (1)	100.0	**0.0**	[0.0 - 97.5]										100.0							
	Pork Chop (2)	0.0	**100.0**	[15.8 - 100.0]												**50.0**	**50.0**				
Monobactam																					
Aztreonam	Retail Chicken (54)	55.6	**20.4**	[10.6 - 81.3]				1.9				7.4	14.8	55.6	**20.4**						
	Ground Turkey (36)	44.4	**22.2**	[10.1 - 72.0]			11.1	2.8				5.6	13.9	44.4	**19.4**	**2.8**					
	Ground Beef (1)	0.0	**0.0**	[0.0 - 97.5]								100.0									
	Pork Chop (2)	0.0	**100.0**	[15.8 - 100.0]											**100.0**						

[1] Percent of isolates with intermediate susceptibility

[2] 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

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

[4] 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, 2002-2011[1]

	Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total Species (a) Per Year	***C. jejuni***	**202**	**330**	**517**	**414**	**439**	**356**	**339**	**413**	**360**	**406**
	C. coli	**95**	**147**	**204**	**160**	**157**	**162**	**200**	**192**	**155**	**228**
	C. lari	**0**	**2**	**0**	**2**	**3**	**0**	**2**	**0**	**3**	**0**
	Total (A)	**297**	**479**	**721**	**576**	**599**	**518**	**541**	**605**	**518**	**634**
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
	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
	C. lari		100.0% 2			33.3% 1				66.7% 2	
	Total (N)[4]	**97.0% 288**	**97.9% 469**	**97.9% 706**	**96.2% 554**	**95.5% 572**	**91.7% 475**	**94.3% 510**	**95.9% 580**	**97.5% 505**	**95.1% 603**
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
	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
	C. lari				50.0% 1	66.7% 2		100.0% 2		33.3% 1	
	Total (N)	**1.3% 4**	**1.0% 5**	**1.7% 12**	**3.5% 20**	**4.0% 24**	**6.6% 34**	**5.7% 31**	**4.1% 25**	**2.5% 13**	**4.9% 31**

[1] Grey areas indicate no isolates were identified for this species per meat type.

[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 isolates per species per meat type (n) / total # of isolates per species (a).

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

Table 15.1 *Campylobacter jejuni* Isolates from Retail Chicken by Month for All Sites, 2002-2011

Month	2002 n (%[1])	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 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)
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)
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)
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)
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)
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)
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)
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)
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)
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)
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)
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)
Total N (%)[2]	**198 (100)**	**325 (100)**	**510 (100)**	**403 (100)**	**426 (100)**	**332 (100)**	**329 (100)**	**404 (100)**	**355 (100)**	**393 (100)**

Table 15.2 *Campylobacter coli* Isolates from Retail Chicken by Month for All Sites, 2002-2011

Month	2002 n (%)	2003 n (%)	2004 n (%)	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 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)
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)
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)
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)
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)
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)
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)
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)
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)
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)
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)
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)
Total N (%)	**90 (100)**	**142 (100)**	**196 (100)**	**151 (100)**	**145 (100)**	**143 (100)**	**181 (100)**	**176 (100)**	**148 (100)**	**210 (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, 2002-2011[1]

Meat Type[2]	Species	Year (N)	Aminoglycosides GEN	Ketolides TEL	Lincosamides CLI	Macrolides AZI	Macrolides ERY	Phenicols FFN	Quinolones CIP	Quinolones NAL	Tetracyclines TET[3]
Retail Chicken	*C. jejuni*	2002 (198)	-				-		15.2%		38.4%
		2003 (325)	0.3%				-		14.5%		40.6%
		2004 (510)	-	0.4%	0.4%	0.8%	0.8%	-	15.1%	15.1%	50.2%
		2005 (403)	-	0.5%	0.5%	0.5%	0.5%	-	15.1%	14.9%	46.4%
		2006 (426)	-	0.7%	0.7%	0.9%	0.9%	-	16.7%	16.7%	47.2%
		2007 (332)	-	0.6%	0.6%	0.6%	0.6%	-	17.2%	17.2%	48.5%
		2008 (329)	-	0.3%	0.9%	1.2%	1.2%	-	14.6%	14.6%	49.8%
		2009 (404)	-	0.2%	0.5%	1.0%	1.0%	-	21.3%	21.3%	45.8%
		2010 (355)	-	0.8%	0.6%	0.6%	0.6%	-	22.5%	22.8%	36.3%
		2011 (393)	-	0.3%	0.3%	0.5%	0.5%	-	22.4%	20.9%	48.3%
		Total (3675)	< 0.1	0.4%	0.5%	0.7%	0.7%	-	17.6%	15.3%	40.1%
	C. coli	2002 (90)	-				7.8%		10.0%		44.4%
		2003 (142)	-				7.0%		13.4%		50.7%
		2004 (196)	-	8.2%	7.1%	9.2%	9.2%	-	16.3%	16.3%	46.4%
		2005 (151)	-	7.9%	8.6%	9.9%	9.9%	-	29.1%	29.1%	42.4%
		2006 (145)	-	4.8%	4.8%	5.5%	5.5%	-	22.1%	20.7%	46.9%
		2007 (143)	0.7%	7.0%	4.9%	6.3%	6.3%	-	25.9%	25.9%	39.9%
		2008 (181)	1.7%	7.7%	5.0%	9.9%	9.9%	-	20.4%	20.4%	46.4%
		2009 (176)	5.7%	4.5%	3.4%	4.5%	4.5%	-	18.2%	18.2%	38.1%
		2010 (148)	12.8%	4.1%	1.4%	4.1%	4.1%	-	13.5%	13.5%	39.2%
		2011 (210)	18.1%	3.8%	1.0%	4.3%	4.8%	-	18.1%	17.1%	49.0%
		Total (1582)	4.5%	5.1%	3.8%	5.8%	6.9%	-	19.0%	16.9%	37.1%
	C. lari	2003 (2)	-				-		100.0%		-
		2006 (1)	-	-	-	-	-	-	100.0%	100.0%	-
		2010 (2)	-	-	-	-	-	-	100.0%	100.0%	-
		Total (5)	-	-	-	-	-	-	100.0%	60.0%	-
	Total (N= 5262)		1.4%	1.8%	1.5%	2.2%	2.5%	-	18.1%	15.8%	45.3%
Ground Turkey	*C. jejuni*	2002 (2)	-				-		50.0%		100.0%
		2003 (4)	-				-		-		75.0%
		2004 (7)	-	-	-	-	-	-	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)	-	-	-	-	-	-	44.4%	44.4%	100.0%
		2010 (5)	-	-	-	-	-	-	40.0%	40.0%	80.0%
		2011 (13)	-	-	-	-	-	-	46.2%	46.2%	92.3%
		Total (92)	-	2.2%	2.2%	2.2%	2.2%	-	37.0%	35.9%	78.3%
	C. coli	2002 (2)	-				-		50.0%		50.0%
		2003 (1)	-				-		100.0%		100.0%
		2004 (5)	-	-	-	-	-	-	-	-	-
		2005 (9)	-	22.2%	-	22.2%	22.2%	-	55.6%	55.6%	88.9%
		2006 (10)	-	-	-	-	-	-	30.0%	30.0%	80.0%
		2007 (14)	-	-	-	-	-	-	50.0%	50.0%	64.3%
		2008 (19)	-	5.3%	-	5.3%	5.3%	-	47.4%	47.4%	94.7%
		2009 (16)	-	-	-	-	-	-	43.8%	43.8%	75.0%
		2010 (7)	-	-	-	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%
		Total (101)	-	4.0%	1.0%	5.0%	5.0%	-	45.5%	43.6%	75.3%
	C. lari	2005 (1)	-	-	-	-	-	-	100.0%	100.0%	-
		2006 (2)	-	-	-	-	-	-	100.0%	100.0%	-
		2008 (2)	-	-	-	-	-	-	100.0%	100.0%	-
		2010 (1)	-	-	-	-	-	-	100.0%	100.0%	-
		Total (6)	-	-	-	-	-	-	100.0%	100.0%	-
	Total (N= 199)		-	3.0%	1.5%	3.5%	3.5%	-	43.2%	41.7%	77.9%
Grand Total (N= 5461)			1.3%	1.9%	1.5%	2.2%	2.6%	-	19.0%	16.8%	46.5%

[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, 2002-2011[1]

Species	Year (N)		Aminoglycosides	Ketolides	Lincosamides	Macrolides		Phenicols	Quinolones		Tetracyclines[2]
			GEN (MIC ≥ 8)	TEL (MIC ≥ 16)	CLI (MIC ≥ 8)	AZI (MIC ≥ 8)	ERY (MIC ≥ 32)	FFN[3] (MIC > 4)	CIP (MIC ≥ 4)	NAL (MIC ≥ 64)	TET (MIC ≥ 16)
C. jejuni	2002 (198)	n (%R[4])	–	Not Tested	Not Tested	Not Tested	–	Not Tested	30 (15.2)	Not Tested	76 (38.4)
	2003 (325)		1 (0.3)	Not Tested	Not Tested	Not Tested	–	Not Tested	47 (14.5)	Not Tested	132 (40.6)
	2004 (510)		–	2 (0.4)	2 (0.4)	4 (0.8)	4 (0.8)	–	77 (15.1)	77 (15.1)	256 (50.2)
	2005 (403)		–	2 (0.5)	2 (0.5)	2 (0.5)	2 (0.5)	–	61 (15.1)	60 (14.9)	187 (46.4)
	2006 (426)		–	3 (0.7)	3 (0.7)	4 (0.9)	4 (0.9)	–	71 (16.7)	71 (16.7)	201 (47.2)
	2007 (332)		–	2 (0.6)	2 (0.6)	2 (0.6)	2 (0.6)	–	57 (17.2)	57 (17.2)	161 (48.5)
	2008 (329)		–	1 (0.3)	3 (0.9)	4 (1.2)	4 (1.2)	–	48 (14.6)	48 (14.6)	164 (49.8)
	2009 (404)		–	1 (0.2)	2 (0.5)	4 (1.0)	4 (1.0)	–	86 (21.3)	86 (21.3)	185 (45.8)
	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)		–	1 (0.3)	1 (0.3)	2 (0.5)	2 (0.5)	–	88 (22.4)	82 (20.9)	190 (48.3)
	P-value[5]		N/A	0.4412	0.3716	0.2695	0.2695	N/A	<0.0001	<0.0001	0.3387
C. coli	2002 (90)	n (%R)	–	Not Tested	Not Tested	Not Tested	7 (7.8)	Not Tested	9 (10.0)	Not Tested	40 (44.4)
	2003 (142)		–	Not Tested	Not Tested	Not Tested	10 (7.0)	Not Tested	19 (13.4)	Not Tested	72 (50.7)
	2004 (196)		–	16 (8.2)	14 (7.1)	18 (9.2)	18 (9.2)	–	32 (16.3)	32 (16.3)	91 (46.4)
	2005 (151)		–	12 (7.9)	13 (8.6)	15 (9.9)	15 (9.9)	–	44 (29.1)	44 (29.1)	64 (42.4)
	2006 (145)		–	7 (4.8)	7 (4.8)	8 (5.5)	8 (5.5)	–	32 (22.1)	30 (20.7)	68 (46.9)
	2007 (143)		1 (0.7)	10 (7.0)	7 (4.9)	9 (6.3)	9 (6.3)	–	37 (25.9)	37 (25.9)	57 (39.9)
	2008 (181)		3 (1.7)	14 (7.7)	9 (5.0)	18 (9.9)	18 (9.9)	–	37 (20.4)	37 (20.4)	84 (46.4)
	2009 (176)		10 (5.7)	8 (4.5)	6 (3.4)	8 (4.5)	8 (4.5)	–	32 (18.2)	32 (18.2)	67 (38.1)
	2010 (148)		19 (12.8)	6 (4.1)	2 (1.4)	6 (4.1)	6 (4.1)	–	20 (13.5)	20 (13.5)	58 (39.2)
	2011 (210)		38 (18.1)	8 (3.8)	2 (1.0)	9 (4.3)	10 (4.8)	–	38 (18.1)	36 (17.1)	103 (49.1)
	P-value		<0.0001	0.9199	0.0906	0.7490	0.0093	N/A	0.7810	0.3427	0.0061

[1] Dashes indicate 0% resistance.

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

[3] Percent non-susceptible is reported as no resistant CLSI breakpoint has been established. NARMS breakpoint established to determine resistance.

[4] % R = the number of resistant isolates (n) / the number of positive isolates (N).

[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, 2002-2011

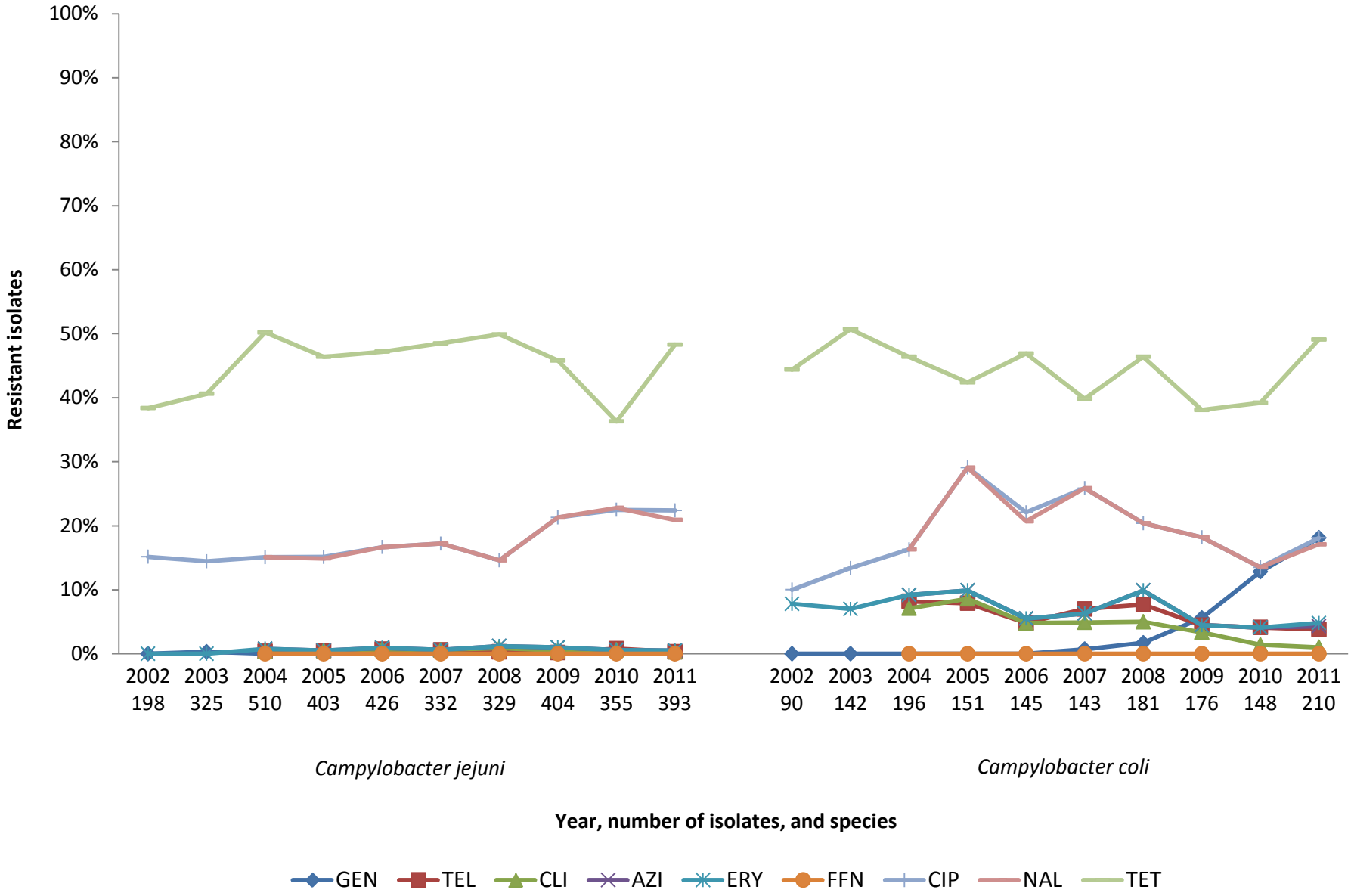


Table 18. Multidrug Resistance among *Campylobacter* Isolates by Species, 2002-2011[1]

Year			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
No. of Isolates Tested by Species and Source	*C. jejuni*	Retail Chicken	198	325	510	403	426	332	329	404	355	393
		Ground Turkey	2	4	7	10	12	20	10	9	5	13
	C. coli	Retail Chicken	90	142	196	151	145	143	181	176	148	210
		Ground Turkey	2	1	5	9	10	14	19	16	7	18
Resistance Pattern	**Species**	**Isolate Source[2]**										
1. No Resistance Detected	*C. jejuni*	Retail Chicken	54.5% 108	51.7% 168	41.0% 209	43.4% 175	43.9% 187	40.4% 134	40.4% 133	41.8% 169	51.3% 182	42.2% 166
		Ground Turkey	–	25.0% 1	42.9% 3	30.0% 3	16.7% 2	10.0% 2	–	–	20.0% 1	–
	C. coli	Retail Chicken	51.1% 46	43.0% 61	38.3% 75	36.4% 55	38.6% 56	45.5% 65	41.4% 75	49.4% 87	54.7% 81	41.9% 88
		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	8.1% 16	7.1% 23	7.1% 36	6.0% 24	8.7% 37	7.2% 24	7.0% 23	10.4% 42	11.5% 41	13.5% 53
		Ground Turkey	50.0% 1	–	14.3% 1	10.0% 1	41.7% 5	30.0% 6	70.0% 7	44.4% 4	40.0% 2	38.5% 5
	C. coli	Retail Chicken	12.2% 11	10.6% 15	15.3% 30	19.9% 30	15.2% 22	19.6% 28	24.3% 44	16.5% 29	23.6% 35	32.4% 68
		Ground Turkey	50.0% 1	100.0% 1	–	55.6% 5	30.0% 3	42.9% 6	52.6% 10	37.5% 6	57.1% 4	55.6% 10
3. Resistance to ≥ 3 Antimicrobial Classes	*C. jejuni*	Retail Chicken	–	–	0.4% 2	0.5% 2	0.7% 3	0.6% 2	0.3% 1	0.2% 1	0.6% 2	0.5% 2
		Ground Turkey	–	–	–	–	–	5.0% 1	10.0% 1	–	–	–
	C. coli	Retail Chicken	1.1% 1	3.5% 5	8.2% 16	9.3% 14	5.5% 8	7.0% 10	6.1% 11	4.5% 8	4.1% 6	2.9% 6
		Ground Turkey	–	–	–	22.2% 2	–	–	5.3% 1	–	14.3% 1	5.6% 1
4. Resistance to ≥ 4 Antimicrobial Classes	*C. jejuni*	Retail Chicken	–	–	0.4% 2	0.3% 1	0.7% 3	–	–	–	0.3% 1	–
		Ground Turkey	–	–	–	–	–	5.0% 1	10.0% 1	–	–	–
	C. coli	Retail Chicken	–	–	1.5% 3	4.6% 7	2.1% 3	2.8% 4	2.2% 4	1.7% 3	2.0% 3	1.4% 3
		Ground Turkey	–	–	–	22.2% 2	–	–	–	–	–	5.6% 1
5. Resistance to ≥ 5 Antimicrobial Classes	*C. jejuni*	Retail Chicken	–	–	–	–	–	–	–	–	–	–
		Ground Turkey	–	–	–	–	–	5.0% 1	–	–	–	–
	C. coli	Retail Chicken	–	–	0.5% 1	0.7% 1	–	0.7% 1	–	1.1% 2	–	–
		Ground Turkey	–	–	–	–	–	–	–	–	–	–

[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, 2002-2011

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 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**	[0.0 - 1.8]				1.0	3.5	24.7	65.7	5.1							
	2003 (325)	0.0	**0.3**	[0.0 - 1.7]					0.9	15.4	67.7	15.7					**0.3**		
	2004 (510)	0.0	**0.0**	[0.0 - 0.7]					1.8	5.1	85.1	8.0							
	2005 (403)	0.0	**0.0**	[0.0 - 0.9]						5.5	89.1	5.5							
	2006 (426)	0.0	**0.0**	[0.0 - 0.9]					0.2	12.9	82.9	3.8	0.2						
	2007 (332)	0.0	**0.0**	[0.0 - 1.1]					0.6	17.2	79.8	2.4							
	2008 (329)	0.0	**0.0**	[0.0 - 1.1]						3.7	88.2	8.2							
	2009 (404)	0.0	**0.0**	[0.0 - 0.9]						1.0	49.7	49.3							
	2010 (355)	0.0	**0.0**	[0.0 - 1.0]						10.7	83.7	5.4	0.3						
	2011 (393)	0.0	**0.0**	[0.0 - 0.9]						10.4	80.4	8.9	0.3						
Ketolides																			
Telithromycin	2004 (510)	0.4	**0.4**	[0.0 - 1.4]		0.2		0.4	0.2	13.1	56.5	23.7	4.9	0.2	0.4	**0.4**			
	2005 (403)	0.0	**0.5**	[0.1 - 1.8]		0.2			1.0	11.4	45.4	35.7	5.7			**0.5**			
	2006 (426)	0.2	**0.7**	[0.1 - 2.0]					0.9	11.5	50.0	31.7	4.9		0.2	**0.7**			
	2007 (332)	0.0	**0.6**	[0.1 - 2.2]					0.6	11.4	39.8	40.1	6.6	0.9		**0.6**			
	2008 (329)	0.9	**0.3**	[0.0 - 1.7]					1.2	10.6	42.9	30.4	13.7		0.9	**0.3**			
	2009 (404)	0.5	**0.2**	[0.0 - 1.4]					0.3	7.4	36.1	41.8	12.6	1.0	0.5	**0.3**			
	2010 (355)	0.0	**0.8**	[0.2 - 2.4]					2.0	23.7	50.1	20.8	2.3	0.3		**0.8**			
	2011 (393)	0.3	**0.3**	[0.0 - 1.4]				0.3	0.8	16.0	51.9	24.9	5.1	0.5	0.3	**0.3**			
Lincosamides																			
Clindamycin	2004 (510)	0.0	**0.4**	[0.0 - 1.4]			0.6	10.2	55.5	29.6	2.0	1.2	0.6			**0.4**			
	2005 (403)	0.0	**0.5**	[0.1 - 1.8]			0.5	8.4	55.1	30.3	4.5	0.7			**0.5**				
	2006 (426)	0.0	**0.7**	[0.1 - 2.0]			1.6	14.1	46.9	32.4	4.2				**0.7**				
	2007 (332)	0.0	**0.6**	[0.1 - 2.2]			1.2	12.7	58.4	24.7	2.4						**0.6**		
	2008 (329)	0.3	**0.9**	[0.2 - 2.6]			3.7	20.4	45.3	27.4	1.5	0.6		0.3	**0.6**	**0.3**			
	2009 (404)	0.2	**0.5**	[0.1 - 1.8]				3.7	42.8	45.8	6.2	0.5	0.2	0.2	**0.5**				
	2010 (355)	0.0	**0.6**	[0.1 - 2.0]			3.1	33.8	47.0	13.8	1.7				**0.3**	**0.3**			
	2011 (393)	0.0	**0.3**	[0.0 - 1.4]			0.5	29.8	45.0	21.1	2.5	0.5	0.3		**0.3**				
Macrolides																			
Azithromycin	2004 (510)	0.0	**0.8**	[0.2 - 2.0]		4.9	49.6	38.2	5.3	0.2	0.2	0.6	0.2						**0.8**
	2005 (403)	0.0	**0.5**	[0.1 - 1.8]		3.5	46.4	46.4	3.0	0.2									**0.5**
	2006 (426)	0.0	**0.9**	[0.3 - 2.4]		6.6	47.9	39.4	5.2										**0.9**
	2007 (332)	0.0	**0.6**	[0.1 - 2.2]		4.8	41.6	48.5	4.5										**0.6**
	2008 (329)	0.0	**1.2**	[0.3 - 3.1]		3.7	32.2	45.6	15.8	1.5									**1.2**
	2009 (404)	0.0	**1.0**	[0.3 - 2.5]		1.2	22.8	64.1	9.9	1.0									**1.0**
	2010 (355)	0.0	**0.6**	[0.1 - 2.0]		10.4	59.4	28.2	1.4										**0.6**
	2011 (393)	0.0	**0.5**	[0.1 - 1.8]		8.4	56.7	29.8	4.3	0.3									**0.5**
Erythromycin	2002 (198)	0.0	**0.0**	[0.0 - 1.8]							6.1	48.0	39.4	6.6					
	2003 (325)	0.0	**0.0**	[0.0 - 1.1]						0.9	18.5	55.7	21.2	3.7					
	2004 (510)	0.0	**0.8**	[0.2 - 2.0]				0.4	2.5	53.1	35.3	7.8							**0.8**
	2005 (403)	0.0	**0.5**	[0.1 - 1.8]				0.5	4.5	36.7	46.2	11.2	0.5						**0.5**
	2006 (426)	0.0	**0.9**	[0.3 - 2.4]					8.0	39.4	39.0	12.7							**0.9**
	2007 (332)	0.0	**0.6**	[0.1 - 2.2]				0.3	6.9	43.7	34.3	13.6	0.6						**0.6**
	2008 (329)	0.0	**1.2**	[0.3 - 3.1]				0.6	6.1	35.9	38.6	14.9	2.7						**1.2**
	2009 (404)	0.0	**1.0**	[0.3 - 2.5]					1.7	34.2	45.5	17.6						**0.2**	**0.7**
	2010 (355)	0.0	**0.6**	[0.1 - 2.0]				1.1	14.1	54.1	26.8	3.1	0.3						**0.6**
	2011 (393)	0.0	**0.5**	[0.1 - 1.8]				0.3	11.5	48.1	28.2	10.4	1.0						**0.5**
Phenicols																			
Florfenicol[5]	2004 (510)	N/A	**0.0**	[0.0 - 0.7]					0.6		5.1	85.9	8.0	0.4					
	2005 (403)	N/A	**0.0**	[0.0 - 0.9]							10.4	77.7	11.7	0.2					
	2006 (426)	N/A	**0.0**	[0.0 - 0.9]					0.2		8.2	77.9	13.6						
	2007 (332)	N/A	**0.0**	[0.0 - 1.1]							9.3	80.7	9.9						
	2008 (329)	N/A	**0.0**	[0.0 - 1.1]						0.6	14.9	73.6	10.3	0.6					
	2009 (404)	N/A	**0.0**	[0.0 - 0.9]						0.2	6.7	80.5	12.6						
	2010 (355)	N/A	**0.0**	[0.0 - 1.0]					0.3		33.5	63.1	2.8	0.3					
	2011 (393)	N/A	**0.0**	[0.0 - 0.9]						0.3	39.2	55.2	5.1	0.3					
Quinolones																			
Ciprofloxacin	2002 (198)	0.0	**15.2**	[10.5 - 20.9]				2.0	41.9	29.8	9.1	2.0				**12.1**	**2.5**	**0.5**	
	2003 (325)	0.3	**14.5**	[10.8 - 18.8]				2.2	58.2	21.5	3.4		0.3	**0.6**	**2.5**	**6.2**	**4.9**	**0.3**	
	2004 (510)	0.0	**15.1**	[12.1 - 18.5]			0.2	39.8	37.3	7.6				**0.4**	**9.0**	**4.5**	**1.2**		
	2005 (403)	0.0	**15.1**	[11.8 - 19.0]				24.8	50.9	8.9	0.2			**0.5**	**6.2**	**6.7**	**1.7**		
	2006 (426)	0.0	**16.7**	[13.3 - 20.6]			0.7	29.8	44.8	8.0				**0.2**	**7.0**	**7.5**	**1.9**		
	2007 (332)	0.0	**17.2**	[13.3 - 21.7]			0.9	30.1	44.0	7.8					**6.3**	**7.5**	**3.3**		
	2008 (329)	0.0	**14.6**	[11.0 - 18.9]			0.3	26.4	46.8	11.6	0.3				**4.0**	**7.9**	**2.7**		
	2009 (404)	0.0	**21.3**	[17.4 - 25.6]			0.5	8.4	58.2	11.7					**4.7**	**7.9**	**8.7**		
	2010 (355)	0.0	**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)	0.0	**22.4**	[18.4 - 26.8]			0.5	18.1	43.0	15.8		0.3		**0.8**	**6.9**	**11.2**	**3.0**	**0.5**	
Nalidixic acid	2004 (510)	0.2	**15.1**	[12.1 - 18.5]										64.3	20.4		0.2	**0.4**	**14.7**
	2005 (403)	0.2	**14.9**	[11.6 - 18.7]										69.0	15.9		0.2	**0.2**	**14.6**
	2006 (426)	0.0	**16.7**	[13.3 - 20.6]										71.4	12			**0.5**	**16.2**
	2007 (332)	0.0	**17.2**	[13.3 - 21.7]										69.3	13.6			**0.3**	**16.9**
	2008 (329)	0.0	**14.6**	[11.0 - 18.9]										69.3	15.8	0.3		**0.9**	**13.7**
	2009 (404)	0.0	**21.3**	[17.4 - 25.6]										59.4	19.3			**0.3**	**21.0**
	2010 (355)	0.0	**22.8**	[18.6 - 27.5]										60.3	16.6	0.3		**2.5**	**20.3**
	2011 (393)	0.8	**20.9**	[17.0 - 25.2]										43.5	33.8	1.0	0.8	**8.4**	**12.5**
Tetracyclines																			
Doxycycline	2002 (198)	9.1	**38.4**	[31.6 - 45.5]				15.2	16.2	6.6	4.0	2.5	8.1	9.1	**17.7**	**11.1**	**9.6**		
	2003 (325)	6.2	**40.6**	[35.2 - 46.2]				23.4	20.9	4.0	1.5	0.6	2.8	6.2	**17.8**	**16.6**	**6.2**		
Tetracycline	2004 (510)	0.2	**50.2**	[45.8 - 54.6]				0.6	24.3	15.3	7.6	1.8			0.2	**2.2**	**4.9**	**25.9**	**17.3**
	2005 (403)	0.0	**46.4**	[41.5 - 51.4]				0.7	19.1	20.6	9.4	3.2	0.5			**1.0**	**3.2**	**17.9**	**24.3**
	2006 (426)	0.0	**47.2**	[42.4 - 52.0]				1.4	23.2	13.8	10.3	2.8	0.7	0.5		**1.2**	**3.3**	**17.4**	**25.4**
	2007 (332)	0.0	**48.5**	[43.0 - 54.0]				1.2	13.3	21.1	10.5	5.1		0.3		**2.4**	**6.3**	**14.5**	**25.3**
	2008 (329)	0.0	**49.8**	[44.3 - 55.4]				0.6	16.1	19.5	9.7	3.7	0.6			**0.6**	**4.6**	**20.4**	**24.3**
	2009 (404)	0.0	**45.8**	[40.9 - 50.8]					16.4	23.8	10.7	2.2	0.7			**1.0**	**5.5**	**13.6**	**26.1**
	2010 (355)	0.0	**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)	0.8	**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**

[1] Percent of isolates with intermediate susceptibility.

[2] Percent of isolates that are resistant. 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 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] For Florfenicol, percent non-susceptible (MIC ≥8 µg/ml) is reported rather than percent resistant because a resistance breakpoint has not been established.

Table 19.2 MIC Distribution among *Campylobacter coli* from Retail Chicken, 2002-2011

Antimicrobial	Year (n)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 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**	[0.0 - 1.8]						23.3	75.6	1.1							
	2003 (325)	0.0	**0.0**	[0.0 - 1.1]					1.4	36.6	52.8	9.2							
	2004 (196)	0.0	**0.0**	[0.0 - 1.9]					0.5	4.1	85.7	9.7							
	2005 (151)	0.0	**0.0**	[0.0 - 2.4]						4.0	88.1	7.9							
	2006 (145)	0.0	**0.0**	[0.0 - 2.5]						2.8	93.1	4.1							
	2007 (143)	0.0	**0.7**	[0.0 - 3.8]					0.7	2.8	88.8	7.0					**0.7**		
	2008 (181)	0.0	**1.7**	[0.3 - 4.8]						1.1	73.5	23.2	0.6					**1.7**	
	2009 (176)	0.0	**5.7**	[2.8 - 10.2]							57.4	36.9						**5.7**	
	2010 (148)	0.0	**12.8**	[7.9 - 19.3]						2.7	75.0	9.5						**12.8**	
	2011 (210)	0.0	**18.1**	[13.1 - 24.0]						1.4	55.7	24.8						**18.1**	
Ketolides																			
Telithromycin	2004 (196)	2.6	**8.2**	[4.7 - 12.9]		0.5			1.0	20.4	5.6	18.9	35.7	7.1	2.6	**8.2**			
	2005 (151)	2.0	**7.9**	[4.2 - 13.5]					4.0	17.2	5.3	17.2	33.1	13.2	2.0	**7.9**			
	2006 (145)	0.7	**4.8**	[2.0 - 9.7]					1.4	13.1	2.1	11.7	47.6	18.6	0.7	**4.8**			
	2007 (143)	0.0	**7.0**	[3.4 - 12.5]						11.2	8.4	17.5	48.3	7.7		**7.0**			
	2008 (181)	1.7	**7.7**	[4.3 - 12.6]				0.6	0.6	14.4	6.1	22.1	32.6	14.4	1.7	**7.7**			
	2009 (176)	0.6	**4.5**	[2.0 - 8.8]					0.6	18.2	9.1	14.8	38.6	13.6	0.6	**4.5**			
	2010 (148)	0.0	**4.1**	[1.5 - 8.6]					6.8	27.0	3.4	26.4	28.4	4.1		**4.1**			
	2011 (210)	1.9	**3.8**	[1.7 - 7.4]					1.9	26.2	7.1	20.0	31.4	7.6	1.9	**3.8**			
Lincosamides																			
Clindamycin	2004 (196)	2.0	**7.1**	[4.0 - 11.7]				1.5	19.4	51.0	14.3	4.6		2.0	**3.1**	**4.1**			
	2005 (151)	1.3	**8.6**	[4.7 - 14.3]			0.7	0.7	20.5	42.4	25.2		0.7	1.3	**5.3**	**3.3**			
	2006 (145)	0.7	**4.8**	[2.0 - 9.7]			0.7	0.7	22.8	44.1	15.9	5.5	4.8	0.7	**4.8**				
	2007 (143)	1.4	**4.9**	[2.0 - 9.8]				0.7	16.8	60.8	11.9	3.5		1.4	**2.1**	**2.8**			
	2008 (181)	2.8	**5.0**	[2.3 - 9.2]				4.4	27.1	40.9	13.3	5.5	1.1	2.8	**2.8**	**1.1**	**1.1**		
	2009 (176)	1.7	**3.4**	[1.3 - 7.3]				0.6	8.5	60.2	19.3	3.4	2.8	1.7	**0.6**	**1.7**	**1.1**		
	2010 (148)	3.4	**1.4**	[0.2 - 4.8]				2.0	42.6	47.3	2.7		0.7	3.4	**0.7**	**0.7**			
	2011 (210)	1.9	**1.0**	[0.1 - 3.4]				5.2	40.0	39.5	7.6	2.4	2.4	1.9	**1.0**				
Macrolides																			
Azithromycin	2004 (196)	0.0	**9.2**	[5.5 - 14.1]			14.3	42.9	29.6	3.1	0.5	0.5							**9.2**
	2005 (151)	0.0	**9.9**	[5.7 - 15.9]			13.2	44.4	29.1	3.3									**9.9**
	2006 (145)	0.0	**5.5**	[2.4 - 10.6]			11.7	37.9	37.9	5.5	0.7	0.7							**5.5**
	2007 (143)	0.0	**6.3**	[2.9 - 11.6]			9.1	61.5	21.7	0.7		0.7							**6.3**
	2008 (181)	0.0	**9.9**	[6.0 - 15.3]			8.3	40.3	33.2	7.7	0.6								**9.9**
	2009 (176)	0.0	**4.5**	[2.0 - 8.8]			3.4	46.6	40.9	4.6									**4.5**
	2010 (148)	0.0	**4.1**	[1.5 - 8.6]		1.4	17.6	60.8	15.5	0.7									**4.1**
	2011 (210)	0.0	**4.3**	[2.0 - 8.0]			17.6	58.6	18.6	1.0									**4.3**
Erythromycin	2002 (90)	0.0	**7.8**	[3.2 - 15.4]						2.2	26.7	10.0	26.7	15.6	11.1				**7.8**
	2003 (142)	0.7	**7.0**	[3.4 - 12.6]						5.6	11.3	16.9	27.5	29.6	1.4	0.7			**7.0**
	2004 (196)	0.0	**9.2**	[5.5 - 14.1]					1.0	21.9	17.3	39.8	8.7	1.5	0.5				**9.2**
	2005 (151)	0.0	**9.9**	[5.7 - 15.9]					2.6	21.2	10.6	39.1	15.9	0.7					**9.9**
	2006 (145)	0.0	**5.5**	[2.4 - 10.6]					2.1	13.1	10.3	49.0	17.9	2.1					**5.5**
	2007 (143)	0.7	**6.3**	[2.9 - 11.6]				0.7	1.4	19.6	11.2	46.2	14.0			0.7		**6.3**	
	2008 (181)	0.0	**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)	0.0	**4.5**	[2.0 - 8.8]					0.6	17.6	25.6	39.8	10.8	1.1					**4.5**
	2010 (148)	0.0	**4.1**	[1.5 - 8.6]					8.1	26.4	27.7	31.1	2.7						**4.1**
	2011 (210)	0.5	**4.8**	[2.3 - 8.6]					3.3	30.0	24.3	32.4	4.8			0.5			**4.8**
Phenicols																			
Florfenicol[5]	2004 (196)	N/A	**0.0**	[0.0 - 1.9]							1.5	64.3	33.7	0.5					
	2005 (151)	N/A	**0.0**	[0.0 - 2.4]							3.3	55.6	39.1	2.0					
	2006 (145)	N/A	**0.0**	[0.0 - 2.5]							1.4	61.4	33.8	3.4					
	2007 (143)	N/A	**0.0**	[0.0 - 2.5]							2.1	78.3	19.6						
	2008 (181)	N/A	**0.0**	[0.0 - 2.0]							6.6	63.0	29.3	1.1					
	2009 (176)	N/A	**0.0**	[0.0 - 2.1]							1.7	59.1	37.5	1.7					
	2010 (148)	N/A	**0.0**	[0.0 - 2.5]							7.4	75.0	17.6						
	2011 (210)	N/A	**0.0**	[0.0 - 1.7]							7.1	77.6	14.8	0.5					
Quinolones																			
Ciprofloxacin	2002 (90)	0.0	**10.0**	[4.7 - 18.1]				1.1	27.8	36.7	16.7	7.8				**5.6**	**4.4**		
	2003 (142)	0.0	**13.4**	[8.3 - 20.1]				1.4	28.2	37.3	19.7				**0.7**	**0.7**	**11.3**	**0.7**	
	2004 (196)	0.0	**16.3**	[11.4 - 22.3]				23.0	36.7	23.5		0.5			**2.0**	**12.8**	**1.5**		
	2005 (151)	0.0	**29.1**	[22.0 - 37.1]				11.3	29.1	29.1	0.7	0.7			**7.3**	**15.2**	**6.6**		
	2006 (145)	0.0	**22.1**	[15.6 - 29.7]				6.2	36.6	31.7	3.4				**2.8**	**13.8**	**5.5**		
	2007 (143)	0.0	**25.9**	[18.9 - 33.9]				9.8	34.3	30.1					**3.5**	**18.2**	**4.2**		
	2008 (181)	0.0	**20.4**	[14.8 - 27.1]				7.2	45.9	25.4	1.1			**0.6**	**4.4**	**12.2**	**3.3**		
	2009 (176)	0.0	**18.2**	[12.8 - 24.7]				5.1	46.6	30.1				**0.6**	**4.0**	**5.7**	**7.4**	**0.6**	
	2010 (148)	0.0	**13.5**	[8.5 - 20.1]				14.9	49.3	21.0	1.4				**4.7**	**6.1**	**2.7**		
	2011 (210)	0.0	**18.1**	[13.1 - 24.0]				3.8	44.8	32.4	1.0				**3.8**	**11.0**	**3.3**		
Nalidixic acid	2004 (196)	0.0	**16.3**	[11.4 - 22.3]										47.4	34.7	1.5		**3.6**	**12.8**
	2005 (151)	0.0	**29.1**	[22.0 - 37.1]										44.4	26.5			**5.3**	**23.8**
	2006 (145)	0.0	**20.7**	[14.4 - 28.2]										51.0	24.8	3.4		**4.8**	**15.9**
	2007 (143)	0.0	**25.9**	[18.9 - 33.9]										50.3	22.4	1.4		**6.3**	**19.6**
	2008 (181)	0.0	**20.4**	[14.8 - 27.1]										47.5	31.5	0.55		**5.5**	**14.9**
	2009 (176)	0.0	**18.2**	[12.8 - 24.7]										40.3	37.5	4.0		**5.1**	**13.1**
	2010 (148)	0.7	**13.5**	[8.5 - 20.1]										56.8	29.1		0.7	**8.8**	**4.7**
	2011 (210)	1.0	**17.1**	[12.3 - 22.9]										25.7	53.8	2.4	1.0	**9.5**	**7.6**
Tetracyclines																			
Doxycycline	2002 (90)	0.0	**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)	0.7	**50.7**	[42.2 - 59.2]				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)	0.0	**46.4**	[39.3 - 53.7]					6.6	21.4	9.7	9.7	5.6	0.5			**1.0**	**2.6**	**42.9**
	2005 (151)	0.0	**42.4**	[34.4 - 50.7]					2.6	22.5	11.3	13.9	5.3	2.0			**1.3**	**4.6**	**36.4**
	2006 (145)	0.0	**46.9**	[38.6 - 55.4]					2.8	19.3	18.6	6.9	5.5					**3.4**	**43.4**
	2007 (143)	0.0	**39.9**	[31.8 - 48.4]				0.7	0.7	32.9	18.2	6.3	1.4					**3.5**	**36.4**
	2008 (181)	0.6	**46.4**	[39.0 - 54.0]					0.6	24.9	21.5	3.3	1.7	1.1	0.6			**2.8**	**43.6**
	2009 (176)	0.6	**38.1**	[30.9 - 45.7]					2.3	19.3	23.3	9.7	6.8		0.6			**2.3**	**35.8**
	2010 (148)	0.7	**39.2**	[31.3 - 47.5]					2.0	30.4	14.9	8.1	4.1	0.7	0.7			**2.7**	**36.5**
	2011 (210)	1.0	**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**

[1] Percent of isolates with intermediate susceptibility.
[2] Percent of isolates that were resistant. Discrepancies between %R and sums of distribution %s are due to rounding.
[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] For Florfenicol, percent non-susceptible (MIC ≥8 µg/ml) is reported rather than percent resistant because a resistance breakpoint has not been established.

Table 20. *Enterococcus* Species by Meat Type, 2002 - 2011[1]

	Species	2002		2003		2004		2005		2006		2007		2008		2009		2010		2011	
Total (a) Isolates per Year	*E. faecalis*	893		1014		855		1001		945		852		901		884		1221		1181	
	E. faecium	506		575		757		618		649		357		341		353		335		380	
	E. hirae	102		129		129		117		115		87		70		36		74		64	
	Total (A)[2]	1520		1742		1755		1765		1731		1312		1337		1307		1677		1674	
Meat Type	**Species**	**n**	**%[3]**	**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%
	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%
	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%
	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%**
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%
	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%
	E. hirae	2	2.0%	3	2.3%	–	–	1	0.9%	3	2.6%	2	2.3%	–	–	–	–	2	2.7%	–	–
	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%**
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%
	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%
	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%
	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%**
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%
	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%
	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%
	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%**

[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, 2002-2011[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 (MIC ≥ 512)	KAN (MIC ≥ 1024)	STR (MIC ≥ 1024)	VAN (MIC ≥ 32)	TGC (MIC ≥ 1)	LIN (MIC ≥ 8)	DAP (MIC > 4)	ERY (MIC ≥ 8)	TYL (MIC ≥ 32)	NIT (MIC ≥ 128)	LZD (MIC ≥ 8)	PEN (MIC ≥ 16)	CHL (MIC ≥ 32)	CIP (MIC ≥ 4)	QDA[3] (MIC ≥ 4)	TET (MIC ≥ 16)
Chicken Breast	2002 (381)	10.0%	15.7%	21.0%	–	Not Tested	91.9%	Not Tested	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%	Not Tested	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%	3.0%	17.0%	15.0%	65.5%	–	30.9%	–	40.8%	29.9%	49.1%
	2005 (457)	9.6%	16.0%	15.5%	–	–	85.1%	1.3%	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%	1.1%	16.6%	16.2%	26.4%	–	15.4%	–	26.2%	35.0%	56.7%
	2007 (339)	13.0%	18.6%	9.1%	–	–	90.3%	0.3%	30.1%	29.8%	18.6%	–	7.4%	–	11.5%	54.6%	66.4%
	2008 (348)	14.9%	20.1%	9.5%	–	–	90.8%	0.3%	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%	3.7%	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%	3.9%	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%	2.5%	27.9%	27.3%	23.3%	–	9.9%	–	17.1%	30.0%	53.8%
	P-value[4]	<0.0001	0.0012	0.1454	N/A	N/A	0.8494	<0.0001	0.7868	0.6543	<0.0001	N/A	<0.0001	0.0957	0.8747	<0.0001	0.4860
Ground Turkey	2002 (387)	20.4%	28.9%	27.6%	–	Not Tested	96.6%	Not Tested	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%	Not Tested	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%	3.0%	37.1%	34.6%	27.0%	–	24.3%	–	24.7%	62.7%	87.0%
	2005 (452)	17.9%	28.1%	24.8%	–	–	96.2%	1.3%	38.5%	36.1%	11.9%	–	15.5%	–	12.2%	61.1%	85.8%
	2006 (435)	19.8%	32.4%	20.9%	–	–	98.4%	1.1%	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%	1.5%	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%	1.8%	41.2%	34.8%	8.5%	–	14.0%	–	8.8%	67.7%	86.6%
	2010 (417)	33.8%	41.2%	27.8%	–	–	95.7%	2.2%	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%	0.7%	45.5%	44.6%	3.7%	–	7.1%	0.2%	5.5%	53.5%	91.5%
	P-value	<0.0001	<0.0001	0.0631	N/A	N/A	0.2784	0.0860	0.0022	0.0011	<0.0001	N/A	<0.0001	0.3740	<0.0001	0.1750	0.0535
Ground Beef	2002 (383)	1.8%	2.1%	3.9%	–	Not Tested	91.9%	Not Tested	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%	Not Tested	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%	4.7%	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%	1.6%	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%	1.4%	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%	1.5%	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%	3.6%	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%	3.4%	3.1%	2.5%	4.3%	–	1.5%	–	4.6%	13.0%	27.2%
	2010 (415)	0.2%	1.7%	1.4%	–	–	94.7%	2.4%	2.9%	2.7%	2.7%	–	0.5%	0.7%	2.4%	2.3%	24.3%
	2011 (423)	–	2.1%	2.4%	–	–	92.7%	1.4%	4.5%	4.3%	6.9%	–	0.7%	0.5%	3.3%	8.4%	25.5%
	P-value	0.0119	<0.0001	0.0040	N/A	N/A	0.0002	0.0649	0.0001	0.0014	<0.0001	N/A	0.8733	0.5690	<0.0001	<0.0001	0.0726
Pork Chop	2002 (369)	2.2%	4.1%	8.9%	–	Not Tested	97.0%	Not Tested	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%	Not Tested	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%	0.3%	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%	0.3%	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%	0.7%	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%
	P-value	0.4356	0.0266	0.0935	N/A	N/A	0.7572	0.0881	0.0030	0.0205	0.0028	N/A	0.5239	0.8964	0.0331	<0.0001	0.5822

[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 presented for all species except *E. faecalis* , which 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.

Figure 8. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Retail Chicken and Ground Turkey, 2002-2011

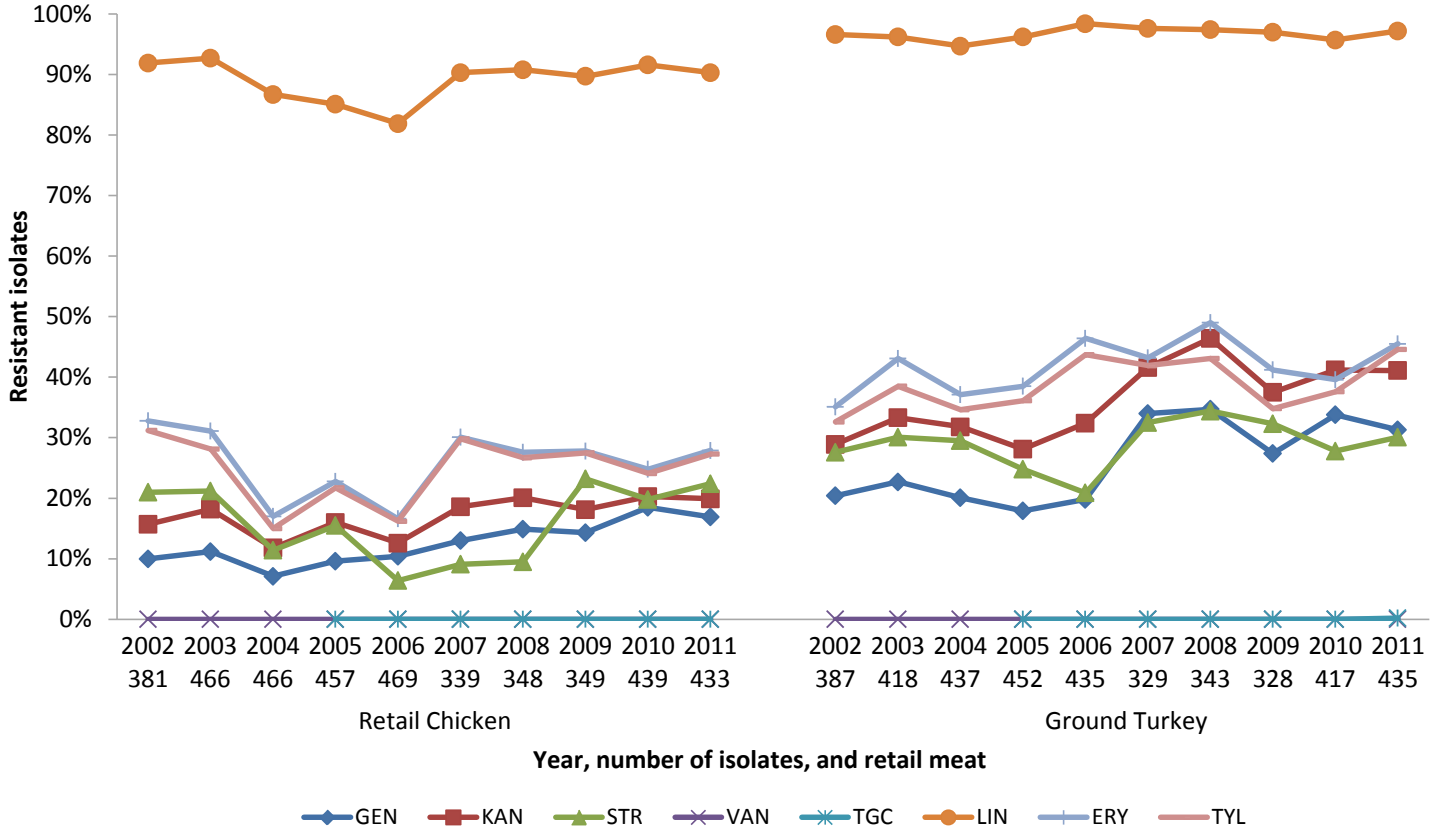


Figure 9. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Ground Beef and Pork Chop, 2002-2011

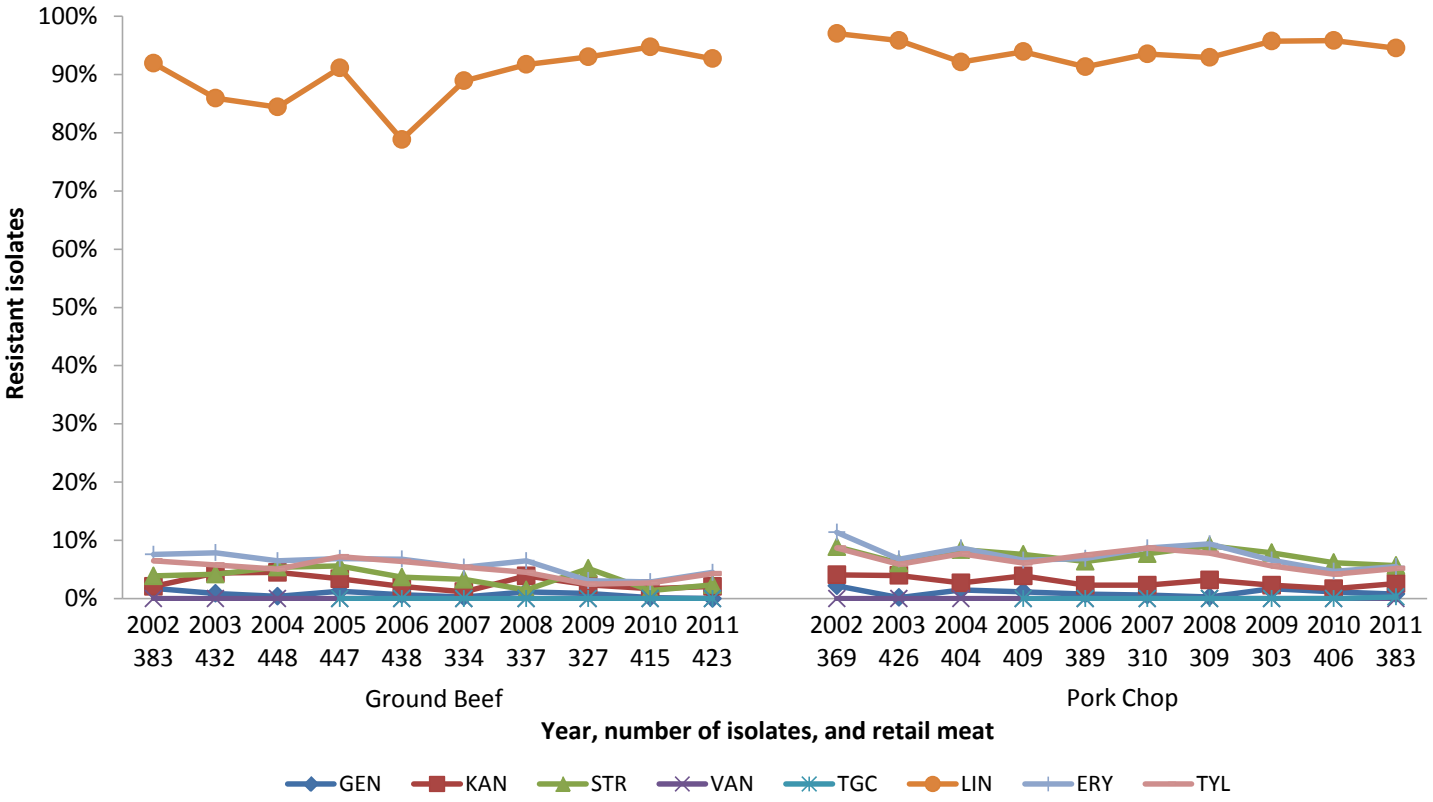


Figure 10. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Retail Chicken and Ground Turkey, 2002-2011

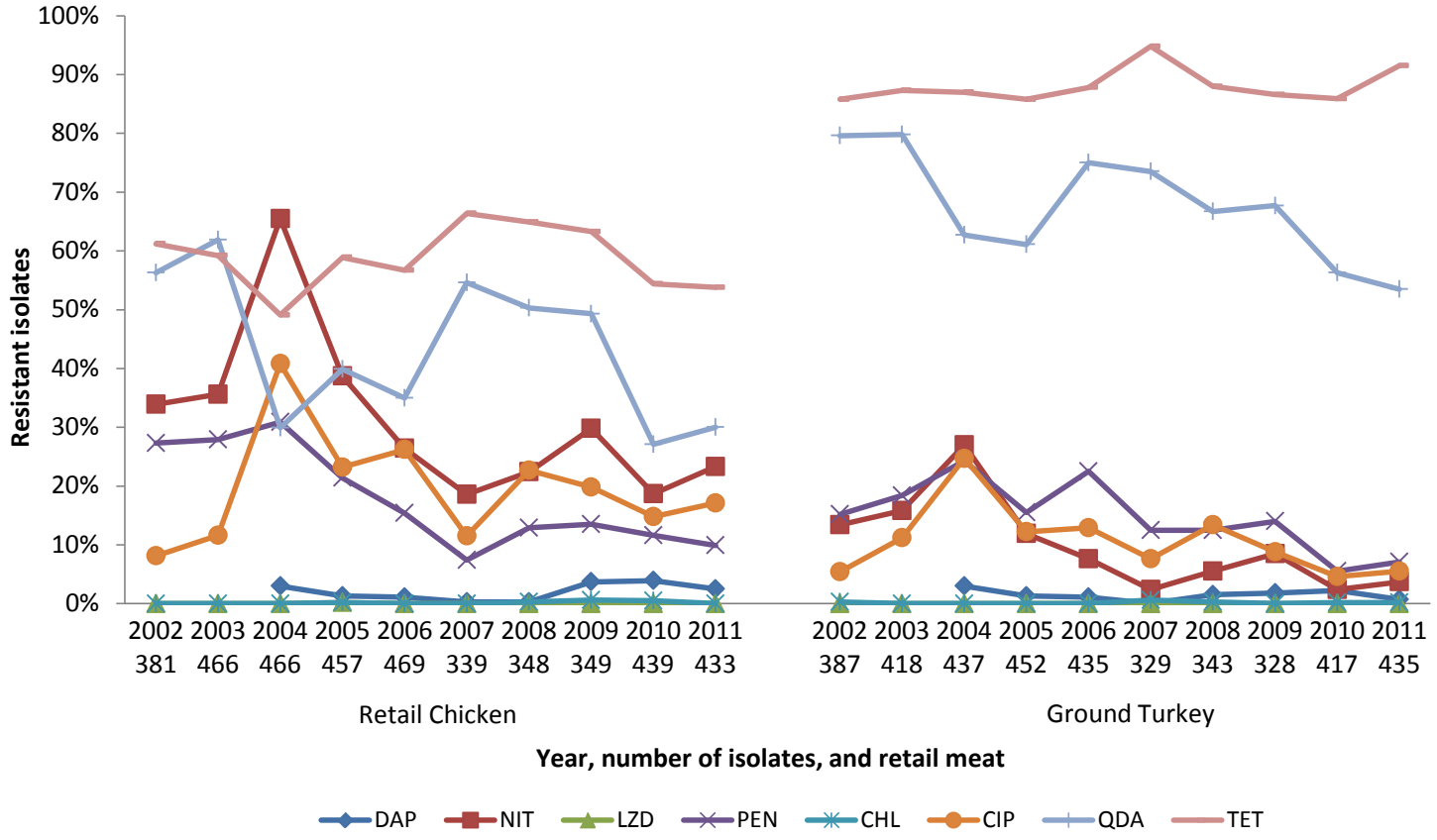


Figure 11. Temporal variation in resistance to selected antimicrobials in *Enterococcus* isolates from Ground Beef and Pork Chop, 2002-2011

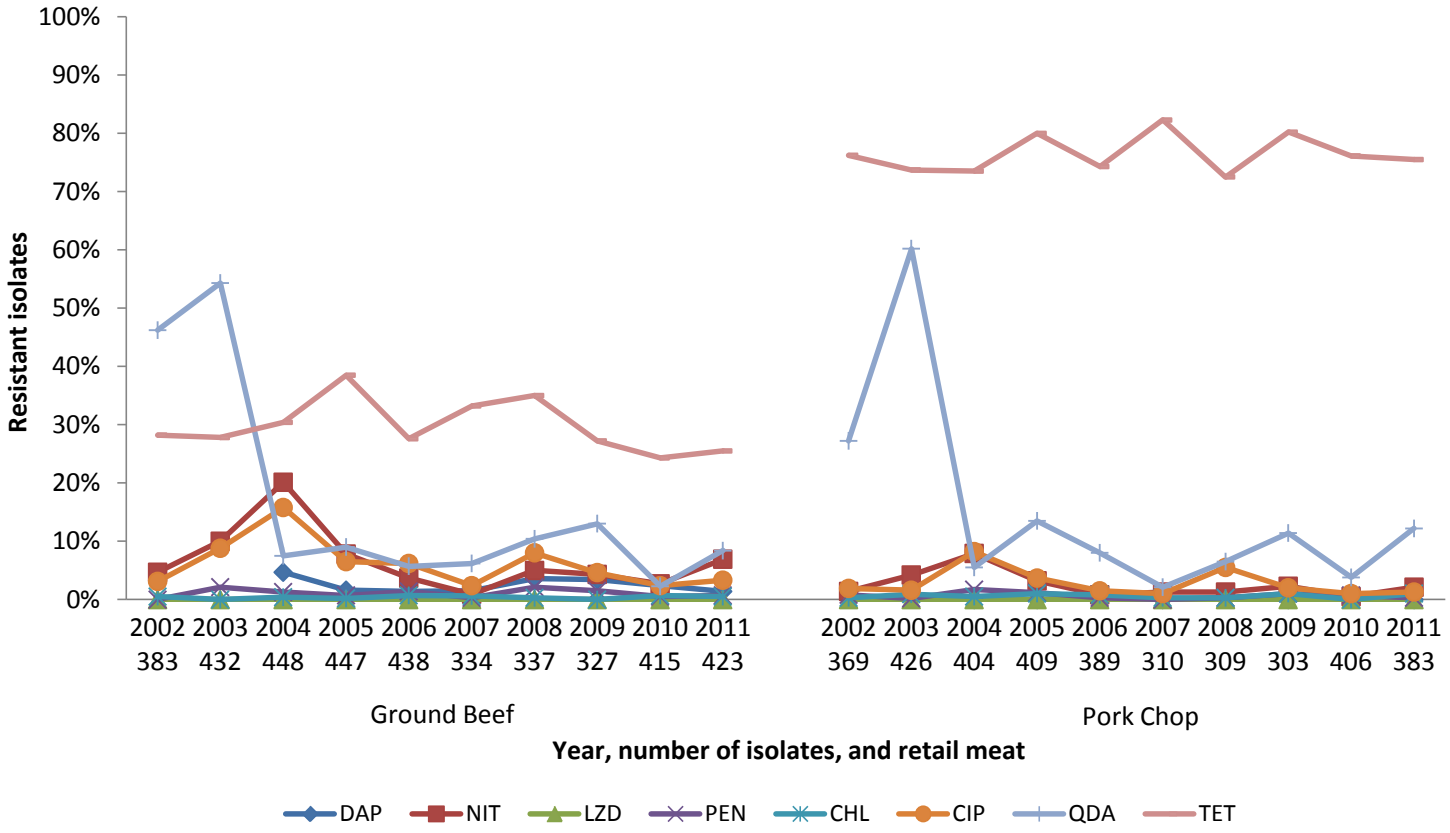


Table 22.1 Trends in Antimicrobial Resistance among *Enterococcus faecalis* by Meat Type, 2002-2011[1,2]

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%
	P-value[4]	0.0079	0.0631	0.0022	N/A	N/A	0.5729	N/A	0.0172	0.0099	0.0518	N/A	N/A	0.1513	0.1372	N/A	0.5571
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%	–	–	98.5%	–	47.2%	47.2%	–	–	–	0.3%	0.3%		92.3%
	P-value	<0.0001	<0.0001	0.0857	N/A	N/A	0.5188	0.9129	0.0004	0.0012	<0.0001	N/A	0.4272	0.5115	0.0313	N/A	0.0081
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%
	P-value	0.0094	0.0823	0.0003	N/A	N/A	0.4080	N/A	0.0893	0.0375	0.6697	N/A	N/A	0.2135	0.0051	N/A	0.1401
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%
	P-value	0.3377	0.0133	0.0832	N/A	N/A	0.8864	N/A	0.0074	0.0066	N/A	N/A	0.9077	0.5593	0.0233	N/A	0.6908

[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 presented for all species except *E. faecalis*, which 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, 2002-2011[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	TET
Retail Chicken	2002 (231)	3.0%	6.5%	16.9%	–	Not Tested	87.0%	Not Tested	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%	Not Tested	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%	4.0%	12.6%	10.3%	85.3%	–	39.1%	–	52.3%	31.6%	45.1%
	2005 (307)	6.2%	10.7%	14.0%	–	–	78.2%	1.6%	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%	1.6%	9.5%	7.9%	38.4%	–	22.2%	–	37.5%	36.5%	53.0%
	2007 (189)	9.5%	12.2%	3.7%	–	–	84.1%	0.5%	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%	6.4%	19.8%	19.3%	51.5%	–	23.3%	–	34.2%	50.0%	56.9%
	2010 (197)	6.1%	5.6%	26.4%	–	–	82.2%	6.6%	13.7%	12.2%	40.1%	–	24.4%	–	32.5%	28.9%	35.5%
	2011 (221)	9.5%	9.5%	27.1%	–	–	81.9%	3.2%	21.7%	20.4%	41.6%	–	18.6%	–	33.5%	32.1%	43.4%
	P-Value[3]	0.0225	0.8697	<0.0001	N/A	N/A	0.0782	<0.0001	0.4212	0.1982	<0.0001	N/A	<0.0001	N/A	<0.0001	0.0001	0.0170
Ground Turkey	2002 (89)	15.7%	39.3%	39.3%	–	Not Tested	94.4%	Not Tested	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%	Not Tested	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%	7.6%	43.0%	35.5%	66.9%	–	61.6%	–	53.5%	64.5%	86.6%
	2005 (107)	12.1%	29.9%	34.6%	–	–	92.5%	4.7%	41.1%	29.9%	43.0%	–	59.8%	–	43.9%	63.6%	91.6%
	2006 (139)	15.1%	33.8%	22.3%	–	–	97.8%	3.6%	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%	5.7%	37.1%	12.9%	27.1%	–	61.4%	–	54.3%	68.6%	81.4%
	2009 (66)	18.2%	33.3%	51.5%	–	–	93.9%	9.1%	56.1%	24.2%	40.9%	–	69.7%	–	40.9%	69.7%	92.4%
	2010 (45)	6.7%	15.6%	28.9%	–	–	86.7%	20.0%	33.3%	15.6%	22.2%	–	48.9%	–	42.2%	57.8%	71.1%
	2011 (40)	10.0%	25.0%	55.0%	–	–	87.5%	7.5%	32.5%	22.5%	40.0%	–	75.0%	–	57.5%	55.0%	82.5%
	P-Value	0.6764	0.4573	0.0360	N/A	N/A	0.2591	0.2396	0.9028	0.1871	0.0003	N/A	0.0114	N/A	0.0349	0.1443	0.1136
Ground Beef	2002 (93)	1.1%	4.3%	3.2%	–	Not Tested	76.3%	Not Tested	11.8%	6.5%	18.3%	–	–	1.1%	12.9%	47.3%	22.6%
	2003 (112)	–	8.0%	2.7%	–	Not Tested	58.9%	Not Tested	8.9%	0.9%	36.6%	–	8.0%	–	33.0%	50.0%	28.6%
	2004 (162)	–	8.6%	5.6%	–	Not Tested	67.9%	0.6%	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%	0.8%	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%	1.4%	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%	1.2%	6.1%	3.7%	28.0%	–	3.7%	–	17.1%	11.0%	22.0%
	P-Value	0.7282	0.7993	0.3315	N/A	N/A	0.1927	0.4518	0.2139	0.6835	<0.0001	N/A	0.1402	0.8169	0.0712	<0.0001	0.6360
Pork Chop	2002 (93)	1.1%	3.2%	5.4%	–	Not Tested	90.3%	Not Tested	20.4%	9.7%	5.4%	–	3.2%	–	4.3%	24.7%	68.8%
	2003 (97)	–	2.1%	3.1%	–	Not Tested	89.7%	Not Tested	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%	2.9%	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%	3.1%	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%
	P-Value	N/A	0.6597	0.4265	N/A	N/A	<0.0001	0.1153	0.1950	0.6115	0.9478	N/A	0.1513	N/A	0.0170	<0.0001	0.0005

[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] 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, 2002-2011[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	TET
Retail Chicken	2002 (12)	8.3%	16.7%	16.7%	–	Not Tested	100.0%	Not Tested	16.7%	16.7%	8.3%	–	8.3%	–	8.3%	66.7%	83.3%
	2003 (28)	–	28.6%	42.9%	–	Not Tested	100.0%	Not Tested	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%	3.3%	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%	6.3%	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%	16.7%	41.7%	41.7%	4.2%	–	8.3%	–	–	16.7%	50.0%
	2011 (18)	11.1%	16.7%	5.6%	–	–	100.0%	22.2%	16.7%	16.7%	5.6%	–	5.6%	–	–	5.6%	72.2%
	P-Value[3]	0.1330	0.2489	0.0077	N/A	N/A	0.9757	0.0016	0.2656	0.3745	0.1747	N/A	0.1400	N/A	0.4836	<0.0001	0.8685
Ground Turkey[4]	2002 (2)	–	–	50.0%	–	Not Tested	100.0%	Not Tested	–	–	50.0%	–	–	–	–	50.0%	100.0%
	2003 (3)	–	66.7%	–	–	Not Tested	100.0%	Not Tested	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%
	2011 (2)	–	–	–	–	–	50.0%	–	50.0%	50.0%	–	–	–	–	–	50.0%	50.0%
	P-Value	N/A	0.3827	0.4607	N/A	N/A	0.3814	N/A	0.7550	0.7550	0.6070	N/A	0.2761	N/A	0.3689	0.9803	0.4965
Ground Beef	2002 (76)	–	–	2.6%	–	Not Tested	93.4%	Not Tested	19.7%	19.7%	–	–	–	1.3%	–	44.7%	60.5%
	2003 (84)	–	3.6%	3.6%	–	Not Tested	91.7%	Not Tested	15.5%	15.5%	–	–	–	–	–	60.7%	46.4%
	2004 (88)	–	–	–	–	Not Tested	85.2%	22.7%	8.0%	8.0%	6.8%	–	1.1%	–	1.1%	10.2%	53.4%
	2005 (82)	1.2%	1.2%	4.9%	–	–	98.8%	8.5%	17.1%	17.1%	4.9%	–	–	–	–	11.0%	65.9%
	2006 (77)	1.3%	1.3%	2.6%	–	–	81.8%	5.2%	14.3%	15.6%	–	–	–	–	–	5.2%	53.2%
	2007 (57)	–	–	1.8%	–	–	96.5%	8.8%	17.5%	19.3%	–	–	–	–	1.8%	5.3%	52.6%
	2008 (49)	–	2.0%	–	–	–	91.8%	20.4%	12.2%	12.2%	–	–	–	–	–	4.1%	53.1%
	2009 (26)	–	–	–	–	–	88.5%	38.5%	3.8%	3.8%	–	–	–	–	–	7.7%	50.0%
	2010 (41)	–	–	–	–	–	95.1%	24.4%	14.6%	14.6%	–	–	–	–	–	7.3%	43.9%
	2011 (44)	–	–	–	–	–	84.1%	11.4%	13.6%	13.6%	2.3%	–	–	–	–	9.1%	38.6%
	P-Value	0.8661	0.3632	0.0908	N/A	N/A	0.2093	<0.0001	0.3442	0.3800	0.4018	N/A	N/A	N/A	0.8247	<0.0001	0.0659
Pork Chop	2002 (12)	–	–	–	–	Not Tested	100.0%	Not Tested	–	–	–	–	–	–	–	25.0%	66.7%
	2003 (14)	–	–	–	–	Not Tested	100.0%	Not Tested	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%	28.6%	–	–	–	–	–	–	–	–	85.7%
	2011 (2)	–	–	50.0%	–	–	100.0%	–	50.0%	50.0%	–	–	–	–	–	50.0%	50.0%
	P-Value	N/A	N/A	0.2869	N/A	N/A	0.7554	N/A	0.2678	0.3345	0.5479	N/A	N/A	N/A	0.8414	0.0938	0.1052

[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] 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.

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

Table 23.1 Multidrug Resistance among *Enterococcus faecalis* Isolates by Antimicrobial Class, 2002-2011[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested by Source	Retail Chicken	134	188	88	116	126	123	165	138	214	186
	Ground Turkey	294	289	260	339	291	261	271	260	369	392
	Ground Beef	210	224	194	226	227	205	202	227	285	269
	Pork Chop	255	313	313	320	301	263	263	259	353	334
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
	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
	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
	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
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
	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
	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
	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
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
	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
	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
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
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, 2002-2011[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested by Source	Retail Chicken	231	248	348	307	315	189	163	202	197	221
	Ground Turkey	89	118	172	107	139	65	70	66	45	40
	Ground Beef	93	112	162	129	125	70	73	59	61	82
	Pork Chop	93	97	75	75	70	33	35	26	32	37
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
	Ground Turkey	–	–	0.6% 1	–	–	1.5% 1	2.9% 2	1.5% 1	6.7% 3	5.0% 2
	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
	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
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	67.3% 136	50.8% 100	55.2% 122
	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	80.0% 36	85.0% 34
	Ground Beef	31.2% 29	40.2% 45	27.2% 44	15.5% 20	10.4% 13	7.1% 5	28.8% 21	20.3% 12	9.8% 6	20.7% 17
	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
3. Resistance to ≥ 4 Antimicrobial Classes	Retail Chicken	49.4% 114	52.8% 131	53.2% 185	44.0% 135	36.5% 115	39.2% 74	51.5% 84	56.4% 114	38.1% 75	42.5% 94
	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	66.7% 30	75.0% 30
	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
	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	29.6% 103	28.7% 88	17.1% 54	16.9% 32	34.4% 56	41.1% 83	25.4% 50	24.0% 53
	Ground Turkey	66.3% 59	68.6% 81	63.4% 109	57.0% 61	58.3% 81	38.5% 25	55.7% 39	65.2% 43	46.7% 21	62.5% 25
	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
	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	15.5% 54	16.0% 49	10.5% 33	10.6% 20	23.3% 38	16.3% 33	12.2% 24	11.8% 26
	Ground Turkey	47.2% 42	43.2% 51	46.5% 80	38.3% 41	30.9% 43	15.4% 10	31.4% 22	48.5% 32	24.4% 11	50.0% 20
	Ground Beef	–	4.5% 5	4.3% 7	–	2.4% 3	–	4.1% 3	1.7% 1	1.6% 1	2.4% 2
	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.

Table 24.1 MIC Distribution among *Enterococcus faecalis* and *E. faecium* from Retail Chicken, 2011

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	**26.9**	[20.7 - 33.9]														69.4	3.8	**0.5**	**7.0**	**19.4**	
	faecium	N/A	**9.5**	[6.0 - 14.2]														90.5			**0.5**	**9.1**	
Kanamycin	*faecalis*	N/A	**33.3**	[26.6 - 40.6]														65.6		1.1	**0.5**	**32.8**	
	faecium	N/A	**9.5**	[6.0 - 14.2]														74.2	14.0	2.3	**0.5**	**9.1**	
Streptomycin	*faecalis*	N/A	**19.4**	[13.9 - 25.8]																80.7		**3.2**	**16.1**
	faecium	N/A	**27.1**	[21.4 - 33.5]																72.9	**14.9**	**9.0**	**3.2**
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 2.0]						0.5	55.9	38.7	4.8										
	faecium	0.0	**0.0**	[0.0 - 1.7]						56.6	27.6	14.5	1.4										
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.0**	[0.0 - 2.0]		10.8	43.6	38.2	7.5														
	faecium	N/A	**0.0**	[0.0 - 1.7]		22.6	61.1	12.2	4.1														
Lincosamides																							
Lincomycin	*faecalis*	0.0	**98.9**	[96.2 - 99.9]							0.5	0.5			**98.9**								
	faecium	0.0	**81.9**	[76.2 - 86.7]							17.7	0.5		**1.8**	**80.1**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 2.0]						3.8	65.0	31.2											
	faecium	N/A	**3.2**	[1.3 - 6.4]							3.2	19.0	74.7	**3.2**									
Macrolides																							
Erythromicin	*faecalis*	45.7	**35.5**	[28.6 - 42.8]					14.0	4.8	21.5	23.7	0.5	**0.5**	**34.9**								
	faecium	54.2	**21.7**	[16.5 - 27.7]					12.7	11.3	16.7	33.9	3.6	**1.8**	**19.9**								
Tylosin	*faecalis*	0.0	**35.5**	[28.6 - 42.8]						0.5	18.3	45.7					**35.5**						
	faecium	0.5	**20.4**	[15.3 - 26.3]							16.7	19.5	36.7	6.3	0.5	**20.4**							
Nitrofurans																							
Nitrofurantoin	*faecalis*	3.8	**0.5**	[0.0 - 3.0]										29.0	65.6	1.1	3.8	**0.5**					
	faecium	57.5	**41.6**	[35.1 - 48.4]												0.9	57.5	**41.6**					
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 2.0]							81.2	18.8											
	faecium	0.0	**0.0**	[0.0 - 1.7]						1.4	77.4	21.3											
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 2.0]								15.1	84.9										
	faecium	N/A	**18.6**	[13.7 - 24.3]					1.8	0.9	3.6	11.8	51.6	11.8	**10.4**	**8.1**							
Phenicols																							
Chloramphenicol	*faecalis*	0.5	**0.0**	[0.0 - 2.0]									41.9	57.5	0.5								
	faecium	0.0	**0.0**	[0.0 - 1.7]								0.5	82.8	16.7									
Quinolones																							
Ciprofloxacin	*faecalis*	41.4	**0.0**	[0.0 - 2.0]						2.2	56.5	41.4											
	faecium	53.9	**33.5**	[27.3 - 40.1]						1.8	10.9	53.9	**24.4**	**9.1**									
Streptogramins																							
Quinupristin-	*faecalis*[5]																						
Dalfopristin	*faecium*	44.3	**32.1**	[26.0 - 38.7]						17.7	5.9	44.3	**5.4**	**14.0**	**5.4**	**7.2**							
Tetracyclines																							
Tetracycline	*faecalis*	0.0	**63.4**	[56.1 - 70.4]							36.6				**0.5**	**4.3**	**58.6**						
	faecium	5.4	**43.4**	[36.8 - 50.3]							48.0	0.9	2.3	5.4	**1.8**	**0.9**	**40.7**						

[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] 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, 2011

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	**33.7**	[29.0 - 38.6]														65.8	0.5		**1.5**	**32.1**	
	faecium	N/A	**10.0**	[2.8 - 23.7]														90.0			**2.5**	**7.5**	
Kanamycin	*faecalis*	N/A	**42.9**	[37.9 - 47.9]														56.4	0.3	0.5		**42.9**	
	faecium	N/A	**25.0**	[12.7 - 41.2]														72.5	2.5		**2.5**	**22.5**	
Streptomycin	*faecalis*	N/A	**27.6**	[23.2 - 32.3]																72.5	**0.3**	**0.5**	**26.8**
	faecium	N/A	**55.0**	[38.5 - 70.7]																45.0	**12.5**	**25.0**	**17.5**
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 0.9]							62.5	33.7	3.8										
	faecium	0.0	**0.0**	[0.0 - 8.8]					2.5	47.5	27.5	22.5											
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.3**	[0.0 - 1.4]		2.0	27.3	61.2	9.2	0.3													
	faecium	N/A	**0.0**	[0.0 - 8.8]		10.0	60.0	27.5	2.5														
Lincosamides																							
Lincomycin	*faecalis*	0.5	**98.5**	[96.7 - 99.4]							1.0		0.5	**0.3**	**98.2**								
	faecium	0.0	**87.5**	[73.2 - 95.8]							12.5			**7.5**	**80.0**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 0.9]						4.1	72.5	23.5											
	faecium	N/A	**7.5**	[1.6 - 20.4]							5.0	22.5	65.0	**7.5**									
Macrolides																							
Erythromicin	*faecalis*	29.1	**47.2**	[42.2 - 52.3]					20.4	3.3	11.0	18.1		**0.3**	**46.9**								
	faecium	40.0	**32.5**	[18.6 - 49.1]					20.0	7.5	5.0	22.5	12.5	**7.5**	**25.0**								
Tylosin	*faecalis*	0.0	**47.2**	[42.2 - 52.3]							17.6	35.0	0.3				**47.2**						
	faecium	0.0	**22.5**	[10.8 - 38.5]							17.5	22.5	37.5				**22.5**						
Nitrofurans																							
Nitrofurantoin	*faecalis*	2.6	**0.0**	[0.0 - 0.9]										35.7	61.2	0.5	2.6						
	faecium	60.0	**40.0**	[24.9 - 56.7]													60.0	**40.0**					
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 0.9]						0.5	78.8	20.7											
	faecium	0.0	**0.0**	[0.0 - 8.8]						5.0	80.0	15.0											
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 0.9]							2.6	14.8	82.7										
	faecium	N/A	**75.0**	[58.8 - 87.3]								5.0	17.5	2.5	**20.0**	**55.0**							
Phenicols																							
Chloramphenicol	*faecalis*	0.0	**0.3**	[0.0 - 1.4]									30.1	69.6			**0.3**						
	faecium	0.0	**0.0**	[0.0 - 8.8]									80.0	20.0									
Quinolones																							
Ciprofloxacin	*faecalis*	35.5	**0.3**	[0.0 - 1.4]						3.3	61.0	35.5	**0.3**										
	faecium	27.5	**57.5**	[40.9 - 73.0]					2.5	2.5	10.0	27.5	**52.5**	**5.0**									
Streptogramins																							
Quinupristin-	*faecalis*[5]																						
Dalfopristin	*faecium*	27.5	**55.0**	[38.5 - 70.7]						10.0	7.5	27.5	**7.5**	**10.0**	**22.5**	**15.0**							
Tetracyclines																							
Tetracycline	*faecalis*	0.3	**92.3**	[89.3 - 94.8]							7.4			0.3		**3.3**	**89.0**						
	faecium	0.0	**82.5**	[67.2 - 92.7]							17.5						**82.5**						

[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 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] 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, 2011

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 - 1.4]														100.0					
	faecium	N/A	**0.0**	[0.0 - 4.4]														100.0					
Kanamycin	*faecalis*	N/A	**1.5**	[0.4 - 3.8]														98.5			**0.4**	**1.1**	
	faecium	N/A	**6.1**	[2.0 - 13.7]														82.9	11.0		**1.2**	**4.9**	
Streptomycin	*faecalis*	N/A	**1.9**	[0.6 - 4.3]																98.1			**1.9**
	faecium	N/A	**6.1**	[2.0 - 13.7]																93.9	**1.2**	**2.4**	**2.4**
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 1.4]						0.7	55.8	40.9	2.6										
	faecium	0.0	**0.0**	[0.0 - 4.4]					6.1	78.1	9.8	6.1											
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.0**	[0.0 - 1.4]		17.5	61.7	16.7	4.1														
	faecium	N/A	**0.0**	[0.0 - 4.4]	1.2	25.6	57.3	15.9															
Lincosamides																							
Lincomycin	*faecalis*	0.0	**97.4**	[94.7 - 98.9]							2.6			**0.7**	**96.7**								
	faecium	2.4	**79.3**	[68.9 - 87.4]							17.1	1.2	2.4	**32.9**	**46.3**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 1.4]					0.4	8.6	52.0	38.7	0.4										
	faecium	N/A	**1.2**	[0.0 - 6.6]						1.2	4.9	35.4	57.3	1.2									
Macrolides																							
Erythromicin	*faecalis*	76.6	**3.0**	[1.3 - 5.8]					14.5	6.0	39.8	32.0	4.8		**3.0**								
	faecium	75.6	**6.1**	[2.0 - 13.7]					15.9	2.4	14.6	42.7	18.3	**2.4**	**3.7**								
Tylosin	*faecalis*	0.0	**3.0**	[1.3 - 5.8]						0.7	29.4	66.9				**3.0**							
	faecium	1.2	**3.7**	[0.8 - 10.3]							17.1	20.7	32.9	24.4	1.2	**3.7**							
Nitrofurans																							
Nitrofurantoin	*faecalis*	0.0	**0.0**	[0.0 - 1.4]										17.1	82.2	0.7							
	faecium	70.7	**28.0**	[18.7 - 39.1]												1.2	70.7		**28.1**				
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 1.4]						0.4	62.5	37.2											
	faecium	0.0	**0.0**	[0.0 - 4.4]							58.5	41.5											
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 1.4]								18.6	81.4										
	faecium	N/A	**3.7**	[0.8 - 10.3]					19.5	3.7	1.2	9.8	42.7	19.5	**3.7**								
Phenicols																							
Chloramphenicol	*faecalis*	0.0	**0.7**	[0.1 - 2.7]									43.5	55.8		**0.4**	**0.4**						
	faecium	0.0	**0.0**	[0.0 - 4.4]									76.8	23.2									
Quinolones																							
Ciprofloxacin	*faecalis*	49.4	**0.0**	[0.0 - 1.4]						3.4	47.2	49.4											
	faecium	24.4	**17.1**	[9.7 - 27.0]					3.7	12.2	42.7	24.4	**13.4**	**3.7**									
Streptogramins																							
Quinupristin-	*faecalis*[5]																						
Dalfopristin	*faecium*	64.6	**11.0**	[5.1 - 19.8]						19.5	4.9	64.6	**11.0**										
Tetracyclines																							
Tetracycline	*faecalis*	0.0	**18.2**	[13.8 - 23.4]							81.8				**0.4**	**0.7**	**17.1**						
	faecium	0.0	**22.0**	[13.6 - 32.5]							78.1					**1.2**	**20.7**						

[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] 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, 2011

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	**0.9**	[0.2 - 2.6]														99.1				**0.9**	
	faecium	N/A	**100.0**	[90.5 - 100.0]														100.0					
Kanamycin	*faecalis*	N/A	**2.4**	[1.0 - 4.7]														97.3	0.3			**2.4**	
	faecium	N/A	**5.4**	[0.7 - 18.2]														83.8	10.8			**5.4**	
Streptomycin	*faecalis*	N/A	**5.7**	[3.5 - 8.7]																94.3			**5.7**
	faecium	N/A	**5.4**	[0.7 - 18.2]																94.6	**2.7**	**2.7**	
Glycopeptides																							
Vancomycin	*faecalis*	0.0	**0.0**	[0.0 - 1.1]						0.3	61.4	36.8	1.5										
	faecium	0.0	**0.0**	[0.0 - 9.5]						89.2	10.8												
Glycylcycline																							
Tigecycline	*faecalis*	N/A	**0.3**	[0.0 - 1.7]		4.5	34.1	50.6	10.5	0.3													
	faecium	N/A	**0.0**	[0.0 - 9.5]		13.5	48.7	29.7	8.1														
Lincosamides																							
Lincomycin	*faecalis*	0.0	**97.0**	[94.6 - 98.6]							3.0				**97.0**								
	faecium	5.4	**73.0**	[55.9 - 86.2]							18.9	2.7	5.4	**32.4**	**40.5**								
Lipopeptides																							
Daptomycin	*faecalis*	N/A	**0.0**	[0.0 - 1.1]					0.3	4.2	53.6	41.6	0.3										
	faecium	N/A	**0.0**	[0.0 - 9.5]						2.7	13.5	59.5	24.3										
Macrolides																							
Erythromicin	*faecalis*	73.7	**4.5**	[2.5 - 7.3]					12.0	9.9	41.0	24.3	8.4		**4.5**								
	faecium	89.1	**10.8**	[3.0 - 25.4]							21.6	43.2	24.3	**2.7**	**8.1**								
Tylosin	*faecalis*	0.0	**4.8**	[2.8 - 7.7]						1.2	34.4	58.7	0.9				**4.8**						
	faecium	0.0	**5.4**	[0.7 - 18.2]							8.1	24.3	35.1	27.0			**5.4**						
Nitrofurans																							
Nitrofurantoin	*faecalis*	0.0	**0.0**	[0.0 - 1.1]									0.3	24.9	74.3	0.6							
	faecium	81.1	**18.9**	[8.0 - 35.2]													81.1	**18.9**					
Oxazolidinones																							
Linezolid	*faecalis*	0.0	**0.0**	[0.0 - 1.1]							76.4	23.7											
	faecium	0.0	**0.0**	[0.0 - 9.5]							67.6	32.4											
Penicillins																							
Penicillin	*faecalis*	N/A	**0.0**	[0.0 - 1.1]							0.3	24.9	74.6	0.3									
	faecium	N/A	**2.7**	[0.1 - 14.2]					35.1		13.5	18.9	24.3	5.4	**2.7**								
Phenicols																							
Chloramphenicol	*faecalis*	0.0	**0.9**	[0.2 - 2.6]									56.6	42.5		**0.3**	**0.6**						
	faecium	0.0	**2.7**	[0.1 - 14.2]									86.5	10.8		**2.7**							
Quinolones																							
Ciprofloxacin	*faecalis*	33.2	**0.3**	[0.0 - 1.7]						6.3	60.2	33.2	**0.3**										
	faecium	43.2	**10.8**	[3.0 - 25.4]						10.8	35.1	43.2	**10.8**										
Streptogramins																							
Quinupristin-	*faecalis*[5]																						
Dalfopristin	*faecium*	59.5	**13.5**	[4.5 - 28.8]						8.1	18.9	59.5	**13.5**										
Tetracyclines																							
Tetracycline	*faecalis*	0.0	**79.3**	[74.6 - 83.6]							20.4	0.3				**3.6**	**75.8**						
	faecium	0.0	**48.6**	[31.9 - 65.6]							51.4					**2.7**	**46.0**						

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

Table 25. *Escherichia coli* by Meat Type, 2002-2011

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%	471	295	62.6%	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%	360	146	40.6%
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%
Total	4288	3507	81.8%	4242	3455	81.4%	4291	2792	65.1%	4300	1795	41.7%

Figure 12. Percent of Retail Meat Samples Culture Positive for *Escherichia coli* , 2002-2011

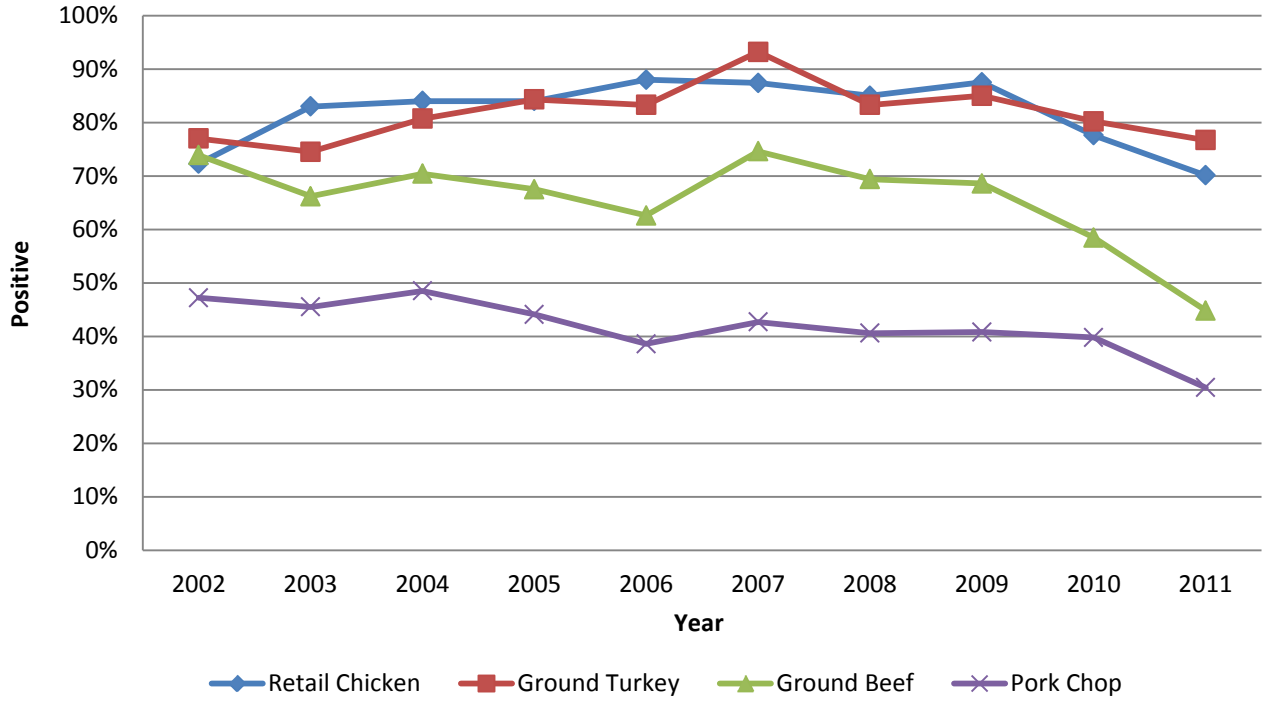


Table 26. Trends in Antimicrobial Resistance among *Escherichia coli* by Meat Type, 2002-2011[1]

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 ≥ 4)	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%	–	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%	0.3%	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%
	P-value[4]	0.0375	0.2095	<0.0001	0.7749	0.0037	0.0253	0.0417	0.6831	0.3115	N/A	0.8219	0.5444	0.1929	0.0280	<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%	–	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%
	P-value	<0.0001	<0.0001	0.1378	<0.0001	<0.0001	<0.0001	<0.0001	0.0841	0.0134	N/A	<0.0001	0.0071	0.3992	<0.0001	0.8279
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%	–	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%
	P-value	0.8506	0.7576	0.2607	0.0213	0.1012	0.6281	0.8998	0.6950	0.0306	N/A	0.2778	0.9515	N/A	0.0896	0.0041
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%
	P-value	0.0477	0.0895	0.2094	0.0105	0.1461	0.2000	0.2765	0.2305	0.2315	N/A	0.6262	0.7389	N/A	0.4151	0.0682

[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 Chicken Breast and Ground Turkey, 2002-2011

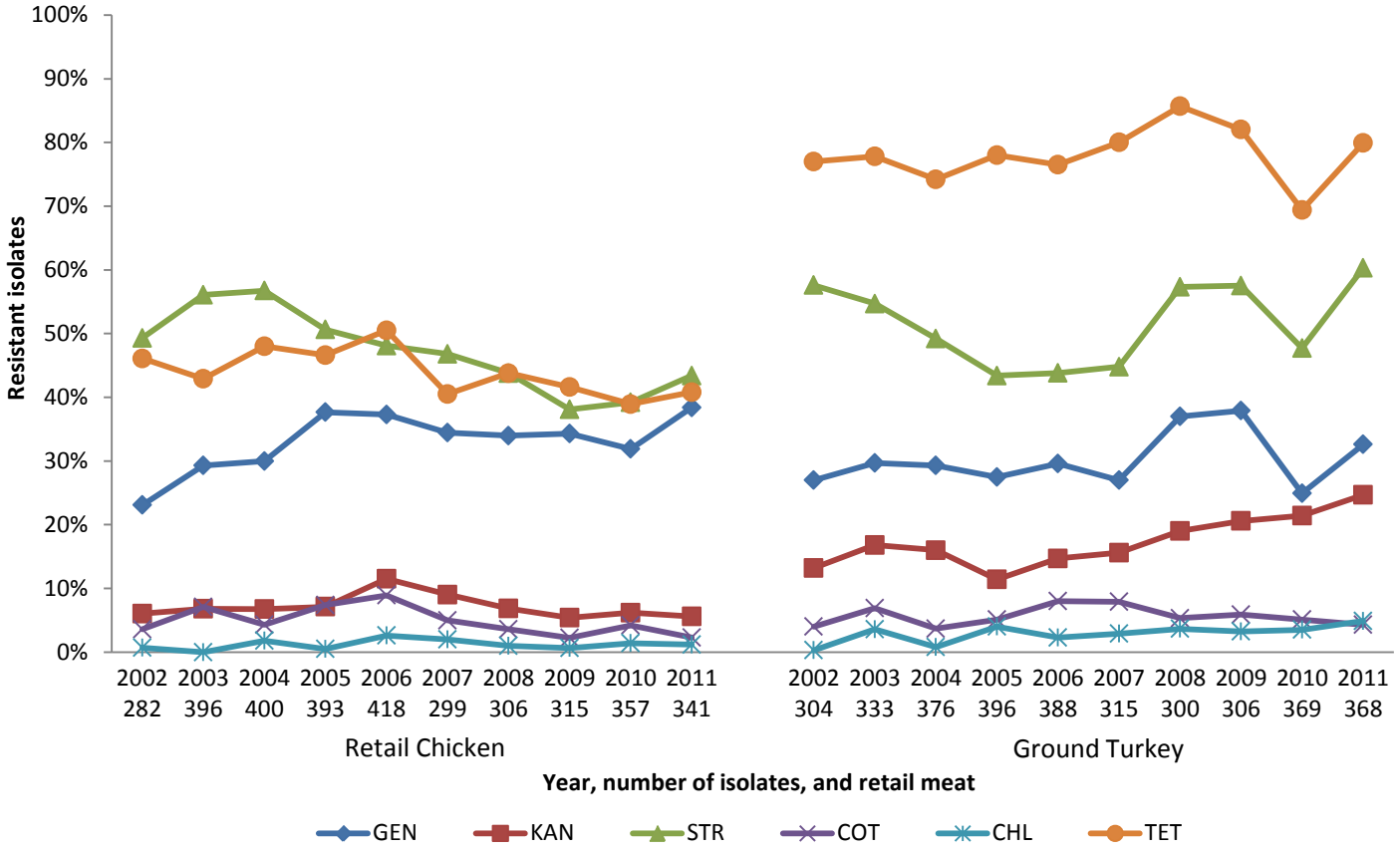


Figure 14. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Ground Beef and Pork Chop, 2002-2011

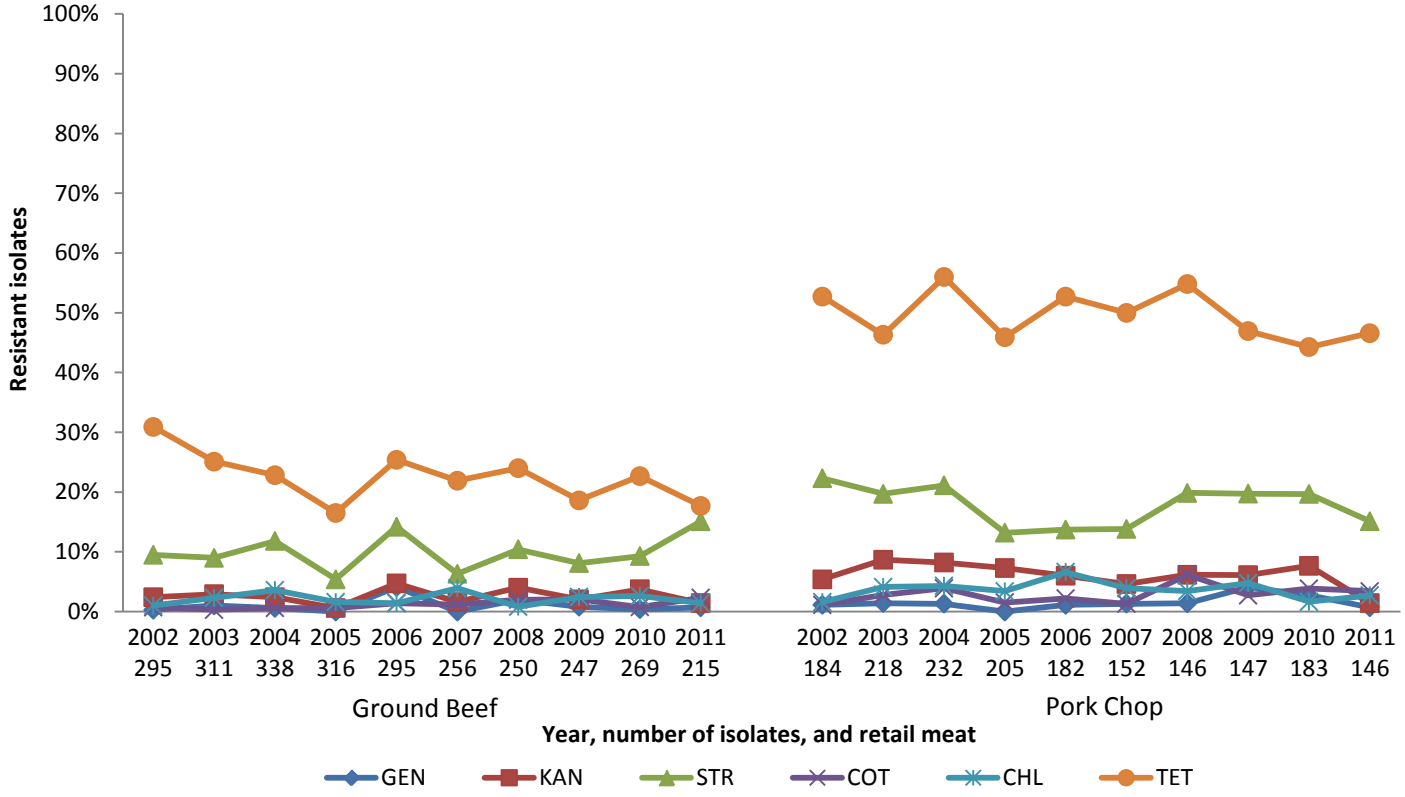


Figure 15. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Retail Chicken and Ground Turkey, 2002-2011

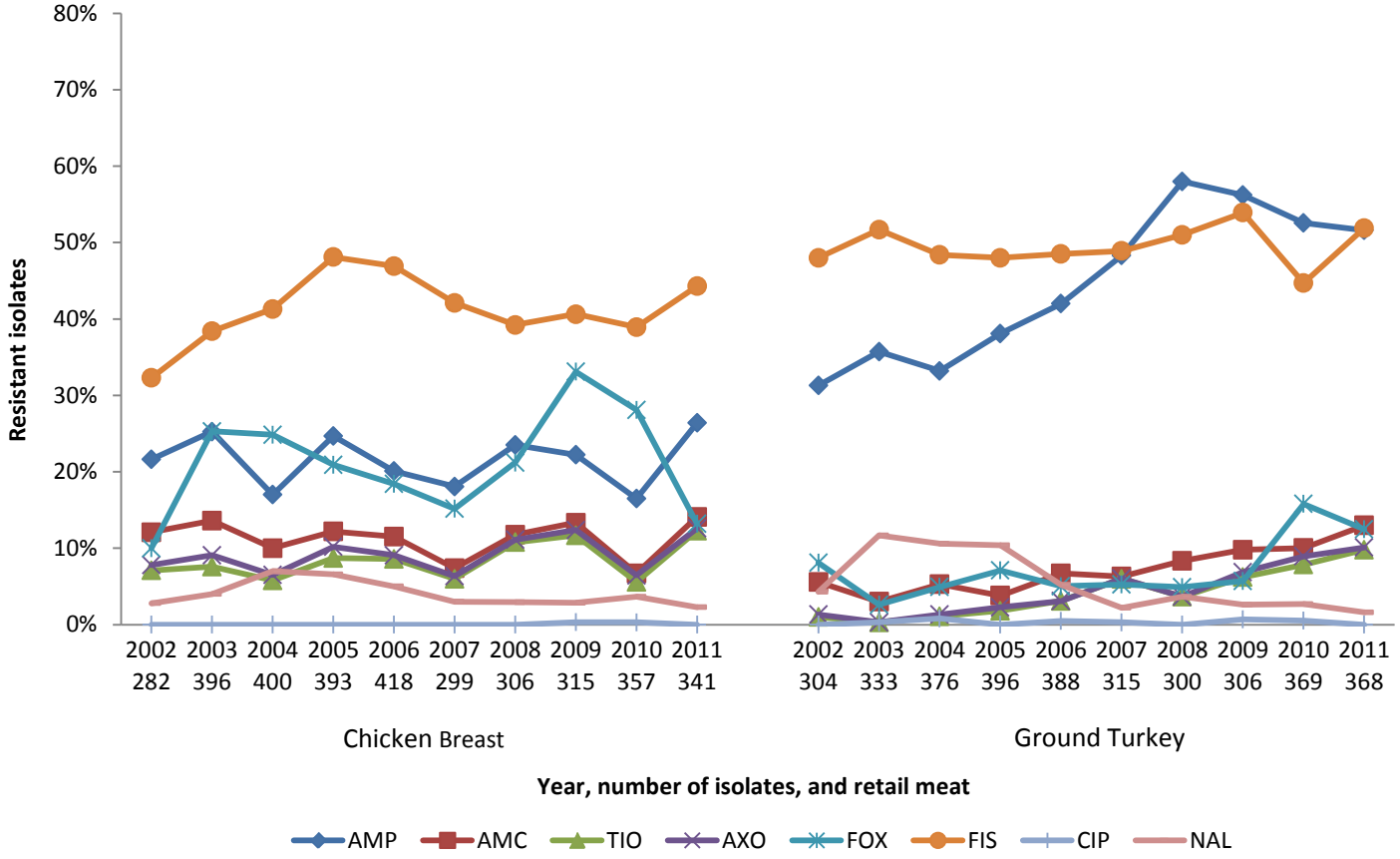


Figure 16. Temporal Variation in Resistance to Selected Antimicrobials in *Escherichia coli* Isolates from Ground Beef and Pork Chop, 2002-2011

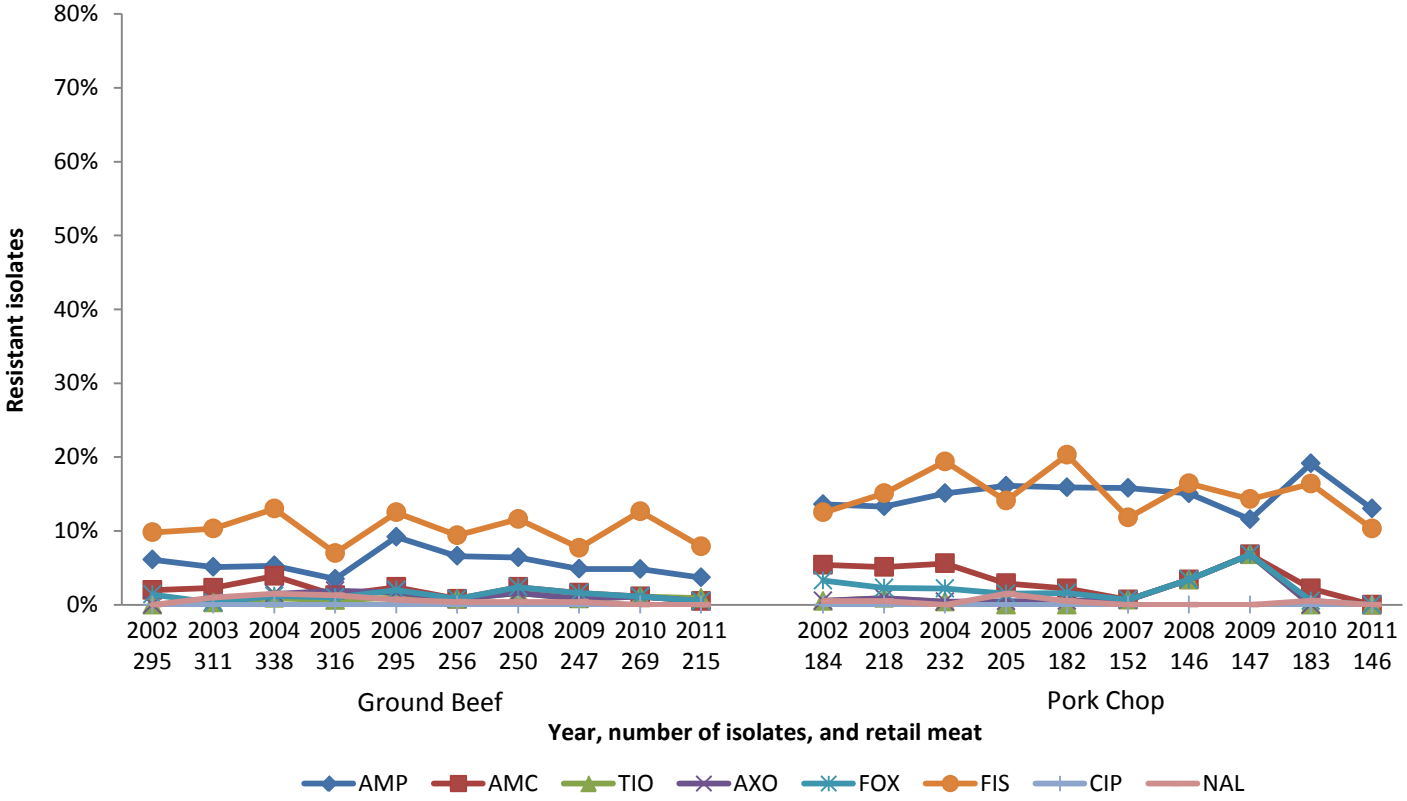


Table 27. Multidrug Resistance Patterns among *Escherichia coli* Isolates by Year, 2002-2011[1]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested by Source	Retail Chicken	282	396	400	393	418	299	306	315	357	341
	Ground Turkey	304	333	376	397	388	315	300	306	369	368
	Ground Beef	295	311	338	316	295	256	250	247	269	215
	Pork Chop	184	218	232	205	182	152	146	147	183	146
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
	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
	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	–
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	–
	Ground Beef	–	–	–	0.3% 1	0.3% 1	–	–	–	–	–
	Pork Chop	0.5% 1	–	0.4% 1	0.5% 1	–	–	–	0.7% 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
	Ground Turkey	–	0.3% 1	–	0.3% 1	–	1.3% 4	1.3% 4	1.0% 3	1.1% 4	2.2% 8
	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	–	–
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	–
	Ground Turkey	0.3% 1	0.3% 1	0.3% 1	0.3% 1	–	0.6% 2	–	–	–	0.3% 1
	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, 2002-2011[1,2]

Year		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Isolates Tested by Source	Retail Chicken	282	396	400	393	418	299	306	315	357	341
	Ground Turkey	304	333	376	396	388	315	300	306	369	368
	Ground Beef	295	311	338	316	295	256	250	247	269	215
	Pork Chop	184	218	232	205	182	152	146	147	183	146
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
	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
	Ground Beef	64.4% 190	70.7% 220	73.1% 247	80.4% 254	71.5% 211	77.0% 197	73.2% 183	78.1% 193	76.6% 206	79.5% 171
	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
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
	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
	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
	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
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
	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
	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
	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. 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
	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
	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
	Pork Chop	3.3% 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	–
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
	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
	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	–
	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	–

[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, 2002-2011

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**					
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**			
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**			
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**				
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**						
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**					
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**				

[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 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 plates used to test isolates. 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, 2002-2011 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**	
Trimethoprim-	2002 (282)	N/A	**3.5**	[1.7 - 6.4]				82.6	6.4	6.0	0.4	1.1		**3.6**							
Sulfamethoxazole	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**							
Macrolides																					
Azithromycin	2011 (341)	N/A	**0.0**	[0.0 - 1.1]						0.3	0.9	22.0	71.0	5.9							
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**				
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**				
Quinolones																					
Ciprofloxacin	2002 (282)	0.4	**0.0**	[0.0 - 1.3]	90.4	6.4	0.4	0.4	1.4	0.4	0.4	0.4									
	2003 (396)	0.0	**0.0**	[0.0 - 0.9]	92.9	3.0		2.3	1.5	0.3											
	2004 (400)	0.0	**0.0**	[0.0 - 0.9]	90.3	2.3	0.5	1.7	4.0	1.2											
	2005 (393)	0.0	**0.0**	[0.0 - 0.9]	84.2	4.8	2.3	3.8	4.6	0.3											
	2006 (418)	0.0	**0.0**	[0.0 - 0.9]	93.3	1.7	0.2	1.2	2.9	0.7											
	2007 (299)	0.0	**0.0**	[0.0 - 1.2]	96.7	0.3		1.0	1.7	0.3											
	2008 (306)	0.0	**0.0**	[0.0 - 1.2]	93.8	2.9		0.3	2.6	0.3											
	2009 (315)	0.0	**0.3**	[0.0 - 1.8]	96.5	0.3	0.3	0.3	2.2					**0.3**							
	2010 (357)	0.0	**0.3**	[0.0 - 1.6]	95.0	1.4		0.6	2.5		0.3			**0.3**							
	2011 (341)	0.0	**0.0**	[0.0 - 1.1]	96.8	0.6		1.2	1.5												
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**				
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**				

[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 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 plates used to test isolates. 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, 2002-2011

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**					
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**			
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**			
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**				
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**						
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**					
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**				

[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 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 plates used to test isolates. 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, 2002-2011 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**	
Trimethoprim-Sulfamethoxazole	2002 (304)	N/A	**3.9**	[0.0 - 7.3]				77.3	13.5	4.9	0.3			**4.0**							
	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**							
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**					
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**				
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**				
Quinolones																					
Ciprofloxacin	2002 (304)	0.0	**0.0**	[0.0 - 4.9]	90.1	5.6		1.0	2.3	0.3	0.7										
	2003 (333)	0.0	**0.3**	[0.0 - 3.2]	83.5	3.9	0.6	4.2	6.3	1.2				**0.3**							
	2004 (376)	0.0	**0.8**	[0.0 - 2.6]	84.3	3.5	0.8	2.9	7.4	0.3				**0.8**							
	2005 (396)	0.0	**0.0**	[0.0 - 2.0]	81.3	4.8	1.3	4.0	8.6												
	2006 (388)	0.0	**0.5**	[0.0 - 2.3]	91.8	2.6	0.3	2.1	2.3	0.5				**0.5**							
	2007 (315)	0.0	**0.3**	[0.0 - 1.8]	96.5	1.3		1.0	1.0					**0.3**							
	2008 (300)	0.0	**0.0**	[0.0 - 1.2]	92.7	3.3		0.3	3.7												
	2009 (306)	0.0	**0.7**	[0.1 - 2.3]	93.8	3.6		0.3	1.6				**0.3**	**0.3**							
	2010 (369)	0.0	**0.5**	[0.1 - 1.9]	94.6	2.4		0.3	2.2				**0.3**	**0.3**							
	2011 (368)	0.0	**0.0**	[0.0 - 1.0]	95.4	2.7	0.3	1.6													
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**				
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**				

[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 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 plates used to test isolates. 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, 2002-2011

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**						
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**			
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**			
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**					
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**						
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**						
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**				

[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 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 plates used to test isolates. 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, 2002-2011 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**	
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**							
Macrolides																					
Azithromycin	2011 (215)	N/A	**0.0**	[0.0 - 1.7]							0.5	12.6	69.3	17.2	0.5						
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**				
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**				
Quinolones																					
Ciprofloxacin	2002 (295)	0.0	**0.0**	[0.0 - 1.2]	95.3	4.8															
	2003 (311)	0.0	**0.0**	[0.0 - 1.2]	95.5	3.5		0.6	0.3												
	2004 (338)	0.0	**0.0**	[0.0 - 1.1]	94.4	3.8		0.6	0.9	0.3											
	2005 (316)	0.0	**0.0**	[0.0 - 1.2]	90.2	4.1	1.9	2.2	1.3		0.3										
	2006 (295)	0.0	**0.0**	[0.0 - 1.2]	98.0	1.4		0.3	0.3												
	2007 (256)	0.0	**0.0**	[0.0 - 1.4]	99.2				0.8												
	2008 (250)	0.0	**0.0**	[0.0 - 1.5]	97.6	2.0			0.4												
	2009 (247)	0.0	**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																
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							
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**				

[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 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 plates used to test isolates. 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, 2002-2011

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**						
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**			
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**			
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							
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											
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												
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							

[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 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 plates used to test isolates. 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, 2002-2011 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**	
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**							
Macrolides																					
Azithromycin	2011 (146)	N/A	**0.0**	[0.0 - 2.5]							2.7	21.2	61.6	13.7	0.7						
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**				
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**				
Quinolones																					
Ciprofloxacin	2002 (184)	0.0	**0.0**	[0.0 - 2.0]	96.2	2.7	1.1														
	2003 (218)	0.0	**0.0**	[0.0 - 1.7]	96.3	3.2			0.5												
	2004 (232)	0.0	**0.0**	[0.0 - 1.6]	97.8	0.9	0.4	0.4	0.4												
	2005 (205)	0.0	**0.0**	[0.0 - 1.8]	91.2	4.9	1.0	2.4	0.5												
	2006 (182)	0.0	**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)	0.0	**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																
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								
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**				

[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 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 plates used to test isolates. 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 30. Other Resistance among all Ceftiofur/Ceftriaxone Resistant *Escherichia coli* (Surveillance for ESBL-producing isolates), 2011

Antimicrobial	Isolate Source (# of Isolates)	%I [1]	%R [2]	[95% CI] [3]	Distribution (%) of MICs (µg/ml) [4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
β-Lactam/β-Lactamase Inhibitor Combinations																					
Piperacillin-tazobactam	Retail Chicken (43)	0.0	**0.0**	[0.0 - 8.2]							2.3	37.2	58.1	2.3							
	Ground Turkey (37)	0.0	**0.0**	[0.0 - 9.5]								35.1	51.4	13.5							
	Ground Beef (3)	0.0	**0.0**	[0.0 - 70.8]								66.7	33.3								
	Pork Chop (0)	N/A	**N/A**	N/A																	
Penems																					
Imipenem	Retail Chicken (43)	0.0	**0.0**	[0.0 - 8.2]				65.1	30.2	4.7											
	Ground Turkey (37)	0.0	**0.0**	[0.0 - 9.5]				59.5	37.8	2.7											
	Ground Beef (3)	0.0	**0.0**	[0.0 - 70.8]				100.0													
	Pork Chop (0)	N/A	**N/A**	N/A																	
Cephems																					
Cefepime	Retail Chicken (43)	0.0	**0.0**	[0.0 - 100.0]				23.3	65.1	11.6											
	Ground Turkey (37)	0.0	**0.0**	[0.0 - 100.0]				8.1	64.9	27.0											
	Ground Beef (3)	0.0	**0.0**	[0.0 - 100.0]			66.7		33.3												
	Pork Chop (0)	N/A	**N/A**	N/A																	
Cefotaxime	Retail Chicken (43)	20.9	**97.7**	[87.7 - 99.9]								2.3	**4.7**	**72.1**	**20.9**						
	Ground Turkey (37)	32.4	**100.0**	[90.5 - 100.0]									**13.5**	**54.1**	**32.4**						
	Ground Beef (3)	0.0	**33.3**	[0.8 - 90.6]			66.7							**33.3**							
	Pork Chop (0)	N/A	**N/A**	N/A																	
Ceftazidime	Retail Chicken (43)	25.6	**72.1**	[56.3 - 84.7]									2.3	25.6	**65.1**	**7.0**					
	Ground Turkey (37)	24.3	**73.0**	[55.9 - 86.2]									2.7	24.3	**59.5**	**13.5**					
	Ground Beef (3)	0.0	**33.3**	[0.8 - 90.6]				66.7							**33.3**						
	Pork Chop (0)	N/A	**N/A**	N/A																	
Monobactam																					
Aztreonam	Retail Chicken (43)	46.5	**0.0**	[0.0 - 24.3]							2.3	2.3	48.8	46.5							
	Ground Turkey (37)	48.6	**5.4**	[0.7 - 43.8]								5.4	40.5	48.6	**5.4**						
	Ground Beef (3)	33.3	**0.0**	[0.0 - 78.4]			66.7							33.3							
	Pork Chop (0)	N/A	**N/A**	N/A																	

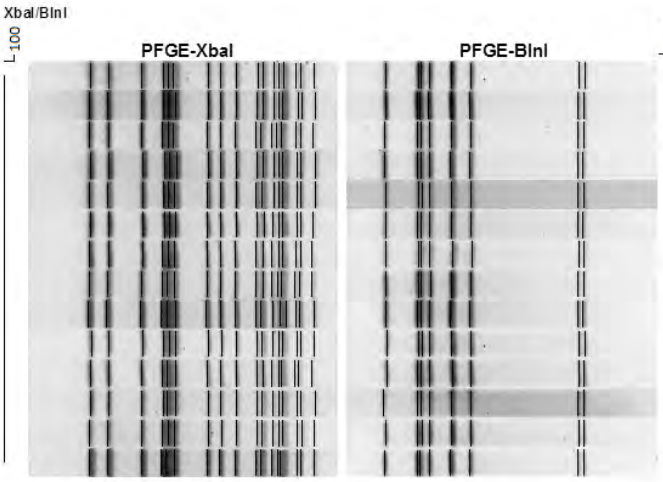
[1] Percent of isolates with intermediate susceptibility

[2] 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

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

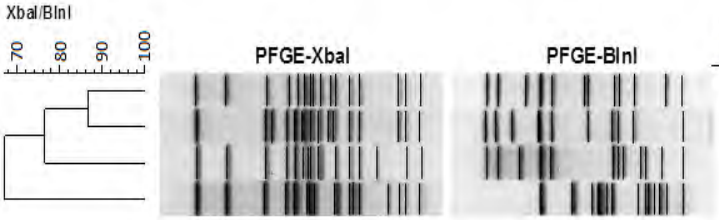
[4] The unshaded areas indicate tthe range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded areas indicate the percentages of isolates with MICs greater 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* IIIa 18:z4,z32:-



	AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO	CVM #	State	Source	Date Isolated	Serotype
N29301			■													N29301	CA	Ground Turkey	01/11	IIIa 18:z4,z32:-
N29306																N29306	CA	Ground Turkey	03/11	IIIa 18:z4,z32:-
N29347																N29347	OR	Ground Turkey	03/11	IIIa 18:z4,z32:-
N29354		■									■		■			N29354	CA	Ground Turkey	04/11	IIIa 18:z4,z32:-
N29355		■									■		■			N29355	CA	Ground Turkey	04/11	IIIa 18:z4,z32:-
N31389																N31389	CA	Ground Turkey	08/11	IIIa 18:z4,z32:-
N31390																N31390	CA	Ground Turkey	08/11	IIIa 18:z4,z32:-
N31597		■			■				■		■					N31597	OR	Ground Turkey	08/11	IIIa 18:z4,z32:-
N31835																N31835	CO	Ground Turkey	05/11	IIIa 18:z4,z32:-
N32747																N32747	CA	Ground Turkey	09/11	IIIa 18:z4,z32:-
N32748																N32748	CA	Ground Turkey	10/11	IIIa 18:z4,z32:-
N32767																N32767	NM	Ground Turkey	08/11	IIIa 18:z4,z32:-
N37901																N37901	CO	Chicken Breast :	09/11	IIIa 18:z4,z32:-
N37930																N37930	NM	Ground Turkey	12/11	IIIa 18:z4,z32:-

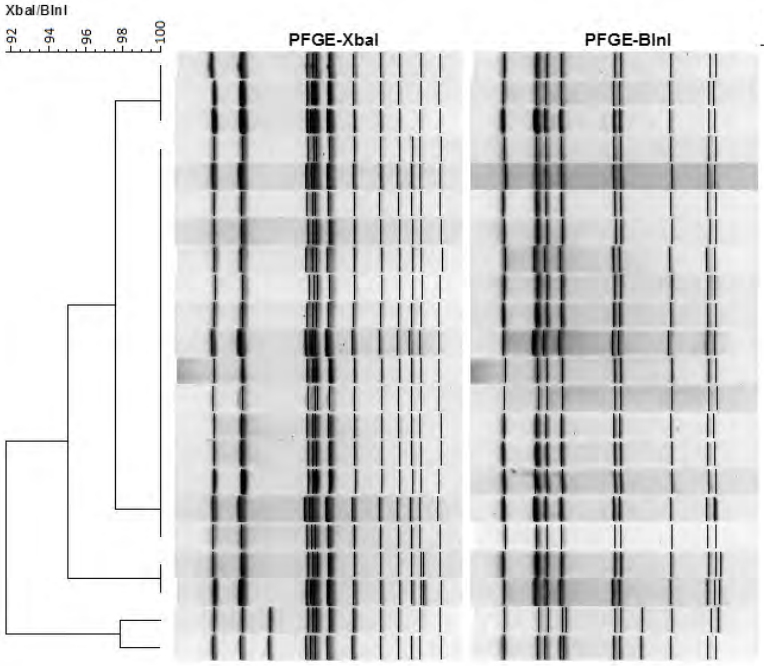
A-1d. PFGE Profiles for *Salmonella* Derby



Antibiogram

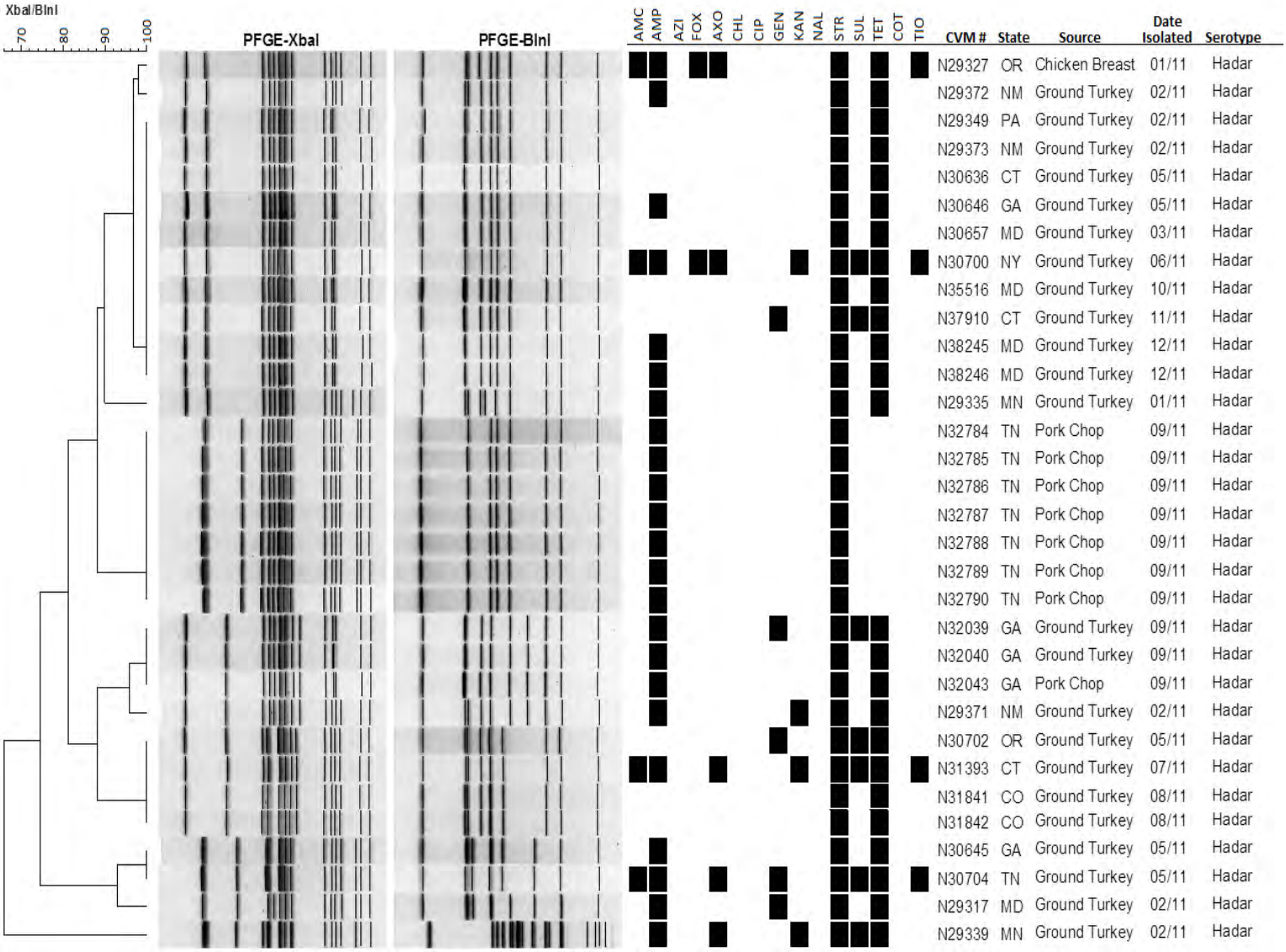
	AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO	CVM #	State	Source	Date Isolated	Serotype
N30705								■			■	■	■			N30705	TN	Ground Turkey	05/11	Derby
N31416								■			■	■	■			N31416	TN	Ground Turkey	08/11	Derby
N30679																N30679	NM	Pork Chop	05/11	Derby
N37937													■			N37937	NY	Pork Chop	10/11	Derby

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

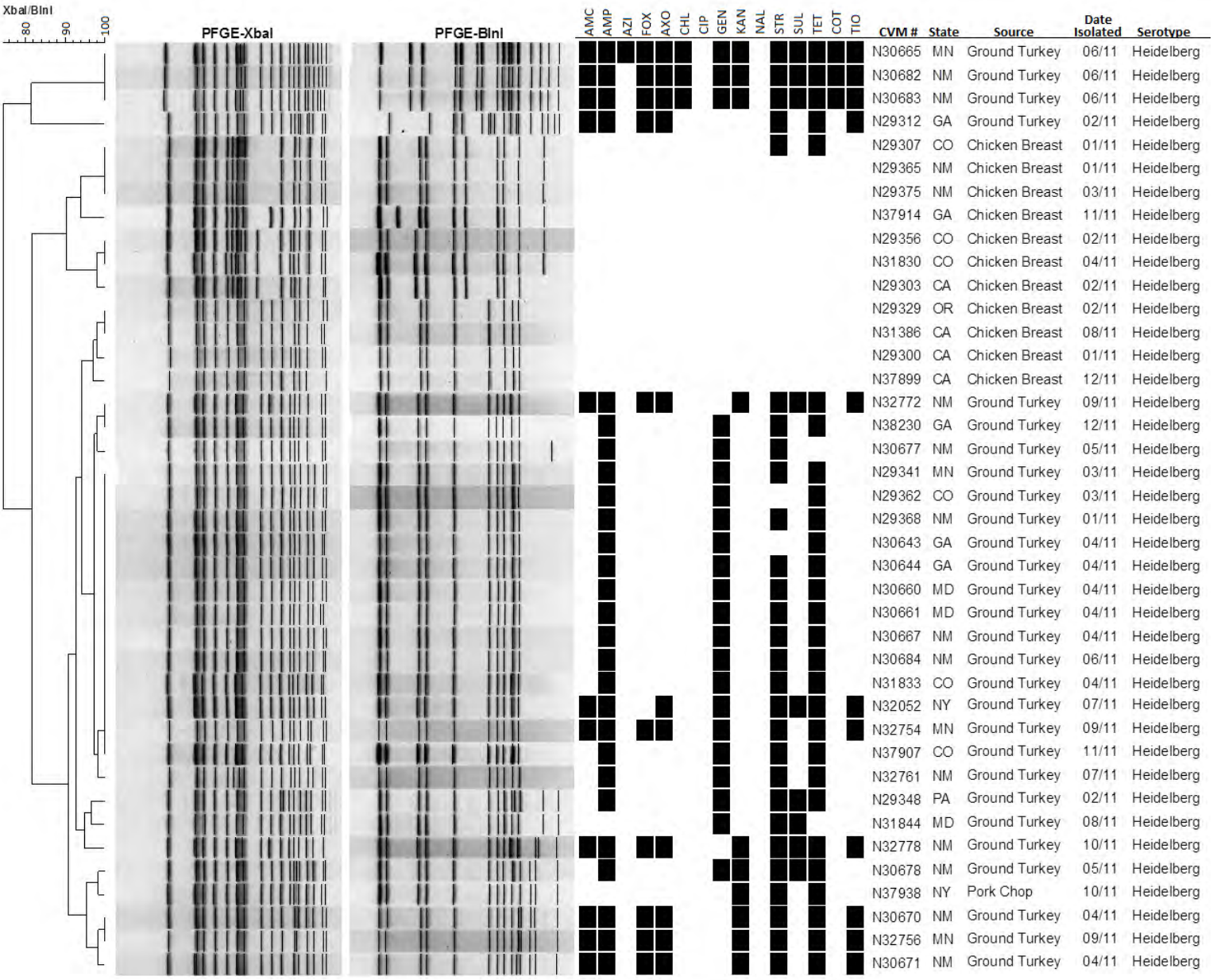


	AMC	AMP	AZI	FOX	AXO	CHL	CIP	GEN	KAN	NAL	STR	SUL	TET	COT	TIO	CVM #	State	Source	Date Isolated	Serotype
N30639											■		■			N30639	GA	Chicken Breast	04/11	Enteritidis
N37920																N37920	MN	Chicken Breast	11/11	Enteritidis
N37947																N37947	OR	Chicken Breast	12/11	Enteritidis
N29328																N29328	OR	Chicken Breast	01/11	Enteritidis
N29358																N29358	CO	Chicken Breast	03/11	Enteritidis
N29385																N29385	OR	Ground Turkey	04/11	Enteritidis
N30659																N30659	MD	Chicken Breast	04/11	Enteritidis
N30675																N30675	NM	Chicken Breast	05/11	Enteritidis
N31396																N31396	GA	Chicken Breast	07/11	Enteritidis
N31397																N31397	GA	Chicken Breast	07/11	Enteritidis
N31405													■			N31405	OR	Chicken Breast	07/11	Enteritidis
N32062																N32062	PA	Chicken Breast	08/11	Enteritidis
N32752																N32752	MN	Chicken Breast	09/11	Enteritidis
N37902																N37902	CO	Chicken Breast	10/11	Enteritidis
N37904																N37904	CO	Chicken Breast	10/11	Enteritidis
N37924																N37924	NM	Chicken Wing	11/11	Enteritidis
N37936		■									■	■	■			N37936	NY	Chicken Breast	10/11	Enteritidis
N38233																N38233	MD	Chicken Breast	11/11	Enteritidis
N30658																N30658	MD	Chicken Breast	04/11	Enteritidis
N30691																N30691	NY	Chicken Breast	05/11	Enteritidis
N31380		■									■	■	■			N31380	CA	Chicken Breast	06/11	Enteritidis
N37909																N37909	CT	Chicken Breast	11/11	Enteritidis

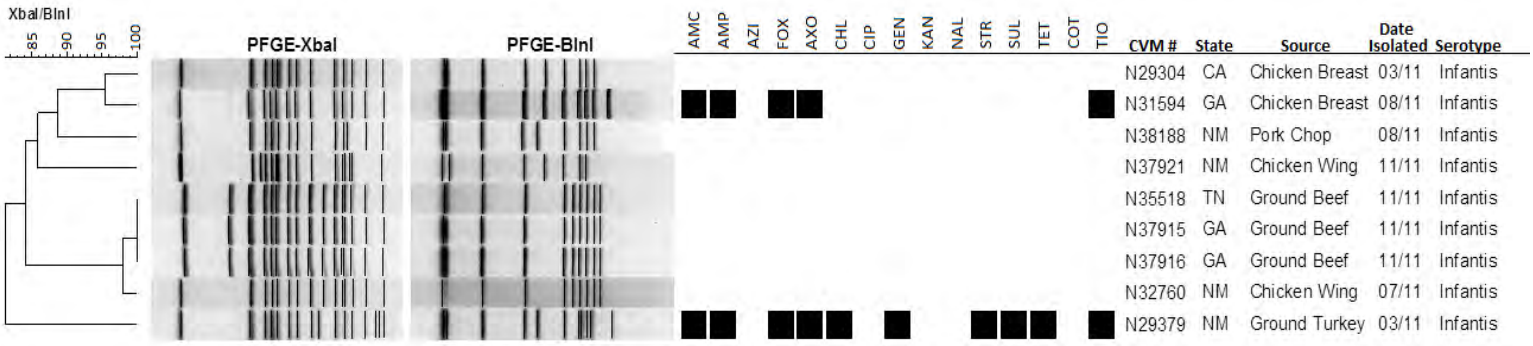
A-1f. PFGE Profiles for *Salmonella* Hadar



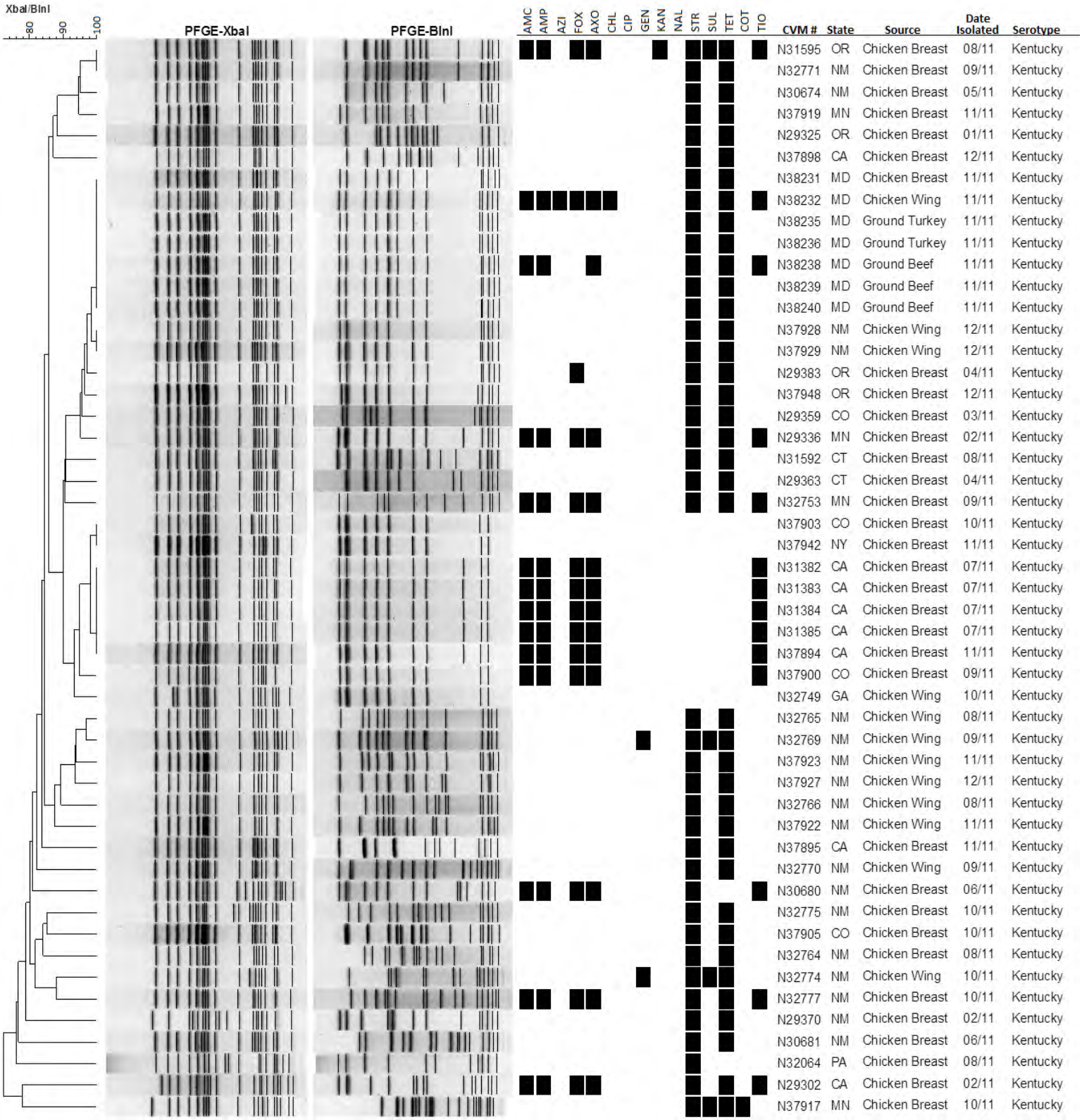
A-1g. PFGE Profiles for *Salmonella* Heidelberg



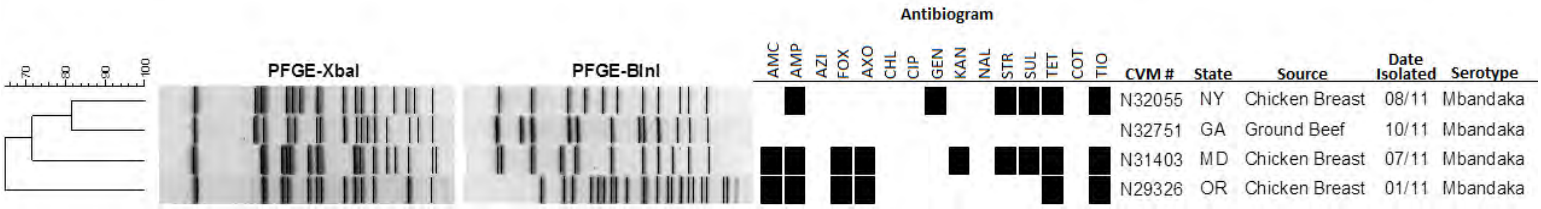
A-1h. PFGE Profiles for *Salmonella* Infantis



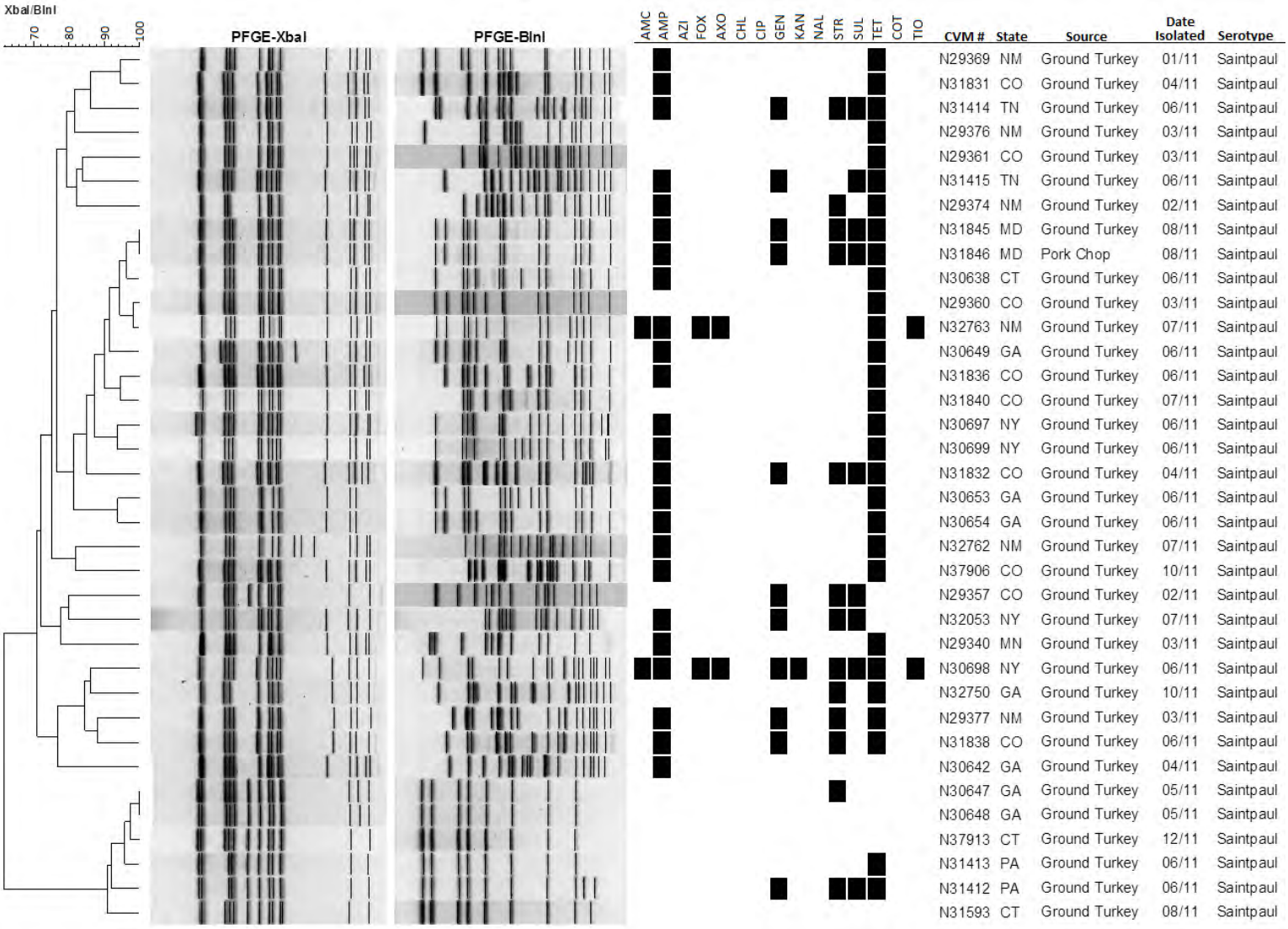
A-1i. PFGE Profiles for *Salmonella* Kentucky



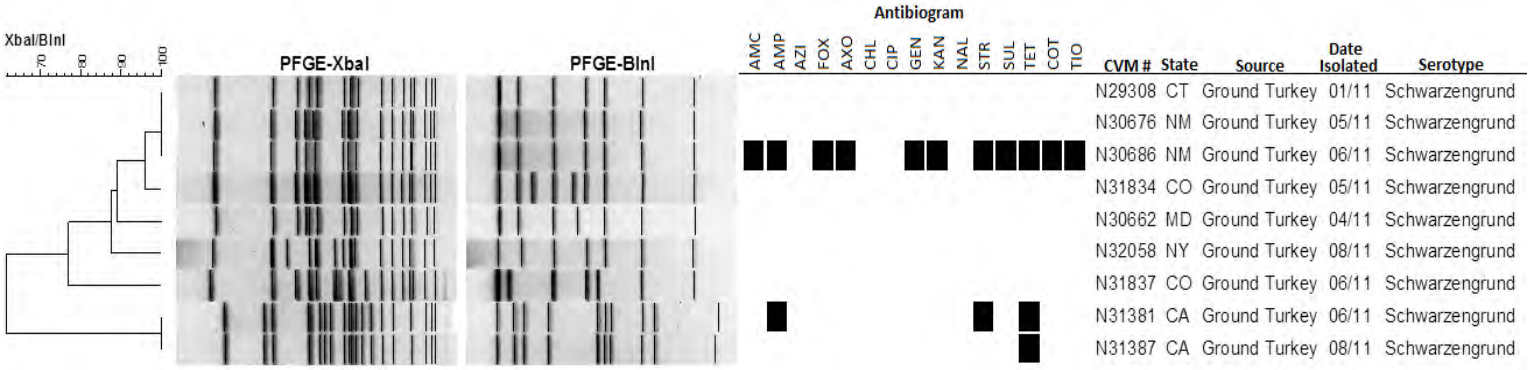
A-1j. PFGE Profiles for *Salmonella* Mbandaka



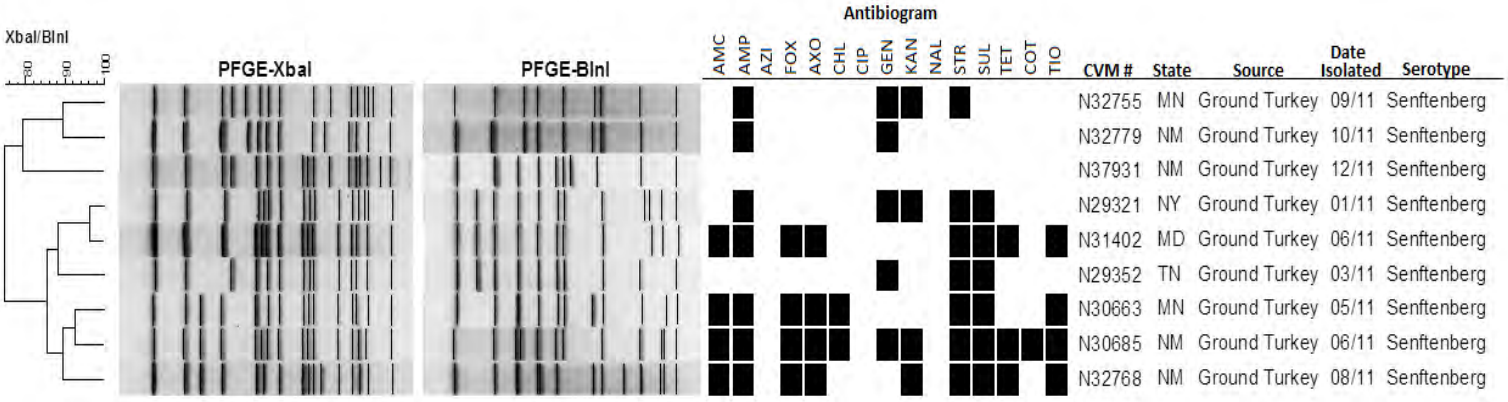
A-1k. PFGE Profiles for *Salmonella* Saintpaul



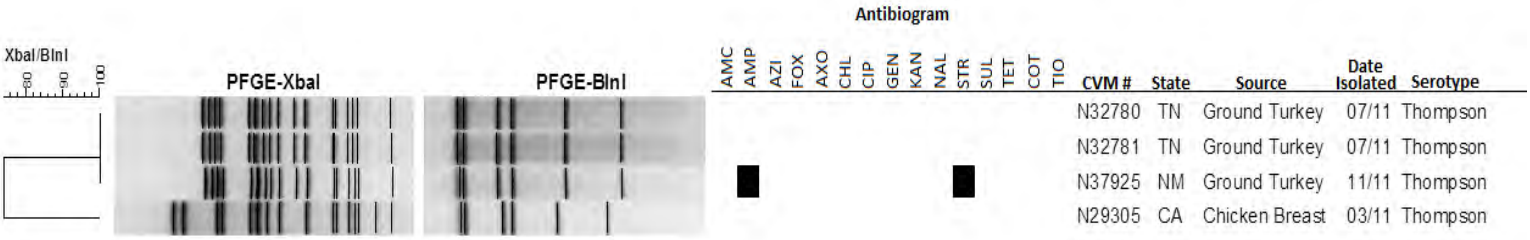
A-1l. PFGE Profiles for *Salmonella* Schwarzengrund



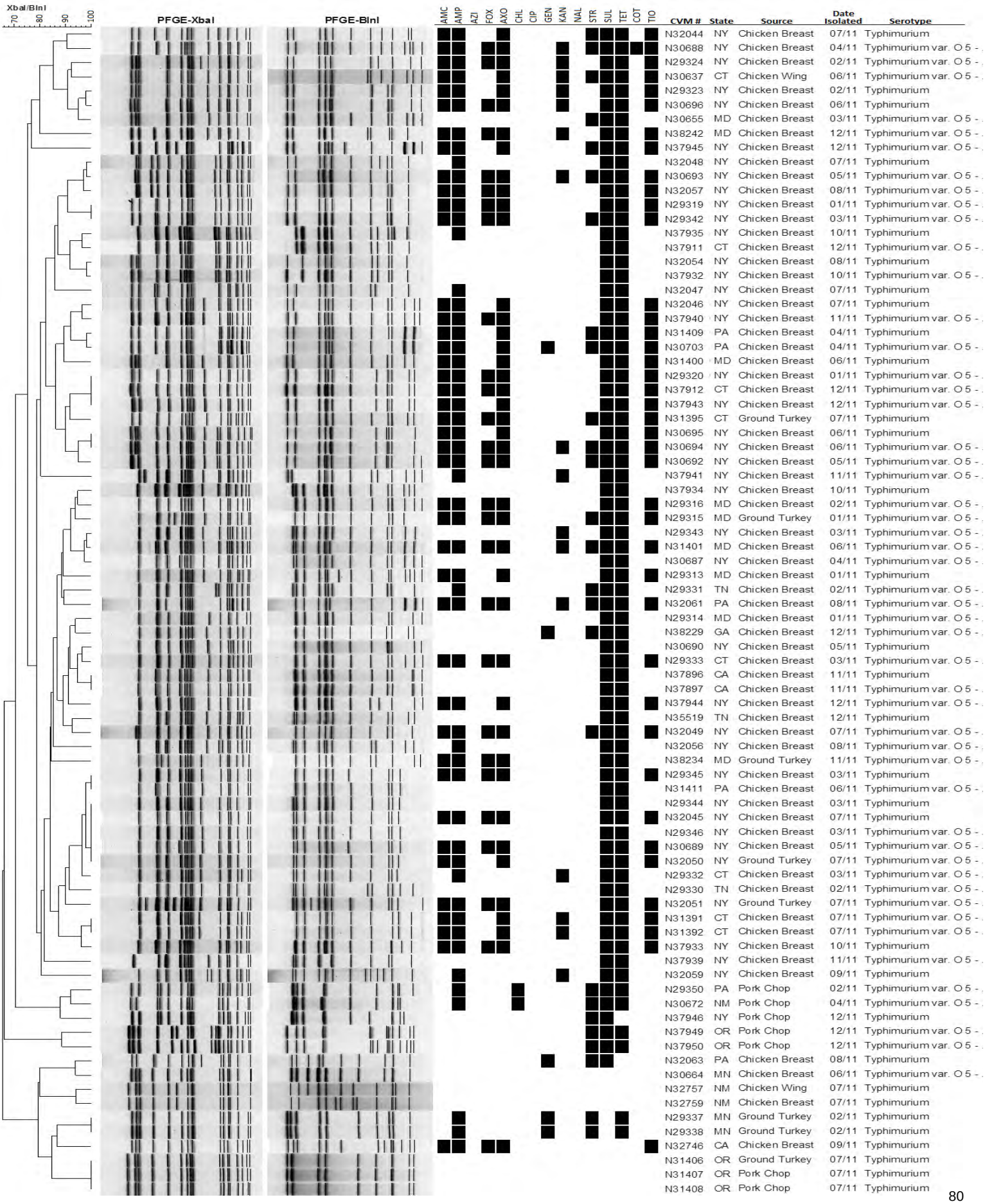
A-1m. PFGE Profiles for *Salmonella* Senftenberg



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



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



A2. NARMS Retail Meat Log Sheet Example

State	
Month	
Year	

Completed by (Initials): ____

Received Date ____ (CVM USE ONLY)

Click to email logsheet

Send original log sheet with isolates to CVM and CDC.

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 (CA) 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 2011) 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 CA method, but also increase the validity of the model by allowing us to deal with any sampling differences that may occur among the 11 participating public health laboratories.